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Original Article

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Inverted Papilloma a Retrospective Study of 17 Cases

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Abstract

Complete surgical excision of inverted papilloma of nasal cavity is challenging owing to high chances of recurrence following removal. However the advent of nasal endoscope has provided a new avenue for removal of these tumors. We report 17 cases of inverted papilloma which were either removed via an endoscopic route or via endoscope aided external approach. There was no recurrence in any of the cases over a 2 year followup period.

Keywords: Inverted Papilloma; Endoscope.

Introduction

Inverted papillomas are an enigma to the surgeon owing to their locally aggressive behaviour, propensity for malignant transformation and have high recurrence rates following removal. The main goal of treatment is complete surgical excision without any scope for recurrence. Excision using external approaches [1] is now being replaced by endoscopic resection . We report 17 cases of inverted papilloma of nasal cavity treated by endoscopic and endoscopic assisted open approach. There was no recurrence in a followup of 2 years. The purpose of this study was to highlight the use of endoscope in successful management of inverted papilloma.

Materials and Methods

17 cases of histologically proven inverted papilloma managed in our department over a 5 year period (2010-2015) were retrospectively considered for this study to (2010-2014).

Results

In this retrospective study we analysed 17 cases of inverted papilloma regarding its clinical behaviour, extent of disease, approach adapted for surgery, recurrence rate and rate of malignant transformation.

In this study the most commonly affected age group was between 50 to 60 years; 7out of 17(41%). Male to female ratio in this series was 16:1(16males and 1 female).

Age group	No. of patients
30-40	1
40-50	5
50-60	7
60-70	4

Most of the patients presented with nasal obstruction 12(70 %) and epistaxis 09 (52 %).

Symptomatology	No. of patients
Nasal obstruction	12
Epistaxis	09
Nasal mass	06
Swelling over cheek	01

4 patients were recurrent cases with previous history of functional endoscopic sinus surgery being present . Clinical examination revealed nasal mass arising from the lateral nasal wall in all the cases. All the patients underwent radiological evaluation by CT / MRI PNS to assess the extent of disease.

Majority of the cases were found to involve the maxillary sinuses along with the nasal cavity 7 cases (41%) (Figure 1). Mass was attached to middle turbinate in 1 case. Maxillary sinus with ethmoid involvement was seen in 4 cases on CT PNS and maxillary with ethmoid and frontal and sphenoid involvement on CT PNS was seen in 3 cases. In 1 case the mass was found breaching the septum and crossing over to involve the opposite side on CT PNS (Figure 2). In 1 case mass was found entering ant cranial fossa (extradural extension.

Patients were staged as per Krouse's staging of inverted papilloma. 1 patient was in Krause stage 1 and 7 cases were in Krause stage2 and 8 in stage 3 and 1 in stage 4. Out of 17 cases 5 (with frontal and sphenoidal / ant cranial fossa / involvement of opposite side) of which 4 cases were recurrent cases underwent an open approach for surgery - 4 cases underwent open medial maxillectomy / medial maxillectomy with frontoethmoidectomy and 1 case anterior craniofacial resection was done. In doing an external medial maxillectomy a lateral rhinotomy approach was used with lynch extension for frontoethmoidectomy and standard bone cuts for medial maxillectomy were taken. After excision of the mass in all these 5 cases cases 0 and 30 degree 4mm nasal endoscope was introduced through the incision and an angled micromotor hand piece with diamond burr used to aid in subperiosteal dissection and entire mucoperiosteal lining of cavity removed. 12 cases were taken up for surgery through the endoscopic endonasal route. Nasal part of the mass (Figure 3) was removed using a microdebrider. Uncinectomy was done and mass which was found involving the middle meatus and maxillary sinus was removed and its attachment was widely excised. Middle meatal antrostomy done. Middle and inferior turbinate were removed. Maxillary antrum was enlarged posteriorly till the posterior wall of maxillary sinus. Entire maxillary sinus including entire medial wall of maxillary sinus removed and medial maxillectomy done. Anterior and posterior ethmoidectomy was done. Entire maxillary sinus including anterior wall and floor was visualised using a 4mm angled 45 degree endoscope. Removal of the medial maxillary wall enabled removal of the tumor origin. Sphenoidotomy was done and frontal recess was cleared. At the remaining site of attachment subperiosteal dissection was done and drilling was done with a diamond burr.

Histopathology of 16cases was of inverted papilloma. Histopathology of the mass (fig4) showed inverted proliferation of squamous epithelial cells with some mucus secreting cells and microcysts. Occassional mitosis was seen in basal layer. Subepithelial fibrous stroma was edematous with neutrophils and contains congested capillaries. The tumor cells were polygonal with round to oval vesicular and inconspicuous nucleoli. Diagnosis was of inverted squamous cell papilloma. 1 case on histopathology was of transitional carcinoma and all margins were free on open medial maxillectomy. Patient was subsequently sent for postoperative radiation.

Followup was done by serial nasal endoscopy monthly and imaging every yearly. Followup over 2 years revealed no recurrence in any of the 17 cases .1 patient had complaints of excessive nasal crusting which was treated with saline nasal douching.

