Endoscopic Management of Inverted Papilloma Using CT Scan as the Predictor of Tumour Origin

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ABSTRACT

Introduction

Inverted papillomas are notorious for recurrence. The surgical cause attributed to recurrence is failure to achieve good surgical exposure and inadequate clearance of disease. Pre-operative prediction about the site of origin by CT Scan may contribute to a better surgical outcome. This study was undertaken to assess if focal hyperostosis on pre-operative CT scan can be considered to be a predictor of the site of tumour origin and correlate with endoscopic finding of the site of origin.

Materials and Methods

A prospective descriptive study was carried out between Jan 2014 and May 2016. Fifteen patients of histopathologically proven inverted papilloma that reported during this time period were evaluated using contrast enhanced CT Scan and subsequently underwent endoscopic excision of tumour identifying the tumour origin. Assessment of age, gender, symptoms, pre-operative staging, location of the tumour origin on CT Scan and surgical correlation of origin was done. Post-operative follow-up was done at 1 month, 3 months and 6 monthly thereafter.

Results

Six (40%) were classified as Krouse II and nine (60%) were classified as Krouse III. 12 (80%) arising from maxillary sinus, 02 (13.3%) arising from maxillary sinus and anterior ethmoids and 01 (6.7%) from sphenoid. Thirteen (86.7%) cases CT scan could predict the tumour origin which was confirmed during surgery. All cases managed by endoscopic technique with no recurrence or co-existence of malignancy.

Discussion

Focal hyperostosis in the walls of paranasal sinus is seen to be associated with IP tumour origin, the cause of which is not fully understood. It is hypothesized that tumour induced inflammation at the site of origin leads to bone remodeling and increased bone deposition with vascularity at the site of attachment.

Conclusion

CT scan is a good predictor of tumour origin and a conservative endoscopic approach can be planned accordingly for complete clearance of disease.

Keywords

Papilloma, Inverted; Tomography, X-Ray Computed; Hyperostosis

Sinonasal papilloma is a benign and locally aggressive neoplasm of sinonasal epithelium. It arises from the Schneiderian membrane of the sinonasal tract. In 1854 Ward was the first to describe the Schneiderian papilloma in the nasal cavity[1] and subsequently Kramer and Som classified the Papilloma as a true neoplasm and distinguished it from inflammatory polyp[2]. Reingertz in 1935 first described the histopathological features of inverted papilloma (IP).[3] In 1991 the World health organization classified the Schneiderian Papilloma into three histopathological type: endophytic (Inverted), exophytic (Fungiform) and oncocytic (Cylindrical) type.[4]

Sinonasal papillomas are relatively uncommon neoplasm comprising of 0.5- 4% neoplasm of all primary nasal tumours and 70% of all sinonasal papillomas are inverted papillomas. The incidence of Inverted Papilloma ranges from 0.74- 1.5 cases per 1,00,000 per year.

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IPs are notorious for recurrence and the rate of recurrences ranges from 6-75% according to various literatures. The surgical cause attributed to recurrence is failure to achieve good surgical exposure and inadequate clearance of disease.[5] The gold standard of treatment of IP is lateral rhinotomy and medial maxillectomy however in recent times a more conservative endoscopic approach is becoming the standard of care without compromising the sub-periosteal clearance of disease. This creates the need for imaging to predict the origin of tumour pre-operatively to have better surgical outcome. On CT Scan the changes in IP are associated calcification, sclerosis, erosion or thinning of bony confines of nasal cavity and paranasal sinus.[6] So, a prospective study was designed to show if focal hyperostosis on preoperative CT scan predicts the tumour origin of inverted papilloma and correlates with endoscopic finding of the tumour origin.

