Bengal Journal of Otolaryngology and Head Neck Surgery

Official Publication of The Association of Otolaryngologists of India, West Bengal

Volume 27 No. 3 - December, 2019

This journal is indexed in Index Copernicus, Google Scholar, OCLC WorldCat, WHO Hinari, OAIster, BASE, JournalTOCS, OAJI, EZB and listed in AcademicKeys. It is also registered in the OAI database of conforming repositories.

p-ISSN: 2395-2393
e-ISSN: 2395-2407
RNI No.: 62551/95

CONTENTS

Bengal Journal of Otolaryngology and Head Neck Surgery
(Incorporating and directly descended from State Journal of Otolaryngology and Otolaryngology, Calcutta)

Published by
The Association of Otolaryngologists of India, West Bengal
CMC House, 91B Chittaranjan Avenue,
Kolkata - 700073,
West Bengal,
India.

Copyright Notice

Legal Disclaimer

Correspondence
Dr Saumendra Nath Bandyopadhyay
Editor
Bengal Journal of Otolaryngology and Head Neck Surgery
C/O The Association of Otolaryngologists of India, West Bengal
CMC House, 91B Chittaranjan Avenue, Kolkata - 700073
Email: editor@bjohns.in

Bengal Journal of Otolaryngology and Head Neck Surgery

Official Publication of The Association of Otolaryngologists of India, West Bengal

Volume 27 No. 3 - December, 2019

This journal is indexed in Index Copernicus, Google Scholar, OCLC WorldCat, WHO Hinari, OAIster, BASE, abcGATE, CiteFactor, SIS, JournalTOCS, OAJI, EZB and listed in AcademicKeys and UIUC Repository. It is also registered in the OAI database of conforming repositories.

p-ISSN: 2395-2393
e-ISSN: 2395-2407
RNI No.: 62551/95

CONTENTS

This Page is intentionally left blank.

The Association of Otolaryngologists of India
West Bengal

OFFICE BEARERS 2019-20

President
Dr Mrinal Kanti Acharyya

President Elect
Dr Subhajit Banerjee

Immediate Past President
Dr Debasish Mukherjee

Vice-Presidents
Dr Bidhan Roy
Dr Utpal Jana

Honorary Secretary
Dr Snehasis Barman

Honorary Treasurer
Dr Dwaipayan Mukherjee

Editor-in-chief
Dr Saumendra Nath Bandyopadhyay

Honorary Joint Secretaries
Dr Ajoy Kumar Khaowas
Dr Diptanshu Mukherjee

Executive Committee Members
Dr Amitabha Roychoudhury
Dr Atish Haldar
Dr Debabrata Das
Dr Debasish Guha
Dr Manoj Mukherjee
Dr Pijush Kumar Roy
Dr Ranjan Raychowdhury
Dr Sarmistha Bandyopadhyay

Editorial Board Members
Dr Debanshu Ghosh
Dr Saumitra Kumar

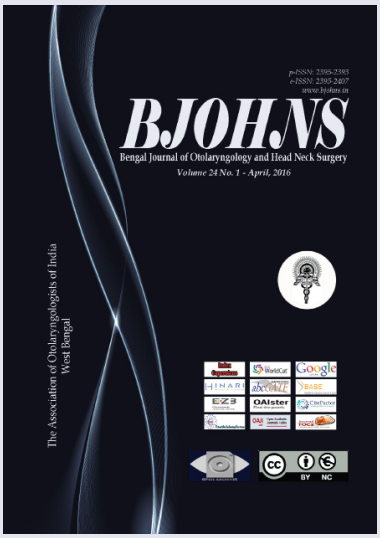
Trustee Board Members
Dr A M Saha
Dr Tarun Palit

BJOHNS

Bengal Journal of Otolaryngology and Head Neck Surgery

The Official Publication of The Association of Otolaryngologists of India, West Bengal

NOW ONLINE at www.bjohns.in



EASY ONLINE SUBMISSION OF ARTICLES

DOUBLE-BLIND PEER REVIEW PROCESS

ZERO SUBMISSION AND PUBLISHING CHARGES

PUBLISHED IN PRINT AND ONLINE VERSIONS

INDEXED IN POPULAR INDEXING SERVICES

OPEN ACCESS PROVIDED FOR ALL READERS

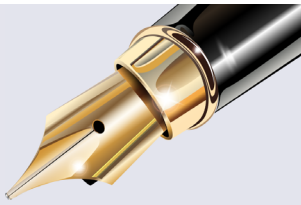
FOR AUTHORS

1. Visit **www.bjohns.in** on your internet browser (BJOHNS recommends Google Chrome or Mozilla Firefox)
2. Click '**Submit Article**' under *Publish with Us* from the right navigation bar
3. Registered users can log in to the system with their passwords
4. New users must complete a *one-time Registration Process* by selecting '**Not a user? Register with this site**'
5. Follow the instructions for the easy 5-step submission process
6. Track the status of your submission online as it is processed

FOR READERS

1. Visit **www.bjohns.in** on your internet browser (BJOHNS recommends Google Chrome or Mozilla Firefox)
2. Prior registration is *not mandatory* to browse articles but is preferred as all users are notified about new issues
3. Readers can access *all articles* published in the journal absolutely free of charge
4. Select '**Current**' for the current issue and '**Archives**' for previous issues from the top navigation bar
5. Use 'Article Tools' from the right navigation bar to cite the article, email the article hyperlink to a colleague or contact the corresponding author by email

From the Desk of the Editor



Live surgical demonstrations are very popular in our conferences. The live surgical sessions have traditionally been considered to be a very attractive and efficient dynamic educational platform to demonstrate and teach surgical techniques and explain the procedures to an audience of discerning peers where they can exchange their ideas. The real-time visual of the live surgical procedure exposes the audience to the challenges and intricacies of the surgery, second-best only to the proximity offered by being scrubbed and assisting the surgeon in the operating room. We learn how an accomplished expert avoids complications or how he deals with unexpected problems or challenges on the table. This may also be an ideal platform to demonstrate certain innovations in technique and introduction of technological advances, which has the advantage of interactive peer review.

Nobody doubts the benefits of surgical demonstrations for the medical profession. But, ethical appropriateness of live surgical workshops has recently been questioned. Opponents allege that live surgical broadcasts violate the autonomy of the patients. Financially disadvantaged patients are provided with inadequate information or even coerced into signing the consent for surgery. Surgery is not a procedure alone. Pre-operative work-up and post-operative follow-up are vital to the success of a surgery, as also choosing the right surgery for the patient. The visiting surgeon has to perform in an unfamiliar environment, using instruments he is unaccustomed to, while working with an unconditioned team. Movement of the audio-visual people and the presence of unsterile equipment increase the risk of infection. The distraction caused by continuous interaction with the audience increases the operating time and may also have other catastrophic consequences for the patient. The surgeon may be tempted to take some undue risk or perform some unnecessary manoeuvre to enthral the audience to enhance his prestige, putting the interest of the patient at risk.

Contd..

Unedited video may be an alternative, which can overcome the ethical dilemma. In video demonstrations, the audience can request for a pause and can review a certain step time and again. But there will be no real-time interaction with the surgeon; there will be no opportunity to ask for a closer view or a different camera angle; and the general opinion is that, they tend to be boring to watch. Advances in audiovisual technology and high-speed telecommunications system have provided us with the opportunity of live telecast of surgeries from the comfort of the surgeon's own operating room. But the surgeon cannot actually participate in the conference, in person.

There still is no consensus about the best option till now. Some of the associations are against the live surgical workshops, some others have set up panels to debate the pros and cons of the practice and have allowed live surgical broadcasts with some riders. Live surgical sessions, for now, should take care of the ethical issues in right earnest and patient safety must get priority over all other considerations in such events

Dr Saumendra Nath Bandyopadhyay
Editor,
Bengal Journal of Otolaryngology and Head Neck Surgery

Endoscopic 3-S Technique Tympanoplasty : Taking the Convention a Step Ahead

Mridul Janweja,[1] Sayan Hazra,[1] Arindam Das,[1] Arya Brata Dubey [1]

ABSTRACT

Introduction

Endoscopic Surgery has immense potential for middle ear surgery and is currently favoured by many surgeons. The 3 (vascular) Strips/ 3 Flap Tympanoplasty with operating microscope is popular but Endoscopic 3-Flap Tympanoplasty remains less explored. Hence this study was conducted to compare advantages and disadvantages of Endoscopic and Microscopic 3-Flap Tympanoplasty.

Materials and Methods

Forty two patients with large/subtotal perforation of tympanic membrane were divided into two equal groups (Group A & B). Endoscope was used in Group A, whereas, operating microscope in Group B. Temporalis fascia was the graft material in all patients. Patients were followed up for six months. Pre and post-operative audiograms, post-operative pain, graft uptake, time taken for surgery and intra-operative visualization convenience were compared.

Results

Mean Air-Bone Gap closure at the end of six months was 9.23 dB (SD-0.88 dB) in the endoscope group and 8.95 dB (SD-0.66 dB) in microscope group whereas the graft uptake rate was 95.2% and 90.2% respectively. Post-operative pain, cosmesis, ease of doing surgery and time taken for surgery were better in 'Endoscope' as compared to 'Microscope' group.

Conclusion

The three flaps produce adequate exposure in very large or subtotal perforations, very thin anterior rim or with anterior bony overhang. Results in terms of mean hearing gain and graft uptake were comparable. In terms of morbidity (post-op pain), recovery (return to routine activity), mean duration of surgery and cosmesis, endoscopic surgery produced better outcome.

Keywords

Endoscopic, Microscope, Type 1 tympanoplasty, temporalis fascia

Tympanoplasty is one of the most common surgeries performed. Over many years, otologists have been trying to achieve the perfect surgical outcome. Conventionally, tympanoplasty has been done using an operating microscope. The basic optics and principles employed in the operating microscopes as well as their limitations have remained unchanged despite the continuous technical advancements.[1,2] The linear view offered by the microscope is disadvantageous for the visualization of deeper recesses of the middle ear such as facial recess, sinus tympani, hypotympanum, attic, anterior recess, deep anterior canal wall and anterior margin.[3] This is overcome by the use of various endoscopes-both angled and zero degree, which provide a wider field of view, magnification and the ability to visualize all quadrants and parts of middle ear simply by moving and rotating the endoscope.

Endoscopic surgery has already been in vogue for the management of sino-nasal pathologies since many decades. The use of endoscopes in middle ear was first set forth by Mer et al in 1967, but their use was restricted for diagnostic and photographic purposes for the next 20-25 years. The concept was further advocated by Tarabichi, Presutti, Nogueira, Marchioni and others in the 1990s. The recent years have witnessed surgeons experimenting with the endoscope in ear surgeries. Middle ear surgeries

1 - Department of ENT, Institute of Post-Graduate Medical Education & Research (IPGME&R), Kolkata

Corresponding author:
Dr Sayan Hazra
email: sayanhazra@yahoo.co.in

such as tympanoplasty, ossiculoplasty, myringotomy, grommet insertion etc. which were traditionally done using the microscope are now being done using the endoscope.

The 3-Strip Technique of tympanoplasty with operating microscope was first introduced by Dr. BK Roychaudhuri in 2004 for repair of large to subtotal perforations of tympanic membrane, and those with anterior bony overhang. A modified end-aural incision is used utilizing only the vertical limb of Lempert's incision. Three skin flaps ware elevated in the bony external auditory canal from within outwards by taking three radial incisions on the tympanic membrane remnant at 11'o, 1'o and 6'o clock positions. This creates an anterior flap, a superior, and a posterior flap. The graft is placed lateral to handle of malleus and secured under the three flaps. No gel foam is given in the middle ear. This technique has shown good results with a graft uptake rate of 94.4% as well as good hearing outcome.[4] This study was conducted with an aim to determine the advantages and disadvantages of endoscope as compared to microscope in 3-Flap Tympanoplasty in terms of intra-operative ease of visualization and time taken for surgery and to compare the results of both groups in terms of hearing gain, graft uptake, cosmesis, post-op pain and morbidity, return to routine activity, intra-operative ease of visualization and time taken for surgery.

Materials and methods

Patients presenting at the OPD during the period January 2018 to May 2018 (5 months) were taken for this study. Meticulous history was taken and otoscopic, oto-endoscopic and microscopic examination was done. Notably, many patients gave history of pond bathing and/or recurrent episodes of URTI in childhood. The size, site and nature of perforation was assessed. Twenty one (21) cases were taken for this study under each group by randomly assigning them either group (A & B) using a Random Numbers Table. Group A underwent endoscopic 3-Flap tympanoplasty by endo-meatal technique and Group B underwent microscopic 3-Flap tympanoplasty by end-aural technique. Local anaesthesia was used to perform the surgeries and all the cases were done by a single surgeon. Temporalis fascia graft was used in all cases by a separate incision behind the hairline.

Patients with chronic otitis media (COM) inactive mucosal type with large or subtotal perforation, no history of ear discharge for last 4 weeks, aged between 18 and 60 years and pure conductive hearing loss were included in our study.

Patients with sensorineural or mixed hearing loss, ossicular discontinuity as appeared in otoscopic examinations or tympanometry or found intra-operatively, cholesteatoma and marginal perforations, actively discharging ear, active infection of nose, PNS, throat, URTI, history of previous ear surgery and otitis externa, otomycosis, uncontrolled diabetes mellitus were excluded.

Pure Tone Audiometry was performed in an acoustically treated room without ambient noise and following standard protocol. Patients were explained about the procedure before audiometry and adequate time was taken for testing. The technique followed was Carhart and Jerger's technique which is mostly used (technique of 5 up and 10 down method). An average of A-B Gap at 500, 1000 & 2000 Hz was taken to calculate the hearing loss.

Surgical Procedure: All patients underwent surgery under local anaesthesia (2% lignocaine with 1:100000 adrenaline). Pre-medication was done using Pentazocine 30 mg injected im, Diazepam 10 mg injected im and 10 mg charged in iv fluid. In microscopic surgery cases, tragal and pre-auricular region and external auditory canal were infiltrated with 2% lignocaine with 1 in 1,00,000 adrenaline. For endoscopic surgery cases, only the external auditory canal four quadrant block was done. Separate infiltration was done at the graft donor site. For both the techniques, a small 1" skin incision was given underneath the hairline and temporalis fascia graft was harvested. The graft was then allowed to dry. For the microscopic approach, a modified Lempert's Endaural incision utilizing only the vertical limb was placed. Although there was no significant bleeding, even the scanty bleeding was controlled adequately by compression and cauterization. This incision gave a good exposure.

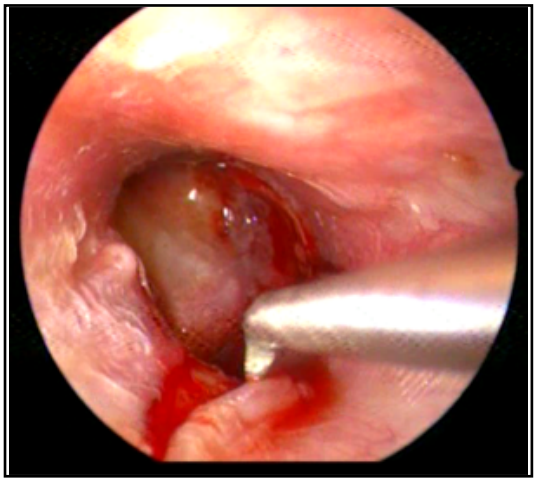


Fig.1. Endoscopic Flap raising

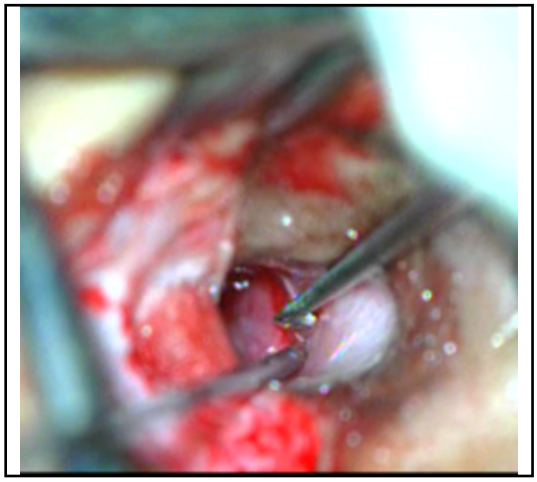


Fig.2. Microscopic flap raising

A 0° 4 mm Hopkin's Rod rigid endoscope was used for most of the duration of the surgery in endoscopic approach. A 30° 4 mm rigid endoscope was used for inspection of the middle ear cavity. The margins of the perforation were freshened by a sickle knife or angled pick. Three incisions were given on the tympanic membrane remnant at 11'o, 1'o and 6'o clock positions from within outwards and three strips viz. Anterior, Posterior and Superior were raised medial to lateral. (Figs. 1 & 2)

After inspecting the middle ear, attic, meso and hypotympanum, the dried graft was placed lateral to the handle of malleus and over the bony annulus. (Figs. 3 & 4) The strips with attached annulus were repositioned- superior first, then the anterior and posterior flaps. Incision lines were then apposed and no gap between graft and flaps was ensured. No gel-foam was given in the middle-ear. Air entry in the middle ear via the Eustachian tube ensured adequate inflation and prevention of graft medialization.

Patients of Group A were discharged the same day and those of Group B were discharged on second post-operative day. Antibiotics, analgesics, oral decongestants and nasal decongestants were given for seven days. Sutures were removed after one week. Patients were followed up for three months. Post-operatively, they

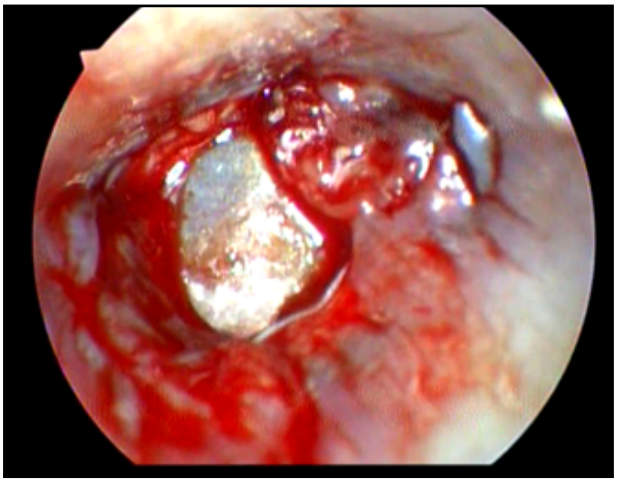


Fig. 3. Graft after Endoscopic Surgery

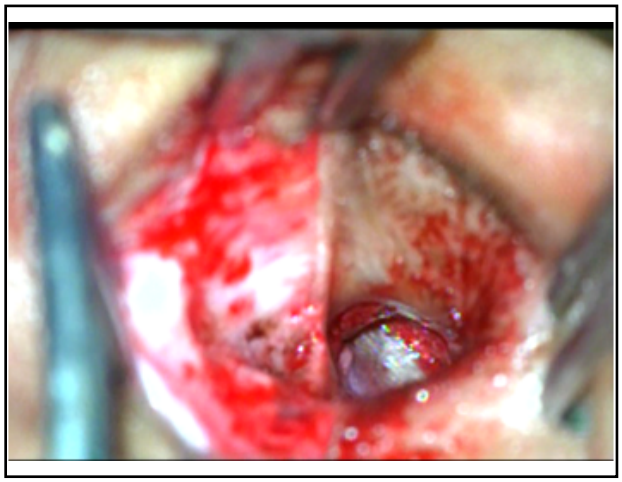


Fig. 4. Graft after Microscopic surgery

Table I: Age demography

AGE (IN YEARS)	GROUP A (ETP)	GROUP B (MTP)
18-25	2	4
26-35	8	9
35-45	8	6
>45	3	2

There were 9 males (43%) and 12 (53%) females in Group A. In Group B, 11 (52%) were males and 10 (48%) were females.

were called for follow up at 1 week, 2 weeks, 4 weeks, 6 weeks, 8 weeks and 12 weeks. The dressing and skin sutures were removed on 7th post-operative day. The wounds were found to be healing and healthy. The neotympanum could not be assessed at the first visit since the gel foam had not dissolved completely, but it could be assessed 4 weeks post-operatively. Post-op audiometry was done at the end of three months.

Results

In both the groups, majority of the patients belonged to 26-45 years age group; 76.2% (16) in Group A and 71.4% (15) in Group B. (Table I)

In Group A, mean pre-op Air Conduction Threshold was 22.42 dB (SD±4.99 dB) with 38% (8) cases lying in the range 11-20 dB and 62% (13) of the cases lying in the range 21-30 dB. Post-operatively, mean Air Conduction Threshold was 13.19 dB (SD±4.72 dB), with 38% (8) of cases lying in the range 0-10 dB, 57% (12) cases in the range 11-20 dB and 4.7% (1) in the range 21-30 dB. So, the mean hearing gain in the endoscopic group was 9.23 dB (SD±0.88 dB). (Table II)

In Group B, mean pre-op Air Conduction Threshold was 23.42 dB (SD±5.19dB), with 38% (8) of the patients lying in the range 11-20 dB and 57% (12) of the

Table II: Hearing gain in Group A

HEARING (AC THRESHOLD-DB)	PRE-OP	POST-OP
0-10 dB	0	8
11-20 dB	8	12
21-30 dB	13	1
31-40 dB	0	0
MEAN (SD)	22.42 (4.99)	13.19 (4.72)
MEAN AB GAP CLOSURE (SD)	9.23 (0.88)	

Table III: Hearing gain in Group B

HEARING (AC THRESHOLD-DB)	PRE-OP	POST-OP
0-10 dB	0	6
11-20 dB	8	12
21-30 dB	12	3
31-40 dB	1	0
MEAN (SD)	23.42 (5.19)	14.47 (5.01)
MEAN AB GAP CLOSURE (SD)	8.95 (0.66)	

The p-value thereby obtained is 0.2503, which is not significant

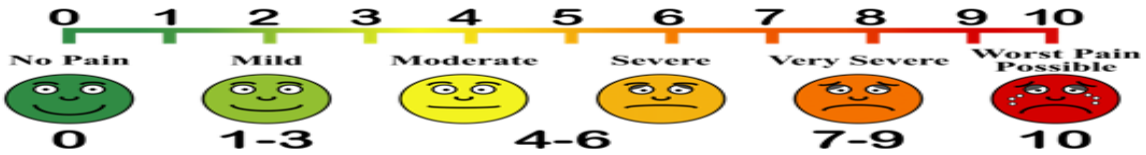
patients lying in the range of 21-30 dB. Mean post-op Air Conduction Threshold was 14.47 dB (SD±5.01dB), with 28.6% (6) patients in the range 0-10 dB 57% (12) patients in the range of 11-20 dB and 14.2% (3) in 21-30 dB range. So, the mean hearing gain was 8.95 dB (SD-0.66 dB) in the microscopic group. (Table III)

In Group A, the graft was taken up in 95.2% (20) of the cases with 4.8% (1) cases having a residual CP at the end of six months. Whereas in Group B, the graft was taken up in 90.4% (19) of cases and 9.6% (2) had a residual CP at the end of six months.

In Group A, 90.4% (19) patients reported their

Table IV: Post-operative pain

VAS SCORE	GROUP A (ETP)	GROUP B (MTP)
0	0	0
1-3	18	7
4-6	3	13
7-9	0	1
10	0	0



cosmetic outcome as excellent, 9.6% (2) as satisfactory and no patient reported his/her cosmetic outcome as poor. the microscopic group, 71.4% (15) patients reported their cosmetic outcome as excellent, 23.8% (5) as satisfactory and 4.7% (1) as poor. Whereas in Group B, 71.4% (15) patients reported their cosmetic outcome as excellent, 23.8% (5) as satisfactory and 4.7% (1) as poor.

The average time taken for endoscopic tympanoplasty was 60 minutes with a range of 50-80 minutes. The time range for microscopic tympanoplasty was 60-110 minutes with an average of 78 minutes.

The patients were given a Visual Analogue Pain Scale and asked to rate their pain. A total of 85.7% of the patients of Group A rated their pain between 1-3, which is classified as mild pain. On the other hand, 33.3% patients of Group B rated their pain as mild pain and 66.7% patients rated the pain as moderate to moderately-severe (Table IV).

Patients of Group A returned to routine activity in 2.3 days and those of Group B took 6.1 days for the same on an average.

Discussion

The objective of this study was to compare Type-I Endoscopic 3-Strip technique tympanoplasty with the conventional End-aural 3-Strip technique tympanoplasty.

The three vascular strips utilized for the procedure (superior, anterior and posterior) produce adequate exposure in all the cases such as very large or subtotal perforations, very thin anterior rim or with anterior bony overhang. The anterior flap can be elevated even in cases with bony overhangs. The annulus cut at the 6 o'clock position does not create any problem subsequently. This also overcomes the problem of lower flap being too bulky if two flap technique is employed.[4]

Almost similar outcomes were found as regards Hearing Gain (p value-0.2) and Graft Uptake which correlate with the study done by El-Guindy[5] and Raj & Meher[6] who also didn't find a significant difference between the Endoscopic and Microscopic group as regards hearing gain. But the endoscopic approach was found better as regards cosmesis, time taken for surgery, post-op pain and return to routine activity.[7] Patil's study results also match with that of ours.[8]

The endoscopic technique carries multiple advantages like ease of visualization of the whole tympanic membrane and ear canal without the need to manipulate the patient's head or the microscope.[6,9] Also, the structures usually hidden under the microscope (round window niche, eustachian tube orifice, incudo-stapedial joint, anterior tympanic perforation, facial recess, and hypotympanum) can be seen easily with the help of an endoscope.[3,10] Various structures can be visualized from multiple angles as opposed to the microscope's single axis view along the ear canal.

The chorda tympani nerve can be directly visualized and accidental injury to it can be avoided while raising the posterior meatal flap. The Eustachian tube opening can also be closely visualized with an angled endoscope. (Fig.5) Also, the patency can be confirmed as a patent tube leads to repeated fogging of the Endoscope.

In cases of canal wall bulges, appropriate graft placement can be ensured by advancing the scope beyond the bulge.[10] There is no requirement of canalplasty.[7] Also, the image obtained via an endoscope is much sharper with higher resolution.[6]

The time taken for surgery as well as the average duration of hospitalization is reduced if the surgery is performed endoscopically.[7] Since there is no Endaural incision in the endoscopic approach, there is less

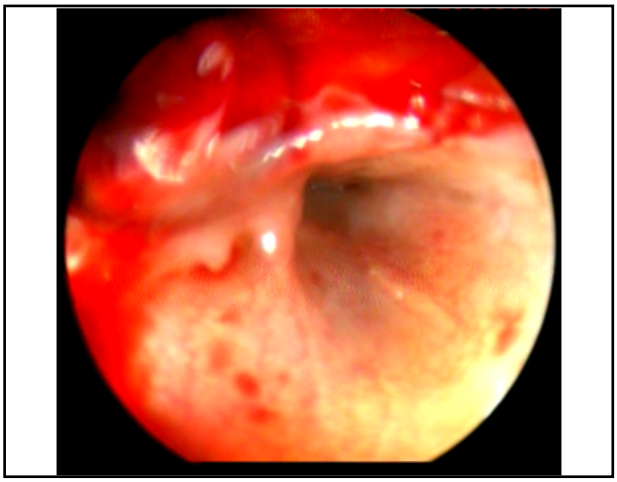


Fig. 5. Visualizing the eustachian tube opening

dissection of normal tissues,[10] which, in turn, results in less incidence of post-operative pain7 and better cosmetic results.

The endoscopic equipment is portable. So, the surgeon can carry it to far off places easily. This is especially beneficial in our Indian setup to perform tympanoplasties in rural areas. It is much more cost effective to perform tympanoplasties through the help of endoscopes and can be widely used in various health camps.[10]

The endoscopic technique is also not without disadvantages such as one handed surgical technique[3,6] loss of depth perception[3,6] steep learning curve, arm fatigue due to increased weight of camera, cumbersome to control bleeding.[10] Endoscope holder, 3-D camera, regular practice of endoscopic otological procedures, adequate vasoconstriction during local anaesthetic infiltration and use of suction micro-instruments can overcome most of these problems.

Conclusion

The endoscope gives panoramic, wide angle, and magnified view and also provides ease of negotiation through the EAC. In this way, it has overcome most of the disadvantages of microscope. In our study success rate was comparable between endoscopic and microscopic technique. In terms of morbidity, postoperative recovery and cosmesis, endoscope produced better results. Use of endoscope not only serves as a great teaching tool, but also helps to visualize the middle ear anatomy and pathology intraoperatively with minimal soft tissue manipulation. Thus endoscope holds the greatest promise in ear surgery in coming days.

References

1. Harugop AS, Mudhol RS, Godhi RA. A comparative study of endoscope assisted myringoplasty and microscope assisted myringoplasty. Indian J Otolaryngol Head Neck Surg. 2008; 60:298-302
2. Glasscock ME, Shambaugh GE. Tympanoplasty. In: Glasscock and Shambaugh, Eds. Surgery of the Ear, 5th ed. People's Medical Publishing House, Connecticut, p 350-70
3. Tarabichi M. Endoscopic middle ear surgery. Ann Otol Rhinol Laryngol. 1999; 108: p 39-46
4. Roychaudhuri BK. 3-Flap Tympanoplasty- A simple and sure success technique. Indian J Otolaryngol Head Neck Surg. 2004; 56(3):196-200
5. El-Guindy A. Endoscopic transcanal myringoplasty. J Laryngol Otol. 1992; 106:493-5
6. Raj A, Meher R. Endoscopic transcanal myringoplasty-a study. Indian J Otolaryngol Head Neck Surg. 2001; 53(1):47-9
7. Jyothi AC, Shrikrishna BH, Kulkarni NH, Kumar A. Endoscopic Myringoplasty Versus Microscopic Myringoplasty in Tubotympanic CSOM: A Comparative Study of 120 Cases. Indian J Otolaryngol Head Neck Surg. 2017; 69(3):357-62
8. Patil RN. Endoscopic tympanoplasty—definitely advantageous (preliminary reports). Asian J Ear Nose Throat 2003; 25:9-13
9. Mer SB, Derbyshire AJ, Brushenko A, Pontarelli DA. (1967) Fibreoptic endotoscopes for examining the middle ear. Arch Otolaryngol. 1967; 85:387-93
10. Patel J, Aiyer RG, Gajjar Y, Gupta R, Raval J, Suthar PP. (2015) Endoscopic tympanoplasty vs microscopic tympanoplasty in tubotympanic CSOM: a comparative study of 44 cases. Int J Res Med Sci. 2015; 3(8):1953-7.

Laryngopharyngeal Reflux: Inter-rater Reliability of Reflux Finding Score in Clinical Practice

Venkatesha Belur Keshavamurthy,[1] Yogeesha Beesanahalli Sadashivappa,[2] Nithin K Harsham[2]

ABSTRACT

Introduction

Laryngopharyngeal reflux (LPR) is a clinical entity, caused due to retrograde flow of gastric content into the larynx. It imposes great diagnostic challenge to clinicians because of lack of specific symptoms, signs and validated tool. Reflux Finding Score (RFS) has been proposed for clinical diagnosis of LPR. Inter observer reliability of RFS tool was found out using two independent observers.

Materials and Methods

In this Cross sectional study, ninety LPR subjects were subjected to 90° rigid endoscopic examination of larynx and RFS scores were calculated by two observers. Inter observer reliability of RFS was calculated using Kappa value.

Results

Most commonly observed laryngeal findings were erythema/hyperemia, posterior commissure hypertrophy, and vocal fold edema. Subglottic edema, thick endolaryngeal mucus and erythema had fair agreement.

Conclusion

There was a poor agreement between observers for total RFS score. The variables like subglottic edema, erythema/hyperemia, and thick endolaryngeal mucus showed fair agreement between the raters. The findings of diffuse laryngeal edema and posterior commissure hypertrophy showed poor inter rater reliability.

