

Loop Drainage in Subcutaneous Head and Neck Abscesses: A Minimally Invasive Procedure

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ABSTRACT

Introduction

Incision and drainage (I&D) of abscess is the gold standard treatment. The purpose of this study was to compare Loop Drainage Technique (LDT) of subcutaneous Head and Neck abscess with I&D in terms of primary outcome like efficacy and change in abscess diameter and secondary outcome like pain, duration of procedure, duration of healing and patient satisfaction.

Materials and Methods

A prospective cohort study was conducted in a tertiary care hospital for one year. Patients were consecutively allocated to I&D and LDT. All patients underwent ultrasonic evaluation of abscess size pre-procedure and 7th day post-procedure. Both groups received antibiotics at discharge and followed up at regular interval.

Results

A total of 70 patients were selected (35 in each group). Mean(sd) change in abscess diameters between I&D and LDT was not significant ($p=0.83$). In terms of efficacy or healing both procedures were equivalent ($p=0.72$). The secondary outcome like Pain (VAS score), duration of procedure was significantly lower in LDT than I&D ($p<0.0001$). The patient satisfaction score measured by Likert scale was significantly better in LDT than I&D ($p<0.0001$). However duration of healing was same in both groups ($p=0.49$).

Conclusion

Loop drainage is equally efficacious to standard I&D in abscess resolution but the duration of procedure and pain experienced was less, with better compliance.

Keywords

Abscess; Drainage; Minimally Invasive; Head and Neck

Skin abscesses and other soft tissue infections remain one of the most common patient afflictions presenting to the emergency department. Abscesses are the second most frequent soft tissue infection after cellulitis in adults.¹ These infections usually progress to well-organized, multi-loculated structures, where antibiotic penetration is poor. It presents as a red, painful swelling, fluctuant on palpation.

The age-old technique for treating subcutaneous abscess has been INCISION and DRAINAGE. It has its own set of drawbacks owing to the co-morbidities associated with it. I & D has been rated as the second

most painful emergency procedure after Nasogastric tube insertion². This technique can be painful in adult patients and can be difficult in children.³ The abscess cavity requires regular dressing, packing and repacking which needs strict adherence to regular follow-ups. The surgical interventions often leave disfiguring wounds that require

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lengthy care. There is also a risk of treatment failure, leading to repeat incision and drainage, hospitalization for intravenous antibiotics, or surgical management, which may occur in up to 10% of cases.⁴ Minimally invasive techniques like Loop Drainage Technique (LDT) has gained popularity among children^{3,5-9} and adults.¹⁰ Invasive techniques like I & D in head neck region likely to produce complications due to close proximity to anatomic structures such as nerves and blood vessels.

The purpose of this study was to assess outcomes using the LDT and I & D technique specifically in head neck region. To compare I & D and LDT of subcutaneous head neck abscesses in terms of primary and secondary outcome. The primary outcome was measured on the basis of resolution of abscess by reduction in size as measured by Ultrasonography (pre and post procedure) and efficacy in healing of the abscess without the need for further clinical intervention. The secondary outcome was assessed in terms of intensity of pain, duration of procedures, duration of healing, patient satisfaction (Likert Scale).

Materials and Methods

This is a prospective cohort study, which was conducted at the Department of Otorhinolaryngology and Head and Neck Surgery of a Tertiary Care Centre over a period of 1 year among the patients having Subcutaneous Head and Neck abscesses. Institutional review board approval for the study was obtained and the patients gave written informed consent before they were enrolled in the study. The study population included patients of age group 7 years to 50 years. Exclusion criteria included patients who were immunocompromised (transplant patients, active cancer, hereditary and acquired immunodeficiencies), patients who were using medications which have effects on wound healing including chemotherapeutics and steroids, patients who have lidocaine allergy, large abscesses (size >5cm and < 1cm), deep neck space abscesses and patients who refused to give consent.

The patients who participated in the study were consecutively allocated into standard I & D and LDT.