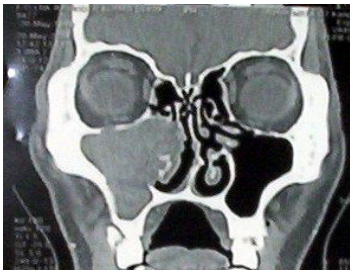

Fig. 1: CT scan image showing the involvement of nasal cavity and maxillary sinus

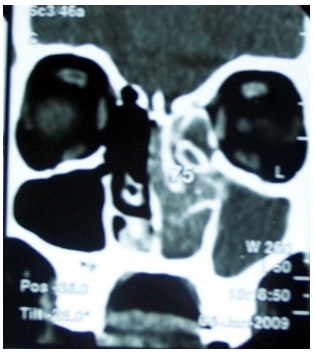

Fig. 2: CT scan image showing the mass eroding the septum and crossing over to the opposite side

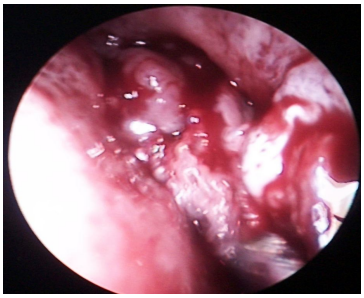

Fig. 3: Endoscopic image of inverted papilloma

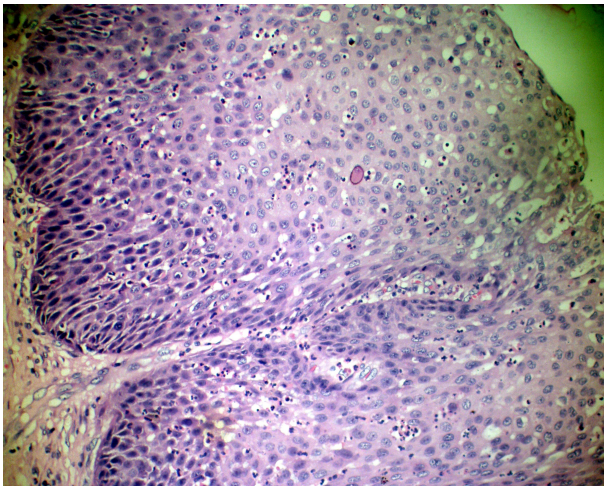

Fig. 4: Low power histopathology image H&E Stain of inverted papilloma

Discussion

Schneiderian papillomas account for .4-4.7% of all sinonasal tumors. Human papilloma virus is implicated in the development of these papillomas [2]. These papillomas are of 3 types-fungiform, inverted & cylindrical cell. Inverted papillomas account for 47% of all sinonasal papillomas. They are most common in men aged 40-70 years. Common sites of origin of inverted papilloma are the lateral nasal wall in the region of middle turbinate and ethmoid sinus. Less common sites are nasopharynx, oropharynx, middle ear, nasal septum, lacrimal system, frontal and sphenoid sinus. Although histologically benign inverted papillomas are locally aggressive and can invade paranasal sinuses, nasopharynx, occassionally orbit and even brain. Inverted papilloma is frequently multicentric and there is a 3% to 24% (average 13%) incidence of coexisting carcinoma mostly squamous cell [3]. Although a benign entity the three main clinical characteristic attributes of inverted papillomas are they are locally aggressive, may harbour coexisting malignancy and have the tendency to recur and hence the main goal of treatment is complete surgical excision. This minimises risk of recurrence and allows comprehensive evaluation of the specimen for the presence of any coexisting malignancy.

Recurrence rates vary from 5 to 75% depending on surgical approach and completeness of surgical excision. Although multicentricity of tumor has been suggested to be responsible for high recurrence, inadequate tumor removal during initial resection seem to be the most important predictive factor for local recurrence [1]. In this study we carried out resection of this mass using either using an endoscope or assisted by an endoscope to ensure complete resection of the tumor and complete removal of periosteal lining and had no recurrences during the period of followup.

There is evidence that the tumor recurs after inadequate removal Lund V [4] in their paper state that that the outcome of treatment relates to how thoroughly the diseased mucosa is removed. Aggressive early management with medial maxillectomy by using external approach either with lateral rhinotomy or midfacial degloving has reduced the recurrence rate to 0 to 29% [2]. However these external approaches may come with significant morbidity associated with it such as scarring, ectropion, nasocutaneous fistula and vestibular stenosis.

In the past decade an increasing number of authors have reported endoscopic resection of inverted papilloma and have reported success and recurrence rates similar to open approaches. Wormald et al [5] in their series of 17 patients with inverted papilloma treated endoscopically had only 1 recurrence (6%) and that particular patient was subsequently found to have sinonasal carcinoma. Klimek T [6] in their study of 55 patients of inverted papilloma found that the recurrence rates in patients who had undergone endonasal excision 6 out of 33 (18%) were the same as those in whom lateral rhinotomy or medial maxillectomy had been carried out (4 out of 22). The principle of endoscopic sinus surgery involves disassembling the lesion in oriented blocks and carrying out the dissection is carried out in a subperiosteal plane. An added advantage is all the involved subsites with microinvasive squamous cell cancer can be located at definitive histology.

Such evidence should have propelled surgeons to adopt endoscopy as the technique of choice however endoscopic method is still shrouded in criticism. The validity of comparison between endoscopic surgeries with those of external approach in management of inverted papilloma has been faulted due to perceived patient bias in patient selection for the procedure. This is because patients who were selected for the endoscopic approaches usually have limited disease. Due to inadvertent selection of patients with lesser disease for endoscopic treatment have rendered comparisons between the external and endoscopic approaches invalid. Advocates of endoscopy proposed criteria for selection of patients. Klimek T[6] recommended that endonasal excision should be carried out in those inverted papilloma limited to nasal cavity, middle and posterior parts of ethmoid involving the sphenoid and the medioposterior wall of maxillarysinus. Stankiewicz [7] recommended that

endoscopic approach be used for disease that is limited to the ethmoid or sphenoid sinuses, the lateral nasal wall and the medial wall of the maxillary sinus. However this criteria for selection was refuted in other studies. Lee TJ [8] in their study of 43 patients with inverted papilloma endoscopic techniques could be applied in extensive lesions and that proper preoperative evaluation, intraoperative determination of extent and attachment of tumor, expert application of endoscopic techniques and close endoscopic followup were the key to successful endoscopic treatment of inverted papilloma .

Combined approach has been used in 11 out of 212 cases of inverted papilloma [9] using an Osteoplastic flap approach along with transnasal endoscopic approach in those which had extensive mucosal involvement inside a supraorbital cell extending far laterally over the orbit or massive involvement of frontal sinus mucosa .