Keywords

Laryngopharyngeal Reflux; Reflux Finding Score; Endoscopy

Laryngopharyngeal reflux (LPR) is a recently described clinical entity which is caused due to the retrograde flow of gastric contents into the throat, i.e. into laryngopharynx.[1] The importance of LPR has been increasing in clinical practice as it is implicated as the etiological agent in a variety of conditions like reflux laryngitis to laryngeal carcinoma. It has been estimated that up to 10% of patients presenting to an otolaryngologist's office is LPR and 50% of all patients suffering from hoarseness and voice disorder may have significant LPR.[2] Patients with LPR usually present with non specific symptoms like globus sensation, vocal fatigue, hoarseness, frequent throat clearing, dysphagia and chronic cough. LPR associated laryngoscopic findings include inter arytenoid erythema, infraglottic edema, ventricular obliteration, posterior commissure hypertrophy, granuloma / granulation and thick endolaryngeal mucus. As the symptoms and clinical signs attributed to LPR are non-specific and there are no validated diagnostic tools for LPR, the diagnosis of this condition imposes a great challenge to otorhinolaryngologist.

Belafsky developed a diagnostic tool called Reflux Finding Score (RFS) based on the laryngoscopic findings in patients with suspected LPR to ease the clinical diagnosis.[3] It is an 8 item clinical severity score. Score ranges from 0 (no abnormal findings) to maximum of 26 (worst score) depending up on the presence and severity

1 - Department of ENT, S.S. Institute of Medical Sciences & Research Centre, Davangere , Karnataka
2 - S.S. Institute of Medical Sciences & Research Centre, Davangere , Karnataka

Corresponding author:
Dr Venkatesha Belur Keshavamurthy
email: bk.venkatesha@gmail.com

of the laryngoscopic findings. As the laryngoscopic findings are subjective in interpretation, the RFS score can vary from evaluator to evaluator for a single patient. So, this study makes an attempt to find out the inter-rater reliability of RFS tool in diagnosing LPR using RFS tool.

Materials and Methods

A cross sectional observational study was conducted in a tertiary hospital in central Karnataka, for a period of two years from November 2016 to October 2018. Institutional ethics committee approval was obtained for the study. A total of 90 subjects were recruited who presented with symptoms suggestive of LPR after obtaining a valid informed written consent satisfying following inclusion and exclusion criteria.

All patients aged between 16 and 45 years, clinically diagnosed with LPR, were included in the study. People with asthma / COPD/ organic laryngeal disorders not associated with LPR and persons with the history of previous radiotherapy or head and neck surgeries or psychiatric illness were excluded from this study.

After initial clinical evaluation, all the 90 patients underwent laryngoscopic examination using a 90° rigid pharyngolaryngoscope. Laryngoscopic findings were recorded and the RFS score was rated independently for each patient by two raters by reviewing the recorded video of the laryngoscopy at different points of time (with more than 10 years of Otorhinolaryngological practice)

The RFS is an 8 item scoring system based on the presence and the severity of the laryngoscopic findings. If there was no abnormal findings the score will be zero and the maximum score of 26 was given to the severe findings. A score of more than 7 was diagnostic of LPR. (Table I)

Inter rater reliability among the raters were calculated using kappa statistics for the individual variables of RFS as well as the total RFS score. Kappa is a statistical method which measures inter-rater agreement for categorical items. As it takes into account the possibility of agreement occurring by chance, it is thought to be more robust measure than simple percent agreement calculation.

The kappa value ranges from -1 to +1. When the observed agreement is perfect, kappa will be +1. If the observed agreement equals the chance expected agreement, kappa will be 0. If the observed agreement is less than the chance expected agreement, kappa will become negative. (Table II)

Results

Age of the study group ranged from 20 to 45 years (Mean age 36.1). Majority of the subjects were between 40-45 years. There were 49 males (54.4%) and 41 females (45.6%) in the study group. Most common laryngoscopic findings (Fig. 1) in the study group were erythema/ hyperemia and posterior commissure hypertrophy 89 (98.9%), vocal fold edema 67(74.4%), ventricular obliteration 21(23.3%), thick endolaryngeal mucus 21(23.3%), diffuse laryngeal edema 17(18.9%), subglottic edema 13(14.4%), granuloma/granulation 11(12.2%). (Fig. 2)

The RFS score ranged from 2.5 to 14 (mean = 6.01 ± 2.14). The mean RFS score by the first rater was 6.31 and the mean RFS score by the second rater was 5.72.

Inter-rater reliability was assessed by using kappa value for each variable of RFS as well as for total RFS score. The kappa value for total RFS score was 0.152, indicating only a slight agreement that exists between the two raters. There was a fair agreement between the raters for the variables of subglottic edema, erythema /hyperemia (Fig. 3) and thick endolaryngeal mucus. (kappa value 0.371. 0.230, 0.323 respectively). Findings of diffuse laryngeal edema and posterior commissure hypertrophy showed poor agreement between raters. (kappa value -0.024 and -0.032 respectively). None of the variables in RFS showed perfect agreement between the two raters. (Table III)

There were 14 patients in the study group whose RFS score showed difference of 5 and more between the raters. (Table IV) Among the individual variables of RFS in these patients, ventricular obliteration, vocal fold edema (Fig. 4), diffuse laryngeal edema and posterior commissure hypertrophy showed maximum variability between the raters.

Table I. Showing Reflux Finding Score (RFS)

Subglottic edema (pseudo sulcus)	**0 = absent**
	2 = present
Ventricular obliteration	**0 = absent**
	2 = partial
	4 = complete
Erythema /hyperemia	**0 = absent**
	2 = only in the arytenoids
	4 = diffuse
Vocal fold edema	**0 = absent**
	1 = mild
	2 = moderate
	3 = diffuse
	4 = polypoidal
Diffuse laryngeal edema	**0 = absent**
	1 = mild
	2 = moderate
	3 = severe
	4 = obstruction
Posterior commissure hypertrophy	**0 = absent**
	1 = mild
	2 = moderate
	3 = severe
	4 = obstruction
Granuloma /granulation tissue	**0 = absent**
	2 = present
Thick endolaryngeal mucus	**0 = absent**
	2 = present
Total	

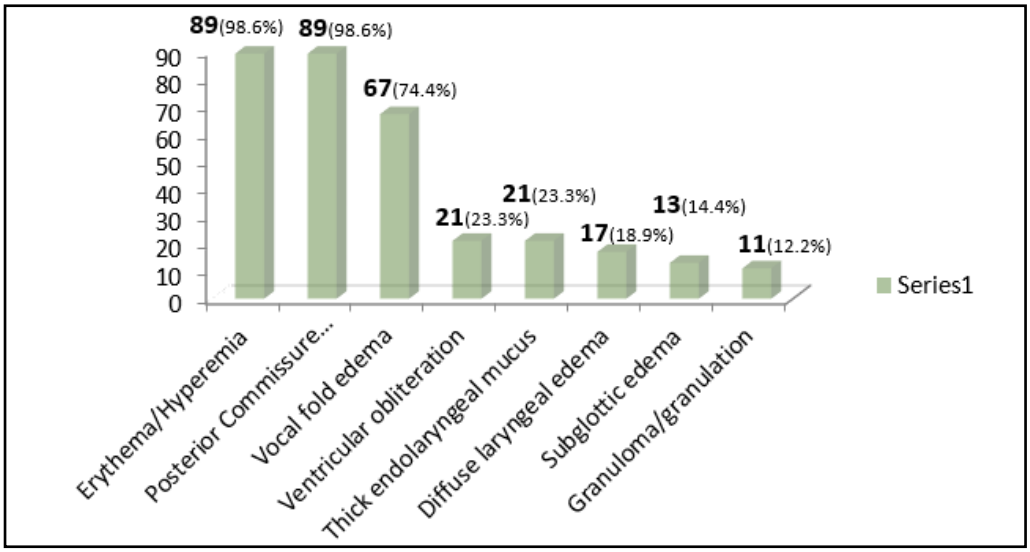


Fig. 1. Distribution of laryngeal signs

Discussion

Various laryngeal signs attributed to LPR are erythema or edema of the posterior one-third of the glottis, hyperemia of the posterior larynx, cobble stoning, and "heaping up" or thickening of the inter arytenoid mucosa (pachydermialaryngis), but none of these signs are specific and pathognomonic to this condition and hence there is a diagnostic difficulty. Reflux Finding Score (RFS) was developed by Belafsky in order to facilitate the clinical diagnosis of LPR based on the scoring of certain common laryngeal findings according to their presence and severity on endoscopy. In their study they had established validity and high inter and intra rater reliability of this tool. Ever since this tool is being clinically utilised for the diagnosis of LPR controversies exist on the reliability of RFS variables. Most of the variables in RFS tool are subjective in interpretation.

In the Study conducted by Mesallam et al, RFS score was rated by four raters demonstrated high inter

Fig. 2. Laryngoscopic image in which there is high agreement among the raters for the findings of posterior commissure hypertrophy and granulation tissue

Table II. Showing interpretation of kappa value[4]

KAPPA VALUE	INTERPRETATION
<0	Poor agreement
0.0 – 0.2	Slight agreement
0.21- 0.4	Fair agreement
0.4 – 0.6	Moderate agreement
0.61- 0.8	Substantial agreement
0.81- 1.0	Perfect agreement

Table III: showing inter-rater reliability of RFS

RFS PARAMETERS	KAPPA VALUE
Sub glottis edema	0.371
Ventricular obliteration	0.098
Erythema / hyperemia	0.230
Vocal fold edema	0.112
Diffuse laryngeal edema	-0.024
Posterior commissure hypertrophy	-0.032
Granuloma / granulation tissue	0.145
Thick endolaryngeal mucus	0.323
Average kappa (±SD)	0.152 ± 0.147

rater and intra rater reliability.[5] Karakaya et al also demonstrated high intra rater and inter rater reliability for RFS score; findings of Vocal fold edema and the thick endolaryngeal mucus showed highest intra rater and inter rater agreement.[6]

Study by Branski et al noted relatively poor inter and intra rater agreement for the variables of the laryngeal findings.[7] Only finding of edema of the musculo membranous fold exhibited fair reliability. Eren et al could not find inter observer agreement among the RFS variables.[8] Highest inter-rater agreement was noted for the finding of thick endolaryngeal mucus. Other findings like pseudosulcus, ventricular obliteration, diffuse laryngeal edema and posterior commissure hypertrophy had low inter rater agreement.

In the present study we could not find high reliability of RFS among the raters. There was only slight agreement between the raters for total RFS score. (kappa value 0.152; SD +/- 0.147). Among the individual variables of RFS, none of the variables had perfect agreement. The variables like subglottic edema, erythema/ hyperemia, and thick endolaryngeal mucus showed fair agreement

Fig. 3. Laryngoscopic image in which there is high agreement among the raters for the findings of arytenoids erythema.

between the raters. The findings of diffuse laryngeal edema and posterior commissure hypertrophy showed poor inter-rater reliability.

Lack of prior sensitization of the observers/raters, intrinsic observer bias could have led to the poor consistency in rating. The degree and severity of findings vary from observer to observer and it depends on many factors like types of endoscopes used (rigid vs. flexible), lighting set up of the instrument, recordings

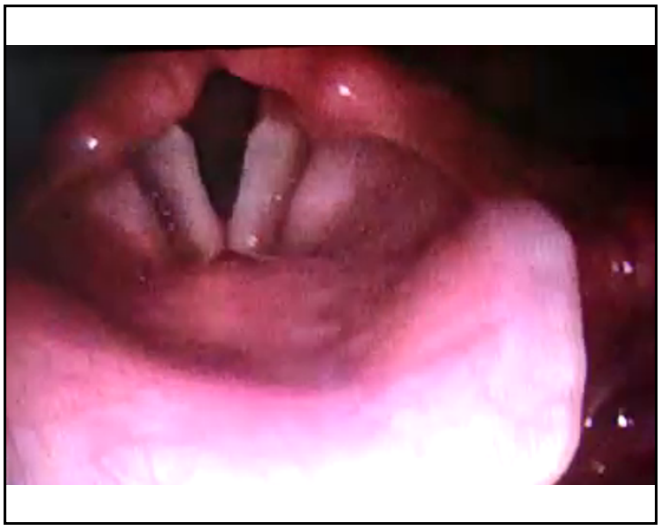


Fig. 4. Laryngoscopic imaging in which there is poor agreement between the raters for vocal fold edema.

Table IV: Showing differences in scoring among the RFS variables

SL NO.	RFS SCORE		DIFFERENCE IN THE SCORE BETWEEN THE OBSERVERS FOR THE VARIABLES							
	O1	O2	SUBGLOTTIC EDEMA	VENTRICULAR OBLITERATION	ERYTHEMA	VOCAL FOLD EDEMA	DIFFUSE LARYNGEAL EDEMA	POSTERIOR COMMISSURE HYPERTROPHY	GRANULOMA	ENDOLARYNGEAL MUCUS
1	11	3	0	2	0	2	1	1	0	2
2	14	5	0	4	2	1	2	0	0	0
3	9	15	2	0	0	0	2	0	0	2
4	4	12	0	0	2	1	2	1	2	0
5	11	17	2	0	0	0	1	1	0	2
6	6	17	0	2	0	2	2	1	2	2
7	14	5	2	2	2	2	1	0	0	0
8	8	3	0	2	0	1	0	2	0	0
9	9	4	0	2	0	2	1	0	0	0
10	11	4	0	4	0	2	1	0	0	0
11	10	5	0	0	0	2	1	0	0	2
12	10	5	0	0	2	1	1	1	0	0
13	11	6	0	0	0	1	1	1	2	0
14	11	4	0	0	2	1	1	1	0	2

O1- Observer 1, O2- Observer2.

and the experience of the raters. So RFS as a clinical tool to be cautiously interpreted in the background context for inters rater reliability, and there needs to be prior sensitization of raters with a set of standardized examinations, to foster consistency and to reduce inter rater variations of laryngeal findings.

Conclusion

RFS as a clinical tool for diagnosis of LPR should be viewed with limited utility as it exhibits low inter-rater reliability. Variables in RFS are highly subjective in interpretation. However, considering few findings like thick endolaryngeal mucus which consistently show higher inter observer reliability can be given more scores in RFS scale while diagnosing LPR.

References

1. Koufman JA, Aviv JE, Casiano RR, Shaw GY. Laryngopharyngeal reflux: Position statement of the committee on speech, voice, and swallowing disorders of the American Academy of Otorhinolaryngology-Head and Neck Surgery. Otolaryngol Head Neck Surg. 2002; 127(1):32-5
2. Datta R, Datta K, Venkatesh MD. Laryngopharyngeal reflux: Larynx on fire. Medical Journal Armed Forces India 2010; 66:245-8
3. Belafsky PC, Postma GN, Koufman JA. Validity and reliability of the reflux finding score (RFS). Laryngoscope 2001; 111: 1313-7
4. Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics 1977; 33: 159-74
5. Mesallam TA, Stemple JC, Sobeih TM, Elluru RG. Reflux symptom index versus reflux finding score. Ann Otol Rhinol Laryngol. 2007; 116: 436-40
6. Karakaya NE, Akbulut S, Altıntaş H, Demir MG et al. The reflux finding score: Reliability and correlation to the reflux symptom index. Journal of Academic Research in Medicine 2015; 5: 68-74
7. Branski RC, Bhattacharyya N, Shapiro J. The reliability of the assessment of endoscopic laryngeal findings associated with Laryngopharyngeal reflux disease. Laryngoscope 2002; 112: 1019-24
8. Eren E, Arslanoğlu S, Aktaş A, Kopar A et al. Factors confusing the diagnosis of Laryngopharyngeal reflux: the role of allergic rhinitis and inter-rater variability of laryngeal findings. Eur Arch Otorhinolaryngol 2014; 271: 743-7.

Mycological Profile in Otomycosis Patients: A Cross Sectional Hospital Based Study in Tertiary Care Centre

Nitin Ankale,[1] Jyoti M Nagmoti,[1] Utkarsh Anand[1]

ABSTRACT

Introduction

This study was conducted to study the fungal profile in otomycosis patients in the tropical region of North Karnataka. A total of 108 samples of symptomatic otomycosis were investigated in this study.

Materials and Methods

Aural swabs were collected on 1st visit and these swabs were immediately inoculated over Sabouraud's dextrose agar media and incubated at 37 degree Celsius for culture of fungi.

Results

Fungal pathogens were isolated in 89 samples, 18 samples were negative and 1 sample was reported as being contaminated. Fungi belonging to genus Aspergillus was isolated in 92.11% of cases of which Aspergillus niger was commonest isolated in 38(41.57%) followed br Aspergillus flavus 32(35.95%) and Aspergillus fumigatus 7(7.86%). Candida species were found in 2(2.24%) and Mucor in 1(1.12%). The most common symptom was Itching 91(84.25%). In this study ear discharge was the commonest finding (44.44%) followed by Black mycotic plug (28.70%).

Conclusion

Otomycosis is a condition encountered in hot, humid climate with symptoms like itching and ear discharge. Aspergillus and Candida are the fungal species responsible for majority of cases. Local antifungal treatment with measures like keeping the ear dry resolves most of the cases.

Keywords

Otomycosis; Aspergillus; Candida

Otomycosis or fungal otitis externa has typically been described as fungal infection of the external auditory canal with infrequent complications involving the middle ear.[1] Otomycosis is one of the common conditions encountered in a general otolaryngology clinic. Symptoms usually include itching, otalgia, otorrhoea, ear blockage, hearing loss and tinnitus.[2,3,4] It is worldwide in distribution with more prevalence in warm, wet, humid and dusty environment of the tropics and subtropics.[1,5,7,8,9] Its incidence has been increasing due to the increased use of antibiotics, immunocompromised host conditions such as diabetes and more recently increased use of topical antibiotics-steroid combination and bad aural hygiene (instilling oil and water in the ear).[1,10,12]

Other factors that predispose patients to otomycosis include: open mastoid cavities, hearing aids with occlusive moulds, trauma and bacterial infection.[11,12] Although rarely life threatening, in immuno-compromised patients otomycosis can lead to skull base osteomyelitis along with multiple cranial nerve palsies with serious mortality and morbidity.[10,11,13,14,15] The disease is challenging and frustrating for both patients and otolaryngologists as it frequently requires long term treatment and follow up. This study was devised to review the fungal profile in otomycosis patients in the tropical region of North Karnataka.

1 - JNMC, Nehru nagar, Belagavi

Corresponding author:
Dr Utkarsh Anand
email: utkarshanand117@gmail.com

Table I: Symptoms with which the patient presented

COMPLAINTS	TOTAL NO OF AFFECTED EARS	PERCENTAGE
Itching in the Ear	91	84.25
Otalgia	77	71.29
Decreased Hearing	70	64.81
Ear Discharge	50	46.29
Tinnitus	9	8.33

Materials and Methods

This cross sectional study was done in a tertiary care centre in the tropical region of North Karnataka, with the objective to study the fungal profile in clinically diagnosed patients of otomycosis in ENT outpatient as well as inpatient departments.

The samples were procured from the ear using sterile cotton swab on the 1st visit and immediately transported to the microbiology laboratory. The swabs were immediately inoculated over Sabouraud's dextrose agar media and incubated at 37 degree Celsius. A total of 108 samples of symptomatic otomycosis were investigated in this study.

The debris in the external auditory canal was thoroughly cleaned by suction aspiration and dry mopping and patients were put on antifungal ear drops.

Results

In our study males (54.62%) were more than females (45.38%). Youngest patient was 2 years old while the oldest was an 86 years old male. Occupationally most of the patients were farmers (34.25%) followed by students (15.74%), businessmen (15.74%), and housewives (13.8%). Other groups included drivers, service personnel and teachers. Left ear was more commonly involved (49.07%) while incidence on right side was 34.86%. Most common symptom at presentation was ear itching (84.95%). (Table I)

Most of the samples i.e. 62.94% were collected between June to September when the incidence of otomycosis increased, probably due to the rainy season.

On otoscopic examination 45% of the ears had discharge and COM, 28.7% had black mycotic plug, 9.25 % had wet mycelial mat, 7.4% had dry mycelial mat, 5.55% had soft debris and 4.62% had cotton woolly mat.

We did a mycological profile of the samples collected and on growing over Sabouraud's dextrose agar the most commonly isolated group was Aspergillus. Among the Aspergillus group the most common species isolated

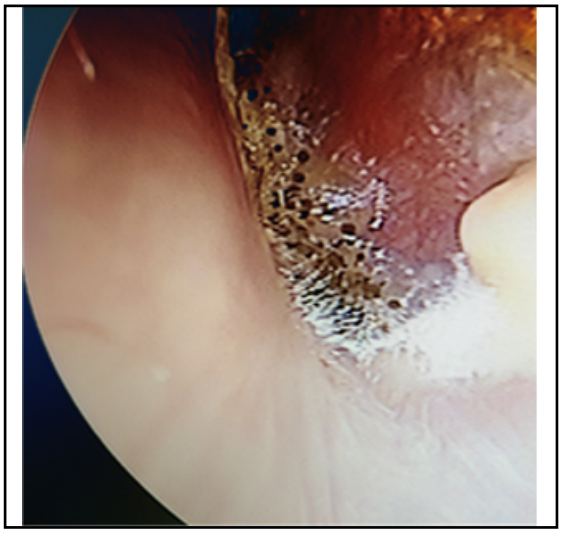


Fig.1. Clinical photograph of left external auditory canal showing black otomycotic debris suggestive of aspergillus niger (Otoscopic view)

Table II: The fungal profile

FUNGAL SPECIES	TOTAL NO OF SAMPLES	PERCENTAGE
Aspergillus niger	**38**	**41.57**
Aspergillus flavus	**32**	**35.95**
Aspergillus fumigatus	**7**	**7.86**
Aspergillus versicolor	**3**	**3.37**
Aspergillus tertius	**2**	**2.24**
Aspergillus glacus	**1**	**1.12**
Candida glabrata	**1**	**1.12**
Candida lipolytica	**1**	**1.12**
Verticillium species	**1**	**1.12**
Rhizopus species	**1**	**1.12**
Alternaria species	**1**	**1.12**
Mucor species	**1**	**1.12**

was Aspergillus niger (41.57%), followed by Aspergillus flavus (35.95%) and Aspergillus fumigatus (7.86%). (Fig.1) Other species isolated were Candida species, Rhizopus species, Verticillium species, Alternaria species and Mucor species. (Table II)

Patients were treated with Clotrimazole ear drops for 7 days. In cases with partial/no response, Fluconazole was added both orally and topically(in the form of ear drops) for 2 weeks. All the patients responded well.

Discussion

Otomycosis is a chronic infective disorder of the ear and remains a frustrating condition for the clinicians and is a source of misery for the infected patients. The term is used to denote fungal infection of the external auditory canal. The incidence of this condition is not known but it has been found that out of 8 cases of otitis externa,1 is of fungal origin. Of the cases diagnosed with otomycosis, 90% are caused by Aspergillus and the rest by Candida species.[16] Incidence of otomycosis is higher in hot climates and much of the literature has originated from the tropical and subtropical regions of the world. An American study has found that the incidence of otomycosis peaked during the summer months. Various factors have been held responsible for otitis externa in general and otomycosis in particular. These include high humidity, increased temperature and local trauma usually from the use of cotton swabs.

Cerumen which is present in the external auditory canal has a pH of 4 to 5 and hence it supresses the bacterial and fungal growth. Aquatic sports including swimming and surfing are particularly associated with this condition because repeated exposure to water removes the cerumen from the external auditory canal and results in the drying of external auditory canal.[17]

The mycological infection results in masses of debris containing hyphae and suppuration. Pruritus is a marked feature of this condition and discharge is often present.[10,18]

The initial presentation is similar to bacterial infection but the fungal infection of the ear is characterised by many long, white, filamentous hyphae which are growing from the skin of the external auditory canal. Suspicion of otomycosis only arises when the condition fails to resolve with standard antibiotic treatment.[19]

In order to treat otomycosis, the external auditory canal should be cleaned of the debris and discharge as these lower the pH of the external auditory canal and hence reduce the activity of aminoglycoside ear drops (used in those patients who showed signs and symptoms suspicious of bacterial otitis externa). Suction may be done for this. Ear should be kept dry and scratching of the ear with cotton bud should be avoided. Antifungal ear drops are of value in treating such patients.[20]

Conclusion

Otomycosis is a common condition encountered in this geographical area where the humid weather is favourable for the growth of fungi. The disease was found to be predominantly unilateral (84.25%) and only 15.75% of cases were bilateral. Otomycosis shows a seasonal preponderance with 62.94% of cases in this study presenting between June to September which is the rainy season. Ear itching was the most common symptom (84.25%) at presentation. Commonest sign was ear discharge, seen in 44.44% of cases. The condition was commonly found in people working in dusty environment particularly farmers, businessmen, students who are exposed to the outdoor environment and housewives who work in a cold damp environment. In this study Aspergillus group were found to be the most common causative agent. Of the Aspergillus group the common isolated species were Aspergillus niger (41.57%) followed by Aspergillus flavus (35.95%), Aspergillus fumigatus (7.86%), Aspergillus versicolor (3.37%), Aspergillus tertius (2.24%) and Aspergillus glacus (1.12%). Other species isolated included Candida glabrata.

Topical antifungal medications along with measures like keeping the ears dry will resolve most of the cases of Otomycosis, while in some cases it might be required to be supplemented by oral antifungal medication.

References

1. Haja AN, Shaik KM, Siva Subba RP. Mycology of otomycosis in a tertiary care teaching hospital. J Res Med Den Sci. 2015 Jan-Mar; 3(1):27-30
2. Pradhan B, Tuladhar N, Amatya R. Prevalence of otomycosis in outpatient department of otolaryngology in tribhuvan university teaching hospital, kathmandu, nepal. Ann Otol Rhinol Laryngol. 2003 Apr; 112(4):384-7
3. Ozcan K M, Ozcan M, Karaarslan A et al. Otomycosis in turkey: predisposing factors, aetiology and therapy. J Laryngol Otol. 2003 Jan; 117(1):39-42
4. Chandra J, Maini S, Subrahmanyan S et al. Otomycosis- a clinic-mycological study and efficacy of mercurochrome in its treatment. Mycopathologia 1996 Feb; 135(1):9-12
5. Mgbe R, Umana A, Adekanye A et al. Otomycosis – a management challenge in calabar, south-south nigeria. Int J Third World Med. Jan 2010; 9(2):1
6. Chapparbandi R B, Kazi F N, Ali K. Otomycosis: an overview in hyderabad karnataka region. J Evolu Med Dental Sci. 2014 Sep; 3(46):11213-16
7. Fasunla J, Ibekwe T, Onakoya P. Otomycosis in western Nigeria. Mycoses. 2008 Jan; 51(1):67-70
8. Munguia R, Daniel S J. Ototopical antifungals and otomycosis: a review. Int J Paediatr Otorhinolarygol. 2008 Apr; 72(4):453-9
9. Pontes Z B, Silva A D, Lima Ede O, Guerra Mde H. Otomycosis a retrospective study. Braz J Otorhinolaryngol. 2009 May-Jun; 75(3):367-70
10. Satish H S, Vishwanatha B, Manjuladevi M. A clinical study of otomycosis, IOSR J Dental Med Sci. 2013 Mar-Apr;5(2):57-62
11. Mahmoudabadi A Z, Masoomi S A, Mohammadi H. Clinical and mycological studies of otomycosis. Pak J Med Sci. 2010Jan-Mar; 26(1):187-90
12. Anwar K, Muhammad S G. Otomycosis; clinical features, predisposing factors and treatment implications, Pak J Med Sci. 2014 May-Jun; 30(3): 564-7
13. Mugliston T, O'Donoghue G. Otomycosis a continuing problem. J Laryngol Otol. 1985 Apr; 99(4): 327-33
14. Yehia M M, Al-Habib H M, Shehab N M. Otomycosis: a common problem in north Iraq, J Laryngol Otol. 1990 May; 104(5):387-9
15. Yadav S P S, Gulia J S, Jagat S, Aggrawal N. Role of ototopical fluconazole and clotrimazole in management of otomycosis. Ind J Otol. 2007 Dec; 13:12-5

16. Frank A M, Smit W, Nicolaas P A, et al. Clinical efficacy of three common treatments in acute otitis externa in primary care: randomised controlled trial. 2003 Nov;327(7425):1201-05
17. Kujundzic M, Braut T, Manestar D, et al. Water related otitis externa; Coll Antropol. 2012 Sep; 36(3):893-7
18. Ho T, Vrabec J T, Yoo D, et al. Otomycosis: clinical features and treatment implications; Otolaryngol Head Neck Surg. 2006 Nov; 135(5):787-91
19. Abou-Halawa A S, Khan M A, Alrobaee A A, et al. Otomycosis with perforated tympanic membrane: self medication with topical antifungal solution vs medicated ear wick; Int J Health Sci. 2012 Jan; 6(1):73-7
20. Pabla L, Jindal M, Latif K. The management of otitis externa in UK general practice. Eur Arch Otorhinolaryngol. 2012 Mar; 269(3):753-6.

Impact of Intravenous Tranexamic Acid on Intraoperative Bleeding during Endoscopic Sinus Surgery

Pawan Kumar Padhy,[1] Ramakrishnan Narayanaswamy[2]

ABSTRACT

Introduction

Bleeding during surgery is one of the most important concerns in endoscopic sinus surgery (ESS). The study conducted was aimed at assessing the efficacy of tranexamic acid on bleeding during endoscopic sinus surgeries.

Materials and Methods

A total of 30 patients were enrolled for the study. Lund and Mackay symptom score and radiological staging was used to compare clinical profile. The surgical field was assessed by the surgeon who was blinded, i.e., was not aware of which set of patients were receiving the drug. Boezaart and van de Merwe grading scale was used to assess the intraoperative surgical field. Both groups were selected so as to comprise of patients having similar clinical profile in terms of symptom score and radiological staging.

Results

In the arm receiving tranexamic acid, blood loss was found to be less and statistically significant (p=0.0157). The surgical field in endoscopic sinus surgery is more important factor in determining the completion and satisfactory outcomes of the surgery. Significantly high percentage (80%) of patients who were given the drug had a grade 2 scale when compared to (26.7%) in patients not receiving the drug. The difference in score in surgical field grading scale was also statistically significant (p=0.0034). The reported side effects of tranexamic acid mainly include nausea, vomiting, and possibly arterial or venous thrombosis, however none of the patients in our study had any side effects of the drug. Post-operative stay in the hospital was uneventful.

Conclusion

Intravenous Tranexamic acid reduced the intraoperative bleeding significantly and was useful in providing a better operative field.

Keywords

Endoscopic Sinus Surgery; Tranexamic Acid, Intravenous; Hemorrhage

Chronic rhinosinusitis (CRS) with polyps is a common disease. Sinus surgeries for chronic rhinosinusitis with polyps are commonly done by endoscopic techniques.[1,2] One of the most important concerns in endoscopic sinus surgery (ESS) is bleeding during surgery. Bleeding during endoscopic surgeries is common and a major concern for both anaesthesiologists and otolaryngologists.[3] The most important source of bleeding during ESS are the capillaries.[4] Also, mean arterial pressure (MAP) can influence the severity of bleeding.[5,6]

Controlled hypotension is a way to decrease bleeding during surgery; this may be achieved by using drugs like nitroprusside sodium, nicardipine, nitro-glycerine, beta blockers and also a high dose of anaesthesia drugs like halothane, isoflurane and propofol. Nasal decongestants like oxymetazoline, cocaine and adrenaline[1,7], lidocaine combined with adrenaline[8] and fibrin glue (that is composed of biologic coagulants like thrombin, fibrinogen and cryoprecipitate) can also be used for this purpose. Although the volume of bleeding during ESS is low, considering the limited access to surgery and limitation in visibility of surgical site by endoscope, even low amounts of bleeding can interfere

1 - Department of ENT, Military Hospital, Agra
2 - Department of ENT, Command Hospital(CC), Lucknow Cantt
Corresponding author:
Dr Ramakrishnan Narayanaswamy
email: drnramak5632@gmail.com

with surgeons' visibility.[9] Then, the surgeon will have to use suction frequently and this will increase the risk of further manipulation of field and also more bleeding and longer duration of surgery.[10] It can cause limitations in visualizing the surgical site and thus increase the risk of intracranial complications as well as possible injury to other adjacent organs, such as the vasculature of the eye.[11] One of the popular ways to prevent such problems is administering antifibrinolytic agents, such as tranexamic acid (TA). TA is a hydrophilic antifibrinolytic drug that can be administered orally or intravenously to decrease intra operative bleeding. This product prevents plasminogen linking with fibrin to make plasmin and stabilizes the formed clot.[12] TA has dose dependent complications, such as nausea, vomiting, headache, blurred vision and vertigo. Although, there are some reports of thrombosis on using this product but incidence of such complications is low[13] and generally, this drug is safe.[14] The aim of the study is to assess the effect of intravenous tranexamic acid on haemorrhage during Endoscopic Sinus Surgery.