The participants were informed about the purpose and details of the study and informed consent were taken. Detailed history were taken and clinical examination were performed. The size of the abscess was measured by Ultrasonography (USG) in all cases, pre-procedure and post procedure at 7th day. The efficacy or success of both procedure was measured whether there was complete resolution of abscess irrespective of duration of healing. Patients lost to follow up, need for I & D (in case of loop drainage) and hospitalization was treated as failure. The ultrasound measurement was done by single radiologist both pre and post procedure. A single surgeon performed all I & D and LDT. The surgeon was trained adequately in Loop Drainage Technique. Assessment of efficacy and secondary outcome measure was done by separate physician who was blinded to procedures performed. The secondary outcome like pain was measured by Visual Analog Scale. The patient satisfaction was measured by Likert scale (1- Strongly disagree, 2- Disagree, 3- undecided, 4- Agree, 5- Strongly agree).

Both the interventions were carried out as an OPD based day care procedure. All patients were given Inj. Pentazocin and local anesthesia with 2% Xylocaine and Adrenalin. The pus from the abscess cavities were sent for culture and sensitivity.

For Incision and drainage, after antiseptic dressing and draping, a linear incision is made at the most fluctuant point with a BP HANDLE No. 3 and No. 11 blade and the pus is drained. The locules are broken with the help of haemostatic forcep. The cavity was packed with gauze and alternate day dressing was done.

For loop drainage of abscess, after antiseptic dressing and draping, the two extreme fluctuant points are identified and 18G IV cannula is inserted from one extreme fluctuant point, traversing the abscess cavity and taken out from the other extreme fluctuant point (Fig. 1).

The stylet is taken out keeping the cannula in situ. A 1-0 ethilion suture is introduced through the cannula and then the cannula is taken out. A knot is tied making a loop of size 1cm. the loop is moved too and fro for evacuation of the pus and the procedure of rotating the loop is explained to the patient thoroughly.



Fig. 1. Technique of Loop Drainage

In both the groups Antibiotics (Amoxicillin-Clavulanic acid [625mg/375mg] and Metronidazole [400mg/200mg]) and Analgesics (Paracetamol 15mg/kg BW) were given. The loop patients were followed up at 3rd, 7th day and 15th day.

Data was analysed using SPSS (version 17) software. Normality of the variables was determined using the Shapiro-Wilk test. Normally distributed data were expressed with mean and standard deviation. Unpaired

t test were done for intergroup comparisons of two groups. A p-value of <0.05 was considered statistically significant.

Results

A total of 70 patients were enrolled in our study. Both I & D and LDT group had 35 patients each. The patient demographics has been depicted in Table I.

Table I : Patient Demographics

	INCISION & DRAINAGE	LOOP DRAINAGE TECHNIQUE
Age (Median, Range)	33, 9-50	36, 8-47
Gender (M:F)	1.11	1.57
Size of Abscess (cm, Range)	3.2 (1.8-3.9)	3.1(1.9-4)
Compliance with follow-up	29/35	34/35

Out of 70 patients in the study, 41(58.6%) were male and 29(41.4%) were female. Majority of the study subject fell in the age group 31 to 40 years of which 15 male

(62.5%) and 9 (37.5%) female. The distribution of age and sex in both groups shown in Fig. 2.