Stankiewicz JA [7] in a reveiw of the surgical anatomy in the regions of recurrences showed that the most common sites of recurrence are the lateral nasal wall in region of middle meatus, the nasofrontal duct area, the supraorbital ethmoidal cells, the region of lacrimal fossa and the infraorbital or prelacrimal recess of the maxillary sinus. There was a recurrence rate of 5.7% in a series of 212 patients done by Lombardi et al [9]. Recurrences occurred at the site of origin of lesion following pure endoscopic removal. There was no statistically difference in recurrences based on site [9].

Close followup of patients is mandatory because recurrence may be associated with malignancy. Keles N et al [10] in their study of 13 cases of inverted papilloma treated with endoscopic sinus surgery found that 3 patients had recurrence at mean followup of 27 months(9 to 48 months). In 2 patients recurrences were treated endoscopically and in 1 patient recurrence with malignant transformation occurred at 36 months for which he had to undergo radical maxillectomy.

In our study 15 patients had Krause stage T 2 or T3 disease. We used the endoscopic approach in 1 case of Krause stage T1 and 7 cases of Krause stage 2 and 4 cases of Krause stage 3. Rest 4 cases of Krause stage 3 which were recurrent cases we used an external approach for removal. We adopted the use of endoscope in all the external approaches to enable visualisation of the possible micro invasive subsites. We followed up the cases for 2 years but found no recurrence.

There is no clear cut consensus on the best surgical approach to nasal inverted papillomas. The advantages of the endoscopic approach however are not debatable. Reduced morbidity makes the approach advantageous. Magnified visualization of sites of invasion during surgery is an added advantage. The technique is aided by improved and powered surgical instruments. The advantage of use of endoscope along with the open approach ensures the completeness of resection. In conclusion use of endoscope in the excision of inverted papilloma provides for a safe and effective treatment of management of inverted papilloma.

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Original Article

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Comparative Study of Microbial Flora and Antibiotic Sensitivity in Recurrent Tonsillitis among Children and Adults

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Abstract

Recurrent tonsillitis is one of the commonest infections seen in clinical practice. Though we have abundant literature about the bacteriology of recurrent tonsillitis, it still remains an unresolved puzzle. The infection may arise from the bacteria within the substance of the tonsil rather than bacteria identified on the surface.

This was a prospective study conducted on 80 samples, 40 each in paediatric and adult population, over a period of 12 months in a tertiary care hospital. Preoperative surface swabs and postoperative core swabs were sent for culture. The swab culture from the surface of the tonsils in adult population predominantly yielded normal flora followed by Staphylococcus aureus while those from the paediatric population showed an equal yield of Normal flora and Streptococcus pyogenes.

The core cultures from adult population were mostly of Staphylococcus aureus and Klebsiella pneumoniae while that of paediatric population was predominantly Streptococcus pyogenes.

Staphylococcus aureus showed good sensitivity to Cephalosporins and Azithromycin. All were sensitive to Methicillin except one strain of MRSA. Streptococcus pneumoniae and Streptococcus pyogenes were sensitive to even the basic antibiotics like Ampicillin. The Gram negative bacteria showed varied sensitivity with more of resistance to first line antibiotics and showed the need of higher antibiotics like Imipenem and Amikacin.

The study found differences in the surface and the core pathogens.

Keywords: Tonsillitis; Surface Swab Culture; Core Culture.

Introduction

Despite the availability of affordable clinical care and antibiotics, recurrent tonsillitis still remains one of the common clinical condition seen in the paediatric age group. Conservative management often fails to eradicate the pathogens and also would not prevent the recurrence of the tonsillitis. Though we have abundant literature about the bacteriology of recurrent tonsillitis, it still remains an unresolved puzzle. The reason for this could be that the organisms found on the surface of the tonsil may not be the same as those in the tonsillar core and there might be a difference in bacteriology between children and adults. There may be geographical variations as well. Thus detecting core flora may help to plan and modify medical and post surgical antibiotic treatment.

The present study attempts to throw light on this controversial aspect so that it can aid in the appropriate management of recurrent and chronic tonsillitis in paediatric and adult population.

Materials and Methods

This was a prospective studyconducted on 80 patientsover a period of 12 monthsin a tertiary care hospital. Patients were selected from those admitted for tonsillectomy and they were divided into two groups, paediatric (<12yrs) and adult group(>12yrs). Institutional ethical committee clearance was obtained for the study.

Inclusion criteria includedpatients with three or more severe attacks of tonsillitis in two consecutive years. They were considered to have severe illness if at least three associated symptoms like high fever, snoring during acute attacks, unable to take normal diet, absence from school/ work, and admission to hospital, are present. Those who received antimicrobial therapy within one month prior to surgery, tonsillectomy done for obstructive sleep apnoea, unilateral enlargement, Eagle's syndrome, Diabetes and immune-compromised patients were excluded from the study. Based on the above criteria 80 patients were included in the study forty each in paediatric and adult populations.

Patients who fit into these criteria underwent detailed E.N.T examination and were subjected for tonsillectomy. The procedure was carried out by dissection and snare method. Prior to surgery all routine blood investigations were done. A swab was taken from the surface of the tonsil at the commencement of the surgery. After tonsillectomy, the tonsil specimen along with the swab was sent for microbiological examination within 30 minutes. The swab and core tissue were plated onto appropriate aerobic and anaerobic media separately. After 48 & 96 hours, the microbial growth was identified and the antibiotic sensitivity pattern of the isolate was studied. Bacteriology of tonsils in adult and children were tabulated according to the species and compared. The results were compared and statistical analysis was done using Chi-square test and SPSS program compiled for windows.

Results

Of the 80 patients included in this study 40 were adults and 40 were children. Out of 40 adults, females and males were 20 in number while in children it was 22 and 18 respectively.