Materials and Methods

The study was conducted at the Department of Otolaryngology-Head and Neck Surgery, Command Hospital (Eastern Command), Kolkata, a tertiary care centre. In this comparative interventional study, 30 patients were planned for Endoscopic Sinus Surgery from January 2017 – June 2018.

Subjects included in this study comprised of patients of CRS with polyposis with comparable clinical profile in terms of no. of polyps and sinuses involved. The age range was 12-60 yrs. The patients had to be ASA grade I/II, as all patients were administered controlled hypotensive anaesthesia.

The patients with co morbidities like hypertension, chronic kidney disease, chronic lung disease, malignancies, bleeding diatheses, patients having history of thromboembolic phenomena or those on anticoagulant therapy were excluded from the study.

The patients were randomized. Computer based random number table was used to create two groups (A and B) to ensure an even distribution of treatment allotment. Group A was given IV tranexamic acid (TA) and Group B was given normal saline (control). Outcome measures included the Boezaart and van de Merwe grading scale[15] to assess the intraoperative surgical field and estimated blood loss based on suction container contents with irrigation fluid subtracted (Intraoperative blood loss was estimated by the attending anesthesiologist at the end of surgery). The surgeon was not aware of which patient is receiving the drug (TA), in order to create blinding and eliminate bias during scoring by surgeon in the Boezaart and van de Merwe grading scale. All injections of TA were given by the anaesthetist to provide blinding to the study.

It was a bolus dose of 10 mg/kg TA given immediately after induction of anaesthesia. All surgeries were performed by the same surgical team unaware of which patient received TA. Same concentration of topical vasoconstrictors (4% xylocaine with 1 in 2,00,000 adrenaline) in nasal packings were used and microdebrider was used during all the surgeries. There was no difference in preoperative oral steroid use between groups. As an institutional protocol, we administer oral steroids i.e. tab prednisolone 1mg/kg daily pre-operatively for five days in each case. Injection Amoxycillin-Clavulanic acid 1.2 gm intravenous 12 hourly was given in first 48 hrs in all patients, till the nasal packs were removed. Boezaart and van de Merwe grading scale as given below at Table I, which was used in our study is a validated scale to evaluate surgical field quality and satisfaction of the surgical team. Recently, a multi-centre standardized reliability analysis verified the inter-observer and intra-observer reliability of the Boezaart scale.

Statistical analysis was done by populating data into a Microsoft excel spreadsheet and then analysing by SPSS 24.0. and Graph Pad Prism version 5. The Independent Samples t-test compares the means of two independent groups in order to determine whether there is statistical evidence that the associated population means are significantly different. Unpaired proportions were compared by Chi-square test or Fischer's exact test, as appropriate. p-value ≤ 0.05 was considered as statistically significant.

Table I: Boezaart and van de Merwe grading scale.[15]

GRADING	OPERATIVE FIELD
0	No bleeding (cadaveric conditions).
1	Slight bleeding: no suctioning required.
2	Slight bleeding: occasional suctioning required
3	Slight bleeding: frequent suctioning required. Bleeding threatens surgical field a few seconds after suction is removed
4	Moderate bleeding: frequent suctioning required and bleeding threatens surgical field directly after suction is removed
5	Severe bleeding: constant suctioning required; bleeding appears faster than can be removed by suction; surgical field severely threatened and surgery usually not possible

Results

The study comprised of 30 patients enrolled between Jan 2017 and Jun 2018. The patients were randomised into two groups of 15 each. The study employed strict inclusion and exclusion criteria as described above, to ensure a homogeneous population who had bilateral disease with comparable clinical profile and radiologic staging. The average radiological staging score was around 17 in both groups.

We found that in Group B (control), the mean blood loss (mean ± SD) of patients was 438.3333 ± 40.3408 ml with range 370.0000 - 500.0000 ml and the median was 430.0000 ml and in Group A (TA), the mean of blood loss (mean ± SD) of patients was 404.6667 ± 30.6749 ml with range 340.0000 - 450.0000 ml and the median was 420.0000 ml. Difference between blood loss in two groups was statistically significant (p=0.0157).

It was found that in Group B (control), 4(26.7%) patients had Boezaart and van de Merwe scale grade II and 11(73.3%) patients had Boezaart and van de Merwe scale grade III. Whereas in Group A (TA), 12(80.0%) patients had grade II and 3(20.0%) patients had grade III operative field. Difference between Boezaart and van de Merwe grading of the two groups was statistically significant (p=0.0034).

Discussion

Endoscopic Sinus Surgery is done for the treatment of patients with chronic sinonasal disease who do not respond to the conventional medical management. The main issue in sinus surgery is blood loss due to the vastly vascular nature of the mucosa. Poor visualization during surgery can lead to difficulty in identification of structures and result in complications or inadequate surgery. Systemic infusion of antifibrinolytic drugs efficiently decreases bleeding during and after surgery.

Our study aimed at studying the impact of bolus dose of tranexamic acid given immediately after induction of anaesthesia on intraoperative bleeding or visualization. Boezaart and van de Merwe grading scale was used to assess the intraoperative surgical field and estimated blood loss was based on suction container contents with irrigation fluid subtracted.

In our study a strict inclusion and exclusion criteria resulted in a small sample size with 15 patients in each group. In our study difference between blood loss in two groups was statistically significant (p=0.0157) suggesting a significant reduction in blood loss, which is in accordance to previous studies.

Assessment of difference between intraoperative surgical field using Boezaart and van de Merwe grading scale was statistically significant (p=0.0034). In comparison to 12 (80%) patients of TA group only 4

(26.6%) patients of no drug group had a better surgical field (Grade II) as per Boezaart and van de Merwe grading scale. Only 3 out of 15 (i.e. 20%) patients of TA group had a Grade III score compared to 11 out of 15 (i.e. 73.3 %) patients in the control group. In all cases the grading was either Grade II or Grade III. This better surgical field (Grade II) was very convenient and had a positive impact on the surgery.

In all cases in both groups, ESS was completed and there was no restraint of surgical advancement by bleeding in any of the cases. There were no operative complications and all patients were discharged home after nasal pack removal on day 03 post op. There were no side effects noted in any of the 15 patients who received tranexamic acid.

A study was conducted by Chhapola and Matta at Mumbai Port Trust Hospital India.[16] They did a comparative analysis of use of tranexamic acid in a total of 200 patients undergoing endoscopic nasal surgery and concluded that patients who received tranexamic acid showed decreased blood loss amounting to 72.48% ($p < 0.05$). Our study also had statistically significant reduction in blood loss ($p=0.0157$). The above study however included all endoscopic surgeries including septoplasty and did not use any scoring system to score the surgical field visualization.

Alimian and Mohseni from Department of Anaesthesiology, Tehran University of Medical Science, Iran also conducted an analogous study.[17] A total of 84 patients (49 male and 35 female) with a median age of 35 years (range of 19-64 years) were registered for the study. Blood loss comparison showed 184 ± 64 mL in the TA group and 312 ± 75 mL in the placebo group, ($P < 0.01$). As per the surgeon's estimation, the median bleeding score in the TA group was significantly lower than that of placebo group [2 (1-3) vs 2.5 (2-4); $P < 0.0001$]. Like in our study, they also randomized patients to receive either IV tranexamic acid 10 mg/kg (TA group) or sterile water 0.1 mL/kg (placebo group) as a bolus dose immediately after induction of anaesthesia. This study used the same scale which we used in our study, to assess the surgical field. In the referenced study, however, they did not use any topical vasoconstrictors nor did they use a microdebrider, which were used in all cases of our study. The study population was similar to our study in that patients were treated for chronic rhinosinusitis.

Sahar and Hasanein from Cairo University, Egypt did a triple arm study comparing effect of intravenous tranexamic acid and aminocaproic acid against placebo.[18] A total of 90 patients, aged between 18 to 50 years were randomly allocated into 3 groups (tranexamic acid group/ aminocaproic acid group/normal saline i.e. control group). All patients were undergoing ESS for CRS. They concluded that both intravenous tranexamic acid and aminocaproic acid effectively reduce bleeding during ESS and improve surgical field visualisation and also reduce the duration of surgery. The referenced study compares tranexamic acid vs aminocaproic acid vs placebo (normal saline). They have also compared duration of surgery.

Langille et al stated that 28 patients (median age was 45 years; range was 23-80 years) were involved in the study.[19] Final diagnoses comprised chronic rhinosinusitis with polyposis (n = 23) and chronic rhinosinusitis without polyposis (n = 5). It was determined that adjunctive intravenous tranexamic acid does not seem to result in a clinically meaningful decrease in blood loss (201 vs 231 mL; $p=0.60$) or improve visualization of the surgical field during ESS – Wormald grading scale (5.84 vs 5.80; $p=0.93$). This study is contradictory to previous studies. In this study, 05 patients had CRS without polyposis. This study has used Wormald grading scale for assessing the surgical field.

Three studies, mentioned below have reported the efficacy of topical and oral forms of tranexamic acid in achieving hemostasis and improving the surgical field in nasal surgeries, including ESS.

In a 2007 study by Athanasiadis et al, 20 patients who underwent ESS were randomized to be getting either 2.5 g of EACA solution, a second group getting 100 mg of TA solution and a third group getting 1 g of TA solution, while the opposite nasal cavity received only saline. TA was observed by the blinded surgeon as more effective than only saline (as placebo) in 80% of cases.[20]

Another study included 60 patients with CRS.[21] Thirty patients of the intervention group were given three pledgets soaked in 5% TA and 0.5% phenylephrine for 10 minutes in both nostrils before surgery. In the control

group 30 patients were given only 0.5% phenylephrine by similar technique. The volume of bleed and the clarity of surgical field were evaluated at 15, 30, and 45 minutes subsequently using Boezaart and van de Merwe grading scale. The quality of the surgical field in the intervention group was significantly better only in the first(P=0.002) and second(P=0.003) quarter but not in the third quarter (P=0.163). Moreover, bleeding was considerably less throughout all periods in the intervention group than in the control group (P=0.001).

In a study with 400 patients between 18-60 years, who underwent functional endoscopic sinus surgery with septoplasty and conchoplasty, 200 patients did not receive any hemostatic agent (control group) and the other 200 were administered 1 g of oral TA. Dose given was 1 g TA three times daily starting 2 hours before surgery, for 5 days. Bleeding was scrutinized throughout surgery and postop for 2 weeks. Patients who were administered oral TA had significantly lesser amount of operative and postoperative bleeding compared to controls.[10]

Conclusion

With the review of literature and results of our study, we can conclude that Inj. Tranexamic acid is a very safe drug and is very effective in reducing blood loss and improving the endoscopic surgical field and any medication or protocol that decreases bleeding may help to increase intraoperative visualization and help with surgical progress and allow for a more complete surgical procedure. Thus, we recommend the use of tranexamic acid in regular ESS for CRS with polyposis unless contraindicated.

References

1. Wormald PJ. The surgical field in endoscopic sinus surgery. In: Endoscopic Sinus Surgery Anatomy, Three-Dimensional Reconstruction and Surgical Technique. Thieme, New York 2005, 112, 7-12
2. Damm M, Quante G, Jungehuelsing M, Stennert E. Impact of functional endoscopic sinus surgery on symptoms and quality of life in chronic rhinosinusitis. Laryngoscope 2002; 112: 310-5
3. Pavlin JD, Colley PS, Weymuller Jr, van Norman GV, Gunn HC, Koerschgen ME. Propofol versus isoflurane for endoscopic sinus surgery. Am J Otolaryngol. 1999; 20:96-101
4. Jacobi KE, Bohm BE, Rickauer AJ, Jacobi C, Hemmerling TM. Moderate controlled hypotension with sodi- um nitroprusside does not improve surgical conditions or decrease blood loss in endoscopic sinus surgery. Clin Anesth. 2000; 12:202-7
5. Simpson P. Perioperative blood loss and its reduction: the role of the anaesthetist. Br J Anaesth. 1992; 69:498–507
6. Sivarajan M, Amory DW, Everett GB, Buffington C. Blood pressure, not cardiac output, determines blood loss during induced hypotension. Anesth Analg. 1980; 59:203-6
7. Reigle EV, Gunter JB, Lusk RP, Muntz HR, Weiss KL. Comparison of vasoconstrictors for functional endoscopic sinus surgery in children. Laryngoscope 1992: 102:820-3
8. Wormald PJ, Athanasiadis T, Rees G, Robinson S. An evaluation of effect of pterygopalatine fossa injection with local anesthetic and adrenalin in the control of nasal bleeding during endoscopic sinus surgery. Am J Rhinol. 2005; 19:288-92
9. Maune S, Jeckström W, Thomsen H, Rudert H. Indication, incidence and management of blood transfusion during sinus surgery: a review over 12 years. Rhinology 1997: 35:2-5
10. Yaniv E, Shvero J, Hadar T. Hemostatic effect of tranexamic acid in elective nasal surgery. Am J Rhinol. 2006; 20:227-9
11. Stankiewicz JA. Complications in endoscopic intranasal ethmoidectomy: an update. Laryngoscope 1989; 99:686-90
12. Casati V, Sandrelli L, Speziali G et al. Hemostatic effects of tranexamic acid in elective thoracic aortic surgery: A prospective, randomized, double-blind, placebo-controlled study. J Thorac Cardiovasc Surg. 2002; 123:1084-91
13. Manucci PM. Drug therapy: Hemostatic drugs. N Engl J Med. 1998; 339:245-53
14. Dunn C, Goa K. Tranexamic acid – A review of its use in surgery and other indications. Drugs 1999; 57:1005-32
15. Athanasiadis T, Beule A, Embate J, Steinmeier E, Field J, Wormald PJ. Standardized video-endoscopy and surgical field grading scale for endoscopic sinus surgery: a multi-centre study. Laryngoscope 2008;118(2):314-9
16. Chhapola S, Matta I. Short-term use of tranexamic acid to reduce blood loss in endoscopic nasal surgeries. An International Journal Clinical Rhinology 2011; 4(2):79-81
17. Alimian M, Mohseni M. The effect of intravenous tranexamic acid on blood loss and surgical field quality during endoscopic sinus surgery: a placebo-controlled clinical trial. Journal of clinical anesthesia 2011; 23(8):611-5
18. Sahar M, Hasanein R. Effect of intravenous tranexamic acid and epsilon aminocaproic acid on bleeding and surgical field quality during functional endoscopic sinus surgery (FESS). Egyptian Journal of Anaesthesia 2015; 31(1):1-7
19. Langille MA, Chiarella A, Côté DW, Mulholland G, Sowerby LJ, Dziegielewski PT, Wright ED. Intravenous tranexamic acid and intraoperative visualization during functional endoscopic sinus surgery: a double-blind randomized controlled trial.

Int Forum Allergy Rhinol. 2013; 3(4):315-8. doi: 10.1002/alr.21100

20. Athanasiadis T, Beule AG, Wormald PJ. Effects of topical antifibrinolytics in endoscopic sinus surgery: a pilot randomized controlled trial. Am J Rhinol. 2007;21(6):737-42

21. Jahanshahi J, Hashemian F, Pazira S, Bakhshaei MH, Farahani F, Abasi R, Poorolajal J. Effect of topical tranexamic acid on bleeding and quality of surgical field during functional endoscopic sinus surgery in patients with chronic rhinosinusitis: a triple blind randomized clinical trial. PLoS One 2014; 9(8):e104477. doi: 10.1371/journal.pone.0104477.

Impact of Auditory Verbal Therapy in Children with Cochlear Implant

Nikita Chatterjee,[1] Indranil Chatterjee,[1] Aditya Sarkar[1]

ABSTRACT

Introduction

Auditory Verbal Therapy (AVT) is considered as most successful therapeutic approach for cochlear implant children. The impact of auditory verbal therapy has been studied vividly in Indian context. The number of cochlear implantees receiving AVT has been increased nationwide but there is no structured protocol that is used to assess the efficacy of AVT on children with cochlear implant. Hence, it is important to develop a structured protocol consisting of established tools to study the effectiveness of AVT.

Materials and Methods

The study was conducted on 62 (male-38, female-24) bilaterally profound sensorineural hearing impaired children with cochlear implant done under ADIP (Assistance to Disabled Persons for Purchase/ Fitting of Aids and Appliances) scheme. Pre-therapy assessments were done before 2 weeks of cochlear implantation using Functional Auditory Performance Indicator (FAPI), Assessment of language development, Speech intelligibility rating scales, Brown's (1973) stages of mean length of utterance (MLU) assessment, and Overall rating of parental satisfaction on a visual analog scale of 0 to 10. Auditory verbal therapy (AVT) was given for 6-8 months, twice per week under video-monitoring of the sessions. Post therapeutic scores were obtained by assessing with the same tools through observation and interaction with the children and interviewing the caregivers.

Results

Independent Sample's T-test in SPSS -16 software were used and significant differences between pre and post therapy scores were obtained ($p<0.005$).

Conclusion

These tools can be used further as a protocol for assessment of baseline skills before AVT, then develop an individualized management program and finally to assess the improvement after AVT.

Keywords

Auditory Verbal Therapy; Cochlear Implants

Auditory Verbal Therapy (AVT) is a parent-oriented early intervention approach used for hearing impaired children, first coined by Ling, Beebe, and Pollack.[1] It involves individualized diagnostic sessions emphasizing the use of hearing technology in optimal and meaningful conditions hence emphasizes on developing hearing as an active sense. The auditory verbal therapist follows the principles of auditory verbal therapy under the guidelines of ADIP (Assistance to Disabled Persons for Purchase/ Fitting of Aids and Appliances) scheme adapted by principles originally developed by Pollack and "rigorous application of techniques, strategies, conditions and procedures that facilitate and promote optimal acquisition of spoken language through listening". The listening environment for AVT can be enhanced by various ways like therapist sitting in front of child and using techniques like acoustic highlighting technique, pausing, providing alternatives. A certified auditory verbal therapist may continue as a part of the child's educational team helping the child to progress through inclusion in regular listening environment and social platform from the early childhood onwards.

Since, it has been the constant endeavor of the Government to provide the disabled persons with aids/ appliances, essential for their rehabilitation, at minimum costs, The Ministry of Social Justice and Empowerment, Govt. of India has introduced one such scheme of

1 - Department of Speech and Hearing, Ali Yavar Jung National Institute of Speech and Hearing Disabilities (Divyangjan), Kolkata

Corresponding author:
Dr Indranil Chatterjee
email: inchat75@gmail.com

Assistance to Disabled Person for Purchasing/Fitting of Aids and Appliances – "ADIP-Scheme" which includes cochlear implant and post-operative rehabilitation along with mapping schedule. Under the ADIP Scheme-revised (2014), the AVT that has been provided to cochlear implant beneficiaries without any cost for 1year has been now extended to 2 years with mapping.

The cochlear implant has been found to be beneficial for patients with severe to profound, steeply sloping type hearing loss; who do not get benefitted adequately with the hearing aids but have an intact auditory nerve. A detailed assessment protocol of the child has to be done before deciding whether the child is a suitable candidate for cochlear implant, provided by ADIP scheme, administered by a team of professionals which includes audiologist, speech and language pathologist, ENT surgeon, paediatrician, neurologist, etc. Approximately after 2 to 3 weeks of surgery, the implant and the external processor are programmed and mapped for first time by an audiologist, followed by which, the role of speech and language pathologists began by providing post-operative speech and language rehabilitation to the implantees.

The impact of auditory verbal therapy has been studied vividly in Indian context. After advent of ADIP-scheme, the number of cochlear implantees has been increased nationwide at the rate of 500 implants per year. Hence, there is a wide need to study the effectiveness of AVT on listening and linguistic performance of children after cochlear implantation under ADIP scheme. No such categorized protocols were used so far to tract the listening and linguistic skills of the cochlear implantees. So, a structured protocol using established tools has to be conceptualized with reference to listening and speech perception, linguistic, speech production skills and overall parent's satisfaction from AVT.

Materials and Methods

This prospective observational study was done at the institute, where the authors are attached. Sixty two participants (male-38/female-24) were selected within the age range of 2.5 to 7.5years (mean- 5.53 and S.D. ±1.21) each having bilateral severe to profound sensorineural hearing loss (pure tone average>70dBHL) with congenital onset and normal cognitive, social and motor milestones. Cochlear implantation was done under ADIP scheme in which 32 participants using DIGISONIC®cochlear implant and 30 participants using NUCLEUS® (by COCHLEAR®) cochlear implant.

All the participants were selected as per ADIP scheme-R guidelines for AVT. They received cochlear implant before 5 years (as per the ADIP guidelines) and received mapping on 1st, 2nd, 4th, 6th, 10th, 14th and 18th week post switch-on and once in 3months if required afterwards. Both the parents and other caregivers were counseled to use their native language with their children. Irregular participants with inactive parental participation for whom the transfer of skills to parents and home management was difficult were excluded.

The tools used for the pre and post therapy assessment included Functional Auditory Performance Indicator (FAPI), Assessment of language development, Speech intelligibility rating scales, Brown's (1973) stages of MLU assessment and the Overall rating of parental satisfaction on a visual analog scale of 0 to 10.

The Functional Auditory Performance Indicators (FAPI) was developed by Brown and Johnson (2003) to assess the functional auditory skills of the children with hearing loss. It is used by parents, therapist, early interventionists and teachers.[2] The profile lists the auditory skills in an integrated hierarchical manner. There are seven categories in the checklist: - sound awareness, sound is meaningful, auditory feedback, localizing the sound, auditory discrimination, short-term memory, linguistic-auditory processing. A four tired scoring paradigm has been created. (Table I)

Assessment of language development (ALD) developed by Lakkanna, Venkatesh and Bhatt (2010) is a criterion referenced diagnostic tool to measure language development in children from birth to 7.11 years covering both receptive and expressive language skills.[3] Precursors to language development like attention, vocal development are also embedded in the test. Different aspects of language like vocabulary, syntax, semantics as well thinking/reasoning skills are

Table I: A four tired scoring paradigm of FAPI

LEVEL OF ATTAINMENT	CORRESPONDING OCCURRENCE	VALUE GIVEN
The skill is not present	(NP) = 0-10% Occurrence	(score value=0)
The skill is emergent	(E) = 11-35% Occurrence	(score value=1)
The skill is in process	(P) = 36-79% Occurrence	(score value=2)
The skill is acquired	(A) = 80-100% Occurrence	(score value=3)

included in the assessment. The test material contains the questionnaires and standardized pictures. The test items are divided into items for receptive language (1 to 52) and expressive language (1 to 52) separately. The administration timing of the test ranges from 20-40 minutes. Then the starting point is established below one year of the chronological age. Each test item has specific criteria for passing. Score 1 for passing and score 0 for not and these results are entered in the scoring sheet. Criteria for basal point is obtained when the child passes 3 consecutive items and ceiling point is obtained when the child fails to answer 5 consecutive items and the testing should be stopped there. After testing, the raw score is calculated by subtracting the number of zeroes from the item number of last test item. This raw score is used as appropriate marker to indicate criteria met/ not met.

The Speech Intelligibility rating scale was developed at Ali Yavar Jung National Institute of Speech and Hearing Disabilities (AYJNISHD); Mumbai (2003) is a perceptual scale to see how much the speech is intelligible to the listener on a 7-points scale of 0 to 6, where 0 implies normal and 6 implies poor intelligibility. (Table II) This is done at different levels that are at word level, phases, sentences and conversational speech, depending on the patient's receptive and expressive vocabulary.

Brown's stages of Mean length of utterance (MLU) assessment is a strong communication marker to understand language development in children.[4] Five stages of language development based on the MLU are shown in Table III.

Table II: The seven points rating of the Speech Intelligibility Rating Scale

SCORE	INTERPRETATION
0	Normal
1	Can understand with little effort; however feel speech is not normal
2	Can understand with little effort occasionally need to ask for repetition
3	Can understand with concentration and effort specially be sympathetic listener
4	Can understand with difficulty and concentration by family, but not others
5	Can understand with effort if content is known
6	Cannot understand at all even when content is known

Table III: Five stages of MLU development designed by Brown

STAGES	MLU	APPROXIMATE AGE (IN MONTHS)
1. Semantic roles and syntactic relations	**1.0-2.0**	**12-26**
2. Grammatical morphemes and modulating meaning	**2.0-2.5**	**27-30**
3. Modalities of simple sentences	**2.5-3.0**	**31-34**
4. Embedding	**3.0-3.75**	**35-40**
5. Co-ordination	**3.75-4.5**	**41-46**

An 11 visual analog rating scale (from 0 to 10 point) was developed in AYJNISHD, RC-Kolkata, to track the rate of parental satisfaction from the cochlear implant and post-implant rehabilitation are scored in accordance. The scoring pattern is such that, 0 stands for no satisfaction at all, 5 stands for medium satisfaction while 10 stands for tremendously satisfied.

The study procedure is divided into 5 phases. First, children who were best fitted as per the selection criteria were chosen for the study and their parents and caregivers were given information about the study and its importance and were requested to sign a consent form that pledged for their permission and cooperation for the study. In the second phase pre-therapy assessment scores were obtained for listening skills using Functional Auditory Performance Indicator, Linguistic skills using Assessment of language development, Speech production using Speech intelligibility Rating Scales and Mean Length Utterance were obtained by administering the test using the materials required to administer the test and in specific test environment, before 2 weeks of cochlear implantation. In the third phase, auditory verbal therapy was given for 6-8 months, twice a week by the informally trained auditory verbal therapist, either the post-graduate students or the interns. The scheduled and individualized therapy plan for each participant were prepared and the goals were set to improve the listening skills (sound awareness and detection, sound localization, auditory discrimination and auditory comprehension), linguistic skills (receptive and expressive language skills), speech production (phonetic and phonological skills) and mean length of utterance of morphemes. The overall duration of therapy session was 45 minutes in which included parental counseling and guidance for home management. (Table IV)

Results

The findings of pre and post therapy scores of auditory skills were compared using Independent Sample's T-test in SPSS-16 software showing significant difference was found ($p<0.05$) between pre and post therapy scores of the auditory skills in Functional Auditory Performance Indicator (FAPI). (Fig. 1)

The findings of pre and post therapy scores of Receptive Language assessment and Expressive Language assessment were compared using Independent Sample's T-test in SPSS-16 software. Significant difference was also found ($p<0.05$) between pre and post therapy scores of receptive and expressive language skills tested by Assessment of language development. (Fig. 2)

The findings of pre and post therapy scores of Speech Intelligibility also found to have significant difference ($p<0.05$) between pre and post therapy scores of Speech Intelligibility Rating Scale. (Fig. 3)

The pre and post therapy scores of Mean Length of Utterance also showed significant difference ($p<0.05$) between pre and post therapy scores of Mean Length of utterances. (Fig. 4)

Table IV: Auditory verbal therapy programme

(a) Improving the Auditory Skills: It included improving of Awareness of sound, Supra-segmental discrimination and association, Segmental discrimination and association, Identification and Processing and comprehension.
(b) Developing Speech Skills: It included improving Pre-speech (Imitating two different vocal lengths), Isolation (vowel and consonant in babble in isolation), Vocal play and sound sequencing (to facilitate vocal play and to remediate sound sequencing), Words (to facilitate production of 5 words with 80% intelligibility and to facilitate production of at least 25 words with 80% intelligibility), Phrases (to facilitate production of phrases with 80% intelligibility) and Sentences (to facilitate spontaneous production of sentences with 5-6 words with 80% intelligibility and with 7+ words with 80% intelligibility).
(c) Developing Language Skills: It included improving of Word approximation (to facilitate vocalization to gain attention), Word production (to facilitate production of true words), Connected utterances/ basic sentence production (to facilitate production of 2 word phrases), Connected utterances (to facilitate production of 10 different 2-3 word sentences), Simple sentences with grammatical markers (to facilitate production of simple sentences with grammatical structures), Expanded sentences (to facilitate production of interrogative sentence formulation and expanded sentence formulation) and Complex sentences (to facilitate production of conjoining sentence, complex sentences and narration).
(d) The fourth phase included obtaining the post therapeutic scores by assessing the post therapeutic status of the children administering with the same set of tools used for assessing specific area or skill, that were used during the pre-therapy period. Lastly compilation of the pre and post therapy data were done on Microsoft excel-sheet. These data were then compared to find out significant difference between the pre and post therapy using Independent Sample's T-test in SPSS-16 software.

The pre and post therapy overall satisfaction ratings given by parents after Auditory Verbal Therapy were also compared. Significant difference between pre and post therapy overall satisfaction ratings given by the parents in the visual analog scale were good (mean = 8.06; S.D. ±0.73) for their child's improvement in respect to speech-language and hearing skills after auditory verbal therapy, which was significantly better than the ratings given by parents before the auditory verbal therapy i.e., somewhat satisfied (mean= 4.05; S.D. ±1.24). (Fig. 5)

Discussion

The objectives of the study were to find out and compare the listening skills, linguistic skills, speech intelligibility,

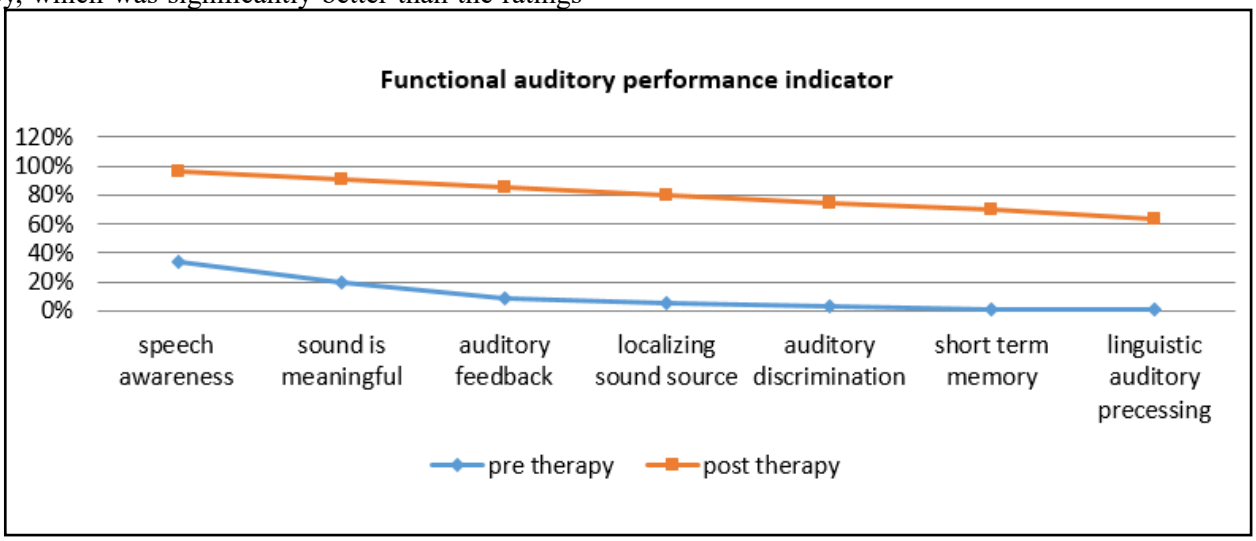


Fig. 1. Comparison of pre and post therapy FAPI scores

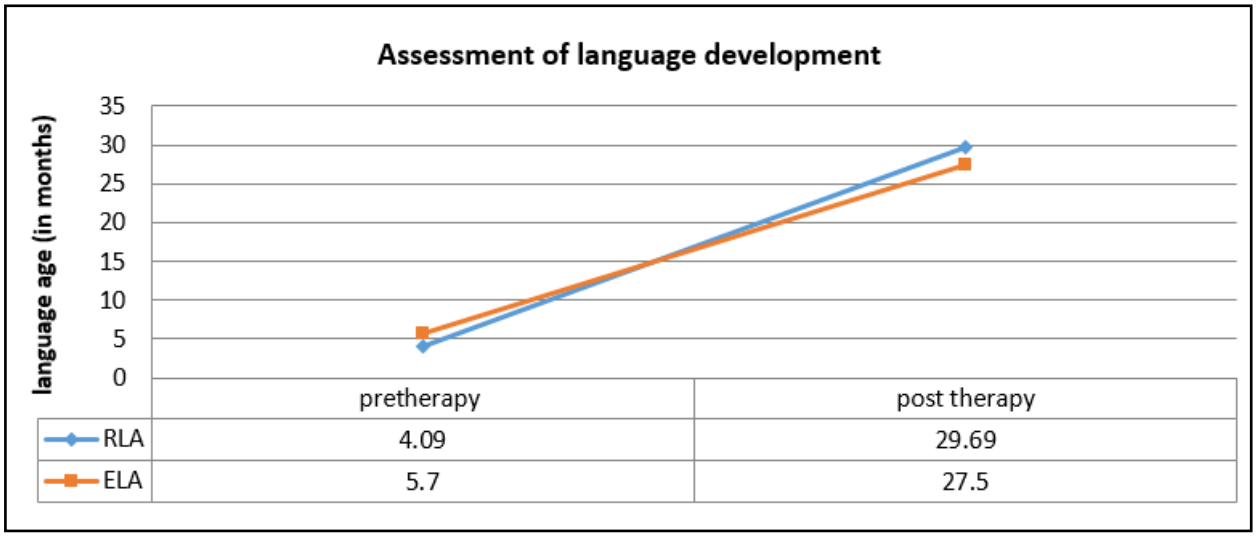


Fig. 2. Comparison of Pre and Post therapy Receptive and Expressive Language scores obtained by assessment of language development

mean length of utterances of morphemes and to rate the overall parental satisfaction of parents from the cochlear implant and compare with post auditory verbal therapy rating.