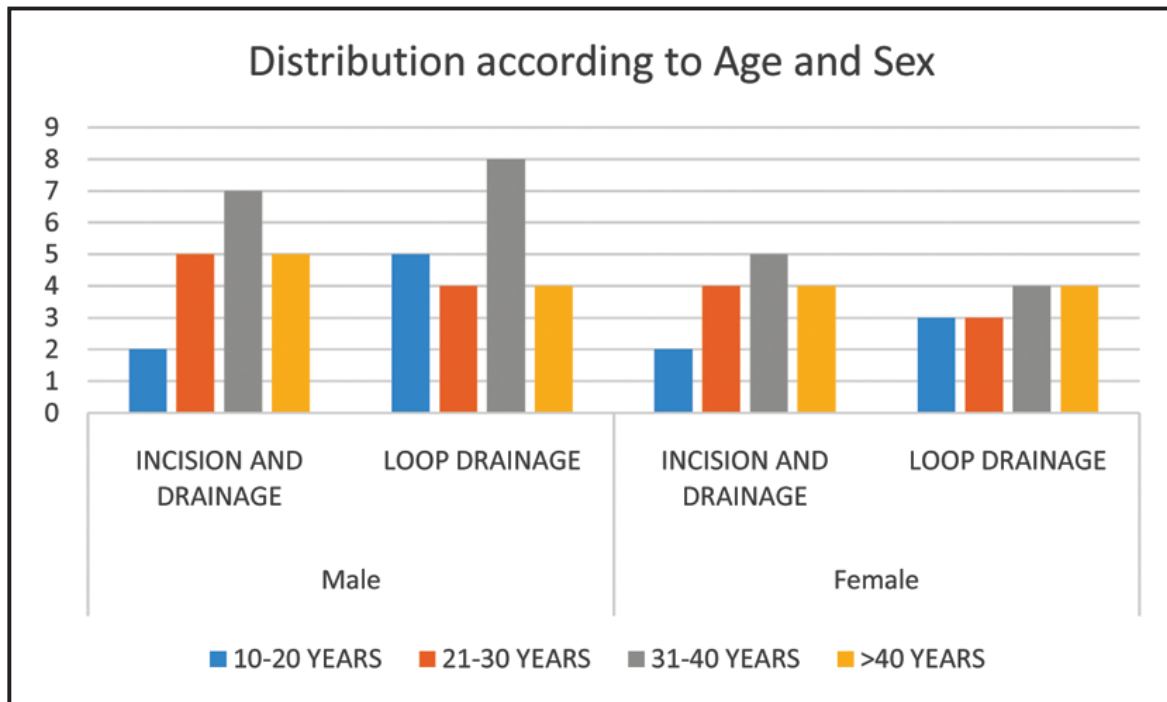


Fig. 2. Distribution according to age and sex

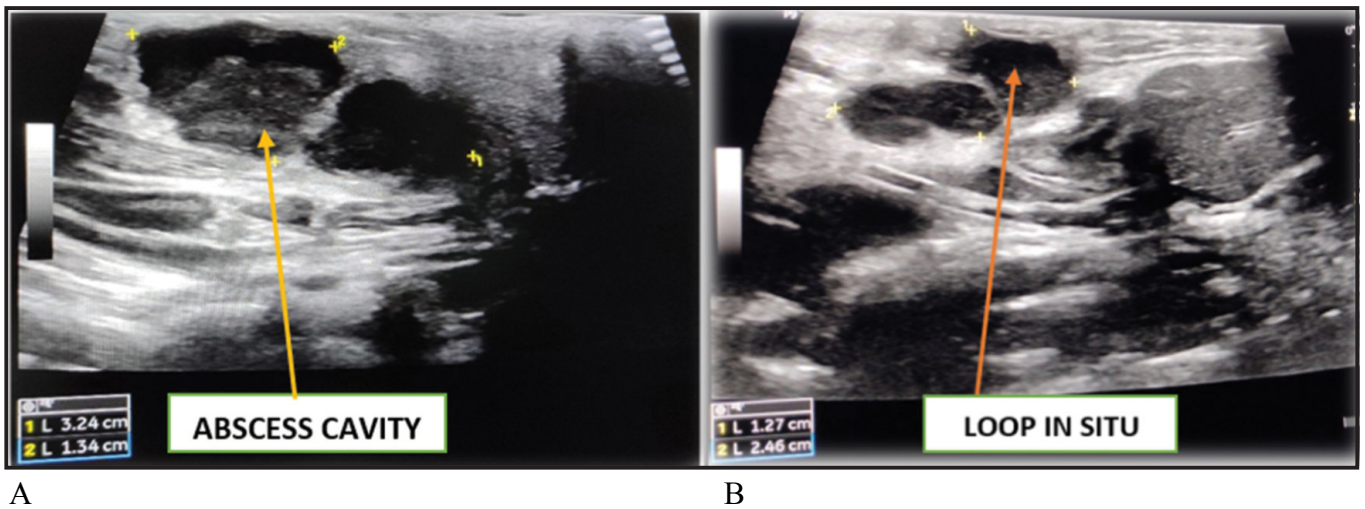
Mean (sd) change in abscess diameters were 2.77 (0.54) cm and 2.74 (0.62) cm respectively for I&D and LD as depicted in Table II. Out of 35 patients treated with I & D 31 patients showed complete resolution and 4 patients were lost to follow up. For LDT out 35 patients

30 patients showed complete resolution, 4 patients did not have complete resolution and 1 patient was lost to follow up. Change in mean diameter pre and post-procedure for I & D and LDT depicted in Table II.