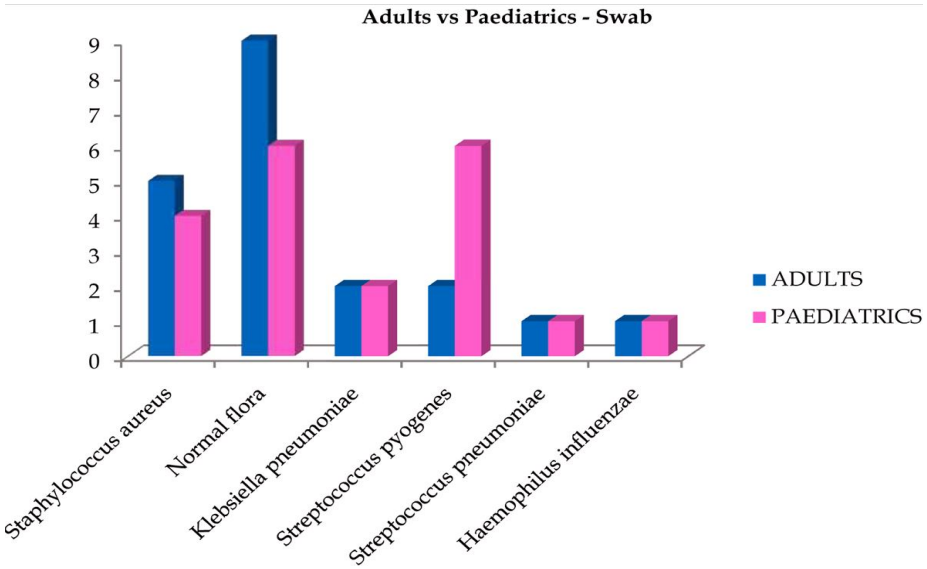
Table 1: Organisms grown in Swab (Adults & Paediatrics)

	Frequency	Percent
Normal flora	30	37.5
Staphylococcus aureus	18	22.5
Streptococcus pyogenes	16	20
Klebsiella pneumoniae	8	10
Streptococcus pneumoniae	4	5
Haemophilus influenzae	4	5
Total	80	100

Table 2: Organisms grown Tonsils core (Adults & Paediatrics)

	Frequency	Percent
Staphylococcus aureus	18	22.5
Klebsiella pneumoniae	16	20
Streptococcus pyogenes	14	17.5
No growth	10	12.5
Pseudomonas aeruginosa	10	12.5
E.coli	6	7.5
Haemophilus influenzae	2	2.5
Peptococcus (anaerobe)	2	2.5
MRSA	2	2.5
Total	80	100

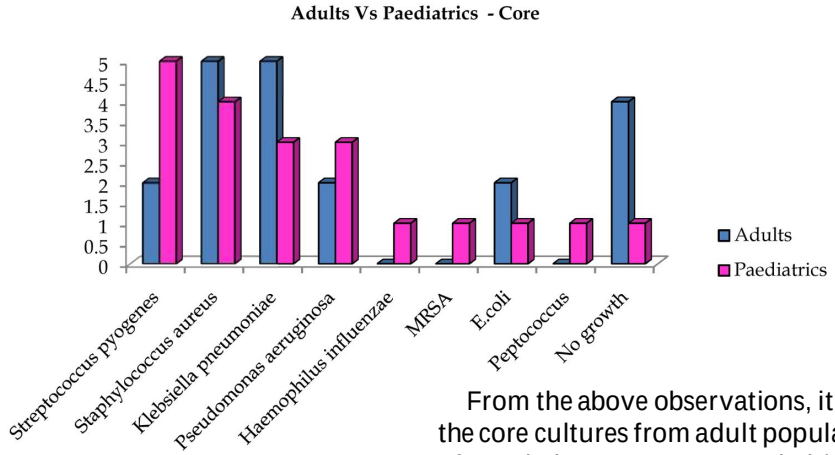
Table 2 shows that all are aerobic bacteria except for Peptococcuswhich is a Gram positive anaerobic coccus.



Graph 1: Shows the comparison of the organisms in swab in both groups.

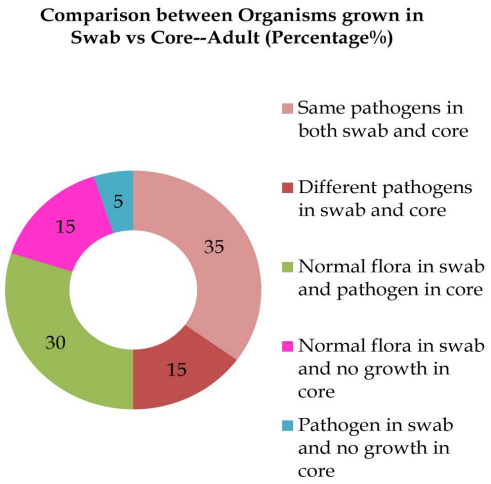
From the above observations, it can be seen that swab culture from the surface of the tonsils in adult population predominantly yielded normal flora followed by Staphyloccus aureus while those from the paediatric population showed an equal yield of Normal flora and Streptococcus pyogenes.

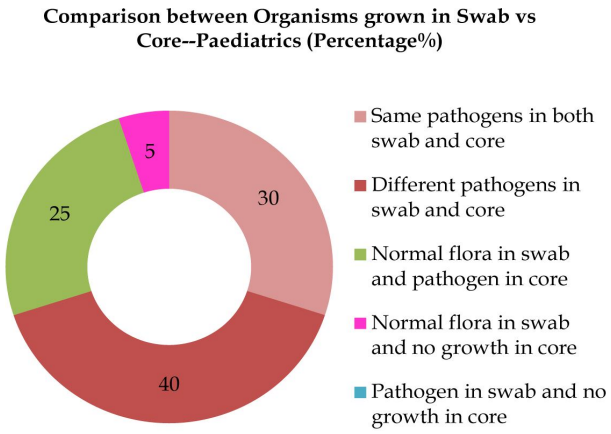
Graph 2:



From the above observations, it can be noted that the core cultures from adult population were mostly of *Staphylococcus aureus* and *Klebsiella pneumoniae* while that of paediatric population was predominantly *Streptococcus pyogenes*.