This preliminary study reveals that although, there was a significant difference in pre and post therapy scores, none of the participants achieved age appropriate speech and language skills however children implanted at early age, have more improvement than others. The differences between the pre and post therapy scores of the listening skills on functional auditory performance checklist suggested significant improvement in listening skills, within 6-8 months of cochlear implantation. For linguistic skills, the differences between the pre and post therapy scores for receptive and expressive language skills on Assessment of Language Development (ALD) suggests, there is significant improvement in their receptive and expressive language skills within 6 months. The mean scores of overall intelligibility of speech in the post-therapy assessment had a significant

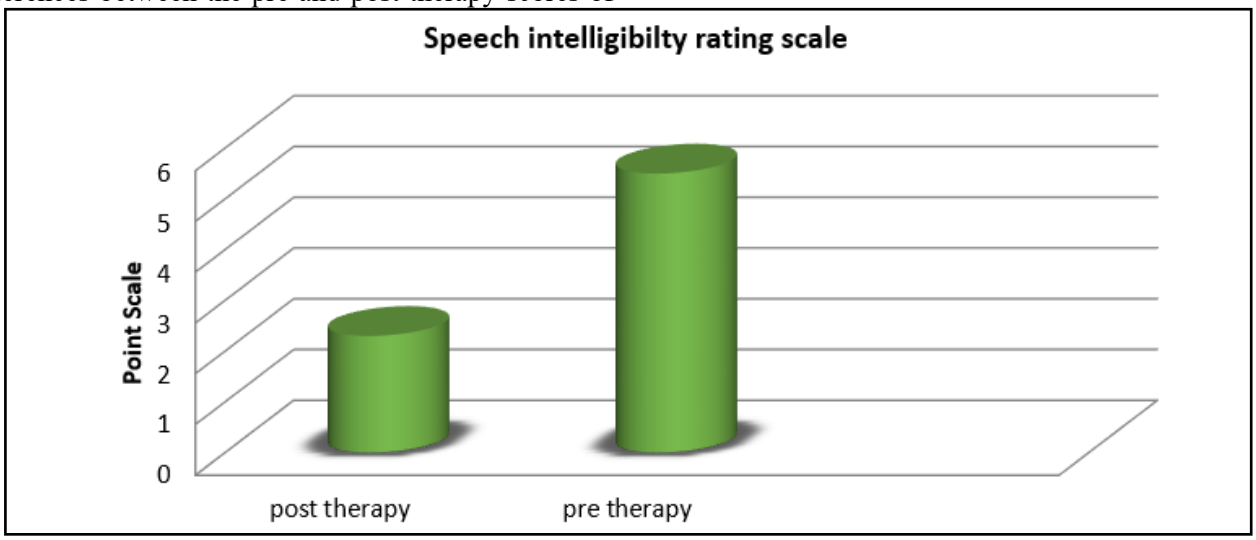


Fig. 3. Comparison of Pre and Post therapy scores obtained by Speech Intelligibility Rating Scale.

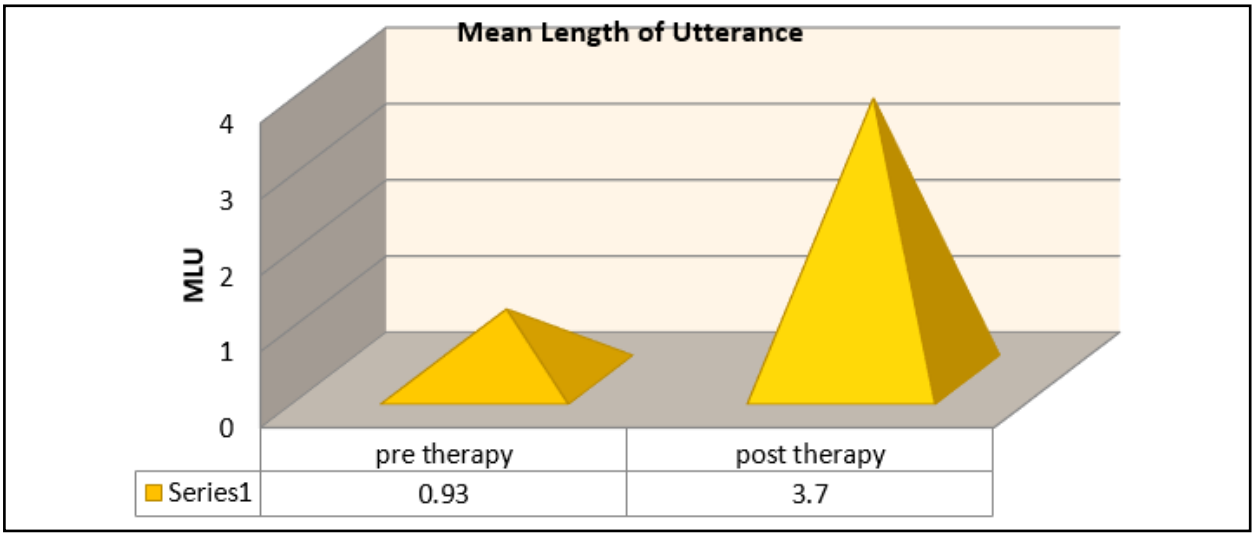


Fig. 4. Comparison of Pre and Post therapy scores obtained by Brown's (1973) stages of MLU assessment

difference from the pre-therapy ratings but the perception of supra-segmental features in speech and the voice of the cochlear implant children had significant but not much stronger outcomes. Similarly, for the mean length of utterances, it has been found that although, there is significant increment in the mean length of utterance of the participants; they still have significantly delayed mean length of utterances in morphemes. It is important to explore the parental expectation and satisfaction with the implant habilitation, parental stress, and quality of life of children and their families, especially due to the diversity in the cultural differences and socio-economic status in the Indian context, which was rated on a visual analog rating scale showing the satisfaction level and expectancy of parents after the implant and therapy is significantly higher.

A recent study conducted by Nadurkar and Susmitha to see the progress in listening skills of cochlear implant children suggests development of auditory skills triggers in first three months of cochlear implantation.[5] A study

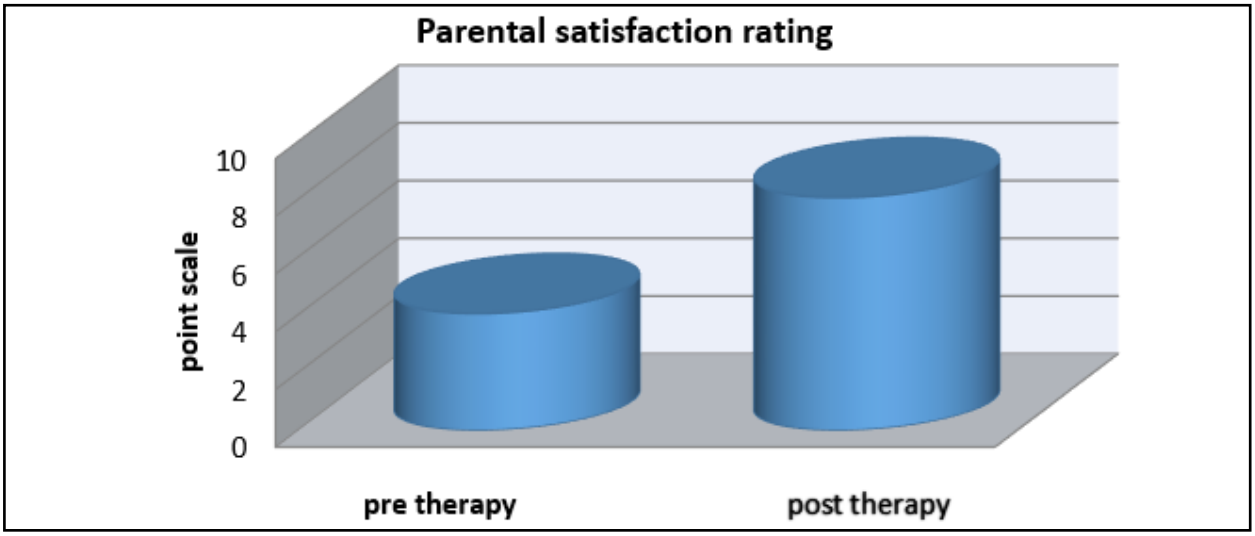


Fig. 5. Comparison of Pre and Post therapy overall satisfaction ratings given by parents after Auditory Verbal Therapy after cochlear implantation.

conducted by Dornan et al. suggest that within nine months of auditory verbal therapy, there is a significant boost in linguistic skills of cochlear implant children and age appropriate linguistic skills can be achieved within 24 months.[6]

Most and Peled in his study concluded that perception of supra-segmental features of speech in children with cochlear implant had not a significant effect on children with hearing aids.[7] Mahmoudi et al. studied on voice abnormalities of cochlear implant children, suggested that "voice abnormalities in speech of cochlear implant children had no significant difference from the children using hearing aids".[8] In dissonance to these findings, Tyler et al. concluded in his study that use of cochlear implant has been associated with stronger outcomes in speech production and verbal intelligibility compared with children using conventional hearing aids.[9]

For the variability in these results, many factors seem to contribute such as the effect of environment and culture, which include gender temperament, socioeconomic status, caregiver interactions, reading habits and social environments. Indeed, with poor socioeconomic background, disparities in the development of language processing are arguably and most consistently found with decrease in vocabulary, phonological awareness and syntax at many different developmental stages which is also supported by Bradley and Corwyn in their study on socioeconomic status and child development.[10]

Conclusion

Though several studies have been demanded the same kind of findings but this study gives a comprehensive light of knowledge with reference to different formats of evaluation in large number of subjects. Studies even proved efficacy of AVT in Cochlear Implant users with small sample sizes but for better population estimation large sample size is always better. In Indian context, there is no protocol-based study on efficacy of AVT on cochlear implant done on a large number of populations. Hence, this study is found to be useful to form a protocol consisting of scales used to measure the efficacy of AVT and can be used for assessment and management for intervention and hence, for tracking the overall improvement of the child. There are several limitations in this study. The limitations included the socio-economic status, language exposure and parental participation which play vital role and success of auditory verbal therapy and development of listening and linguistic skills in hearing impaired children.

This study created numerous recommendations to be implicated for further research. There is a vivid need to develop a strong protocol to check the efficacy of the cochlear implant and the post-surgical habilitation provided under the government schemes; which should be included and implemented under the government policy. Therefore, this research can throw a light on the implication of amendment of a strong protocol of checking efficacy and further development of a treatment efficacy software for assessment, management and tracking development using this structured protocol.

References

1. Ling D. Auditory-verbal options for children with hearing impairment: Helping to pioneer an applied science. The Volta Review 1993; 95(3): 205-15
2. Stredler BA, Johnson DC. Functional auditory performance indicators: An integrated approach to auditory development. 2003 Available from: http://www.cde.state.co.us/cdesped/SpecificDisability-Hearing.htm
3. Lakkanna S, Venkatesh K, Bhat JS. Assessment of Language Development. Bakersfield, CA: Omni therapy services, 2008
4. Brown R. A first language: The early stages. Cambridge Mass: Howard University Press 1973. doi:https://doi.org/10.1017/S030500090000074X
5. Nandurkar A, Susmitha CG. Listening skill progress in children with cochlear implant in the first three months after implantation. Int J Otolaryngol Head Neck Surg. 2017; 3(3): 632-38
6. Dornan D, Hickson L, Murdoch B, Houston T. Speech and language outcomes for children with hearing loss educated in Auditory-Verbal therapy programs: A review of evidence. Communicative Disorders Review 2007; 2(3-4): 157-72
7. Most T, Peled M. Perception of suprasegmental features of speech by children with cochlear implant and with hearing. Journal of Deaf Student and Deaf Education 2007; 12 (3): 350-61
8. Mahmoudi Z, Rahati S, Ghasemi M, Rajati M, Asadpour V, Tayerani H. Diagnosis of voice abnormalities in speech of Children with cochlear implant and Hearing aid with artificial decision making systems. J Med Sci. 2009; 5(2): 67-78

9. Tyler RS, Teagle HB, Kelsay DR, Gantz BJ, Woodworth GG, Parkinsin AJ. Speech perception by prelingually deaf children after six years of cochlear implant use: Effects of age at implant. Int J Language and Communication Disorders, 2001; 36: 82-4

10. Bradley RH, Corwyn RF. Socioeconomic status and child development. Annual Review of Psychology 2002; 53(1): 371-99.

Clinical and Experimental Study on Thermoregulatory System and its Relation with Vasomotor Rhinitis

Somnath Saha,[1] Nirmalya Kumar Majumder,[2] D P Thombre[3]

ABSTRACT

Introduction

Much of the perennial cold are of vasomotor origin still a less appreciated phenomenon even among the medical personnel, much of which is dubbed in a cursorily in the clinical analogue of a west paper wrap as 'allergic rhinitis'. This study was attempted to find out the role of thermoregulatory system with causation of vasomotor rhinitis and assessing role of hypothalamus in causation of vasomotor rhinitis.

Materials and Methods

In this study conducted during the period of July 1987 to August 1988, 20 normal adult individuals were taken as control and thermoregulatory study was done on them. The results were compared with cases of vasomotor rhinitis/non-allergic rhinopathy cases. In experimental study thermoregulatory study was done on albino rats before and after stereotaxis of anterior and posterior hypothalamic nuclei and the result were compared before stereotaxis and post stereotaxis.

Results

Among human study in clinical subjects, patient suffering from vasomotor rhinitis showed a definite shift towards thermoregulatory imbalance both for generalized body caloric fluctuation and particularly on the nasal mucosa. Post-vidian neurectomy results for thermoregulation test was highly significant. In animal study post-hypothalamic stereotaxis temperature measurement showed minimal depression. Dorsal anterior hypothalamic lesion ablation showed significant derangement in the thermoregulatory tolerance profile of the rats' belly temperature. Posterior hypothalamic lesion showed that there may be some amount of derangements in the thermoregulatory tolerance, which however is not statistically conclusive. Thermoregulatory control is done at hypothalamus, particularly at anterior hypothalamic nuclei level and posterior hypothalamic nuclei in the brain. Thermoregulatory study proves a close correlation between non allergic rhinitis with imbalance in central thermal regulation by hypothalamus.

Conclusion

Thermoregulatory study in control and clinical subjects proves a close correlation between vasomotor rhinitis and sympathetic, parasympathetic system.

Keywords

Rhinitis, Vasomotor; Body Temperature Regulation; Autonomic Nervous System; Hypothalamus; Denervation

The term nonallergic vasomotor rhinitis (also called idiopathic rhinitis) means rhinitis symptoms that occur in relation to nonallergic, noninfectious triggers like: changes in temperature, humidity, and barometric pressure; exposure to strong odours, tobacco smoke, and exhaust fumes; and even the ingestion of certain foods. Up to 33 % of patients with rhinitis are estimated to be of nonallergic rhinitis, and close to 65% of patients with allergic rhinitis also have symptoms that occur or worsen in the presence of nonspecific, nonallergic stimuli.[1]

Usually the primary symptoms observed are nasal obstruction and rhinorrhoea, with the term "vasomotor" suggesting involvement of neural, glandular, and vascular pathways.

Vasomotor rhinitis is the most common form of nonallergic rhinitis, comprising approximately 71%

1 - Department of ENT, Medical College, Kolkata
2 - Department of ENT, JIPMER, Puducherry
3 - Department of Physiology, JIPMER, Puducherry

Corresponding author:
Dr Somnath Saha
email: sahasomnath11@gmail.com

of all nonallergic rhinitis conditions.[2] Its etiology and pathogenesis are imperfectly understood. Its diagnosis especially differentiation from other groups of rhinitis is difficult. The natural history is also variable and sometimes it remains undiagnosed in presence of other disabling diseases. Its treatment is also controversial and has changed from time to time. Due to rich autonomic supply of the nose, minimal changes of temperature, any neuroendocrinal change and emotional change can affect the nasal mucosa to a greater or lesser degree. Although the unified airway hypothesis indicates shared pathophysiological processes across both the upper and lower airways,[3-5] the role of the autonomic nervous system (ANS) in nose and sinus symptoms is poorly understood. Historically, the capacity of the nasal vasculature to shrink and engorge in animals was known in the 1850s and was histologically characterized as early as the 1950s.[6]

The important vasomodulatory effects of autonomic nerves in the nose were highlighted by Millonig et al[7] in 1950 and further supported by evidence from cases of autonomic denervation in patients with nose symptoms. Konno and Togawa described, in 1979, the successful use of a vidian nerve section to improve symptoms of patients' allergic rhinitis.[8] However, the transient results and variable benefits for different symptoms indicate a more complex relationship between the nose and the ANS. Alexander et al in their research studied the role of ANS dysfunction in sinonasal disease. The ANS is influenced by multiple factors, including personality and psychological distress, that causes the sinonasal symptoms. Further research will help to clarify the etiology of ANS dysfunction and its contribution to common systemic conditions.[9] As hypothalamus is controlling the sympathetic and parasympathetic system of the body it is postulated that any hypothalamic imbalance specially changes in the molecular level and neurotransmitter level can cause a minimal sympathetic parasympathetic imbalance which can affect the thermoregulatory system of the body. This derangement of the thermoregulatory system can also occur via any endocrinal changes which also work through hypothalamus. In the present study, we tried to find out the role of thermoregulatory system and hypothalamus in the causation of vasomotor rhinitis.

Materials and Methods

CLINICAL MATERIAL:

The material of this clinical study consisted of 30 cases of vasomotor rhinitis and 20 controls seen and treated at Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry during the period of July 1987 to August 1988.

CASE:

A case of vasomotor rhinitis was diagnosed based on the following criteria:

1) More than two attacks of rhinorrhoeic bouts/ month.

2) History of intolerance to temperature variation.

3) Alternate or both nostrils having persistent nasal blockage or nasal blockage without any general signs of nasal inflammation like malaise and fever.

4) Pale or congested edematous mucosa of nasal turbinates without any mucopus.

5) Radiology suggestive of mucosal hypertrophy with or without polypoidal changes, but not exhibiting any fluid level.

6) Nasal smear and peripheral blood not showing eosinophilic preponderance i.e. less than 6 cells/field which is normal in this area.

Any patient fulfilling a minimum of four criteria from the list above, including sixth which is the most confirmatory sign, was taken into the pool of our study.

CONTROL:

Normal adult siblings of the patients were studied (Total 20). After all this preliminary investigation, experimental study on control & clinical subjects was conducted to examine the thermal influence on causation of cold. All the experiments were conducted in a thermoneutral laboratory (temperature 26±1° C) using an indigenously devised thermocouple incorporated to 7P1 preamplifier of Grass Model 7 Polygraph with DC 15 Hz as low frequency and high frequency. The speed of the recording was usually 0.25 mm/sec. Normal palm and nasal mucosal temperature were recorded on clinical

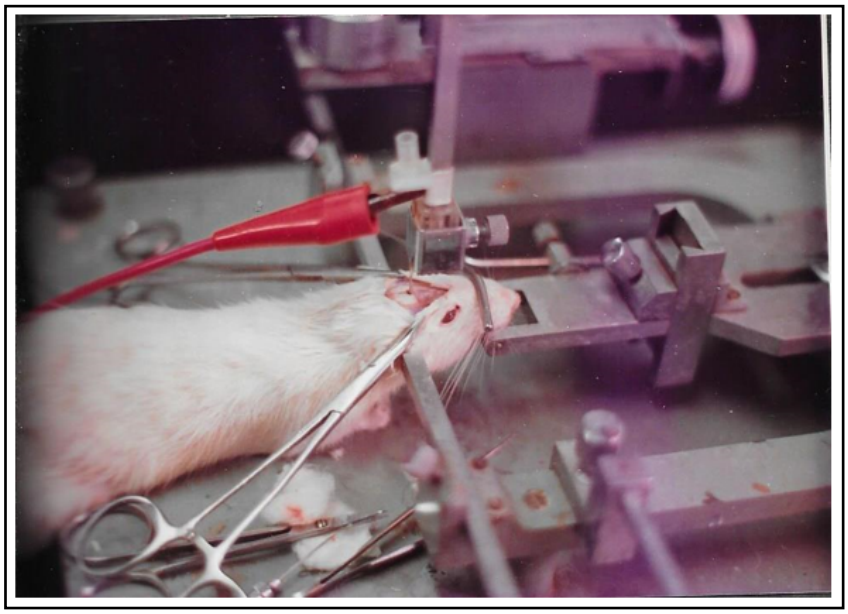


Fig. 1. Hypothalamic stereotaxis (anterior and posterior)

experimental subjects. After that all the experimental subjects were challenged with sudden exposure to cold. Cold challenge was presented to hand and nose.

The palm of the hand was cooled by dipping into ice cold water at 12° C for 3 minutes. Water from the hand was soaked by a filter paper to prevent heat gain by manual rubbing with towel. After that temperature of the palm was measured again for ten minutes and the time period over which the temperature of the palm regains its normal value was recorded. Similarly, the nose was irrigated with ice cold water at 12° C. Residual water in the nasal cavity was soaked by keeping a piece of the filter paper in the dependent portion of the nose. Nasal temperature was recorded again and the time period over which it comes to its normal value was also recorded. During the post cooling temperature measurement, patient is asked to breathe through mouth, so that no caloric exchange took place between nasal air current and respiratory mucosa. Twenty controls were studied to evaluate the normal values.

Another series of 10 patients were taken up from the post vidian neurectomy group to note whether temperature changes can occur in the nasal mucosa after vidian nerve section.

EXPERIMENTAL STUDY:

Experimental study on western Albino rats was done to know the influence of autonomic nervous system on mammalian nasal mucosa. A total of twenty rats were used for the experimental purpose to assess the autonomic denervation at the level of hypothalamus and its relationship with cold exposure. In ten experimental rats, dorsal anterior hypothalamus stereotaxis was done with the help of neurophysiologist. (Fig. 1) Coordinates for the desired area of lesion were determined according to stereotaxis atlas for the rats.[10] Stereotaxis apparatus (INCO) was used. Bilateral electrolytic lesions were made by using a current of two to three amperes from INCO lesion maker for fifteen seconds. Before the lesion all the rats' normal belly temperature and post cooling temperature (after cooling with 12° C water for 3 minutes) of the belly were recorded. Post lesion rats were again then subjected to thermoregulatory study after 3 weeks to examine any post stereotaxis temperature variation with cold challenge test and the results were analyzed. Similarly, posterior hypothalamic lesion was done in 10 albino rats. (Fig. 2)

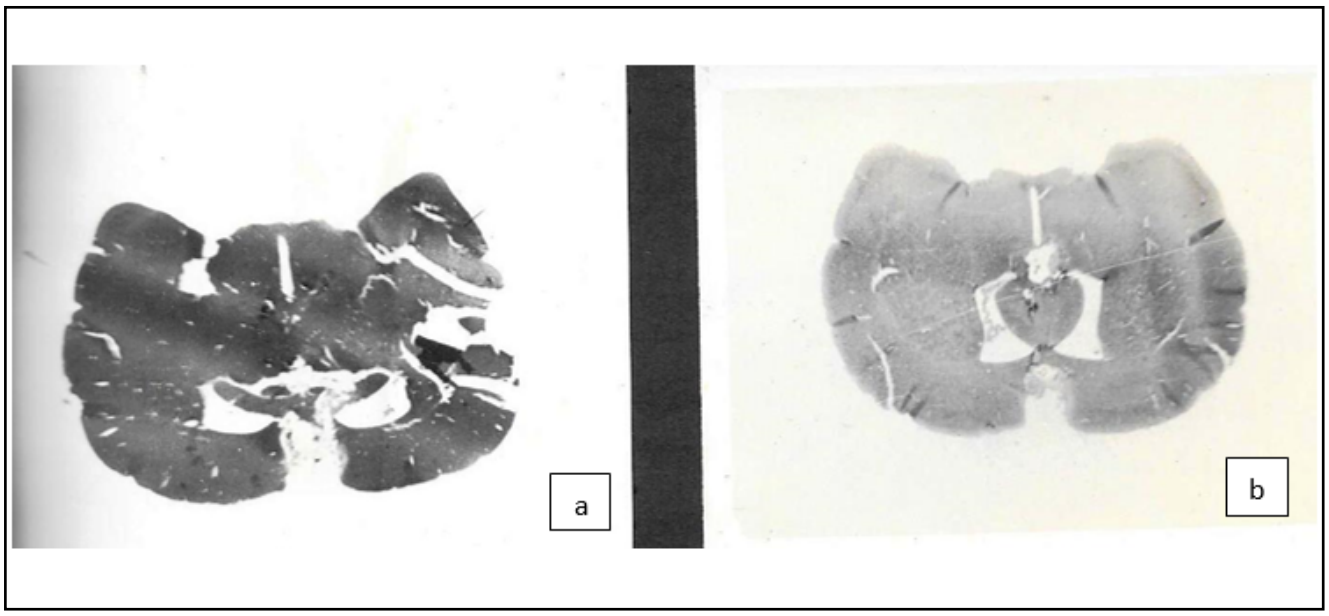


Fig.2. Rat Brain section showing electrolytic lesion in a) Posterior hypothalamus, b) Anterior hypothalamus.

Results

Thermoregulatory profile was done for control group and clinical patients. Experimental cold challenge test was done in both groups and the temperature changes are measured by a thermocouple attached with Grass Model 7 Polygraph.

Control group shows return to normal temperature after initial cooling of hand and nasal mucosa for specified time as per methodology already described. Mean period of return to normal temperature in hand was 335.5 sec. varying from 200 to 600 seconds. In nose the mean period to return to normal temperature 101.58 sec. varying from 80 -120 seconds (Table I)

Vasomotor rhinitis patients show a poor vasomotor response as evidenced by a delayed return to normal temperature (Mean value in hand 746 sec., mean value in nose 250.5 sec). All the data are subjected to statistical analysis by unpaired 't' test and compared to normal and 'p' value calculated. In both hands and nose it is less than 0.001 which is highly significant (Table II).

Post-vidian neurectomy patients (Table III) were examined similarly. Their hands' temperature record was still abnormal but time period over which the nose was coming back to normal after cold challenge test, shows a major shift towards normalcy (Mean value 263 sec. to 103 sec.). Statistical analysis was done by paired 't' test and 'p' value calculated ($P<0.001$) which was highly significant.

ANIMAL EXPERIMENT:

A total of 20 rats were used for this experiment. In 10 rats, dorsal anterior hypothalamic stereotaxis was done. Before the lesion, all the rats' belly temperatures were measured. Average belly temperature for the control rats was 34-37°C. Cold challenge test was done on the rats' belly and temperature was recorded. Similarly, temperature was recorded after the lesion using thermocouple and Grass Model 7 Polygraph.

Temperature was recorded in rats with posterior hypothalamic lesion also in similar manner. After anterior hypothalamic stereotaxis there was elevation of the belly temperature ranging from 34.6°C to 39°C, average 37.61°C. In posterior hypothalamic lesion, it was observed that there was a minimal lowering of the body temperature ranging from 32-37°C (Mean value 34.25°C). All the data were statistically analyzed (paired t test) and p value was calculated. It was seen that p value was significant for anterior hypothalamic

Table I: Control group of patients

SL. NO.	NORMAL TEMPERATURE		AFTER COLD CHALLENGE TEST (AVERAGE TIME TAKEN TO COME BACK TO NORMAL)	
	HAND TEMP(°C)	NOSE TEMP(°C)	HAND	NOSE
1	33	34	600 sec	80 sec
2	34	33	440 sec	90 sec
3	35	34	200 sec	100 sec
4	33	34	330 sec	90 sec
5	36	36	400 sec	100 sec
6	35	35	360 sec	100 sec
7	33	34	200 sec	100 sec
8	31	35	380 sec	120 sec
9	33	33	280 sec	90 sec
10	32	35	200 sec	110 sec
11	33	35	260 sec	60 sec
12	30	34	280 sec	115 sec
13	34	35	400 sec	120 sec
14	32	37	280 sec	110 sec
15	32	38	300 sec	115 sec
16	33	31.5	360 sec	90 sec
17	32	32.5	400 sec	80 sec
18	34	33	400 sec	140 sec
19	32	32.5	360 sec	120 sec
20	33	-	280 sec	-

lesion (p value <0.001). (Table IV)

Discussion

The hypothalamus is a very small, but extremely important part of the diencephalon that is involved in the mediation of endocrine, autonomic and behavioral functions. Recent studies divide the hypothalamus rostrocaudally into four regions: preoptic, supraoptic, tuberal, and mammillary regions. Each region consists of several nuclei, whose functions were defined mainly using lesions, stimulations, and genetic approaches. The anterior hypothalamic nucleus is a nucleus of the hypothalamus. Its function is thermoregulation (cooling) of the body. Damage or destruction of this nucleus causes hyperthermia. The anterior hypothalamic

Table II: Patients selected for surgery (Vasomotor Rhinitis)

SL NO.	NASAL TEMP(°C)	HAND TEMP(°C)	TIME TAKEN FOR HAND TEMPERATURE TO COME BACK TO NORMAL AFTER COLD CHALLENGE(SEC)	TIME TAKEN FOR THE NASAL TEMPERATURE TO COME BACK TO NORMAL (SEC)
1	31	31	1200	240
2	32	31	680	240
3	35	35	600	250
4	34	35	880	280
5	35	33	680	280
6	35	32	800	260
7	33	32	700	280
8	34	35	600	220
9	35	35	520	220
10	37	33	500	240
11	35	37	800	200
12	36	32	960	280
13	36	32	760	360
14	34	33	680	250
15	32	34	700	220
16	34	33	800	270
17	34	33	900	260
18	36	34	760	200
19	35	32	800	220
20	34	31	600	240

region is sometimes grouped with the preoptic area.[11] The posterior nucleus of the hypothalamus is one of the many nuclei that make up the hypothalamic region of the brain. Its functions include elevation of blood pressure, pupillary dilation, and shivering or body heat conservation (thermoregulation).[12]

The hypothalamus has the most complex circuitry of any brain region. Like other brain areas there are neural interconnections. But unlike other brain areas, there are also extensive non-neural communication pathways between the hypothalamus and other brain regions and the periphery.

The circuits are named as limbic circuits, sensory and autonomic circuits and neuro-humoral connections. The role of the hypothalamus in regulation of homeostasis is result of proper interconnection between these circuits.

Table III: Estimation of nasal temperature before and after vidian neurectomy.

SL. NO.	BEFORE SURGERY		AFTER SURGERY	
	NASAL TEMP (°C)	TIME TAKEN FOR NASAL TEMP TO COME BACK TO NORMAL(SEC)	NASAL TEMP (°C)	TIME TAKEN TO COME BACK TO NORMAL TEMP(SEC)
1	34	280	35	120
2	35	280	36	100
3	35	260	36.5	80
4	33	280	38	90
5	34	220	37	110
6	35	220	35	100
7	37	240	36.5	120
8	35	200	37	110
9	36	280	36.5	90
10	36	360	36	110

The above data was subjected to "Paired" 't' test.