Materials and Methods

A prospective descriptive study was carried out at an ENT Centre between January 2014 and May 2016. All patients of unilateral nasal mass/ polyps underwent a diagnostic nasal endoscopy (DNE) after proper decongestion of nose. Careful representative tissue biopsies were taken and sent for histopathological diagnosis. Fifteen (N=15) cases of histopathological proven Inverted papilloma underwent surgical treatment at this centre in the given period and informed written consent was taken from all of them for inclusion in the study. The patients were evaluated by contrast enhanced computed tomography (CECT) Scan of paranasal sinus and nose preoperatively (using 16 slice CT Scanner). The CT protocol used were 1mm cuts in axial imaging and subsequently the reformatted coronal and sagittal cuts in bone window were studied to look for areas of erosion, thinning of the bony walls and focal areas of bony thickening (Focal Hyperostosis). In evaluating the CT Scan paranasal sinus and nose we assumed that the site of focal hyperostosis is the predictor of tumour origin. The CT Scan was studied by a radiologist and ENT surgeon separately to identify the areas of focal hyperostosis. All patients were staged using Krouse staging system on CT scan.[7] Patients with diabetes mellitus, bleeding disorders, unwilling for surgery or unfit for surgery were excluded from the study.

Subsequently the patient underwent conservative endoscopic excision of inverted papilloma with the identification of tumour origin and sub-periosteal clearance.

We also assessed the age, gender, symptoms, surgical approach, and post-operative follow-up was done at 01 months, 03 months and 06 monthly thereafter.

Results

The study included 15 patients of inverted papilloma diagnosed and treated at our centre between January 2014 and May 2016. The Male: Female ratio was 14: 1 with a mean age of 57.26 years (age range, 38-72 years). The symptoms with which the patients presented are described in Table I. All patients were staged using the Krouse's staging system and six (40%) were staged as II and nine (60%) staged as III. The primary sites of tumour involvement were 12 (80%) from maxillary sinus, 02 (13.3%) from the maxillary sinus and anterior ethmoids, 01 (0.7%) from the sphenoid sinus.

Table I :Symptom presentation (N= 15)

SYMPTOMS	N	PERCENTAGE (%)
Nasal Obstruction	15	100
Rhinorrhea	11	73.3
Epistaxis	7	46.6
Headache	3	20
Facial Pain	5	33.3
Postnasal drip	2	13.3
Hyposmia/ anosmia	8	53.3

All patients underwent CECT scan preoperatively in earch of focal hyperostosis and was identified in 13 of the 15 patients (86.7%). The types of focal hyperostosis identified were cone type and plaque type (Fig. 1).

The various types of focal hyperostosis with the predicted site of tumour origin on CT Scan is shown in Table II. All the patients underwent endoscopic excision

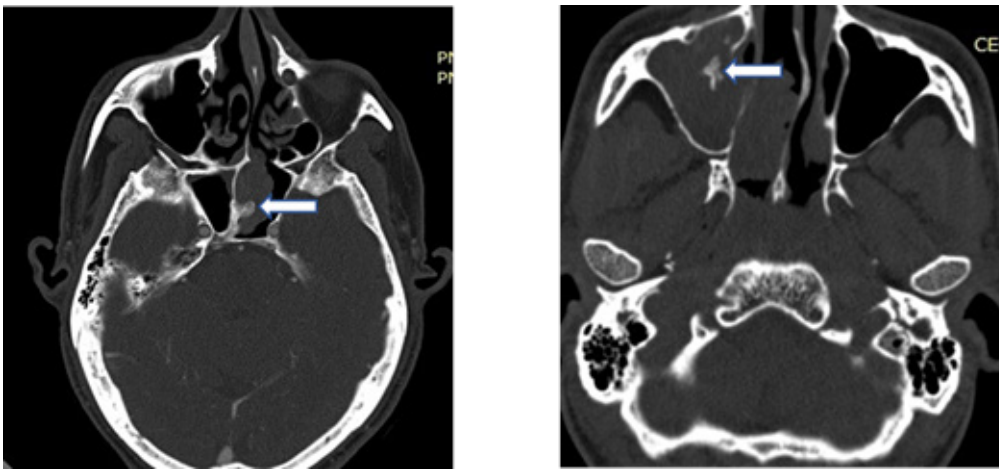

Fig.1. An axial cut CECT scan showing the cone type [A] (indicated by white arrow) and plaque type [B] (indicated by white arrow) of focal hyperostosis

of the tumour with careful identification of the tumour origin and attachment.