Graph 3:





Antibiotic Sensitivity

Staphylococcus aureus showed good sensitivity to Cephalosporins and Azithromycin. All were sensitive to Methicillin except one strain of MRSA. *Streptococcus pneumoniae* and *Streptococcus pyogenes* were sensitive to even the basic antibiotics like Ampicillin. The Gram negative bacteria showed varied sensitivity with more of resistance to first line antibiotics and showed the need of higher antibiotics like Imipenem and Amikacin.

Discussion

Tonsils are important components of the immune system and infection of the tonsils and adenoids is oneof the most frequently seen condition in humans, especially in childhood. Although antibiotic therapy may be sufficient in the treatment of acute tonsillitis, tonsillectomy remains the treatment of choice in the management of recurrent and chronic tonsillitis.The probable causes of recurrence in chronic tonsillitis are; penicillin resistance due to the variations of the oropharyngeal flora, nonspecific antibiotic treatments, reinfection from the environment and suppression of the antibody response due to the previous inappropriate antibiotic therapies [1,2]. Inappropriate and interrupted antibiotic therapy, suppression of host immunity due to unnecessary antibiotic therapy, penicillin resistant L-form production of beta-haemolytic Streptococci, inactivation of antibiotics by beta lactamase producing organisms found in oropharyngeal and tonsillar flora such as S. aureus,H.influenzae, Bacteroidesspp. and therefore protection of *GABHS* [1,3].

The determination of the pathogenic agent is important in antibiotic selection for themedical treatment of tonsillitis. Presently the antibiotic selection for the treatment oftonsillitis is based on tonsillar swab culture.Surow et al., (1989) noted that tonsillar disease may arise from the bacteria within the substance of the tonsil rather than bacteria identified on the surface [4]. Due to the constant contact of tonsil surface with the bacterial flora of oral secretions, the organisms isolated from the surface swabs may be the surface colonized bacteria rather than the actual pathogenic agents. It is the tonsil core pathogens that are responsible for the pathological changes in the tonsils [4]. The antibiotic therapy chosen according to surface swabs become insufficient to eradicate the pathogenic agent and cause chronic infections with tonsillectomy indication.

Many other studies have shown differences between the isolates from tonsillar surface and core and thereby the non-reliability of throat swabs in the diagnosis of recurrent tonsillitis [5,6].

In contrast to this, Almadori et al stated that surface swab cultures did reflect organisms present in the core. They studied the surface and core tonsillar specimens collected from 60 children and observed the same mixed aerobic and anaerobic flora in both samples, thus demonstrating the reliability of the surface swabbing technique. They relied on the assumption that there is a certain degree of homogeneity in the bacterial flora of the tonsils, so sampling of any single area may be reflective of the entire tonsil [7,8].

The present study showed the growth of same organisms in the surface and core in adults and paediatrics in 30% and 40% of the cases only (Graph 3 & 4).

The microbiological study of tonsil core in the present study revealed that Staphylococcus aureus (22.5%) was the most common pathogen isolated. This finding is in agreement with the studies done by Ozek et al. 1967 (33%) [2], Kumar et al. in 2005 (22%) [5] and Loganathan et al. in 2006 (41%) [9]. In contrary to this, Uppal et al. and Kurien et al. found GABHSas the most common isolate with 39% and 33% respectively followed by Staph aureus [7,10].

Tonsil core bacteriology changed with age and it was observed in the present study, that predominant organism in the tonsil core of paediatric population was Streptococcus pyogenes (25%) followed by Staphylococcus aureus (20%) According to Lognathan A, Arumainathan UD, Raman R (2006) *Streptococcus* was predominantly cultured from the core of the tonsil in children and it was 39.3% [9]. According to study by Mostafa Hammouda (2009) Staphylococcus aureus was the organism that was predominantly isolated from swab and core of the

tonsils from Egyptian children [11].

In our study normal flora constituted only in the surface swabs in adults and paediatrics.In a studyby Gaffney normal flora was seen mostly in surface swabs and very rarely in core tissue [12].

One MRSA was isolated in the core tissue of the tonsil in children. Similar finding was noted in a study done by Hossein Rekabi (2008), In their study the number of isolated MRSA from the core culture was quite low (3.3%) [1,7].

However, in the study conducted by Brook et al, MRSA was isolated from 16% of the tonsils [1]. MRSA may serve as a potential source for the spread of the potential hidden pathogens to other body sites as well to other individuals. Isolation of MRSA from cases of chronic tonsillitis calls for a relook at the conservative management of chronic tonsillitis and the antibiotics chosen for the treatment.

In another study by Hadi U et al (2005), more than one pathogen was grown in the culture sample from the core tissue. H. influenza was the most common isolate in the paediatric population [13]. However, our study did not yield multiple pathogens and H influenza was not the common organism.

In our study only one anaerobe (Peptococcus)was isolated from the tonsil.This was in agreement with a study done by Brook and Yokum [3] and another study done by Mitchelmore [14]. But it was contrary to the study done by Reilly et al in the year 1981, which reported that B. melanninogenicus was the most frequently isolated anaerobe [15]. No anaerobe was found in a study by Almadori G [8].

As against a study by Uppal et al [10] wherein the surface and the core tissue of the tonsil had similar pathogens, our present study suggests that the surface pathogen may not be the real pathogen and that it might be different inside the core tissue of the tonsil. Several other studies also showed that tonsil surface cultures do not reflect tonsil core microbiology in 30–70% of patients [5,7,16].