Before Surgery: Average value = 262 sec. S.D = 45.65 sec. S.E = 4.22 't' value = 10.34

After Surgery: Average value = 103 sec. S.D = 13.37 sec. S.E = 4.23

Degree of freedom 9

After surgery on comparison 'P' value is <0.001 (Significant)

Insult on one circuit results in disturbances in other. We by our experimental and clinical study tried to establish relationship of the thermoregulatory circuits with vasomotor rhinitis which is an autonomic dysfunctional problem.

Adaptive heat production (thermogenesis) in a cold environment, such as shivering, is triggered by cold sensation delivered from thermoreceptors in the skin to the thermoregulatory brain centre, preoptic area (POA) of the hypothalamus. The thermosensory information from the skin is transmitted to the lateral parabrachial nucleus (LPB) of the brainstem through the spinal cord and this information is further transmitted from the LPB to the POA. Cold and warm sensory pathways are mediated by separate populations of neurons in the LPB. Rats whose spinal-LPB-POA neural pathways are interrupted cannot promptly produce heat in a cold environment, dissipate body heat in a hot environment, or choose comfort thermal environment, indicating that these thermosensory neural pathways play a critical role in autonomic and behavioral defense of body temperature from ambient cold and heat.[13]

The temperature change and its relation with nasal mucosa was studied by Drettner.[14] The nasal temperature showed a tendency to rise with rise in outdoor temperature. Cooling of the back was associated with decrease in nasal temperature and this cooling is greater in women than men. Also cooling of feet was accompanied by transient reduction of nasal temperature and this decrease is greater than cooling of back. The

Table IV: Animal Studies

SL. NO.	CONTROL	LESION I (POSTERIOR HYPOTHALAMIC LESION)	LESION II (ANTERIOR HYPOTHALAMIC LESION)
	TEMP MEASURED BY THERMOCOUPLE-FILLED WITH GRASS MODEL '7' POLYGRAPH (C)	TEMP MEASURED AFTER POSTHYPOTHALAMIC ELECTROLYTIC LESION (C)	TEMP MEASURED AFTER DORSAL HYPOTHALAMIC ELECTROLYTE LESION(C)
1	34.8	32	37
2	35	33	37
3	36	35	39
4	37	35	38
5	35	34	38
6	34	33	34.6
7	36	35	38
8	34.8	35	38
9	34	34	38.5
10	34	37	39
STASTICAL ANALYSIS (Paired 't' test)	Average value = 35.06 C	AV = 34.25 C	AV = 37.61 C
	Standard Deviation = 1.002	SD = 1.39	SD = 1.3
	Standard Error = 0.317	SE = 0.443	SE = 0.41

nasal passage exhibited gradually progressive narrowing especially marked after discontinuation of cooling. Also cooling of the inspiratory air caused pronounced fall of nasal temperature and nasal passage became narrower during inspiration of cold air. General skin cooling also caused the narrowing of nasal passage. They also did the same cooling experiment on persons with allergic or non-allergic rhinopathy at the period when subjects were in normal phase. There was marked swelling at the end of the cold which was in general similar to those in the normal persons. There was relatively pronounced tendency of blanching of nasal mucosa during the exposure to the cold, followed by a bluish discoloration.

In present study a poor thermoregulatory balance was noticed in all cases of vasomotor rhinitis in comparison to control group, as evident by history of cold intolerance and cold challenge test in hand and nose ($P<0.001$) both in hand and nose by unpaired 't' test. Again, in post vidian neurectomy cases, hand temperature remains abnormal while the nose temperature is coming back to normal level ($P<0.001$ by paired 't' test – highly significant) due to parasympathetic ablation. This is due to very close relation of thermoregulatory centres in hypothalamus and its association with sympathetic-parasympathetic centre.[15] Any thermal stimulus can stimulate the thermoregulatory centre of the body on exposure to thermal change. This, in turn, causes an imbalance in sympathetic-parasympathetic system which act upon the very sensitive tissue of the nasal mucosa resulting in congestion and rhinorrhoea.

Dorsal anterior hypothalamic lesion: Temperature study after lesion of this region was suggestive of the hyperthermia indicating that parasympathetic and thermoregulatory centres are in very close proximity with each other and a dorsal anterior hypothalamic lesion can cause temperature imbalance in experimental albino rats ($P < 0.001$). In anterior hypothalamic lesions the rectal temperature even reaches 43° C and anterior hypothalamus acts on the heat-dissipating centre of the body.[15]

Posterior hypothalamic lesion: In posterior hypothalamic lesion, thermoregulatory study showed there was minimal depression of the temperature in the post stereotaxis rat in comparison to the normal. (Average time 34.25 sec. 't' value 1.488, not significant).

Eccles and Lee found maximal vasoconstrictor response were elicited in the hypothalamus anterior to mammillary body and in the central grey matter of mesencephalon.[16] Secondly, there is central autonomic control which extended to area 6 and 8.

Conclusion

Thermoregulatory control is done at hypothalamus, particularly at anterior and posterior hypothalamic nuclei in the brain. Thermoregulatory study in control and clinical subjects proves a close correlation between vasomotor rhinitis and sympathetic, parasympathetic system via hypothalamus in the body.

Acknowledgement

This is the thesis work of Dr.Somnath Saha, done under the guidance of the professor and Head of the Dept. of ENT, Dr. N.K.Majumder at JIPMER and electrophysiological experiment was carried out at Physiology Dept. of JIPMER with kind permission of Dr. Thombre.

Statement of informed consent

Informed consent taken from all the clinical & control subjects on a preformed proforma.

Statement of human and animal rights

The first author states with supporting documents that he had necessary permission from the institution to perform the procedures.

Editor Comments

Though the study was conducted in 1986-87, the findings of the study are still relevant and studies on this subject are very few since then.

References

1. Kaliner MA, Farrar JR. Consensus review and definition of nonallergic rhinitis with a focus on vasomotor rhinitis, proposed to be known henceforth as Nonallergic Rhinopathy Part 1. Introduction. The World Allergy Organization Journal 2009, 2(6):97
2. Settipane RA. Epidemiology of vasomotor rhinitis. World Allergy Organ J. 2009; 2(6):115-8
3. Stachler RJ. Comorbidities of asthma and the unified airway. Int Forum Allergy Rhinol. 2015; 5(suppl 1):S17-S22
4. Frieri M, Kumar K, Boutin A. Review: Immunology of sinusitis, trauma, asthma, and sepsis. Allergy Rhinol (Providence) 2015; 6:205-14
5. Frieri M. Asthma linked with rhinosinusitis: An extensive review. Allergy Rhinol (Providence) 2014; 5:41-9
6. Dawes JD, Prichard MM. Studies of the vascular arrangements of the nose. J Anat. 1953; 87:311-22
7. Millonig AF, Harris HE, Gardner WJ. Effect of autonomic denervation on nasal mucosa; interruption of sympathetic and parasympathetic fibers. Arch Otolaryngol. 1950; 52:359-72
8. Konno A, Togawa K. Role of the vidian nerve in nasal allergy. Ann Otol Rhinol Laryngol. 1979; 88(pt. 1):258-66
9. Yao A, Wilson JA, Ball SL. Autonomic nervous system dysfunction and sinonasal symptoms. Allergy & rhinology (Providence, R.I.) 2018; 9, 2152656718764233. doi:10.1177/2152656718764233
10. König JFR, Klippel RA. The Rat Brain. A stereotaxic Atlas of the Forebrain and Lower Parts of the Brain Stem. Williams and Wilkins, Amsterdam 1963
11. Onoe H, Watanabe Y, Ono K, Koyama Y, Hayaishi O. Prostaglandin E2 exerts an awaking effect in the posterior hypothalamus at a site distinct from that mediating its febrile action in the anterior hypothalamus. J. Neurosci. 1992;12 (7): 2715-25 PMID 1613554

12. Fundamental neuroscience for basic and clinical applications. Haines Duane E, Ard MD. 4th ed. Philadelphia, PA: Elsevier/ Saunders. 2013. ISBN 9781437702941. OCLC 794603152
13. Nakamura K, Morrison SF. A thermosensory pathway mediating heat-defense responses. Proceedings of the National Academy of Sciences of the United States of America 2010; 107(19), 8848-53 doi:10.1073/pnas.0913358107
14. Drettner B. Vascular reactions of the human nasal mucosa on exposure to cold. Uppsala: Acta oto-laryngologica, suppl. 1961;166, 109 pages
15. Barrett K E, Barman SM, Yuan JX-J, Brooks H. Ganong's Review of Medical Physiology, 26th Ed. 2019; New York, McGraw-Hill Education LLC
16. Eccles R, Lee RL. The influence of the hypothalamus on the sympathetic innervation of the nasal vasculature of the cat. Acta Otolaryngol (Stockh) 1981; 91:127-34.

Non-malignant Oral Ulcer: A Diagnostic Challenge to Otorhinolaryngologists

Neeraj Aggarwal,[1] Sirshak Dutta,[2] Avijit Choudhury,[3] Mainak Dutta,[4] Saumik Das,[4] Ramanuj Sinha[4]

ABSTRACT

Introduction

Apart from the malignant ulcers a wide variety of dermatological and other systemic conditions can affect oral cavity and often be a diagnostic challenge due to their similar presenting features and appearance. Despite being benign, some of them may be fatal if not diagnosed and treated timely. This study aims to assess the incidence of different non malignant ulcers in oral cavity and to estimate the need for histopathological examination for confirmation of the condition for proper management.

Materials and Methods

An institution based observational study was conducted over a time period of 16 months at a tertiary care institute. Total 172 cases were included in the present study irrespective of age, sex and duration. Malignant lesions were excluded from the study.

Results

The present study shows a slight male preponderance (M:F = 1.48:1) with majority of cases were in age group 20-40 years of age (43.02%). Most commonly encountered were recurrent aphthous stomatitis (27.9%) followed by oral lichen planus (16.28%), oral candidiasis, angular stomatitis, traumatic ulcers and others. 78.5% were treated successfully on the basis of clinical diagnosis while 21.5% cases needed further histopathological or other investigation for confirmation of diagnosis.

Conclusion

Though the otolaryngologists are more concerned about malignant ulcer, there are many non malignant ulcers which can cause significant morbidity and can even be fatal and should be given similar importance like malignant lesions. Majority of them can be treated successfully on the basis of clinical diagnosis but histopathological examination may be required in some cases for proper diagnosis and appropriate management.

Keywords

Oral Ulcer; Benign

Oral ulcer is not a very uncommon entity for an Otorhinolaryngologist. A significant number of patients with oral ulcers attend Otolaryngology outpatient department. Non-malignant ulcer is an under-discussed spectrum of disease, but can cause significant morbidity and sometimes can even be fatal. The major contribution among the oral ulcers is from the non-malignant lesions which also need to be diagnosed timely. Maximum emphasis was put on malignant ulcers in the past as evident from available literature. Oral ulcers may seem to be a simple problem; however, it raises many questions about the differential diagnoses of neoplastic, inflammatory, traumatic, and autoimmune conditions involving the oral cavity.

Different types of oral ulcers presented with similar symptoms leading to diagnostic difficulties. Because of the diagnostic dilemma in identifying the cause of the persistently annoying symptoms suffered by the patient of non-malignant oral ulcers and failure of repeated biopsies to diagnose the situation, the treatment for the same is delayed. With this background, an observational study was conducted in a tertiary care centre, to assess the incidence, demographic characteristics, different presentations and diagnosis, clinical and histopathological correlation of the patient presenting

1 - Department of ENT, Kalna Superspeciality Hospital, Purba Barddhaman
2 - Department of ENT, Raiganj Govt. Medical College, Uttar Dinajpur
3 - Department of ENT, Jangipur Sub-Division Hospital, Murshidabad
4 - Department of ENT, Medical College, Kolkata

Corresponding author:
Dr Sirshak Dutta
email: sirshakdutt@gmail.com

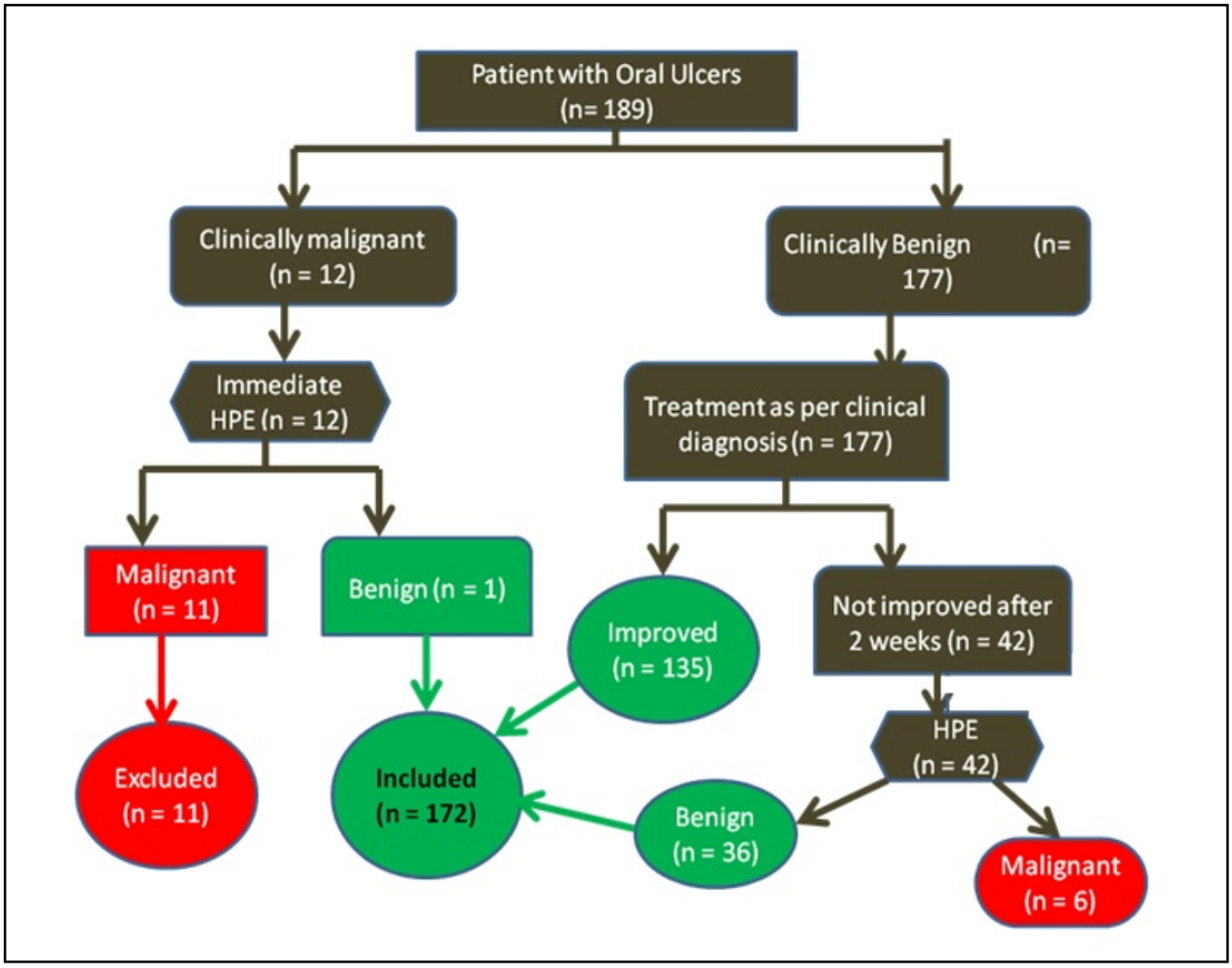


Fig. 1. Working algorithm for inclusion of cases

with non-malignant oral ulcer.

Materials and Methods

A descriptive observational study was conducted in a tertiary care hospital, on patients attending Otolaryngology outpatient department (OPD) with oral ulcers in a period between November 2015-February 2017. These patients underwent proper clinical evaluation. Out of 189 cases of oral ulcers, 172 cases were clinically or histologically confirmed to be benign and are included in the study. Those patients who were suspected to be non-malignant clinically were given an empirical treatment based on the clinical diagnosis for two weeks. If the lesion still persisted, incision biopsy from the ulcers were sent for histopathological evaluation. In some cases, special investigations in the form of Anti-nuclear antibodies (ANA), Anti-Ds DNA, Direct immune florescence, sputum examination, Chest X-ray, etc. were done. On the other hand, all the clinically suspected malignant ulcers underwent histopathological evaluation immediately. One case in this group was found to be benign and was included in the study. (Fig. 1)

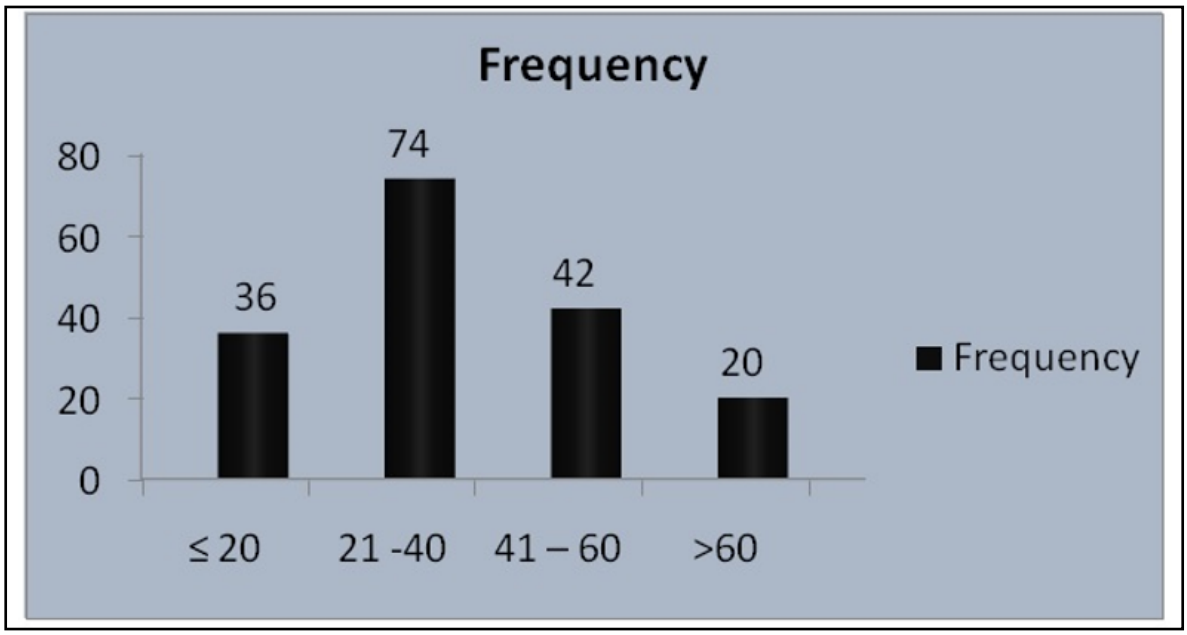


Fig. 2. Age distribution of the patients

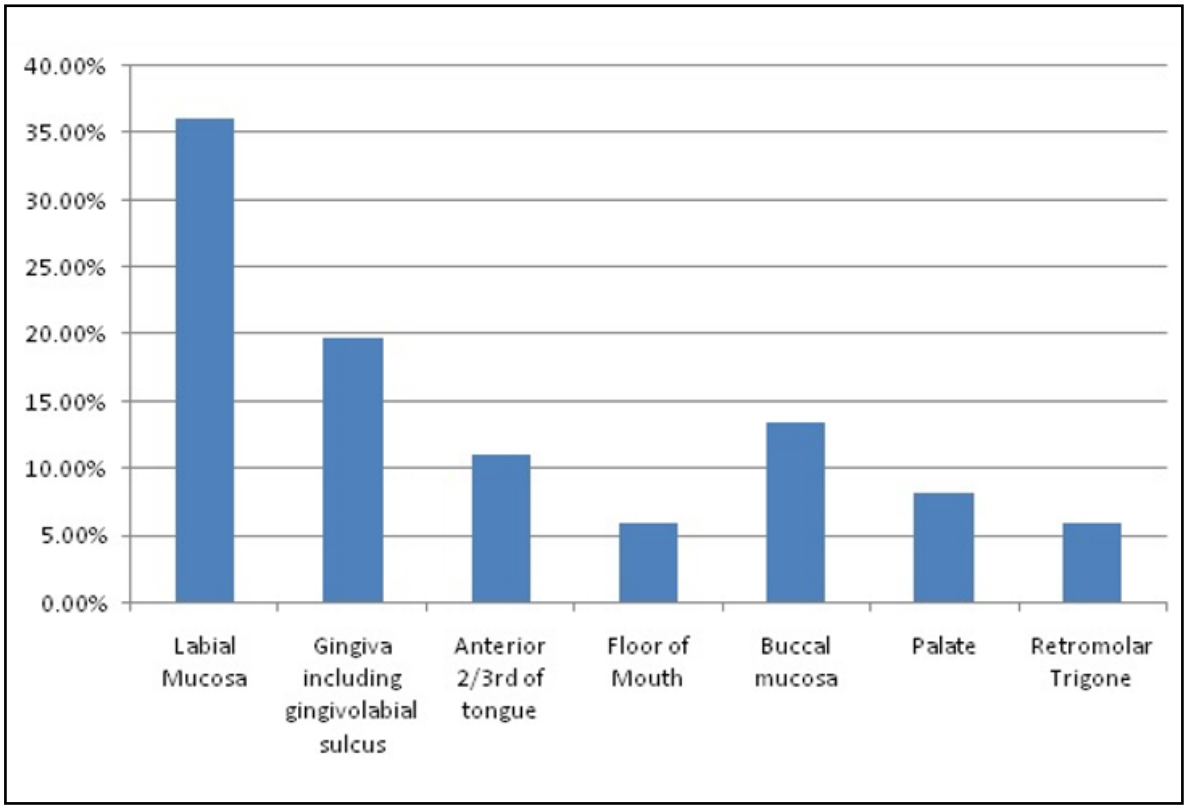


Fig. 3. distribution of case according to site of occurrence

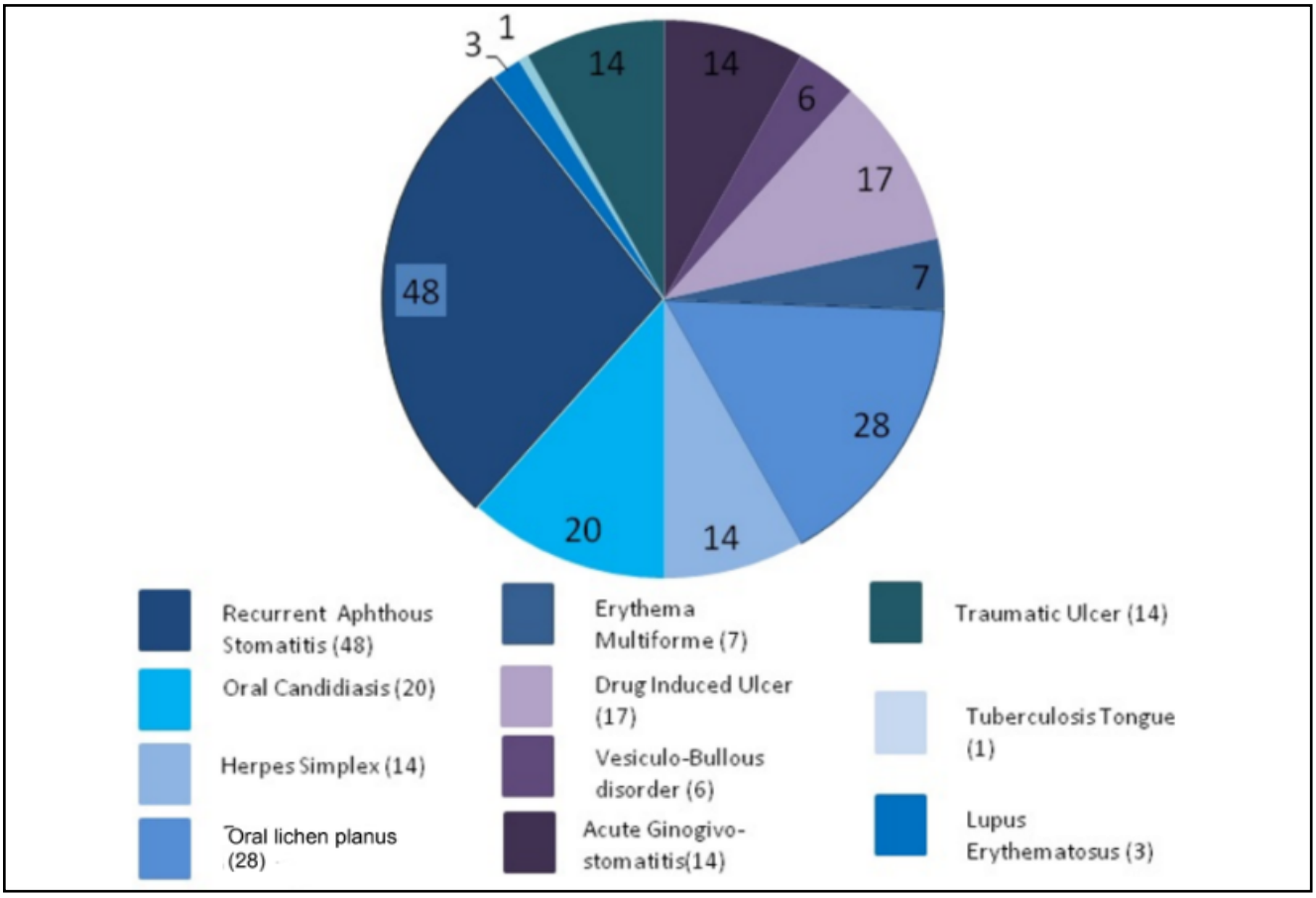


Fig. 4. Variety of ulcers detected in oral cavity

Results

Among 189 cases of oral ulcer, 172 (91%) were diagnosed to be non-malignant. (Fig. 1)

In the present study most of the patients of non-malignant ulcer were in the age group of 20-40 years (43.02%) followed by the age group 40-60 years. (Fig. 2)

There was a slight male preponderance (102 cases, i.e. 59.3%) among the cases of non malignant oral ulcer.

Though there was significant history of addiction in the study population (142 cases i.e. 82.56%) to one or more substance of abuse, the association substance abuse to particular cause of non-malignant ulcer is beyond the limit of the study.

Among the 172 cases finally included in the study, 135 cases (78.5%) were treated successfully on the basis of the clinical diagnosis, while 37 cases (21.5%) required histopathological examination for confirmation or special investigations for diagnosis. (Fig. 1)

While considering the site related preponderance of non malignant oral ulcer, labial mucosa was involved in almost 1/3rd of the patients (36%) followed by gingiva including gingivolabial and gingivobuccal sulcus. (Fig. 3)

Most common lesion was recurrent aphthous stomatitis (27.9%) followed by oral lichen planus. Many rare entities have been encountered during the study like tuberculosis of tongue, pemphigus vulgaris and many others. (Figs 4 & 5)

Discussion

Most of the studies on oral health give more stress on

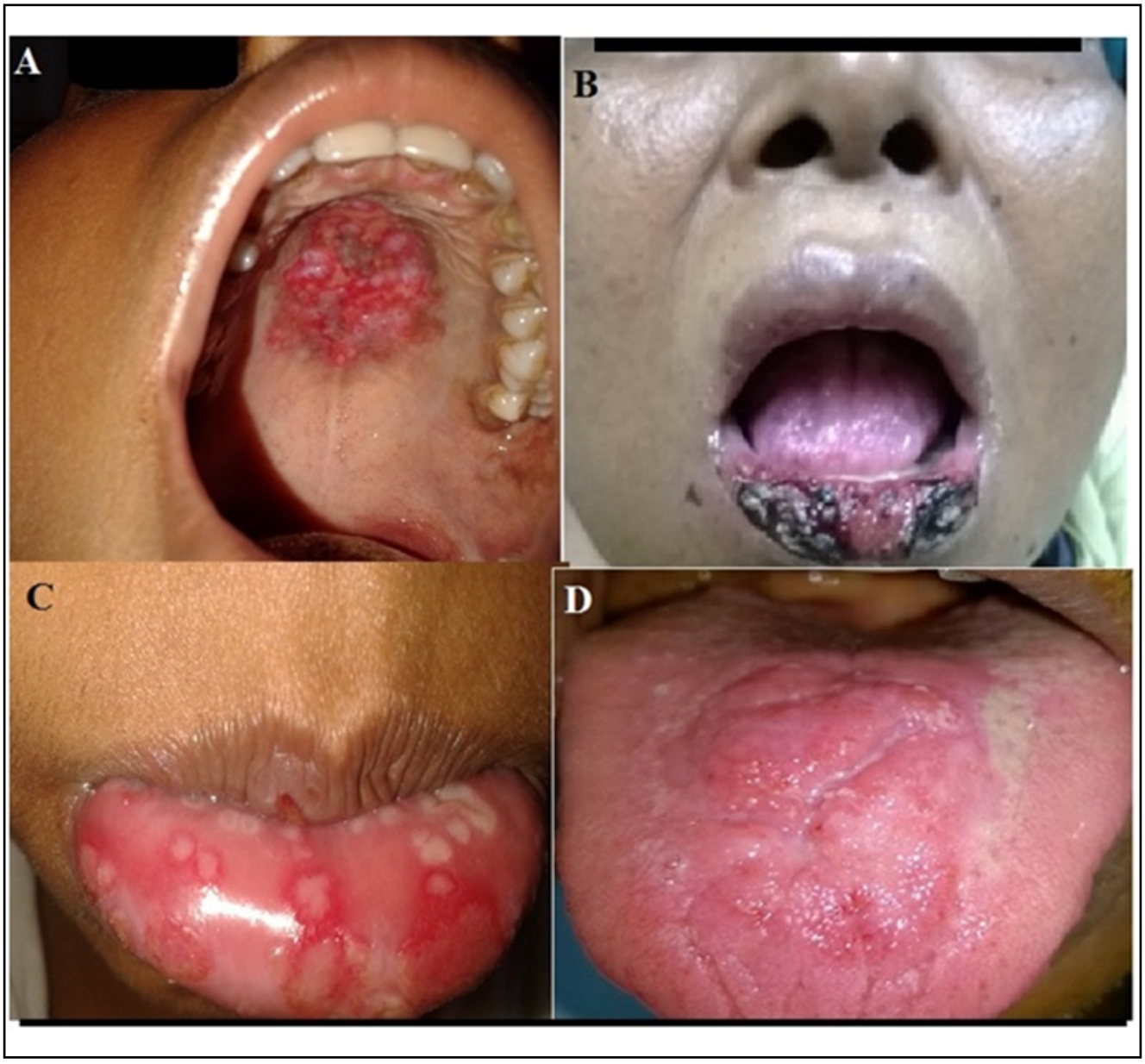


Fig. 5. A) Lupus Erythematosus, B) Pemphigus Vulgaris, C) Multiple Aphthous Stomatitis, D) Tuberculosis Tongue

dental issues and malignant disease of oral cavity and there is paucity of studies on non-malignant ulcer.[1] Ahmed and Uddin (2010), in 'Oral ulceration at primary care' estimated the point prevalence of oral ulcer to be 4% worldwide.[2] Though most of the treating physicians are concerned about the probability of malignancy in a patient of oral ulcer, the present study showed that most of the oral ulcers are benign (91%). The age distribution of patients of oral ulcers varies from study to study and lesion to lesion. According to Roy and Varshney (2013) oral mucosal problems are most prevalent in the age group of 11-40 years.[3] In the present study, most cases were in age group of 20-40 years (43.02%).

If the gender distribution is considered, Saraswathi

et al in their study concluded a slight preponderance of male with male: female ratio of 1.75:1,[4] whereas Roy and Varshney found female preponderance for the condition with sex ratio of 2:3.3 In our study we encountered more male patients with a male: female ratio of 1.46:1. Roy and Varshney (2013), found in their study conducted on 150 cases, aphthous ulcer (28.57%) and pemphigus vulgaris (26.60%) formed the bulk of patients, followed by systemic lupus erythematosus (17.02%), oral candidiasis (16.07%), discoid lupus erythematosus (13.83%), lichen planus (12.77%) and others.[3]

Different studies on oral mucosal lesions show varying results about the final diagnosis. Simi et al in their study on oral mucosal lesions concluded that oral Lichen planus (64%) was the most common entity,[5] while Bhatnagar et al in their study found prevalence of oral lichen planus to be 0.8%, much less than recurrent aphthous stomatitis (1.53%) and oral candidiasis (1.61%).[6] This shows the diversity of diagnosis of oral ulcer in different study groups. In present study, recurrent aphthous stomatitis (27.9%) was most prevalent followed by erosive lichen planus (16.28%).