Table II: Focal hyperostosis predicting the site of tumour origin (N=13)

SITE OF ORIGIN	CONE TYPE	PLAQUE TYPE
Lateral wall nose	1	3
Anterior wall maxillary sinus	2	1
Postero-lateral wall maxillary sinus	4	-
Anterior ethmoids	-	1
Sphenoid sinus	1	-

The site of tumour origin identified intra-operatively coincided 100% with focal areas of hyperostosis in all 13 cases (Figs. 2, 3). One of the cases had multiple focal hyperostosis on the postero-lateral wall of maxillary sinus and intra-operatively showed broadbase attachment of tumour on the specific site (Fig. 4). Two cases in which no hyperostosis was identified on CECT Scan originated from the lateral wall of nose. The various endoscopic approaches to the various sites of origin of IP are described in Table III. Post-operatively the patients were followed up with a mean duration of follow-up of 1.8 years (minimum of 6 month and maximum of 3 years) with no evidence of recurrence. No evidence of synchronous co-existent malignancy has been found in any of the IP under study.

Table III: Various Endoscopic Approaches to Nasal IP

SITE OF ORIGIN/ ATTACHMENT OF TUMOUR	ENDOSCOPIC APPROACHES
Lateral wall of nose	Infero-medial Maxillectomy+ ethmoidectomy ± Excision of part of lamina papyracia
Other sites of Maxillary sinus	Infero-medial maxillectomy ± Modified Denker's approach
Maxillary sinus and ground lamella involvement	Infero-medial maxillectomy+ Ethmoidectomy+ Middle turbinectomy
Sphenoid Sinus	Sphenoidotomy

Discussion

Sinonasal Inverted papillomas are benign locally aggressive epithelial neoplasm; they are notorious for recurrence and known to harbor malignancy. These benign tumours are known to occur at any age but commonest age of incidence is the fifth and sixth decade

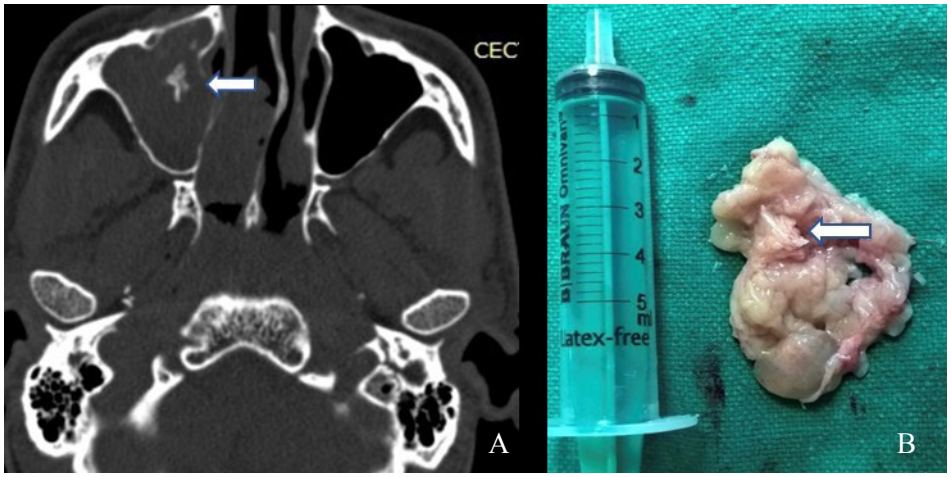

Fig. 2. Plaque type Hyperostosis lateral wall nose (A) and tumour with focal hyperostosis (B) shown by white arrows

of life.[5,8,9] These tumours are also known to occur more in males than female and male to female incidence varies from 3:1 to 8:1 according to various literatures.[5,10] This is in agreement with our study, where the mean age of occurrence is 57.26 years and has occurred in male population predominantly.

The patients of nasal IP present with varied symptoms but commonest are the progressive unilateral nasal obstruction, rhinorrhea, epistaxis, facial pain and headache in varied proportions. However, these are nonspecific features of nasal pathologies except unilateral nasal obstruction with epistaxis in elderly age group above 40 years warrants careful evaluation for malignancy.[5,8]

The best modality of evaluation is diagnostic nasal endoscopy after nasal decongestion. The macroscopic appearance of the nasal IP described in literature is a mulberry-like uneven surface which is reddish grey in colour and bleeds on touch.[5] In the experience of the author the tumour may be inconspicuously hidden behind pale looking polyps which require a careful evaluation and good representative biopsy to have the right diagnosis. On many occasions, the patient has to undergo repetitive surgery due to improper evaluation or inadequate surgery. Four out of the fifteen cases in the present study had to undergo multiple inadequate surgeries in the past due to improper diagnosis.