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Original Article

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Prevalence of Audiovestibular Dysfunction in Soldiers Following Posttraumatic Temporal Bone Fractures

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Abstract

A prospective study of 83 cases of head injury with fracture temporal bone in soldiers over a period of 5 years was done to analyse and elucidate the otologic involvement in these cases. The aim of this paper is to study the prevalence of hearing loss in soldiers following posttraumatic temporal bone fractures and the importance of appropriate investigations and intervention in these patients.

Keywords: Head Injury; Haemotympanum; Perforation.

Introduction

Head injury is one of the commonest traumatic events of this century causing considerable mortality and morbidity. The temporal bone is injured in 25-30% of head injuries[1]. Young men in the 2nd and 3rd decades are the most commonly affected group[2]. Road traffic accidents account for 40-50% of traumatic temporal bone fractures with falls, assaults, sports accidents being the other major causes. Temporal bone fractures present with features such as haemotympanum, tympanic membrane perforation, hearing loss conductive / sensorineural, facial paresis [3]. Most of these patients sustain other life threatening injuries which usually take priority in initial management. Unrecognised otological complications especially hearing loss if left untreated may lead to difficulty in rehabilitation and subsequently affect overall quality of life. The present study was carried out in 83 soldiers with temporal bone fractures to asess otological trauma and hearing loss and select the appropriate management strategy.

Materials and Methods

The prospective study was carried out in 83 patients of head injury who had sustained fracture temporal bone diagnosed on CT scan. The study was done over a period of 5 years from 2011 to 2015. The patients were males between 20 to 54 years of age. Of the 83 cases of temporal bone fractures studied 69 had been sustained in road traffic accidents, 8 had falls and 6 were cases of assault. Many of these patients 47out of 83 had other systemic injuries / other features of head injury. The patients presented with a variety of otological symptoms (Table 1).

Table 1: Otological Symptoms

Symptoms	Number of Patients
Otohaematorrhoea	51
Deafness	29
Vertigo	13
Tinnitus	4
Facial assymetry	3
Otalgia	11

Some of the patients had multiple complaints. On examination of these patients otological findings were seen as per Table 2.

Table 2 Otological findings

Findings	Number of patients
Haemotympanum	64
Traumatic perforation	18
CSF otorrhoea	4
Battle's sign	13
Conductive deafness	69
Sensorineural deafness	6
Mixed deafness	8
Facial palsy	5
Nystagmus	2
Positive Dix Hallpike test	9

Radiological investigation in form of HRCT temporal bone was done in all patients revealed Longitudinal fracture temporal bone In 69, mixed in 9 and transverse in 5 patients. Audiological investigations in form of PureTone audiometry revealed Conductive hearing loss in 69 patients- Mild in 57, Moderate in 10 and Severe in 2. Conductive loss was unilateral in 63 patients and bilateral in 6 cases. Sensorineural hearing loss was seen in 6 patients -Severe unilateral SNHL in 1; High frequency SNHL involving frequencies >4 Khz was seen in 2 -unilateral in 1 case and bilateral in 1 ; Mild SNHL unilateral was seen in 1 and Moderate unilateral SNHL was seen in 2 .In all 5 patients with transverse fracture temporal bone sensorineural hearing loss was present. Mixed hearing loss was seen in 8 patients.

Tympanometry was done in 12 patients 4 weeks after injury showed type B curve in 10 cases suggestive of haemotympanum and Ad type curve in 2 case suggestive of ossicular discontinuity.

Management and Followup

Most of the patients were managed conservatively. The protocol followed was avoidance of aural packs and aural toilet, keeping sterile pads and maintaining aseptic care. CSF otorrhoea spontaneously resolved in 4 cases within 7 days and haemotympanum resolved in 53 patients over a period of 3 to 5 weeks. Of the 18 patients with traumatic perforation in 8 healing occurred spontaneously, 10 patients required surgery 3 patients underwent chemical cauterization of edges, 5 underwent fat plug myringoplasty and 2 underwent Type I tympanoplasty. In the patients with haemotympanum haemotympanum resolved spontaneously. In 2 patients even after resolution of haemotympanum severe conductive hearing loss persisted hence patients were taken up for an exploratory tympanotomy on suspicion of ossicular disruption. On opening the incus was found to be dislocated. A type II tympanoplasty with incus interposition after sculpting the incus was done in both the patients. Surgery in all cases was carried out after 6 weeks. Pure Tone Audiometry in all 10 operated cases done after 6 months revealed good improvement with closure of airbone gap to 20 dB-30 dB. In the patients with mixed and sensorineural hearing loss medical management with steroids and vasodilators was followed. On serial audiometry after 4 weeks; mixed loss in 3 cases improved to normal hearing threshold while in 1 case it improved to mild SNHL(possibly due to resolution of haemotympanum). Mild unilateral SNHL in 1 case completely recovered. 2 cases with high frequency SNHL did not show any improvement. Patients with severe and moderate SNHL did not show any improvement.

Of the 5 patients with facial palsy 2 patients had immediate Grade V (House Brackmann) LMN facial palsy and one patient had Grade III palsy. All these 3 patients had fracture temporal bone transverse type. Two patients of longitudinal temporal bone fracture had delayed facial palsy Grade III(HB) after five days. In 3 cases patients were treated conservatively with oral steroids and physiotherapy and recovered completely over 4 weeks to Grade I (House Brackmann). 2 patients underwent facial nerve decompression and improved to House Brackmann Grade3 at 6months.

Of the 13 patients with vertigo onset was immediate within 3 days in 9 patients whereas in 4 onset was delayed occurring after 4 weeks. All were found to have complaints of positional vertigo and were treated with labyrinthine sedatives betahistine 16mg tds along with vestibular rehabilitation exercises. In 6patients canal repositioning maneouvre (Epley's) was done and symptoms of vertigo in all patients subsided over 2 weeks.

Outcomes

79 patients were followed for a period of 6 months to 1year while others were lost to follow up. All patients with conductive hearing loss improved spontaneously or after surgery. 3 patients of

sensorineural hearing loss were given digital hearing aids.