Most of the cases of non-malignant oral ulcer were treated successfully on the basis of clinical diagnosis alone and less than one fourth cases needed histopathological or other confirmatory investigations. But it is evident from the study that histopathological examination in time according to the clinical nature and course of the disease is mandatory. This is not only to diagnose the malignant lesions, but also for precise diagnosis of some benign entities which need specific treatment on the basis of histopathology.

Conclusion

Every case of non-malignant oral ulcer is needed to be thoroughly examined and even rarest of the rare entities should be kept in mind while dealing with a case of non-malignant oral ulcer. It is to be kept in mind that not only the malignant ulcer but also many non-malignant oral ulcers, if not diagnosed timely, can be life threatening. To diagnose these life-threatening conditions like tuberculosis, pemphigus vulgaris or lupus erythromatosus, a high degree of clinical suspicion along with some timely special investigations should be done. In case of any diagnostic dilemma a team approach should be applied, including Dermatologist, Oral Pathologist and Otolaryngologist as oral ulcerations may be the manifestation of some underlying systemic diseases.

References

1. Petersen PE, Bourgeois D, Ogawa H, Day SE, Ndiaye C. The global burden of oral diseases and risks to oral health. Bulletin of the World Health Organization 2005; 83:661-9
2. Ahmed MU, Uddin MN. Oral ulceration at primary care -A Review. Bangladesh Journal of Plastic Surgery. 2010 ;1:23-9
3. Roy S, Varshney S. Oral dermatological conditions: A Clinical Study. Indian J Otolaryngol Head Neck Surg. 2013; 65:97-101
4. Saraswathi TR, Ranganathan K, Shanmugam S, Ramesh S, Narasimhan PD, Gunaseelan R. Prevelance of oral lesions in relation to habits: Cross-sectional study in south India. Ind J Dent Res. 2006; 17:121-5
5. Simi SM, Nandakumar G, Anish TS. White Lesions in the Oral Cavity: A clinicopathological study from a tertiary care dermatology centre in Kerala. Indian J Dermatol. 2013; 58:269-74
6. Bhatnagar P, Rai S S, Bhatnagar G, Kaur M, Goel S, Prabhat M. Prevalance study of oral mucosal lesions, mucosal variants, and treatment required for patients reporting to a dental school in north India: in accordance with WHO guide lines. J Family Community Med. 2013; 20: 41-8.

Clinico-etiological Profile of Vocal Cord Paralysis

Shivakumar Senniappan,[1] Govind Krishnan Gopalakrishnan,[1] Chinnu Sudha Kumar,[1] Anjali Mahendra Panicker,[1] Visakh Kookkal Nair,[1] Shankar Radhakrishnan[1]

ABSTRACT

Introduction

Vocal Cord Paralysis may be of central or peripheral origin based on the underlying pathology. Central Causes contribute about 10% while peripheral causes about 90% and the current study evaluated the clinical profile of vocal cord paralysis.

Materials and Methods

A cross-sectional observational study was conducted in the department of ENT for a period of one year. Patients with complaints of hoarseness or aspiration who on laryngoscopy examination with 45° telescope have been diagnosed to have vocal cord paralysis were included for the study. A total of 83 patients were included in our study.

Results

Vocal cord palsy was found most commonly after thyroidectomy (20.4%) followed by the idiopathic cause (19.2%). Certain cancers like lung cancer and neck cancers (hypopharyngeal, laryngeal and thyroid) carcinoma had also contributed significantly in the development of vocal cord palsy. Left sided vocal cord palsy (65%) was found to be the commonest side affected followed by bilateral vocal cord palsy.

Conclusion

A proper protocol is necessary for identifying the factors responsible for vocal fold paralysis which would help in managing the condition more effectively. Before making a diagnosis as idiopathic vocal cord paralysis, detailed investigations should be carried out to rule out the possibilities of cancer, causing vocal cord paralysis.

Keywords

Vocal Cord Paralysis

The mechanism of production of voice which is our primary mode of communication is a combination of laryngeal, respiratory and resonance components.[1] Hoarseness is an early and very important symptom of laryngeal pathology caused by simple common cold to the dreaded laryngeal malignancy.[2] Voice disorders also have a significant influence on vocational, social and emotional adjustments of patients. Mostly vocal cord paralysis is considered as a sign of an underlying pathology, which may be central or peripheral in origin. Studies have shown peripheral causes (90%) being more common than central (10%).[3] Vocal cord paralysis is reported commonly following surgical procedures like thyroidectomy, sometimes as a complication of intubation leading to arytenoid dislocation and rarely reported as an isolated neurologic disease.[4] The cause for vocal cord paralysis usually arises in the cranial cavity, mediastinum, or neck along the course of corresponding recurrent or inferior laryngeal branch of Vagus. Due to the longer intrathoracic course of the left recurrent laryngeal nerve of left vocal cord is more common than the right.[5]

Hoarseness is the most common presenting symptom among patients with vocal cord palsy and other associated symptoms are stridor, breathlessness, dysphagia, sore throat, cough and haemoptysis.[6] Diagnosing the cause of vocal cord palsy in the early stage is most challenging and when successful, most of the complications including death due to malignant lesions can be avoided.[7] Thyroid neoplasms, lung cancer, esophageal carcinoma and mediastinal metastases are the common malignancies

1 - Department of ENT, Vinayaka Missions Kirupananda Variyar Medical College, Salem

Corresponding author:
Dr Shivakumar Senniappan
email: drshiva73@gmail.com

which involve the recurrent laryngeal nerve leading to the paralysis of the vocal cords. Further, studies have shown that the most common cause for unilateral vocal cord palsy is bronchogenic carcinoma which involves the left vocal cord 2.5 times more than the right vocal cord.[8] Anesthesia related vocal cord palsy occurs mainly during endotracheal intubation carried out for elective surgeries, leading to arytenoid dislocation.[4] A viral or idiopathic vocal cord palsy generally heals without any medical intervention. All patients with vocal cord palsy need to be evaluated thoroughly with a detailed history, complete examination of head and neck, nervous system and larynx with appropriate radiological tool like chest X-ray and CT scan. MRI screening from the skull base to the diaphragm should be done to rule out the causes in the the brain stem, neck, chest and mediastinum.[9,10]

As of today, only very few studies had reported the clinical picture and the etiology of vocal cord paralysis and so the present study was undertaken to study the clinical profile of vocal cord paralysis.

Materials and Methods

This observational descriptive study was conducted in the department of ENT of our hospital for a period of one year between September 2016 and August 2017. The study had the clearance from the institutional ethics committee. Patients with complaints of hoarseness or aspiration, who had been diagnosed to have vocal cord paralysis on laryngoscopy with 450 telescope were included in the study and other patients with hoarseness without vocal cord paralysis were excluded. A total of 83 patients were included in this study. Informed consent was obtained from all our study subjects.

A complete history related to the causative factors of vocal cord paralysis was obtained from all the patients and a detailed physical examination was conducted. A good ENT examination including mirror examination of the larynx was done and a complete neurological examination was performed by a neurologist. All routine investigations like haemogram, urine examination, kidney function tests, liver function tests, blood glucose and serological assessment were done on all patients. Chest X-ray, and other invasive procedures like fibre-optic laryngoscopy, direct laryngoscopy with a passive mobility test, bronchoscopy, barium swallow, and if abnormal, an esophagoscopy, were performed. If all these procedures had been performed and no etiology found, a patient with vocal cord paralysis was placed in the category of "idiopathic".

The data were analyzed using SPSS version 21. Mean and standard deviation was determined for all the parametric variables and Chi-square test was used to derive statistical inference between two non-parametric variables.

Results

The minimum age in the study population was 18 years and the maximum age was 82. Majority of the subjects in both males and females were aged above 60 years with the mean age among males was 62.6 years and among females it was 64.3 years. The ratio of females to males was 1.12. (Table I) The most common symptom presented by the patients was hoarseness, which was present among all the subjects and there were few associated symptoms like dysphagia, cough and dyspnea reported among 45% of the patients with vocal cord palsy. (Table II) Among the various etiological factors analyzed, we found that thyroidectomy was most commonly associated with vocal cord palsy (20.4%) followed by the idiopathic cause (19.2%). When we further analyzed the idiopathic group, we found that majority of those patients were chronic smokers. Esophagectomy and trauma to vocal cord during intubation were also found to be causes of vocal cord palsy. Certain cancers like lung cancer and neck (hypopharyngeal, laryngeal and thyroid carcinoma) also contributed significantly to the development of vocal cord palsy. (Table III) Left vocal cord palsy (65%) was found to be the commonest, followed by bilateral vocal cord palsy (20.4%) while involvement of the right cord (14.4%) was found to be least common. (Table IV). Analyzing the side of vocal cord palsy and its association with various etiological factors we found a statistically significant association between these two as most of the etiological factors showed involving the left side of the vocal cord except for the neck carcinoma which had a bilateral involvement of the vocal cord. (Table V)

Table I: Age and sex wise distribution of the study subjects

AGE GROUP	GENDER		TOTAL	P VALUE
	MALE	FEMALE		
<20	1 (2.5%)	1 (2.2%)	2 (2.4%)	0.718
21 – 30	1 (2.5%)	2 (4.5%)	3 (3.6%)	
31 – 40	3 (7.6%)	5 (11.3%)	8 (9.6%)	
41 – 50	2 (5.1%)	2 (4.5%)	4 (4.8%)	
51 – 60	4 (10.2%)	4 (9%)	8 (9.6%)	
61 – 70	16 (41%)	18 (40.9%)	34 (40.9%)	
71 – 80	10 (25.6%)	8 (18.1%)	18 (21.6%)	
>80	2 (5.1%)	4 (9%)	6 (7.2%)	
Total	39 (100%)	44 (100%)	83 (100%)	
Mean ± SD	62.6 ± 11.2	64.3 ± 10.8		

Discussion

Vocal cord paralysis is rarely caused by diseases occurring within larynx. As quoted in the literature the commonest cause for vocal cord palsy is the involvement of the recurrent laryngeal nerve mostly between the jugular foramen and its entry point into the larynx such as tumors, abscess, bulbar palsy or cerebrovascular accident.[11] In our study we found majority of the patients were between 60 and 80 years of age and males and females are almost in equal numbers, whereas most of the studies had found majority of patients with vocal cord palsy in the age group of 50-60 years and males were found to be more commonly affected than females with a male: female ratio of 3:1.12.[13] In the present study we found no association between the vocal cord palsy to any particular occupation which concurred with the study done by Jayanthi et al.[12] The most common symptom reported in our study was hoarseness and other symptoms like cough, dysphagia and dyspnea were related to the underlying diseases and similar observations were also made in the study conducted by Swift and Rogers.[14] The onset of symptoms was sudden in 35% patients and gradual in 65%. This is almost

Table II: Symptom wise distribution of the study subjects

SYMPTOM	FREQUENCY	PERCENTAGE
Hoarseness of voice	46	55.4%
Hoarseness of voice with dysphagia	16	19.2%
Hoarseness of voice with cough	13	15.6%
Hoarseness of voice with cough and dyspnoea	8	9.6%
Total	83	100%

Table III: Distribution of the study subjects based on the various etiological factors for vocal cord palsy

ETIOLOGICAL FACTORS	FREQUENCY	PERCENTAGE
Post thyroid surgery	17	20.4%
Carcinoma lung	12	14.4%
Esophagectomy	14	16.8%
Idiopathic	16	19.2%
Trauma	11	13.2%
Neck carcinoma (hypopharyngeal, laryngeal and thyroid)	8	9.6%
Cardiac bypass/open heart surgery	2	2.4%
Neurogenic	3	3.6%
Total	83	100%

in accordance with Swift and Rogers, who found the gradual and sudden onset of symptoms as 73.7% and 26.3% respectively.[14] The paralyzed vocal cord was most commonly found in paramedian position (70.7%) while in 18.5%, paralyzed vocal cord was in intermediate position and median position was noted in 12.2% of the patients and these findings were almost at par with other studies.[15,16] In our study majority of patients showed paralysis of left vocal cord. This is in accordance with the study by Rosenthal et al.[15] In the studies done by Seyed et al and Rosenthal et al, it was found that half of the patients had left vocal cord paralysis followed by right and both sides; which was almost similar to the results of our study.[6,15] In the current study the most common etiology for vocal cord palsy was thyroidectomy followed by idiopathic, neoplasm and trauma. In their study ,Yumoto et al had reported that surgery in 42.7%, malignancy in 22.4%, idiopathic in 17.4% and injuries of the neck in 2.2% of cases contributed to unilateral vocal cord paralysis vocal cord while Rosenthal et al. stated surgery in 46.3%, malignancy in 13.5%, idiopathic in 17.6% and neck trauma in 2.2% of subjects as reason of unilateral vocal cord paralysis in their study.[13,15] In our study among the idiopathic group of vocal cord palsy we found chronic smoking as the most important factor and few of the Korean studies had also shown that chronic smoking was an important cause for vocal cord palsy.[16-18] Esophagectomy (16.8%) was found to be the third most common cause for vocal cord paralysis in our study and few studies done earlier had confirmed

Table IV: Distribution of the study subjects based on the side of vocal cord palsy

SIDE OF VOCAL CORD PALSY	FREQUENCY	PERCENTAGE
Left	54	65%
Right	12	14.4%
Bilateral	17	20.4%
Total	83	100%

Table V: Association between various etiological factors and the side of vocal cord paralysis

ETIOLOGICAL FACTORS	SIDE OF VOCAL CORD PALSY			P VALUE
	LEFT (N=54)	RIGHT (N=12)	BILATERAL (N=17)	
Post thyroid surgery (n=17)	9 (52.9%)	5 (29.4%)	3 (17.6%)	<.0001
Carcinoma lung (n=12)	11 (91.6%)	0	1 (8.3%)	
Esophagectomy (n=14)	13 (92.8%)	0	1 (7.1%)	
Idiopathic (n=16)	8 (50%)	4 (25%)	4 (25%)	
Trauma (n=11)	9 (81.8%)	1 (9%)	1 (9%)	
Neck carcinoma (hypopharyngeal, laryngeal and thyroid)	0	1 (12.5%)	7 (87.5%)	
Cardiac bypass/ open heart surgery (n=2)	1 (50%)	1 (50%)	0	
Neurogenic (n=3)	3 (100%)	0	0	

Chi-square value = 41.83

esophagectomy as a cause for vocal cord palsy.[19-21] In cases of malignancies or tumors the vocal cord palsy occurs either by the direct compression of the nerve by the tumor or the secondaries in the lymph nodes of neck or mediastinum having a pressure effect on the nerve.[21] Various mechanical causes like aortic aneurysm, cardiomegaly, scoliosis or achalasia cardia which would compress or disturb the recurrent laryngeal nerve might lead on to vocal cord palsy. In the present study 3.6% of patients had neurogenic cause of vocal cord palsy which was almost at par with the previous studies.[22]

Conclusion

Voice production is a complex mechanism, involving the muscles of pharynx, palate, tongue, nose and lips. A proper protocol is necessary for identifying the factors responsible for vocal fold paralysis which would help in managing the condition more effectively. Before making a diagnosis of idiopathic vocal cord paralysis, detailed investigations should be carried out to rule out the possibilities of cancer being the etiology of vocal cord paralysis.

References

1. Samlan RA. Voice analysis. In: Cummings CW, Flint PW, Haughey BH, Robbins KT, et al editors. Cummings Otorhinolaryngology Head and Neck Surgery.4th ed. Philadelphia: Elsevier Mosby Inc; 2005.p.2008
2. Mc Glashan J. Disorders of the voice. In: Gleeson M, editor. Scott-Brown's Otorhinolaryngology Head and Neck Surgery.7th ed. London: Hodder Arnold; 2008.p.2192-4
3. Vengala RR, Kapilavaya N, Suraneni VR. Evaluation of Clinical Profile and Etiopathology for Hoarseness of Voice- A Study of 146 Cases. Int J Med Res Rev. 2015; 3(2):167-73. doi: 10.17511/ijmrr.2015.i2.030
4. Shin YH, An DA, Choi WJ, Kim YH. Unilateral vocal cord

paralysis following a short period of endotracheal intubation anesthesia. Korean J Anesthesiol. 2013 Oct;65(4):357-8. doi: 10.4097/kjae.2013.65.4.357. PubMed PMID: 24228153; PubMed Central PMCID: PMC3822032.

5. Titche LL. Causes of recurrent laryngeal nerve nerve paralysis. Arch Otolaryngol. 1976 May; 102(5):259-61
6. Seyed Toutounchi SJ, Eydi M, Golzari SE, Ghaffari MR, Parvizian N. Vocal cord paralysis and its etiologies: a prospective study. J Cardiovasc Thorac Res. 2014;6(1):47-50. doi: 10.5681/jcvtr.2014.009. Epub 2014 Mar 4. PubMed PMID: 24753832; PubMed Central PMCID: PMC3992732
7. Mau T. Diagnostic evaluation and management of hoarseness. Med Clin North Am. 2010; 94:945-60
8. Bando H, Nishio T, Bamba H, Uno T, Hisa Y. Vocal cord paralysis as a sign of chest diseases: a 15-year retrospective study. World J Surg. 2006; 30:293-8
9. Chen HC, Jen YM, Wang CH, Lee JC, Lin YS. Etiology of vocal cord paralysis. ORL J Otorhinolaryngol Relat Spec. 2007; 69:167-71
10. Glazer HS, Aronberg DJ, Lee JK, Sagel SS. Extralaryngeal causes of vocal cord paralysis: CT evaluation. AJR Am J Roentgenol 1983; 141:527-31
11. Gandhi S, Rai S, Bhowmick N. Etiological profile of unilateral vocal cord paralysis: A single institutional experience over 10 years. Journal of Laryngology and Voice 2014; 4 (2) 58-62
12. Pavithran J, Menon JR. Unilateral Vocal cord Palsy- An etiopathological study. International Journal of Phonosurgery and Laryngology 2011; 1(1):5-10
13. Yumoto E, Minoda R, Hyodo M, Yamagata T. Causes of recurrent laryngeal nerve paralysis. Auris Nasus Larynx 2002; 29:41-5
14. Swift AC, Rogers J. Vocal cord paralysis in children. J Laryngol Otol. 1987; 101(2):169-71. DOI: https://doi.org/10.1017/S0022215100101446
15. Rosenthal L H, Benninger M S, Deeb R H. Vocal fold immobility: A longitudinal analysis of etiology over 20 years. Laryngoscope 2007; 117:1864-70
16. Byeon H. The association between lifetime cigarette smoking and dysphonia in the Korean general population: findings from a national survey. Peer J 2015; 3:e912; DOI 10.7717/peerj.912
17. Awan SN. The effect of smoking on the dysphonia severity index in females. Folia Phoniatrica et Logopaedica 2011; 63:65–71 DOI 10.1159/000316142
18. Byeon H. The association between smoking and self-reported voice problems in the Korean adult population. Journal of Speech-Language & Hearing Disorders 2011; 20:17-30 DOI 10.15724/jslhd.2011.20.3.002
19. Scholtemeijer MG, Seesing MFJ, Brenkman HJF, Janssen LM, van Hillegersberg R et al. Recurrent laryngeal nerve injury after esophagectomy for esophageal cancer: incidence, management, and impact on short-and long-term outcomes. J Thorac Dis. 2017; 9(Suppl 8):S868-78
20. Gelpke H, Grieder F, Decurtins M, et al. Recurrent laryngeal nerve monitoring during esophagectomy and mediastinal lymph node dissection. World J Surg. 2010; 34:2379-82
21. Koyanagi K, Igaki H, Iwabu J, et al. Recurrent laryngeal nerve paralysis after esophagectomy: Respiratory complications and role of nerve reconstruction. Tohoku J Exp Med. 2015; 237:1-8
22. Ahmad S, Muzamil A, Lateef M. A Study of incidence and etiopathology of vocal cord paralysis. Indian J Otolaryngol Head Neck Surg. 2002; 54(4); 294-96.

Role of CT Nose Paranasal Sinuses and Nasal Endoscopy for Decision Making in a Case of Deviated Nasal Septum

Sayan Hazra,[1] Ankit Choudhary,[1] Swapan Kumar Ghosh,[1] Subhradev Biswas,[1] Kaustuv Das Biswas[1]

ABSTRACT

Introduction

Deviated nasal septum (DNS) can be asymptomatic in an individual or may cause nasal obstruction. The condition is generally diagnosed clinically and based on clinical diagnosis it is managed Surgically by large without much heed to diagnostic procedure. Thus, often underlying other causes of Obstruction is missed. Thus, it becomes essential to evaluate every patient presenting with history of Nasal obstruction and clinically Deviated septum, with aid of Nasal Endoscopy and CT scan Nose Paranasal Sinuses (PNS) to rule out/diagnose other coexisting conditions.

Materials and Methods

100 patients who presented with nasal obstruction and clinically diagnosed to have Deviated Nasal Septum were then subjected to Nasal Endoscopy and CT scan Nose and PNS and findings were noted for analysis.

Results

Of these 100 patients, 48 patients were found to have coexisting pathological conditions/anatomical variants. Various anatomical and pathological Conditions were found to coexist together. Inferior turbinate hypertrophy in 34% is the most common pathological condition found to be associated with DNS followed by of sinusitis in 25% patients apart from polyp, concha bullosa and paradoxical middle turbinate.

Discussion

Studies done so far shows there is a definite link of deviated nasal septum to various anatomical and pathological conditions of the nose. CT Scan Nose PNS and Nasal Endoscopy plays a vital role in diagnosing such anomalies.

Conclusion

Most of the patients, presenting with nasal obstruction and having Deviated Nasal Septum, undergo management without proper analysis and returns with recurrence of symptoms which could be analyzed properly if Nasal endoscopy and CT scan is employed during diagnosis of the condition, reducing risk of treatment failure.

Keywords

Nasal Septum; Nose Deformities; Nasal Obstruction; Tomography, X-Ray Computed

The nasal septum comprising of bony and cartilaginous parts divides the nasal cavity into right and left halves both anatomically and physiologically. It is an accepted fact that some amount of deviation of nasal septum is common and having a perfectly straight septum is a rarity. Deviated nasal septum (DNS) can be asymptomatic or may cause nasal obstruction. The condition is generally diagnosed clinically and based on clinical diagnosis it is managed surgically by and large without much heed to diagnostic procedure. Thus, often other underlying causes of obstruction are missed. Along with nasal obstruction symptoms of rhinosinusitis like nasal discharge, headache, epistaxis, disturbance of smell, etc. may also be there. Various other anatomical variants and pathological conditions such as concha bullosa, paradoxical middle turbinate, inferior turbinate hypertrophy, polyp, sinusitis may coexist along with Deviated Nasal Septum. Even in absence of significant deviation of septum these conditions often present with similar clinical picture to

1 - Department of ENT, IPGMER & SSKM Hospital, Kolkata

Corresponding author:
Dr Ankit Choudhary
email: dr.ankitchoudhary@gmail.com

Table I: Distribution of patients as per type of Deviation

TYPE OF DEVIATION	NO OF PATIENTS	PERCENTAGE
C- shaped	44	44
S- shaped	12	12
Caudal dislocation	24	24
Spur	16	16
Thickened Septum	4	4

that of DNS. Thus, it becomes essential to evaluate every patient presenting with history of nasal obstruction and clinically deviated septum, with aid of Nasal Endoscopy and CT scan of Nose and PNS to rule out/diagnose other coexisting conditions. It not only helps us in diagnosis but also aids in proper planning of management of the said patient.

Materials and Methods

A prospective study was done at a tertiary care hospital comprising of 100 patients, who presented with nasal obstruction and were clinically diagnosed to have Deviated Nasal Septum. The study was done in a span of 18 months. Thorough history was taken and detailed clinical examination was done in all the cases. Patients above 5 years of age, who were willing to take part in the study through written informed consent, were included in the study. Patients having Deviated Nasal Septum but not complaining of nasal obstruction or patients having Nasal Obstruction but no deviation of Nasal Septum, patients with nasopharyngeal mass as well as those with past history of any nasal surgery were excluded.

All the patients in the study population were subjected to Nasal Endoscopy and CT scan of Nose and PNS and findings were noted for analysis.

Nasal Endoscopy

Diagnostic Nasal endoscopy, because of brighter illumination, magnification and angled views provide examination of all the clefts and crevices of nose. It is done under topical anesthesia with 4% Lignocaine and a Vasoconstrictor viz., Oxymetazoline soaked nasal packs. Nasal packs are removed and then Nasal endoscopy is performed by three passes using 0° Nasal Endoscope.

In the First Pass- Endoscope is passed along the floor of Nasal Cavity; in Second Pass- Endoscope is passed medial to the Middle Turbinate and in the Third Pass- Endoscope is passed lateral to the Middle Turbinate.

CT Scan Nose PNS

CT Scan Nose PNS done for the study employed 1 mm cuts in Axial Sections with Coronal and Sagittal Reconstruction.

Results

Patients were assessed for demography, type and side of deviation, association of different types of deviation with various clinical features. Various pathological conditions/anatomical variants which would have contributed to nasal obstruction, diagnosed by CT Scan and Nasal Endoscopy were noted. These findings would have been otherwise missed resulting in incomplete management. Sixty eight percent (68%) of patients presenting with nasal obstruction with Deviated Nasal Septum were male with majority of patients in the age group of 16-25 years (51%). Majority of patients had right sided deviation in the study (55%). C-shaped deviation was most commonly seen in the study population (44%) (Table I).

Of 100 patients 48 patients were found to have coexisting Pathological / Anatomical variants. Various anatomical and pathological conditions were found

Table II: Incidence of another Pathology/ Anatomical Variant as diagnosed by CT scan/ Nasal Endoscopy

PATHOLOGY/ ANATOMICAL VARIANT	NO OF CO-EXISTING PATHOLOGY/ ANATOMICAL VARIANT	PERCENTAGE
Polyp	10	10
Sinusitis	25	25
Concha Bullosa	12	12
Paradoxical Middle Turbinate	5	5
Inferior Turbinate Hypertrophy	34	34

to coexist. Inferior turbinate hypertrophy is the most common pathological condition found to be associated with DNS (in 34%) followed by sinusitis in 25% patients (Table II). Inferior Turbinate hypertrophy, though can be diagnosed clinically, the exact nature i.e., soft tissue hypertrophy or bony hypertrophy cannot be differentiated without CT scan. Many of those patients had coexisting Concha Bullosa or Paradoxical Middle Turbinate or Inferior Turbinate hypertrophy.

Inferior turbinate hypertrophy was more commonly found to be associated with C shaped deviation followed by sinusitis (Table III). Inferior turbinate hypertrophy was also found to be associated with septal spur with higher incidences. Concha Bullosa was seen to be more common in patients with C shaped deviation.

Thus, a good 48% of cases which would have otherwise been incompletely managed because of incomplete diagnosis could be diagnosed completely with CT Scan and Nasal Endoscopy. (Table IV)

Discussion

Our study is in concordance to various literature and studies. 25% of patients of DNS with nasal obstruction in our study were found to have CT scan and nasal endoscopic features suggestive of sinusitis while 34% of patients had inferior turbinate hypertrophy. Concha bullosa was seen to coexist in 12% of patients. The results are similar to the studies conducted by Elahi & Frenkiel,[1] Smith et al[2] and Cotter et.al.[3] All these

Table III: Coexistence of different types of DNS with another pathology / anatomical Variant

TYPE OF DEVIATION	NO OF PATIENTS	OTHER ASSOCIATED FINDINGS				
		POLYP	SINUSITIS	CONCHA BULLOSA	PARADOXICAL MIDDLE TURBINATE	INFERIOR TURBINATE
C- shaped	44	5	14	8	2	16
S- shaped	12	3	3	2	2	3
Caudal dislocation	24	-	2	1	-	5
Spur	16	2	6	1	1	9
Thickened Septum	4	-	-	-	-	1

Table IV. Clinical Diagnosis Versus CT Scan/ Nasal Endoscopy

	CT SCAN / NASAL ENDOSCOPY FINDING	
	DNS ONLY	DNS WITH OTHER PATHOLOGY
Clinically DNS	52	48

studies showed a high incidence of sinusitis in patients of deviated septum. Matschke & Fliebach[4] and Danese et al[5] also found an association between septal deviation and sinus disease as assessed by CT scan in their respective studies. Rehman et al,[6] in their study, found 23.7% cases having concha bullosa and 7% patients with paradoxical middle turbinate additionally on CT scan. Inferior turbinate hypertrophy was present in 46% of those cases. These results were further substantiated by studies conducted by Orhan et al,[7] Aktas et al.[8]

Our study also revealed that inferior turbinate hypertrophy was more commonly associated with C shaped deviation followed by sinusitis. They were also found to exist in large number of cases of septal spur. Concha bullosa was seen most commonly in patients with C shaped deviation. In a study done by Moorthy et al,[9] C- shaped deviation was associated with pansinusitis in 50% of patients, S-shaped deviation was associated with pansinusitis in 83.3%, spur was associated with pansinusitis in 30% of patients. Danese et al[5] and Calhoun et al[10] also found in their study that septal deviation was associated with ostiomeatal complex disease.

Headache was associated in cases of sinusitis which links it with sinusitis along with Deviated Nasal Septum. It was also seen that nasal discharge, headache and hyposmia are not only because of the Deviated Nasal Septum itself but is also linked with various other pathological/ anatomical variants which coexisted in many of the symptomatic patients of Deviated Nasal Septum.

CT scan needs to be supplemented with Nasal Endoscopy in all the cases of Deviated Nasal Septum as all these pathological / anatomical variations are not identified by CT scan alone. Again, in a symptomatic patient of Deviated Nasal Septum with other nasal pathology or anatomical variant, some component of obstruction may be because of the anatomical variant/ pathology which needs to be corrected medically/ surgically before or along with correction of Deviated Nasal Septum to get optimal results. Like a diagnosed case of sinusitis should be managed medically before undergoing any surgery, in a case of large concha bullosa with Deviated Nasal Septum with nasal obstruction, concha bullosa needs to be reduced surgically.

Conclusion

Most of the patients, presenting with nasal obstruction and having Deviated Nasal Septum, undergo management without proper analysis and return with recurrence of symptoms which could have been analyzed properly if nasal endoscopy and CT scan were employed during diagnosis of the condition, reducing risk of treatment failure. Thus, in patients of deviated nasal septum presenting with nasal obstruction a thorough history and clinical examination must be followed by a nasal endoscopy and CT scan to look for other anatomical variants and associated pathology as various symptoms may be contributed by those pathologies and not by the deviated septum only.

References

1. M. M. Elahi MM, Frenkiel S. Septal Deviation and Chronic Sinus Disease. Am J Rhinol. 2000; 14(3):175-9. doi:10.2500/105065800782102735
2. Smith KD, Edwards PC, Saini TS. The prevalence of concha bullosa and nasal septal deviation and their relationship to maxillary sinusitis by volumetric tomography. Int J Dent. 2010. pii: 404982. Epub 2010 Aug 24
3. C. S. Cotter, S. Stringer, K. R. Rust and A. Mancuso. The Role of Computed Tomography Scans in Evaluating Sinus Disease in Pediatric Patients. Int J Pediatric Otorhinolaryngol. 1999; 50(1):63-8. doi:10.1016/S0165-5876(99)00204-9
4. Matschke R, Fliebach A. Septum Deviation and Concomitant Sinusitis. HNO 1985; 33(12):541-4
5. Danese M, Duvoisin B, Agrifolio A, Cherpillod J, Krayenbulh

M. Influence of naso-sinusal anatomic variants on recurrent, persistent or chronic sinusitis, X-ray computed tomographic evaluation in 112 patients. J Radiologie, 1997; 78(9):651-7

6. Rehman, A., Hamid, S., Ahmad, M. and Rashid, A. (2012) A Prospective Study of Nasal Septal Deformities in Kashmiri Population Attending a Tertiary Care Hospital. Int J Otolaryngol Head Neck Surg. 2012; 1:77-84. doi: 10.4236/ijohns.2012.13016
7. Orhan I, Aydın S, Ormeci T, Yılmaz FA. Radiological analysis of inferior turbinate in patients with deviated nasal septum by using computed tomography. Am J Rhinol Allergy 2014; 28(1):e68-72. doi: 10.2500/ajra.2014.28.4007
8. Aktas D, Kalcioglu MT, Kutlu R, Ozturan O, Oncel S. The relationship between the concha bullosa, nasal septal deviation and sinusitis. Rhinology 2003; 41(2):103-6
9. Moorthy PNS, Kolloju S, Madhira S, Jowkar AB. Clinical Study on Deviated Nasal Septum and its Associated Pathology. International Journal of Otolaryngology and Head & Neck Surgery 2014; 3:75-81. http://dx.doi.org/10.4236/ijohns.2014.32016
10. Calhoun KH, Waggenspack GA, Simpson CB, Hokanson JA, Bailey BJ. CT evaluation of the paranasal sinuses in symptomatic and asymptomatic populations. Otolaryngol Head Neck Surg. 1991;104(4):480-3.