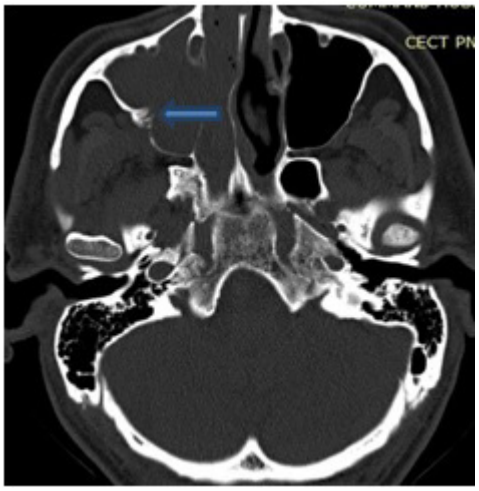

Fig. 3. Cone type of Hyperostosis on postero-lateral wall of right maxillary sinus

With the changing time the more aggressive external approach has been replaced by the conservative endoscopic approach for excision of sinonasal Inverted papillomas. This creates the need of accurate preoperative assessment of tumour origin and mapping of the extent of the lesion. MRI holds superior grounds in better delineation of soft tissue from inflammation, retained secretion but CT imaging is better for evaluation of bony changes such as sclerosis, erosion and thinning of bony walls.[11] CT scan changes such as thinning, bowing

and erosion of bones are due to pressure changes of growing tumour and unlikely to be the site of tumour origin. However localized and eccentric thickening of bone in the walls of paranasal sinus classically defined as focal hyperostosis is seen to be associated with IP tumour origin. The cause of focal hyperostosis is not fully understood but it is hypothesized that tumour induced inflammation at the site of origin leads to bone remodeling and increased bone deposition with vascularity at the site of attachment.[6,12,13,14] This is different from the diffuse, concentric sclerosis of the bony walls of paranasal sinuses seen in chronic rhinosinusitis and is concurred by Lund and Lloyd et al.[15]

In the present study, we identified focal hyperostosis in 13 out of 15 cases of IP (86.7%) and all corresponded with tumour origin identified endoscopically and is in agreement with Lee et al.[12]

Fig. 4. Postero-lateral wall of right maxillary sinus shows multiple cone/ plaque shaped hyperostosis (shown in Blue arrow), tumour origin was broad base

The controversy exists in literature regarding the approach to management of sinonasal inverted papilloma. Open approach is considered to be the standard of care but endoscopic approach in recent time has taken precedence over the traditional open approach. A systemic review comparing the endoscopic approach vs the open approach found recurrence rate of 12% and 17% respectively with a mean follow up of 46 months and showed no statistical advantage of one over the other.[16] However endoscopic approach is less morbid, reduces hospital stay and has better outcome. The factors such as identification of tumour origin and sub-periosteal clearance reduce chances of recurrence. Laterality of disease extent i.e. involvement of infratempral fossa, massive skull base erosion, extensive intraorbital extension poses challenge for a purely endoscopic approach. Thus Krouse Stage I, II, III can be approached purely by endoscopic, but Krouse IV requires open or combined approach.[5] All the patients of IP in the study were of Krouse stage II and III hence approached endoscopically with sub-periosteal clearance and are on follow-up with the mean duration of follow-up of 1.8 years with no recurrence. These patients are reviewed 6 monthly by diagnostic nasal endoscopy. According to Dong-Young Kim et al a follow-up of more than 3 years have shown higher chances of recurrence. Thus, operated patients of IP need longer duration of follow-up to assure disease clearance.[9]

Conclusion

All unilateral nasal masses need evaluation with proper nasal endoscopy and careful representative tissue biopsy to yield a correct diagnosis. In a case of biopsy proven sinonasal inverted papilloma CT Scan identification of focal hyperostosis assists in localization of tumour origin and can be used in planning the surgical approach to inverted papilloma without compromising the disease clearance. The two types of hyperostosis namely the cone type and plaque type correlated equally well with the site of tumour origin.

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