Discussion

Modern day soldier faces an increased risk of otologic injuries due to head trauma. However most of the otological injuries are correctable and treatable.

Temporal bone fractures have been classified as longitudinal, transverse or mixed by reference to the long axis of petrous temporal bone with the longitudinal fractures being the commonest. A classification based on presence or absence of involvement of otic capsule has also been suggested [4]. HRCT temporal bone is the key radiologic investigation for assessing and managing these patients [5].

Longitudinal temporal bone fractures are usually associated with trauma to the middle ear structures. Conductive hearing loss is generally caused by tympanic membrane perforation, haemotympanum or ossicular disruption [6]. The majority of these patients can be managed conservatively however in certain cases like ossicular dislocation and direct trauma to the facial nerve surgical intervention is mandatory.

The commonest cause of ossicular disruption is dislocation of incudostapedial joint [7] .The other common ossicular derangements include fracture of stapedial crura and dislocated stapes footplate [7]. Incus is more commonly involved in trauma as it is heavier than other ossicles, has no muscular attachments and hence easily dislocated. Dislocation of malleus is rare because of its firm attachment to the tympanic membrane and the strong anterior malleolar ligament. Conductive hearing loss due to ossicular chain disruption should be suspected if hearing does not improve after tympanic membrane heals or after haemotympanum has subsided [8]. In our series two patients had incus dislocation for which type II tympanoplasty with incus interposition was done.

In transverse fractures of temporal bone the damage to the audiovestibular apparatus and facial nerve is more severe [6]. The hearing loss associated with transverse fracture is usually sensorineural caused by disruption of the integrity of the labyrinth or the neurovascular bundle in the internal auditory canal. In longitudinal fracture sensorineural hearing loss is relatively uncommon and usually a mild high frequency loss maximal at 4 KHz is present. Fifty percent of patients with a temporal bone fracture who have audiometric evidence of a hearing loss are documented to have a irreversible sensorineural hearing loss in various studies [9, 10]. In our study sensorineural hearing loss was seen in all 5 cases with transverse fracture temporal bone of which 4 did not improve after treatment. 1 patients with longitudinal fracture of temporal bone developed high frequency sensorineural hearing loss.

Benign positional paroxysmal vertigo is the commonest cause of post traumatic vertigo in cases of temporal bone fracture which may present early or late [11]. Other causes of post traumatic vertigo include perilymph fistula and endolymphatic hydrops. In this study 9 patients had immediate onset vertigo whereas 4 patients had delayed onset vertigo after 4 weeks which were managed conservatively.

Facial palsy complicates 7% of temporal bone fractures [9]. Facial weakness after longitudinal fractures is generally rare and if it occurs is incomplete and delayed and is secondary to oedema rather than disruption of the nerve [12]. Two patient with longitudinal fracture had delayed onset facial palsy which recovered completely. Out of 3 patients with transverse fracture temporal bone one recovered spontaneously while two had partial recovery after facial nerve decompression.

CSF otorrhoea occurs in 25-33 percent of patients with a temporal bone fracture [13]. The management is initially conservative as 81% undergo spontaneous resolution within 5 days. In this study 4 patients had CSF otorrhoea which subsided in 3 days.

Conclusion

Careful screening of head injury patients need to be done to look for any otological injuries. The assessment of audiovestibular dysfunction and facial nerve function becomes important in planning appropriate intervention in a case of temporal bone trauma. Head injury patients need to be followed up for a period of 1 year to monitor for sequelae like benign positional paroxysmal vertigo, delayed conductive loss, delayed endolymphatic hydrops.

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Review Article

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Unilateral Sensorineural Hearing Loss (USNHL): Still a Challenge to Manage

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Abstract

Unilateral sensorineural hearing loss (USNHL) is a type of hearing impairment where thereis normal hearing in one ear and impaired hearing in theother ear. Patients with unilateral hearing loss have difficulty inhearing conversation on their impaired side, localizing sound, understanding speech in the presence of background noise, interpersonal and social relations. Usually, it is felt that patients with severe-to-profound USNHL function normally. It is now well established, however, that USNHL is a handicap that can negatively impact QOL. Limited literature is available regarding its incidence, psychological impact and treatment. Hence, it is a challenge to manage a patient with USNHL.

Keywords: Sensorineural Hearing Loss; CROS; SNHL; Unilateral.

Introduction

Hearing impairment cannot be seen and hence its effects are not visible to others, so deaf suffers in silence. Unlike blindness deafness often provokes ridicules rather than sympathy [1]. Imagine pressing your ear with one hand and trying to hear with the other. In unilateral sensorineural hearing loss (USNHL), hearing loss is present only in one ear. The other ear will be having normal hearing capacity. It can be just a mild hearing loss, that does not affect daily functioning or it can be a very major loss with a severe or profound intensity, causing hearing handicap. When a patient can hear from only one ear, and there are limited possibilities to compensate for the handicap, e.g., changing listening position, group discussions and dynamic listening situations become difficult. Individuals with profound unilateral hearing loss are often perceived as socially awkward due to constant attempts to maximize hearing leading to socially unique body language and mannerisms [2]. Unilateral hearing loss is found to be occurring in both children and adults. People with unilateral hearing loss are found to have difficulty in distinguishing sound and speech from the background noise.

Incidence of USNHL

There are very few studies on incidence of USNHL.

Hearing loss is an extremely common disorder, with approximately 32 million Americans having some degree of impairment. Sensorineural hearing loss (SNHL), which accounts for 90 percent of the cases, is caused by damage to the cochlea or the vestibule-cochlear nerve. The vast majority of patients with SNHL have bilateral hearing loss. In the United States, approximately 60,000 new cases of USNHL occur annually (www.singlesideddeafness.com) and far more occur internationally [3].