Managing Rhino - cerebral Mucormycosis: Institutional Experience

Kalpesh Patel,[1] Abhishek Gugliani,[1] Dhwani Mehta[1]

ABSTRACT

Introduction

Rhinocerebral mucormycosis is a rapidly progressive life threatening opportunistic fungal disease and usually occurs in individuals with weakened immune system. It is caused by filamentous fungi of Mucorales from class Mucormycotina. After nasal inoculation, it usually spreads to orbit and brain. The common presenting complaints are purulent sinusitis, facial swelling, headache, complaints of vision or palatal ulceration. Despite the many recent advances in the diagnosis and management of mucormycosis, it still carries a high mortality rate.

Materials and methods

Here we present our experience in managing 30 such cases of mucormycosis that presented to our department between June 2016 to June 2018.

Results

All these patients were started on systemic antifungals with or without surgical debridement. The patients were followed up with repeated nasal endoscopies and imaging studies.

Conclusion

Successful treatment of mucormycosis consists of aggressive repeated surgical debridement of necrotic tissue, systemic antifungal therapy and immediate control of underlying systemic diseases. Since there are no clear-cut guidelines, the treatment needs to be individualized on a case to case basis.

Keywords

Mucormycosis; Debridement; Antifungal

Mucormycosis is a spectrum of chronic, subacute and progressive infection caused by fungi of order Mucorales belonging to class of Zygomycetes. It constitutes the 3rd most common invasive fungal infection.[1] In ENT, it can present as sinusitis (pansinusitis, rhino-orbital or rhino-cerebral), facial swelling, headache, complaints of vision or palatal ulceration.[2] The organism is usually found in decaying organic matter and soil.[3] It spreads by inhalation or direct inoculation of the spores into disrupted skin or mucosa. An intact immune system prevents the development of infection. However, in immunocompromised patients having uncontrolled diabetes mellitus, HIV infection, severe burns, hematological malignancies or diseases that require long term immunosuppressants like transplantations and chronic kidney diseases, it can have devastating consequences. Irrespective of the route of infection, the fungal hyphae can invade the blood vessels, causing tissue necrosis and infarction.[4] Rhinocerebral mucormycosis develops upon inhalation of the spores into the nose and paranasal sinuses. The invading fungus may the spread into the surrounding areas either directly or by the hematogenous route.

Mortality rates range from 20-50% for localized diseases and 70-90% for disseminated disease.[5] No clear-cut guideline exists for the treatment. In this article, we present our experience in managing the cases of Rhino-cerebral mucormycosis.

1 - Department of ENT, B.J Medical College, Ahmedabad

Corresponding author:
Dr Abhishek Gugliani
email: abhishekgugliani@gmail.com

Materials and Methods

A retrospective analysis of 30 patients diagnosed to have histologically proven mucormycosis admitted and managed in our department from June 2016 to June 2018 was

Table I: Co-morbid conditions

ASSOCIATED CO-MORBID CONDITIONS	NO. OF PATIENTS (%)
DIABETES MELLITUS	24 (80%)
CHRONIC RENAL FAILURE	3 (10%)
HEMATOLOGICAL MALIGNANCY	2 (7%)
PROLONGED STEROID USE (Oral/IV)	1 (3%)

carried out. Presenting signs and symptoms, appropriate radiographic imaging, histopathological findings, and the treatment modality followed were recorded and analyzed.

Results

In this study, 18 patients were males while 12 were females. Most common associated co-morbid condition was found to be uncontrolled diabetes mellitus followed by other conditions weakening the immune system. (Table I)

A record was made for the symptoms for which the patient presented to our department. Nasal discharge and/or obstruction was found to be the presenting complaint in all cases followed by generalized headache, complaints of facial swelling, difficulty in vision and ulceration of the palate. (Table II)

Diagnostic Nasal Endoscopy (DNE) was performed in all the cases. Black necrotic crusts were observed within the nose and/or sinuses. (Fig. 1) These were sent for histopathological examination to look for branched, non-septate hyphae with irregular branching representing mucor fungal invasion.

Radiographic analysis by X-Ray Paranasal Sinuses (PNS) were obtained in select cases. These revealed clouding of multiple sinuses, mucosal thickening and bone erosion. Contrast Enhanced Computed Tomography (CECT) scans of PNS were carried out in all the cases to identify the extent of the disease, better definition of soft tissue invasion, necrosis and early bone erosion and to plan surgical debridement, if needed.

All the patients were started on systemic antifungals.

Table II: Common Presenting Symptoms

PRESENTING SYMPTOMS	NO. OF PATIENTS (%)
NASAL DISCHARGE/ OBSTRUCTION	30 (100%)
HEADACHE	20 (68%)
FACIAL SWELLING	18 (60%)
ORBITAL COMPLAINTS	12 (40%)
PALATAL ULCERATION	3 (10%)

Four patients did not require a surgical debridement in view of very limited extension of the disease. The rest 26 patients underwent surgical debridement and medical management simultaneously.

Amongst antifungals, liposomal amphotericin B (AMB) was started at the dose of 3-5mg/kg/day (average 4.5mg/kg/day). Continuous monitoring of renal function by measuring serum urea and creatinine levels was done and the dosage of the drugs were adjusted accordingly. The average duration of treatment was about 8 weeks. 1 patient had to be started on oral Posaconazole 800 mg/day in two divided doses for 2 weeks after he failed to respond to treatment with liposomal AMB.

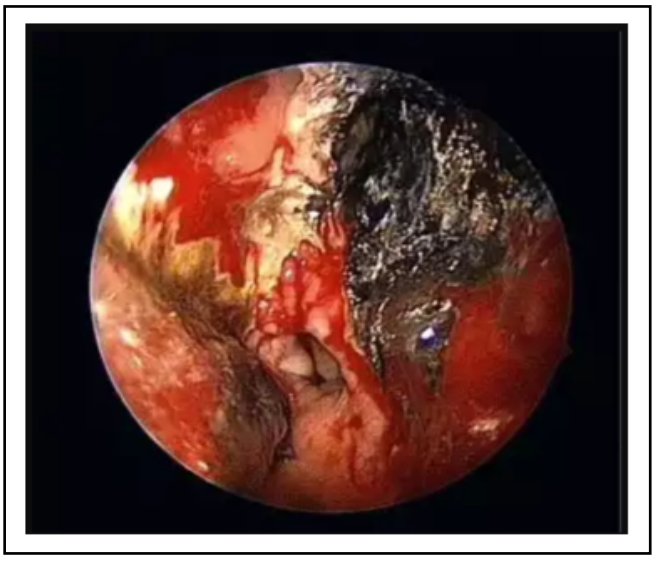


Fig.1. Characteristic black necrotic eschar was observed on nasal turbinate and palate on DNE

Patients were called for regular follow-up once a month for next 6 months and monitored with serial nasal endoscopies. CECT PNS was repeated at the end of 1 month and 3 months to look for any residual or recurrent lesion. All the patients were found to be disease free at the end of 6 months.

Discussion

High incidence of mucormycosis in India is due to increasing numbers of uncontrolled diabetic patients, environmental factors providing optimal set-up for survival of fungi, and improved diagnostic facilities in healthcare centers. Existing data on the management of mucormycosis is not very helpful as there is no standard therapy for its treatment. The treatment needs to be individualized on a case to case basis.[5]

Lipid formulations of AMB are considered the first line therapy of mucormycosis.[6] They are stated on a dosage of 5mg/kg/day intravenously. Higher doses have not been found more efficacious but may need to be given when the central nervous system (CNS) is involved.[7]

Posaconazole is considered as salvage treatment of mucormycosis. As a first line drug, it is considered only in conditions when treatment with amphotericin B is absolutely contraindicated.[7]

Surgical debridement of the necrotic tissue forms the cornerstone of management of mucormycosis. Surgery combined with appropriate systemic antifungal therapy has been shown to increase survival as compared to antifungal therapy alone.[8]

There is no standard duration of treatment and the decision has to be made on an individual basis. The systemic therapy needs to be continued till there is resolution of all clinical and radiological signs and symptoms of infection.

Conclusion

Successful treatment of mucormycosis consists of aggressive repeated surgical debridement of necrotic tissue, systemic antifungal therapy and immediate control of underlying systemic diseases. Due to increase in number of cases, diverse risk factors and inclusion of immunocompetent and immunocompromised patients, there is need of prospective study so that suspected cases can be diagnosed in a timely manner, various risk factors can be analyzed and accordingly patients appropriately treated, which should result in the increase of patient survival.

References

1. Ribes JA, Vanover-Sams CL, Baker DJ. Zygomycetes in human disease. Clin Microbiol Rev. 2002; 13: 236-301

2. Roden MM, Zaoutis TE, Buchanan WL, Knudsen TA et al. Epidemiology and outcome of zygomycosis: A review of 929 reported cases. Clin Infect Dis. 2005; 41:634-53

3. Ribes JA, Vanover-Sams CL, Baker DJ. Zygomycetes in human disease. Clin Microbiol Rev. 2000; 13:236-301

4. Greenberg RN, Scott LJ, Vaughn HH, Ribes JA. Zygomycosis (mucormycosis): emerging clinical importance and new treatment. Current Opin Infect Dis. 2004; 17:517-25

5. Sipsas NV, Gamaletsou MN, Anastasopoulou A, Kontoyiannis DP. Therapy of Mucormycosis. Journal of Fungi 2018; 4(3):90

6. Tissot F, Agrawal S, Pagano L, Petrikkos G et al. ECIL-6 guidelines for the treatment of invasive candidiasis, aspergillosis and mucormycosis in leukemia and hematopooietic stem cell transplant patients. Haematologica 2017; 102:433-44

7. Cornely OA, Arikan-Akdagli S, Dannaoui E, Groll AH et al. ESCMID and ECMM joint clinical guidelines for the diagnosis and management of mucormycosis 2013. Clin Microbiol Infect. 2014; 20:5-26

8. Tedder M, Spratt JA, Anstadt MP, Hegde SS, Tedder SD, Lowe JE. Pulmonary mucormycosis: Results of medical and surgical therapy. Ann Thorac Surg. 1994; 57:1044-50.

Sinonasal Polyps : A Diagnostic Challenge

Sucharita Sarkar,[1] Rama Saha,[2] Mou Das,[2] Samares Sardar[2]

ABSTRACT

Introduction

Sinonasal polyps, presenting as mass lesion of nose and paranasal sinuses ranges pathologic entity including infective diseases to malignant lesions. 80% are non-neoplastic lesions and less than 1% are malignant. They all present with symptoms of nasal stuffiness or obstruction and mass lesion, producing significant diagnostic challenges as they possess extremely varied clinical behaviour, etiopathogenesis, treatment protocol as well as prognosis.

Case Series

During period of one year (March 2017 to February 2018), we had six patients presenting with nasal polyp having special features that need attention. After proper investigation each case was operated and gross examination followed by histopathology was done. They revealed six different diagnoses e.g., Olfactory neuroblastoma, Adenoid Cystic Carcinoma, Basal Cell Adenocarcinoma, Sinonasal Mucosal Melanoma, Primitive Neuroectodermal Tumour (PNET) and Aspergilloma.

Discussion

Clinicians' attention is drawn to the fact that, similar presentation may have varied differential diagnoses, some of which may be very rare and histopathology is essential for coming to definitive diagnosis.

Keywords

Sinonasalpolyp, Etiopathogenesis, Histopathology

Sinonasal polyps can occur in any age group. Polypoidal nasal mass is a very common lesion encountered in day to day clinical practice. It ranges from the simple nasal polyp or polypoidal lesions which maybe infective to granulomatous diseases and malignant ones. They produce significant diagnostic challenges with different cells types and present unique anatomic features.[1]

Allergic and inflammatory polyps are the common nonneoplastic lesions (80%) and the rest are neoplastic whereas sinonasal cancer accounts for less than 1% of all malignancies.

The patients usually present with symptoms of nasal stuffiness or obstruction and mass protruding from the nostril. Other symptoms are total and partial loss of smell, headache, sneezing, and mucoid or watery discharge.[2] Sino nasal neoplasms manifest nonspecific symptoms which can mimic numerous inflammatory pathologies. Nasosinusal malignant tumors are rare, representing less than 3% of head and neck cancers and 0.8% of all human cancers.[3]

Case Series

Case Report 1 - Olfactory neuroblastoma

A 42 year male patient presented with a soft mass protruding from left nasal cavity with a long standing history of unilateral nasal obstruction and occasional bleeding.

CECT revealed an enhancing mass lesion in left maxillary, ethmoid and sphenoid sinus. The mass was excised and sent for histopathological examination.

On gross examination, multiple tissue pieces were found, largest one measuring 3x2x1 cm and smallest one was 0.5 cm in maximum dimension.

1 - R.G Kar Medical College, Kolkata
2 - Institute of Post Graduate Medical Education & Research, Kolkata

Corresponding author:
Dr. Sucharita Sarkar
email; sucharitasarkar78@yahoo.com

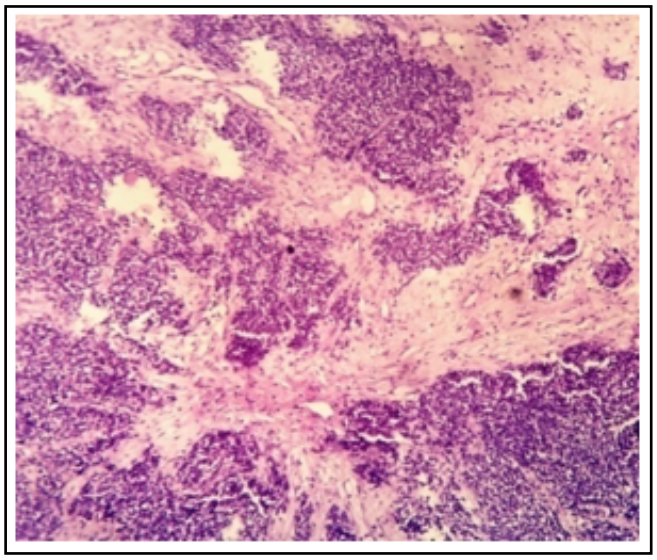


Fig.1. Microphotograph of olfactory neuroblastoma (H&E, 100x)

Microscopic examination shows a neoplastic lesion below an intact mucosa with lobular architecture comprised of small, round, blue cells in circumscribed lobules which were separated by a highly vascularized fibrous stroma. The cells had small and uniform nuclei with hyperchromatic, delicate, uniform 'salt-and-pepper' nuclear chromatin distribution. Nucleoli were inconspicuous. There was syncytial arrangement of tumour cells with a tangle of neuronal processes forming the background. Homer Wright pseudo rosette areas of necrosis and calcification were also present. (Fig. 1) The tumour was diagnosed as olfactory neuroblastoma grade II (Hyams' grading system).

Immunohistochemical study revealed that the tumour was positive for Synaptophysin, Chromogranin A, NSE, Calretinin and negative for CD99.

Case Report 2- Adenoid Cystic Carcinoma

A 52 year-old male presented with bilateral sinus symptoms beginning 4 months prior. The patient complained of left sided facial pain and tenderness, nasal congestion and obstruction.

Nasal endoscopy revealed unilateral polypoid mass in the left nasal cavity, septal deviation, mucosal oedema.

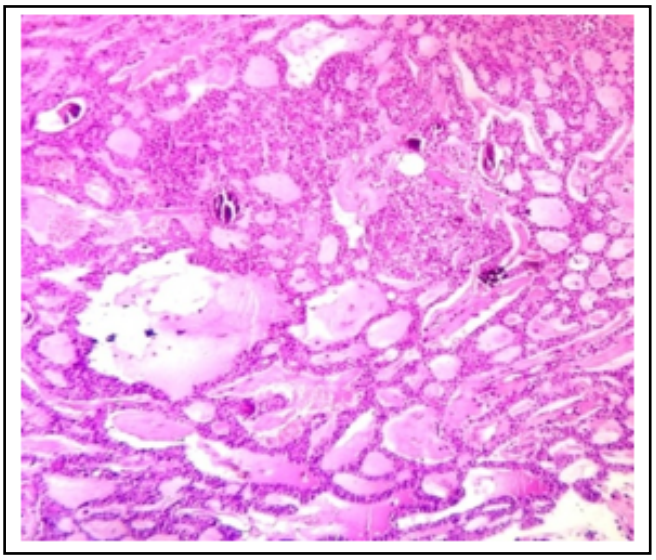


Fig.2. Histopathological examination suggestive of Adenoid Cystic Carcenoma

Neck and orbital examinations were negative. CECT scan of the sinuses revealed irregular soft tissue mass in the posterior part of left nasal cavity, extending to the left maxillary antrum, adjacent nasopharynx, left side of sphenoid sinus, left ethmoidal air cells and involving the soft tissue of the lateral nasal fold with associated bone destruction.

MRI was done and intracranial extension was excluded.

Surgical excision was done. Gross examination showed multiple greyish white tissue pieces with largest fragment measuring 3x2x0.5 cm.

Microscopic examination revealed a circumscribed mass under the olfactory epithelium consisting of glandular structures with cribriform architecture lined by bland looking cuboidal cells, lumens are filled with pink eosinophilic material.(Fig. 2) Overall histopathological features were in keeping with adenoid cystic carcinoma. There were some areas of solid appearance.

Case Report 3-Basal Cell Adenocarcinoma

A 73yrs old lady presented with a swelling over left cheek for 3 years. The growth was painless and gradually progressive. The patient had several episodes

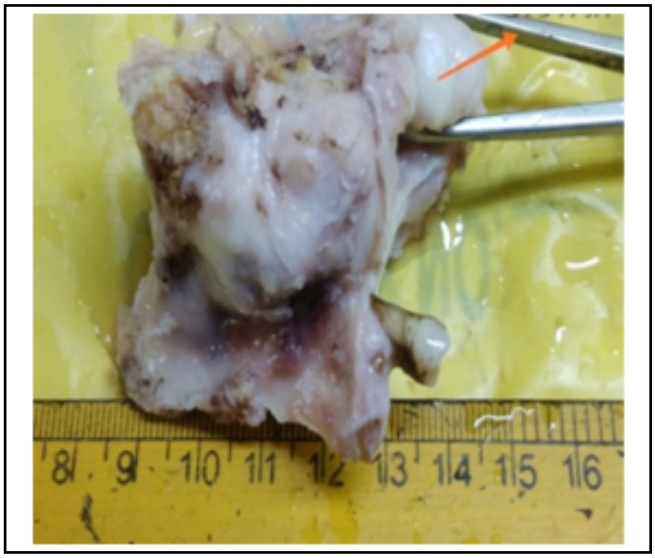


Fig. 3. Specimen of Basal cell ADC

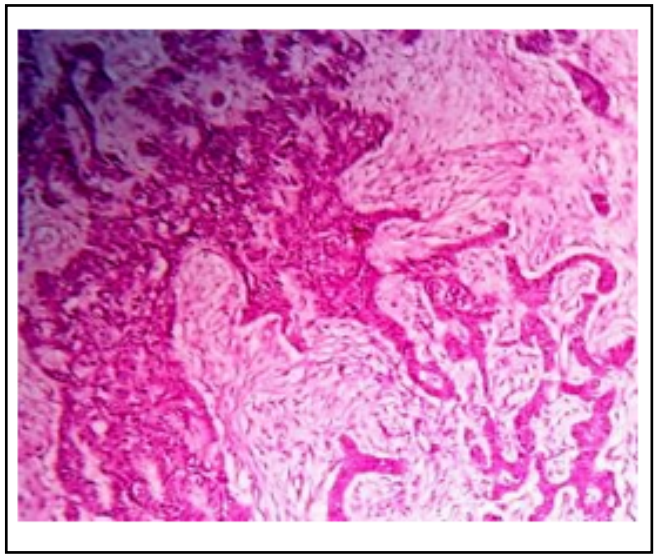


Fig. 4. Microphotograph of basaloid adenocarcinoma (H&E, 100x)

of epistaxis for last one year.

CECT scan showed a mass on left maxillary sinus having extension into adjacent anatomical spaces.

Gross examination of excised specimen revealed 5cm x 6cm lobulated mass with surface irregularities arising from maxilla (Fig.3).

On microscopical examination the tumour was composed of cuboidal to columnar cells arranged in trabecular and tubular fashion with peripheral palisading. (Fig. 4) The tumour was p53 positive whereas calretinin negative.

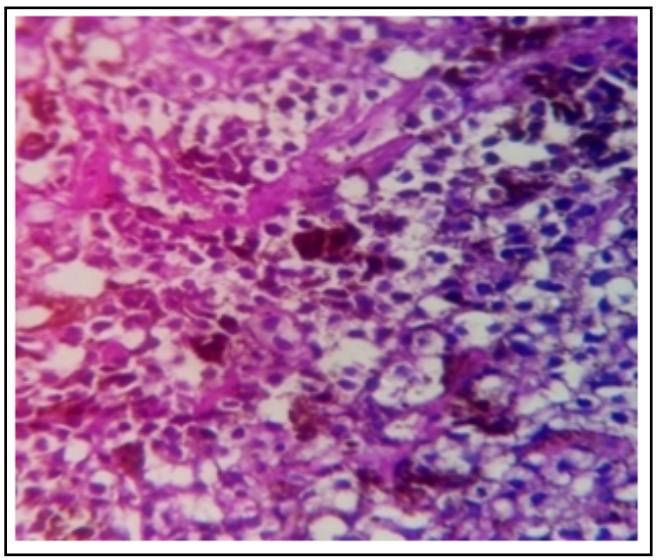


Fig. 5. Microphotograph of Sinonasal melanoma (H&E, 100x)

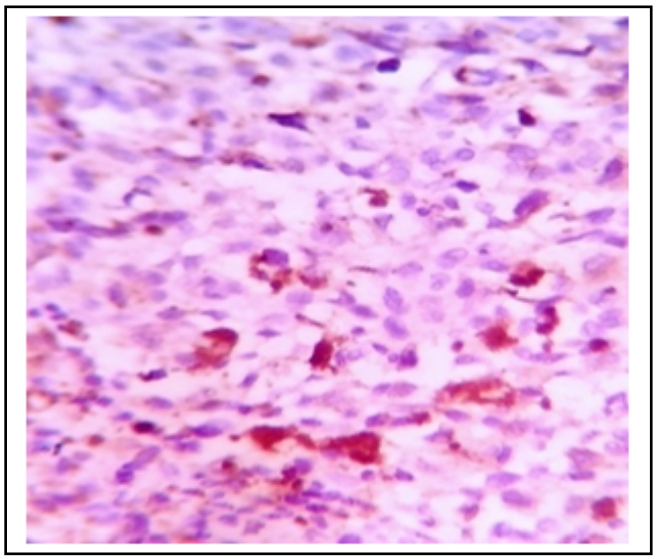


Fig. 6. Immunohistochemical study showing positivity for WT1 (400x)

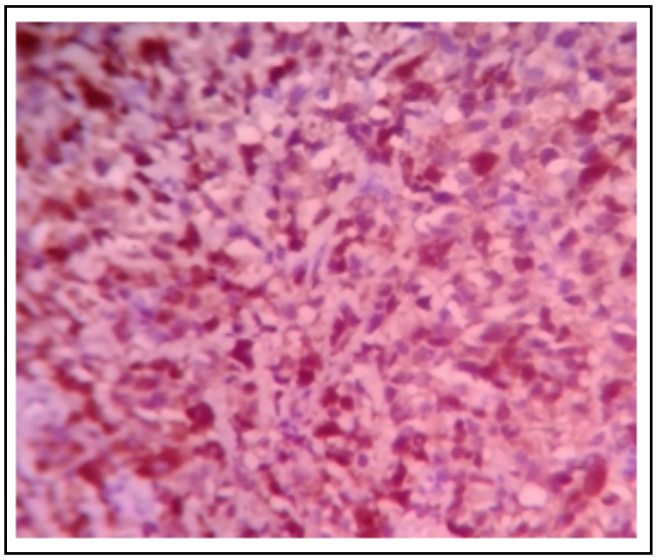


Fig. 7. Immunohistochemical study showing S-100 positivity (400x)

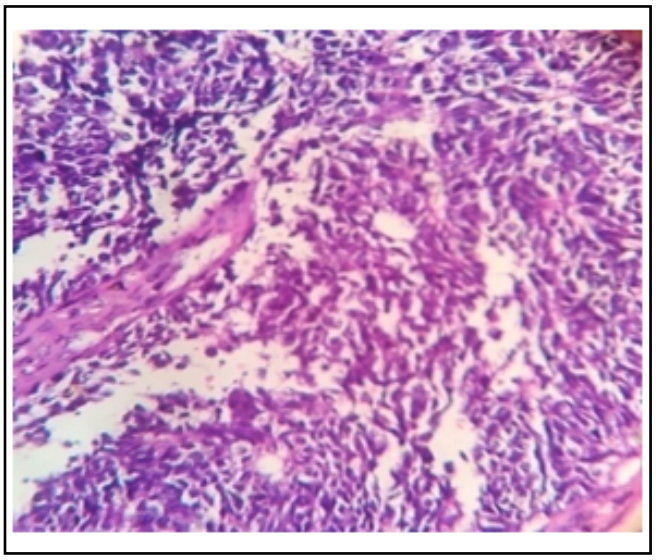


Fig. 8. Microphotograph of PNET (H&E, 100x)

Case Report 4-Sinonasal Mucosal Melanoma

79 year old woman presented with nasal mass. She had a history of unilateral nasal blockage with epistaxis. Clinically a polypoid mass was noted. Surgery was done. Grossly, it showed multiple black tissue pieces.

On histopathological examination, there were sheets of round to oval pigmented cells arranged in diffuse fashion having hyperchromatic nucleus. (Fig.5)

Immunohistochemical study showed the tumour was positive for WT1 (Fig.6) and S-100 (Fig.7).

Case Report 5- Primitive Neuroectodermal Tumour (PNET)

A 53yrs female came with history of epistaxis, unilateral nasal obstruction for 6 months. CT scan showed opacity in left maxillary sinus. Excised specimen was multiple whitish spongy tissue pieces with areas of haemorrhage on gross examination.

Microscopy showed cells arranged in lobules with prominent rosette like structure. (Fig. 8) The tumour showed positivity with Cytokeratin, p53, CD 99 but synaptophysin and chromogranin negative.

Case Report 6-Aspergilloma

62 year old diabetic female presented with bilateral sinus symptoms for 1year. Patient complained of left sided facial pain, nasal congestion and obstruction. CT scan revealed non-specific opacity of paranasal sinuses. Excision biopsy was followed by histopathological examination which revealed fungal colony of broad septate hyphae branching at acute angle. (Fig. 9)

Discussion

1- Olfactory neuroblastoma

Olfactory neuroblastoma (ONB), also known as Esthesioneuroblastoma, is a rare neuroectodermal tumor arising from the olfactory epithelium in the roof of nasal cavity and occasionally other parts of nasal cavity, paranasal sinuses and frontal lobe of brain. Incidence is only 2 to 3% of intranasal tumors. Patients usually present with symptoms of nasal obstruction, epistaxis, headache etc.[4] Metastasis to distant as well as cervical lymph nodes occurs in 10 to 30% of the cases.[5] Grossly, a soft glistening polypoidal mass covered by mucosa or friable mass with overlying ulceration and granulation tissue are found on microscopy. ONB has a lobular

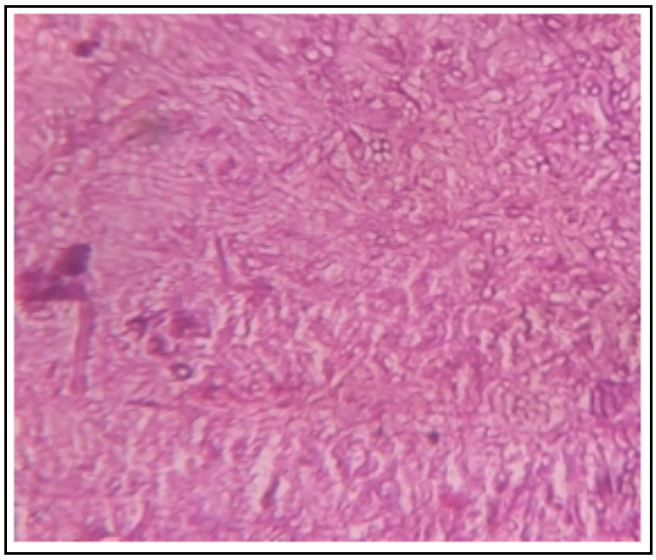


Fig.9. Histopathological examination suggestive of Aspergilloma (H&E, 400x)

(organoid) pattern with intervening fibrous stroma, in a highly vascularised and occasionally hyalinised background. Individual tumor cells are uniform with background neurofibrillary matrix. Nuclei contain salt and pepper chromatin. ONB can demonstrate nuclear atypia, mitosis, calcification, necrosis, Homer-Wright and Flexner-Wintersteiner rosettes.[3]

ONB possess a characteristic immunohistochemical profile which includes diffuse positivity for Neuron Specific Enolase, Synaptophysin, Chromogranin, CD56, GFAP.

The sustentacular cells surrounding the tumors nests shows positivity for S100.5 Approximately one third of the ONB demonstrate focal positivity for cytokeratin. (CK AE1/AE3 and CAM 5.2).[6]

A widely accepted, non-quantitative, 4-tiered grading system, introduced by Hyams and co-workers is based on a constellation of features including growth pattern, presence or absence of neurofibrillary matrix, nuclear atypia, mitotic activity, presence of rosettes and necrosis. This system was modified by Even Hyams et al in order to achieve simplicity and correlate tumour grade with the outcome, classifiying ONB into low grade and high grade. Even Hyams et al. grouped grade I and II as low grade tumors and grade III and IV as high grade tumours with prognostic significance.[7]

Common differential diagnoses of ONB include sinonasal undifferentiated carcinoma(SNUC), nasopharyngeal carcinoma (NPC),sinonasal neuroendocrine carcinomas (SNEC) and small round blue cell tumors,[8] sinonasal melanoma,[9] sinonasal paraganglioma.[10] Our case was of grade II.

2- Adenoid Cystic Carcinoma (ACC)

ACC is a relatively rare tumor in nose and nasal cavity, arising from major or minor salivary glands.[3] Incidence is 3 to 5% of all head and neck malignancies.[11] The peak incidence is from the fourth to the sixth decade and slightly more common in women.[12] Patients usually present with slowly growing, firm mass, producing a constant, low-grade dull ache. Pain increases in severity likely due to the tumor's predilection for perineural invasion specially the facial nerve. Perineural invasion also has poor prognostic significance.ACCs do not usually spread via regional lymph nodes. Distant metastasis can occur; with the lung being the most common site besides extensive bony invasion.[13] ACC is graded as cribriform or tubular (grade 1), less than 30% solid (grade 2), or greater than 30% solid (grade 3), with grade 3 representing the worst prognosis. The tumour is c-kit positive. p63 positivity in ACC is an independent predictor of survival and also helpful in distinction from basaloid squamous cell carcinoma and high-grade neuroendocrine carcinoma.[14] Our case was a 52 year male and was of grade 1.