The ultrasonographic demonstration of abscess healing via LD technique is shown in Fig. 3.

Table II: Change in mean diameter pre and post-procedure for I&D and LDT

	I & D	LD	P-VALUE
CHANGE IN ABSCESS DIAMETER (Mean±sd) (cm)	2.77±0.54	2.74±0.62	0.83
EFFICACY			
RESOLVED	31	30	0.72
NOT RESOLVED		4	
LOST TO FOLLOW-UP	4	1	



A **B**
 Fig. 3. The ultrasonographic demonstration of abscess healing via LD technique in a patient. A-Abscess cavity in right parotid region in a 10 year old child. B- Post-operative 7th day(Loop in situ with reduction in size of abscess cavity).

Table III: Secondary outcome measures.

	INCISION AND DRAINAGE (N = 35)	LOOP DRAINAGE (N = 35)	P-VALUE
Intensity of pain (Measured by VISUAL ANALOGUE SCALE)	7.4 ± 0.95	5.02 ± 1.62	<0.0001
Duration of procedure (mins)	12 ± 3.07	5.14 ± 2.26	<0.0001
Duration of healing (in days)	10 ± 2.03	10.4 ± 2.75	0.49
Patient satisfaction (Likert score)	1.71 ± 0.71	3.71 ± 1.05,	<0.0001



Fig. 4. Healing procedure in Loop Drainage technique

The secondary outcome measures are shown in Table III. In secondary outcome measure pain intensity, duration of procedure and duration of healing was more favourable in LDT group ($p < 0.0001$). However duration of healing did not differ significantly among 2 groups ($p = 0.49$).

There were no significant adverse effects in either group at 7 day follow up including necrotising inflammation or sepsis. The healing in LDT had positive impact in respect to cosmesis and patient satisfaction (Fig. 4).

Discussion

The treatment of subcutaneous abscesses has not changed significantly over 60 years. The Incision and drainage (I & D) remains the gold standard mode of treatment till date. But I & D has its own disadvantages. It's a very painful procedure, requires regular and proper dressing and follow-ups in the post-procedural period. Considering these disadvantages alternative methods of draining abscesses are now practised. Gaspari et al described how needle incision drainage using ultrasound guidance proved inadequate compared with traditional incision and drainage in the emergency department.¹¹ Loop drainage of abscesses has been proposed as an alternative to I & D. This new technique is less painful and reduces the post-procedural follow-up medical care. Tsoraides et al. performed a retrospective review of 115 pediatric patients who had loop drainage of cutaneous abscesses. The findings were a 5.5% need for repeat procedures, which were effective. They concluded that this technique was safe, effective, and the standard of care at their institution.³

Similarly, Ladd et al. performed a retrospective review of 128 pediatric patients treated with loop drains for cutaneous abscesses. They found no recurrences and no significant morbidity related to the procedure. They concluded loop drains are a successful technique for the drainage and treatment of complex abscesses in children with limited postoperative wound care.⁶ McNamara et al found no recurrences or incomplete drainages in 85 pediatric patients with subcutaneous abscess treated with subcutaneous drains.⁵

The trial, comparing loop drainage and standard I&D technique in adult population was conducted by Gaszynski et al.¹² This is the first LDT data in adults and proves it is safe and effective. It saves operating theatre time with 30% of LDT treated in the Emergency Department and ensures excellent follow-up compliance as patients return for VessiLoop removal. Healthcare burden is greatly reduced using LDT; most patients require only one review at 10–14 days.¹²

In this retrospective review by J.G. Ladde et al abscesses treated with the novel LOOP technique had significantly fewer treatment failures than those treated with standard I&D with packing (3.9% versus 16.5%, $p = 0.03$), although differences in baseline characteristics and confounding treatment variables could account for these differences.⁹