3-Basal Cell Adenocarcinoma(BCAC)

BCAC is a low grade tumour accounting for only 1.6% of all salivary gland neoplasms. They mainly arise from submucosal seromucinous glands of parotid and rarely minor salivary glands. Our case is unusual in its occurrence in the nasal cavity. Two main differential diagnoses include basal cell adenoma and adenoid cystic carcinoma. The infiltrating growth and tendency of of vascular and perineural involvement distinguishes basal cell adenocarcinoma from basal cell adenoma along with , higher Ki-67 proliferation index, loss of bcl-2 ,greater expression of p53 and EGFR. Adenoid

cystic carcinoma can be differentiated by absence of cytokeratin 17 staining.[15]

Pluripotent ductal reserve cells are considered as possible origin of the tumour in this unusual location.[16]

On microscopy, the tumor cells form solid (most common), tubular, trabecular, and membranous patterns. There are two types of tumor cells: central larger cells with pale nuclei and peripheral smaller cells with dark nuclei with a tendency to form nuclear palisading.15 Squamous metaplasia, nuclear atypia, necrosis and mitotic activity may be encountered.[17]

In our case, the tumor was solid and p53 immunostain positive.

4-Sino nasal Mucosal Melanoma

A highly aggressive tumour representing between 0.7 and 1% of all melanomas in Caucasian populations and between 4 and 8% of malignant sinonasal tumours.[18] The tumour has extremely poor prognosis, mostly occurring in elderly males, extremely rare in young people. The risk of local recurrence and distant metastasis is 31-85% and 25-50% respectively. Common sites affected are the nasal cavity, septum, inferior and middle nasal conchae, the lateral wall of the nasal cavity, and the facial sinuses.[19]

Higher density of melanocytes in the mucosa of the nasal cavity and paranasal sinuses is responsible for higher incidence of mucosal melanoma in these sites.[20]

Intracytoplasmic melanin pigment can be detected by Fontana stain. Histopathological examination should identify ulceration, necrosis, number of mitoses, inflammation and bone, perineural, lymphatic and vascular invasion.[19]

Histologically, they are either epithelioid or large fusiform cells having abundant eosinophilic cytoplasm. Around one-third of tumours are composed of undifferentiated cells and should be differentiated from close differentials like sinonasal undifferentiated carcinoma, lymphoma, rhabdomyosarcoma, angiosarcoma, neuroendocrine carcinoma, neuroblastoma, and plasmacytoma. IHC markers are S100 and melanocytic markers (HMB45, Melan-A, tyrosinase, MITF).[21]

We had 70-year-old female, with a melan A, S-100 & WT1 positive pigmented nasal polyp.

5- Primitive Neuroectodermal Tumour (PNET)

The incidence of PNETs in the head and neck region is 2-7% and occurrence in sinonasal region is rare.[22]

It is highly aggressive in behaviour with worse outcome compared to other small round cell tumours.

It can occur at any age with peak incidence during adolescence in second decade of life with male preponderance.

Grossly, PNET in nasal cavity is a multilobulated, polypoidal tumour with cut surface being gray-yellow in colour, soft and friable associated with necrosis.[23] Microscopically, it has small round cells arranged in lobules with occasional rosette like structure specially Homer-Wright rosette.[24]

Ultra-structurally, tumour cells contain neurosecretory granules, microtubules and microfilament.

Immunohistochemically, PNET shows positivity for vimentin and neurofilaments, neuron-specific enolase (NSE), Leu-7 (CD57), and S-100.Necrosis is a poor prognostic factor.[23]

PNET in nasal cavity is prognostically very poor and the most significant prognostic factor is the presence of metastasis.[23]

Our case shows CD 99 positivity and was negative for synaptophysin and chromogranin.

6-Aspergilloma

Aspergillosis of the nasal and paranasal sinuses is a very common opportunistic fungal infection in immunocompromised patients. However, invasive variant in healthy and mildly immunocompromised hosts can also be seen.[25]

Veress et al. reported that two factors are important in pathogenesis of paranasal sinus aspergillosis: secretion of a toxic substance by fungi and tissue necrosis caused by an immune mediated mechanism.[26] Rowe-Jones et al classified aspergillosis in 1994.[27] There are three

main types: Noninvasive, Invasive and Destructive noninvasive types. The third variety is further classified into: Aspergilloma, Fungus ball and Mycetoma (affecting one sinus) or Aspergillus sinusitis (affecting more than one sinus).

Grossly, Aspergillosis developing in tissues as fungus ball or necrotic material is green-black in colour with a cheesy consistency. On hematoxylin and eosin stained sections the branching hyphae are usually 2–5 µm in diameter, splitting dichotomously at 45° angle. Methanamine silver stain is ideal for demonstration of hyphae. Conidiospores can also be seen.This fungus should be differentiated from mucormycosis which have broader non-septate hyphae with dichotomous branching at 90° angles.[28]

Conclusion

Sino nasal polyps of the nasal cavity and paranasal sinuses are common, with extremely varied clinical behaviour, etiopathogenesis, treatment protocol as well as prognosis. We hope that our case reports can draw attention of clinicians to the diverse nature and lack of symptom specificity .Overall, histopathology is extremely useful for proper diagnosis and to avoid unnecessary delay in management.

References

1. Shah S N, GoswamiY.Study of Lesions of Nasal Cavity, Nasopharynx and Paranasal Sinuses by Histopathological Examination. Gujarat Medical Journal 2012; 67(2):70-2
2. 2.Zafar U, Khan N, Afroz N, HasanSA. Clinicopathological study of non-neoplastic lesions of nasal cavity and paranasalsinuses. Indian J Pathol Microbiol. 2008; 51(1):26-9
3. Barnes L, Eveson JW, Reichart P, Sidransky D. Eds. Pathology and Genetics of Head and Neck Tumours. 2005; Lyon IARCPress
4. Thompson LD. Olfactory Neuroblastoma Head and Neck Pathol. 2009; 3:252-9
5. 5.Wooff JC, Weinreb I, Perez-Ordonez B, Magee JF, Bullock MJ. Calretinin staining facilitates differentiation of olfactory neuroblastoma from other small round blue cell tumors in the sinonasal tract. Am J Surg Pathol. 2011; 35(12):1786-93
6. Perez-Ordonex B. Special tumours of the head and neck. Current Diagnostic Pathology 2003; 9:366-83
7. Haroon S, Tariq MU, Memon A, Fatima S, Hasan SH. Olfactory neuroblastoma: A clinicopathological experience of a rare entity from Pakistan. Pak J Med Sci. 2016;32(3):585-90. doi:10.12669/pjms.323.9738.
8. Folpe AL, Goldblum JR, Rubin BP, Shehata BM, et al. Morphologic and immunophenotypicdiversity in Ewing family tumors: a study of 66 genetically confirmed cases. Am J SurgPathol. 2005; 29:1025-33
9. Han A, Kristjansson AK, Gilliam AC, Jacobs G, Eisenberg R. Pigmented olfactory neuroblastoma: a CD56-positive mimic of melanoma. Arch Dermatol. 2008; 144:270-2. doi: 10.1001/archdermatol.2007.52
10. Morales H, Castillo M, Jewells V. Paraganglioma of the sphenoid sinus: case report and review of literature. Clin Imaging 2007; 31:32-6
11. Amit M, Binenbaum Y, Sharma K, et al. Adenoid cystic carcinoma of the nasal cavity and paranasal sinuses: a meta-analysis. J Neurological Surg. B, Skull Base, 2013; 74(3):118-25
12. Belaldavar BP, Batra R. Adenoid cystic carcinoma of the nasal septum: a rare case report. Journal of the Scientific Society 2013; 40(1):39–40
13. Gondivkar SM, Gadbail AR, Chole R, Parikh RV. Adenoid cystic carcinoma: a rare clinical entity and literature review. Oral Oncology 2011; 47(4):231-6
14. Ramer N, Wu H, Sabo E, et al. Prognostic value of quantitative p63 immunostaining in adenoid cystic carcinoma of salivary gland assessed by computerized image analysis. Cancer 2010;116(1):77-83
15. Raychaudhuri S, Santosh KV, Kar M. Subramanya H. Basal cell adenocarcinoma of nasal cavity. Otorhinolaryngol Head Neck Surg. 2011; 8(3):35-36
16. Ward BK, Seethala RR, Barnes EL, Lai SY. Basal cell adenocarcinoma of a hard palate minor salivarygland: case report and review of the literature. Head & Neck Oncology 2009;1:41
17. Ellis G. Basal Cell Adenocarcinoma in Barnes L, Eveson JW, Reichart P, Sidransky D. Eds. Pathologyand Genetics of Tumours of the Head and Neck. 2005; Lyon France. IARC Press p 430
18. Mihajlovic M, Mihajlovic S, Jovanovic P, et al. Primary mucosal melanomas: acomprehensive review. Int J Clin Exp Pathol. 2012; 5:739-53
19. Gilain L, Houette A, Montalban A, Mom T, Saroul N. Mucosal melanoma of the nasal cavity and paranasal sinuses European Annals of Otorhinolaryngology, Head and Neck diseases 2014; 131:365-9
20. Patrick RJ, Fenske NA, Messina JL. Primary mucosal melanoma. J Am Acad Dermatol. 2007; 56:828-34
21. Alves ISS, Berriel LGS, Alves RT, Pinto MB, et al. Sinonasal melanoma: a case report and literature review. Hindawi Case Reports in Oncological Medicine 2017; 2017:1-6
22. Patil AM, Yendigeri SM, Sajjanar BB, Kudadi SS. Ewing sarcoma/ PNET of sinonasal region: a rarecase report. www.sciencejournal.in. 2013; 2(2):17-20
23. Sankaran R, Zaifullahbin S; Hamzah S; Kumar R; Singh B. Gendeh Primitive neuroectodermaltumor (PNET) of nasal cavity.

East J Med. 2016; 21(2): 101-4

24. Chowdhury K, Manoukian JJ, Rochon L, Begin LR. Extracranial primitive neuroectodermaltumor ofthe head and neck. Arch Oto- laryngol Head Neck Surg. 1990; 116: 475-8

25. Dayananda BC, Vandana R, Rekha K, Kumar GS. Aspergillosis of the maxillary antrum: A case report. J Oral Maxillofac Pathol. 2002; 1:26-9

26. Veress B, Malik OA, el-Tayeb AA, el-Daoud S, Mahgoub ES. Further observations on the primary paranasal aspergillus granuloma in the Sudan: A morphological study of 46 cases. Am J Trop Med Hyg. 1973; 22:765-72

27. Rowe-Jones JM, Moore-Gillon V. Destructive noninvasive paranasal sinus aspergillosis: Component of a spectrum of disease. J Otolaryngol. 1994; 23:92-6

28. Sapp JP, Eversole LR, Wysocki GP. Contemporary Oral and Maxillofacial Pathology. 2nd ed. Missouri: Mosby - An Affiliate of Elsevier; 2004. Oral infections; 207–51.

Lingual and Mediastinal Ectopic Thyroid with No Normal Thyroid Gland – A Very Rare Occurrence

Shyam Kalyan N,[1] Deepjoy Basu,[1] Mehak Agarwal,[1] Dulal Bose[1]

ABSTRACT

Introduction

Ectopic thyroid is a rare congenital condition. Dual ectopic thyroid is rarer still with only 30 cases reported in literature. The most common location is the lingual or sublingual region followed by the hyoid region. Instances of dual ectopic thyroid with one in lingual region and the other in mediastinum are very few.

Case Report

A case of dual ectopic thyroid is presented with absent normal thyroid in a girl of 14 years who presented with difficulty in swallowing and lump sensation in throat. Ultrasound, MRI scan and Technetium 99m pertechnetate thyroid scan were done. She showed lingual thyroid and thyroid tissue in upper mediastinum and no thyroid tissue in the normal anatomical location.

Discussion

The discovery of mediastinal ectopic thyroid was incidental. She had subclinical hypothyroidism and was treated with thyroxine replacement therapy. .

Keywords

Thyroid Dysgenesis; Ectopic Thyroid Tissue; Mediastinum; Lingual thyroid

Ectopic thyroid tissue (ETT) is a rare congenital anomaly where one finds thyroid tissue in areas other than its normal location, that is, anterior to second to fourth tracheal cartilages. The prevalence of ETT is reported to be 1 per 100000 to 300000 individuals.[1] ETT occurs due to stunted descent of median or lateral thyroid anlage. These are usually found in the midline of anterior neck. It is still rarer to find ectopic thyroid simultaneously at two different locations.[2] The most common location of ETT is the base of tongue. The lingual thyroid may be the only functioning gland in about 70% of the ectopic thyroid cases.[3] The next common location is the hyoid region. Most of the patients are adolescents and frequently present with swelling in the anterior neck or in the tongue with or without altered hormonal status. Only a few cases of dual ectopic thyroid have been documented in the literature. Such a case with an ectopic in mediastinum as well as one in the lingual region with absent normal thyroid has not been reported. Here we report a case of a 14 year old girl who was diagnosed to have dual ectopic thyroid at lingual and mediastinal sites with no thyroid tissue at the normal anatomical location. The diagnosis was aided by ultrasonography, MRI scan and Tc-99m pertechnetate thyroid scan.

Case Report

A 14 year old girl presented to our out-patient department with complaints of foreign body sensation in throat and difficulty in swallowing for the last 2 years. There was a recent worsening of symptoms over the past few months. There was no difficulty in breathing or any symptom of thyroid dysfunction. On clinical examination the girl had a well-defined, smooth, globular mass, about 2 cm x 2 cm in size,

1 - Department of ENT, Peerless Hospital, Kolkata

Corresponding author:
Dr Shyam Kalyan N
email: shyamkal87@gmail.com

Fig. 1. A well-defined smooth, globular mass of size 2x2 cm in the posterior one-third of tongue.

in the posterior one-third of tongue (Fig. 1). Neck examination was normal with no palpable node.

Ultrasound of neck showed a 21mm x 19mm hypoechoic rounded lesion at the base of tongue with internal vascularity (Fig. 2). The thyroid fossa was noted to be empty. MRI neck and thorax confirmed the findings of ultrasound and showed another soft tissue focus in upper mediastinum with right and left components, measuring 20mm x 15mm and 20mm x 10mm respectively, with central confluence (Fig. 3 and Fig. 4). The thyroid fossa was noted to be empty with no evidence of normal thyroid tissue within it in the MRI as well.

The biochemical parameters were suggestive of subclinical hypothyroidism, with T3- 160 ng/dL (normal being 60 to 185 ng/dL), T4-11 mcg/dL (normal being 4.8 to 12 mcg/dL) and TSH-6.4 microIU/mL (normal being 0.3 to 5.5 microIU/mL).

Technetium 99m pertechnetate thyroid scan with 2 mCi (74 MBq) showed no trapping of isotope in the normal pre-tracheal position of thyroid and an increased uptake in the lingual and upper mediastinal regions, suggestive of dual ectopic thyroid. The patient was treated conservatively with thyroid replacement therapy to reduce the size of the ectopic thyroid tissues and followed up with clinical examination for decrease in the size of the swelling and thyroid function tests to check the euthyroid status.

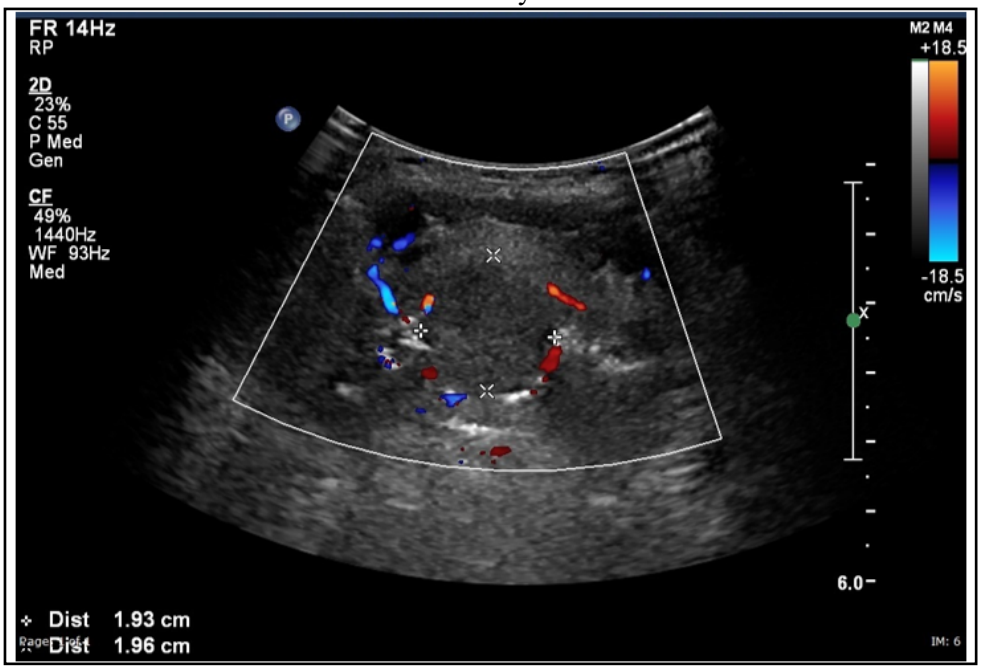


Fig. 2. A well-defined hypoechoic nodule with internal vascularity in the base of tongue.

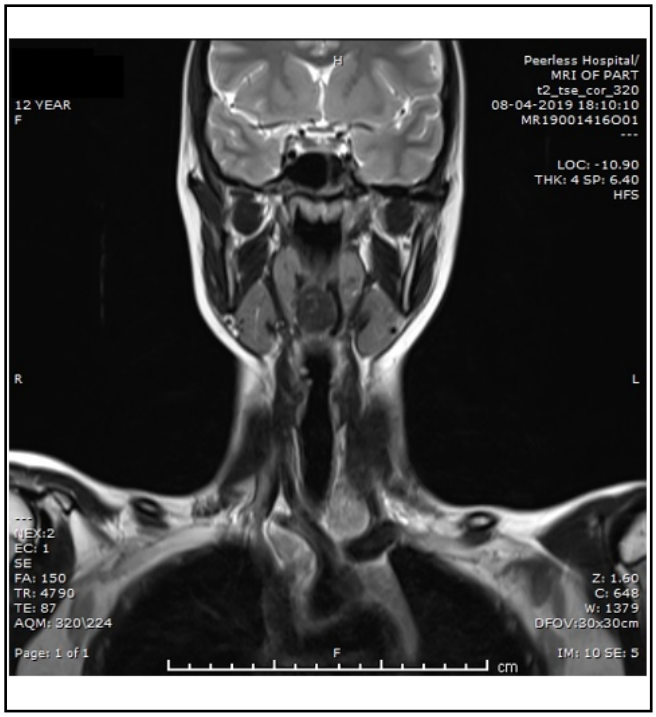


Fig. 3. T2 Coronal images showing hypointense nodule in the base of tongue. Hyperintense nodules are seen in the superior mediastinum. The one on the right is inferolateral to the innominate artery and the one on left is superomedial to the left brachiocephalic vein.

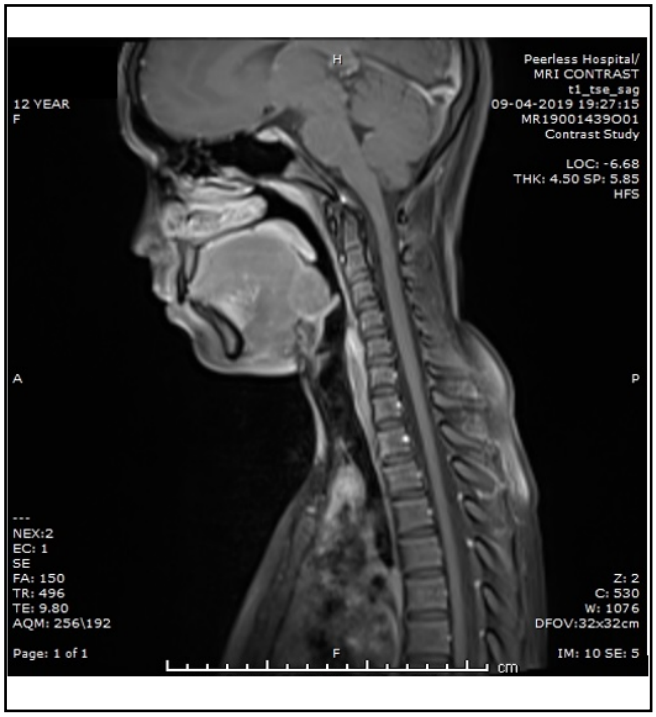


Fig. 4. Sagittal T1 fat saturated (post contrast) cut showing an uniformly enhancing nodule in the base of tongue, at the level of the foramen caecum. It splays the vallecula. There is a hypointense non-enhancing midline tract extending from the inferior aspect of the nodule probably a fibrous tract. No thyroid tissue is seen anterior to the trachea. Isolated enhancing soft tissue nodule is seen in the base of the neck, extending into the retromanubrial space.

Discussion

Ectopic thyroid tissue (ETT) is any thyroid tissue that is not found in relation to the anterolateral aspect of second to fourth tracheal rings. It occurs due to the failure of descent of thyroid tissue from the foramen caecum to the normal location in the cervical region in front of trachea. It occurs more commonly in females and becomes evident during adolescence or pregnancy as the requirement for thyroid hormone increases during this period.[4] Most patients with dual ectopic thyroid seek medical help between the ages of 11 and 28 years.[2] The production from ectopic tissues is insufficient leading to subclinical or clinical hypothyroidism. This causes increased secretion of TSH from the pituitary leading to stimulation of follicular cells of the ectopic tissue resulting in its increased size. The symptoms caused can vary depending on the location of the ETT.

Most reported cases of dual ectopic thyroid have one site of ectopy in the lingual or sublingual region and the second site at subhyoid or suprahyoid level. It is extremely rare to find the second site of ectopy in upper mediastinum, as in our case. As seen in most of the cases of dual ectopic thyroid, our case also did not have normal thyroid gland. In most of the cases, the diagnosis of dual ectopic thyroid is made on thyroid scan, though ultrasound and CT scan are additional imaging modalities in some of the cases.[5]

All diseases capable of affecting the thyroids

can affect the ectopic thyroid tissue as well, like hyperplasia, adenoma, inflammation and malignancy. Carcinoma of lingual thyroid is reported to have an incidence of 1% with follicular variant being the commonest.[6]

Lifelong thyroxine therapy is usually given to reduce the size of the ectopic thyroid by lowering the TSH level as well as achieving euthyroid status. Asymptomatic and euthyroid patients may be just observed without any treatment. Surgery is reserved for those cases where the obstructive or pressure symptoms are severe or there is suspicion of or proven malignancy in the ETT.[7] Surgery may remove the only functioning thyroid tissue in the body and so one has to be cautious before deciding on surgery for a patient.

Benign mediastinal ETT is usually asymptomatic and discovered incidentally. It may be excised to diagnose the nature of the mass as there is a risk of tracheal compression due to haemorrhage within or malignant transformation of the mass.[8] A mediastinal ectopic thyroid mass may need thoracotomy or sternotomy for surgical excision.

In our case the young girl presented with a symptomatic lingual swelling and the discovery of mediastinal ectopic tissue was incidental. She was given thyroxine replacement therapy and is being followed up regularly.

References

1. Guerra G, Cinelli M, Mesolella M, Tafuri D, et al. Morphological, diagnostic and surgical features of ectopic thyroid gland: A review of literature. Int J Surg. 2014; 12 Supplement 1:S3-S11
2. Meng Z, Lou S, Tan J, Jia Q, et al. Scintigraphic detection of dual ectopic thyroid tissue: Experience of a Chinese tertiary hospital. PLoS ONE 2014 Apr18; 9(4):e95686. DOI: 10.1371/journal.pone.0095686
3. Raza SA, Saldanha M, Nagalotimath US, Ponni SA. Dual ectopic thyroid. Natl J Otorhinolaryngol Head Neck Surg. 2013; 1:26-7
4. Kumar R, Sharma S, Marwah A, Moorthy D, Dhanwal D, Malhotra A. Ectopic goiter masquerading as submandibular gland swelling: A case report and review of the literature. Clin Nucl Med. 2001 Apr; 26(4):306-9
5. Sood A, Sood V, Sharma DR, Seam RK, Kumar R. Thyroid scintigraphy in detecting dual thyroid: A review. Eur J Nucl Med Mol Imaging 2008 Apr; 35(4):843-6
6. Jarvis JF. Lingual thyroid: A report of three cases and discussion. S Afr Med J. 1969 Jan 04; 43(1):812
7. Giannoulis G, Manolidi L, Grammaticos P. A case of sublingual thyroid partially implanted in the left iliac fossa. Hell Iatr. 1968; 40:1175-81
8. Choudhury BK, Saikia UK, Sarma D, Saikia M, et al. Dual ectopic thyroid with normally located thyroid: A case report. J. Thyroid Res. 2011; 2011:159703. Available from: https://www.hindawi.com/journals/jtr/2011/159703/

Human Bite on Nose

Prasit Biswas,[1] Shriyash Sinha,[1] Somnath Saha[1]

ABSTRACT

Introduction

Human bites are notorious due to chance of infection by direct inoculation of pathogens from saliva and must be managed properly. Human bite injuries cause dilemma to the treating doctor regarding its way of management. The options of management are primary closure, delayed closure with skin/tissue grafting and conservative.

Case Report

A 43 year old male patient with a human bite injury with tissue loss on the tip of nose was admitted in hemodynamically stable condition. He was given tetanus toxoid and anti-rabies vaccination as per current guidelines. Delayed wound closure was done in 2 steps with forehead flap, in 3 weeks interval. Patient was discharged after suture removal. There was good color matching and no complications.

Discussion

Human bite injuries are mostly due to inter personal violence, alcohol intoxication and psychiatric illnesses. Multiple instances of such bite injuries have been reported. Delayed closure of bite injuries with forehead flap provides good colour and texture match as well as good flap survival due to rich vascularity..

Keywords

Bites, Human; Nose; Rhinoplasty; Forehead; Surgical Flaps

Human bites of the face present as a surgical challenge, sometimes with a dilemma as to the method and timing of surgical repair. Primary surgical repair is the treatment of choice for most clinically uninfected facial bite wounds, whereas delayed closure should be reserved for certain high risk or infected wounds, and especially when there is partial or total loss of important structure(s) of the face. Avulsed injuries with significant tissue loss represent the most difficult cases for definitive management. Reconstruction becomes absolutely necessary in such patients to avoid permanent cosmetic defect. The cosmetic effects of such losses are profound and may affect the social life and even sometimes the livelihood of the individual patient involved. Many of the patients who sustain human bite of the face present with healed wound but with disfiguring scars and deformed facial appendages also needing reconstruction.

Human bites can be classified depending on the mechanism of injury into, occlusion bites and the closed fist bite (or fight bite).[1] Occlusion bites occur when the teeth are sunk into the skin with sufficient force to breach the integrity of the skin. Clenched fist injuries occur when a closed fist impacts another individual's teeth, leaving an injury over the dorsal aspect of the third, fourth or fifth metacarpophalangeal (MCP) joints, most classically over the third MCP.[2] Direct occlusion bites manifest a more or less distinct impression of the biter's teeth. A bite by an adult can usually be reliably distinguished from one by a child (smaller radius, impressions of individual teeth, deciduous dentition). A distance greater than 3 cm between canine teeth indicates that the bite wound was inflicted by an adult. Bite wounds caused by children who still have their primary dentition are characterized by a distance between molars that is usually less than 2.5 cm.[3]

Case Report

A 43 year old male presented to the ENT OPD with a 4 day old human bite post inter-personal violence. He was systematically fine and had no other complaints. The bite wound was circular, about 2cm in diameter, situated at

1 - Department of ENT, Calcutta National Medical College

Corresponding author:
Dr Prasit Biswas
email: prasit.biswas93@gmail.com

Fig. 1. Preoperative photo of the wound

Fig. 2. Reconstruction was done by forehead flap

the tip of nose with loss of skin, subcutaneous tissue and also loss of medial crus of alar cartilage and small part of caudal end of nasal septum.

The wound was not infected, without any discharge or active bleeding. Initial wound care, dressing, was given by his primary health centre. Primary closure was not possible due to the loss of tissue and possibility of poor cosmetic outcome. The patient was admitted with plan of nasal reconstruction using forehead flap. Thorough wound cleaning and fresh dressing were done after admission. The patient had already received Injection Tetanus toxoid. Anti-rabies vaccination and Rabies immunoglobulin were given as per recommended schedule.[4] Routine investigations, serology was done and pre-anaesthetic fitness was taken. Reconstruction was done by rotating forehead flap from right side. The bare area on the patient's forehead was covered with a split thickness skin graft taken from his right thigh (Fig.2) Patient was put on iv antibiotics post operatively.

Twenty one days after the initial reconstruction, patient was again taken for surgery. The flap was repositioned and sutured with 4-0 Nylon. (Fig. 3)

Fig.3. Clinical photograph after repositioning the flap

Discussion

Human bites are serious injuries that may result in infection, loss of function and gross disfigurement.

A classification of the severity of bite wounds, from Rueff et al[5]

Grade I

- Superficial skin lesion
- Torn skin
- Scratched skin
- Bite canal
- Crushing injury

Grade II

- Wound extending from the skin to the fascia, muscle, or cartilage

Grade III

- Wound with tissue necrosis or tissue loss

Infection from oral contaminants, tissue damage, and difficult surgical reconstruction make the management of human bite injuries a challenge. Rate of infection in different bite injuries are as follows:[6] Cat bites: 30-50%, Human bites: 15-25%, Dog bites:5-25% Overall: 10-20%, Hand: 18-36%, Arm: 17-20%, Leg: 7-15%,Face: 4-11%. Tetanus toxoid is essential after any bite injury. Although rare, Rabies can be transmitted via human bite also. Anti-rabies vaccination is advisable as per WHO recommended ARV schedule.[4]

- The 5 dose intramuscular regime (1-1-1-1-1) : one dose of vaccine to be administered on days 0, 3, 7, 14 & 28 in the deltoid region for adults and antero-lateral aspect of thigh in children.
- Dose of rabies immunoglobulin (RIG): 20IU/kg of Human RIG or 40 IU/kg of Equine RIG. Administration of RIG can be delayed till 7 days from the date of first vaccine dose.

A recent incident published in Times of India reports of a mentally challenged man, biting 22 pedestrians at Howrah, West Bengal.[7]

Another incident published in Times of India reports of an intoxicated man biting a snake into pieces after getting bitten by it.[8]

The main reasons of sustaining human bites are interpersonal violence and physical assault, mental instability, intoxication.

The goals of reconstructive surgery is to achieve full wound closure, restoration of normal anatomical landmarks and leaving behind least chance of scarring and healing by secondary intention. Study conducted by Saha et. al. found that forehead flap is one of the safest cutaneous flaps available in reconstructive surgery of nose and orofacial region. It provides good colour and texture match and is quick and easy to raise as well as good flap survival due to rich vascularity.[9]

References

1. Conlon HA. Human bites in the classroom: incidence, treatment, and complications. J Sch Nurs. 2007 Aug;23(4):197-201
2. Fight-Bite: Not Just a Hand Problem. Cook CP, Knox MJ, Wimberly RL, Ellis HB, Riccio AI. J Pediatr Orthop. 2014; 34(6):647-9. doi: 10.1097/BPO.0000000000000155
3. Herrmann B, Dettmeyer R, Banaschak S, Thyen U. Typische Bissverletzungen als Blickdiagnose. In: Herrmann B, Dettmeyer R, Banaschak S, Thyen U, eds. Kindesmisshandlung. Heidelberg: Springer; 2008. 58 pp. https://link.springer.com/book/10.1007%2F978-3-662-48844-7
4. WHO recommendation for ARV prophylaxis. https://www.who.int/ith/vaccines/rabies/en/
5. Rueff F, Bedacht R, Schury G. [Bite injury. Special situation as to clinical aspects, therapy and course of healing]. Med Welt. 1967; 12:663-8. https://www.ncbi.nlm.nih.gov/pubmed/5586321/
6. Brook I. Management of human and animal bite wound infection: an overview. Curr Infect Dis Rep. 2009;11(5):389-95.
7. Banerjee R.. Howrah : mentally challenged man bites 22, run amok on GT road, Times of India 2019, July 28
8. ANI. Uttar Pradesh: Drunk UP man bites snake into pieces after it bit him, Times of India 2019, July 29
9. Saha VP, Ghosh A, Kesarwaani S, Saha S.(2019). Forehead flap for reconstruction of orofacial defects : A tertiary care centre experience, West Bengal, India. Indian Journal of Applied Research 2019; 9(6), 51-3.