A systematic review and meta-analysis of eight studies ($n = 910$ participants) demonstrated that the LDT resulted in fewer treatment failures when compared with I & D.¹³

First, fewer treatment failures means that patients are less likely to receive a repeat incision and drainage, which is an important patient-relevant outcome given the significant pain associated with this procedure.⁶ The LDT has also been suggested to have greater patient satisfaction and an improved cosmetic outcome at follow up when compared with the I & D.^{5,10}

There are few technical pearls that needs to be followed for best outcome in LDT. First, clinicians should ensure that both incisions are placed near the periphery of the abscess. This can be facilitated by using ultrasound to identify the margins of the abscess when not clinically apparent.¹⁴ When larger abscesses are present, providers may need to place multiple loops throughout the cavity to facilitate drainage.⁵ While most studies utilized a vessel loop, the cuff of a sterile glove has been described as an alternative if vessel loops are not readily available in the Emergency Department.¹⁵ In our study we modified the technique of LDT as described in literature in 2 ways. First, we used IV cannula, eliminating the need for placing incision at periphery of abscess. Secondly, we used materials like ethilon instead of vessel loop or gloves.

LDT allows for the ongoing drainage of the wound by

the prevention of premature skin annealing. This technique offers both ease of use not only to both the surgeon as either a formal operative technique or one performed under conscious sedation but also to the patient's family as simple wound cleansing and cover dressings are all that is required after drainage.⁶

No statistical significance was observed in terms of change in abscess diameter at 7th day and efficacy in both the techniques. Our study demonstrates both technique of abscess drainage is equivalent statistically in terms of healing or resolution of abscess. However, in case of LDT 4 patients did not show resolution and required repetitive drainage by the standard I & D technique. Pain as assessed by VAS was found to be significantly lower in LDT than I & D. Similarly, duration

of procedure, healing and patients' satisfaction also showed a significantly better outcome. Our findings suggest that loop drainage technique ensures excellent follow-up compliance as patients return for loop removal. Loop drainage is a safe and effective alternative treatment method for cutaneous abscesses. Patients of I & D had to come every alternate day for change of dressing while wound care in LD was found to be simple and practically no follow-up were required before 7 days.

The summary of existing studies comparing the loop drainage technique with conventional incision and drainage has been shown in Table IV.¹³ The systematic review and meta-analysis performed by Gottlieb et al shows overall odds ratio of 2.02 in favour of LDT (p-0.002).¹³ Summary of existing studies in literature to compare I & D and LDT shown in Table IV.

Table IV: Summary of existing studies in literature to compare I & D and LDT

	STUDY POPULATION	STUDY DESIGN PATIENT AGE (YEARS)	MEAN (IN FAVOUR OF LDT)	ODDS RATIO
Mc Namara 2011	219	Retrospective	7	1.92
Ladde 2015	142	Retrospective	2	4.84
Özturan 2017	46	RCT	35.5	1.82
Adamson 2018	33	RCT	42	5.50
Gaszynski 2018	53	Retrospective	38.8	NA
Rencher 2019	81	RCT	7.2	1.03
Ladde 2020	196	RCT	22	1.61
Schechter-Perkins 2020	140	RCT	37.5	1.66

Our study has few limitations. Firstly, the sample size is not adequate to determine superiority of one technique over another. Secondly, large (>5cm in greatest dimension) and small (<1cm in greatest dimension) abscesses were excluded from the study by treating clinicians, leading to

potential selection bias. Thirdly, deep neck space abscesses were not considered in our study. Confounding treatments, such as use of antibiotics were not controlled for in this study. Both groups received similar rates of antibiotic treatment and were probably affected equally.

Conclusion

Head and neck subcutaneous abscesses are very commonly presented in the ENT outpatient department on daily basis. The standard treatment of abscesses practiced since antiquity is Incision & Drainage. In our study we compared Loop drainage technique with Incision & Drainage specifically in head neck region. Our study introduced slight modifications in technique of LDT as described in previous studies. The results of our study shows LDT is equally effective, if not superior, as I&D. But it is less painful, can be done very easily and safely in a short time. Minimal post-operative care required and healing is excellent. Patient compliance is better in terms of satisfaction and follow-up. The overall health care burden is also reduced.

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