In an Indian retrospective study done on audiometric data of 252 patients to know the demographic characteristics of patients suffering

from hearing loss- 163(66.5%) had Sensorineural hearing loss (SNHL), out of which only 6 cases (3.7%) had unilateral SNHL[4].

Another Indian study on 820 patients diagnosed with pure sensorineural hearing loss (SNHL) on Pure Tone audiometry, 675(82.3%) had bilateral involvement and unilateral (USNHL) was in 145 (17.6%) patients. Amongst unilateral cases, right ear involvement was in 48.2% cases and left ear involvement was in 51.8%[5].

Causes of Unilateral Hearing Loss

Hearing loss can occur suddenly, wiping out hearing within 72 hours (Sudden Sensorineural Hearing Loss- SSNHL), and it can affect anyone of any age.Interestingly, most cases of sudden onset hearing loss are single-sided. Sensorineural unilateral hearing loss, affecting both the nerves and the inner ear, is irreversible .

It is difficult to find out the root cause for the occurrence of unilateral hearing loss in a particular case. But the general causes for the occurrence can be classified as detailed below.

1. Trauma to the ear or parts of the ear
2. Exposure of the ear to excessive and continuous noise
3. Genetic hearing loss
4. Infections and illnesses of various types

Numerous disease processes can lead to severe-to-profound USNHL. These include Congenital, sudden SNHL; idiopathic SNHL; neoplasms; vestibular schwannoma (acoustic neuroma); demyelinating pathologies such as multiple sclerosis, vertebrobasilar arterial occlusion (stroke), acoustic trauma, head injury, perilymphatic fistula, ototoxic drugs, labyrinthitis, Meniere's disease; and autoimmune disease (Cogan disease, Wegener's granulomatosis, lupus, Takayasu arteritis, systemic sclerosis, and other rheumatological disorders)[3].

What Happens in USNHL

Our physiology is designed for bilateral hearing, located on either side of the head. This design, with a space between the two ears, has several evolutionary benefits.The handicap experienced by adults with bilateral sensorineural hearing loss is well known, but the consequences of unilateral sensorineural hearing loss (USNHL) is often underestimated based on the assumption that a person with normal hearing in the contralateral ear is not likely to face a major handicap.

First, there is the notion of space which gives us the advantage of spatial hearing. When we hear a sound, the nerves of the ear closer to the sound gets stimulated just a little earlier than the ear on the other side. Just a micro-second of difference, but it helps the ear to determine which side the sound is coming from. This advantage gets even more pronounced with localization of hearing which helps us discriminate between sounds coming from a distance and sounds close by. The stereo sound effect, letting us hear sounds coming from 360 degrees, gives that rich full sound we are used to.Binaural hearing is vital for sound localization, speech discrimination in a background of noise, ability to identify common sounds and ease of listening. When these sensitive functioning get thrown off-radar, normal life can get quite confusing. For example, the person may not be able to understand normal speech, the direction of a sound, or from how far the sound is coming. This can cause accidents or hamper movement in regular life, while crossing roads, at home or in the workplace.With speech and background noise presented at the same level, persons with unilateral deafness were found to hear only about 30-35% of the conversation [6].

Usually, it is felt that patients with severe-to-profound USNHL function normally. It is now well established, however, that USNHL is a handicap that can negatively impact QOL [3]. A study of USNHL among Indian patients showed mild to moderate psychosocial handicap usingHearing Handicap Inventory for Adults (HHIA), in about a third of patients and no handicap in a little over half the patients. Sound localization and speech in noise are significantly affected in these patients. However, despite this, most patients do not choose to go in for any kind of rehabilitative device and present to the physician to be reassured that there is nothing sinister about their problem [7].

USNHL is Known to Cause: [8]

- Irritability
- Body language and mannerisms which appear socially awkward or unusual
- Frequent headaches, stress
- Social isolation
- Chronic interpersonal communication difficulties due to inability of brain to isolate or beam form sounds and voices of other individuals
- Appearance of anxiousness even in low noise situations

- Jumpiness
- Trouble figuring out where sounds are coming from.
- Trouble paying attention to what people are saying: "evasive" behaviour.
- Misdiagnoses as ADHD
- Seeming lack of awareness of other people's personal space and moods since brain is hyper-focused on deciphering auditory information in lieu of non-verbal social cues.
- Lack of sound depth: any background noise (in the room, in the car) is flat and wrongly interpreted by the brain. The effect is similar to what happens when trying to hear someone speaking in a noisy crowd on a mono TV. The effect is also similar to talking on the phone to someone who is in a noisy environment
- Inability to filter out background noise or selectively listen to only the important portion of the noise in the environment.
- For sensorineural hearing loss, the lack of input coming from the damaged sensory apparatus can cause "ghost beeps" or ringing/tinnitus as the brain attempts to interpret the now missing sensory data. The frequency and the volume of the noise can increase according to one's physical condition (stress, fatigue, etc.). This can aggravate social problems and increase the difficulty of speech comprehension.
- Talking loudly or "broadcasting": the affected person cannot perceive the volume of his or her voice relative to other people in the same room or close company, resulting in being characterized by others (who may be located beyond normal auditory range) as domineering or boorish.

Treatment

Learning of the central nervous system by "plasticity" or biological maturation over time does not improve the performance of monaural listening [8]. In case where surgical remedy has been ruled out by an otolaryngologist, then the following types of amplification of sound signals is the probable method of treatment.

Contralateral Routing of Signals (CROS) hearing aids Hearing aids that take sound from the ear with poorer hearing and transmit to the ear with better hearing.

Types of CROS Hearing Aids- [9], [10]

Conventional CROS/ Bi CROS	comprises a microphone placed near the impaired ear and an amplifier (hearing aid) near the normal ear. The two units are connected either by a wire behind the neck or by wireless transmission. The aid appears as two behind-the-ear hearing aids and are sometimes incorporated into eyeglasses. CROS-*is for a user who has relatively normal hearing in the good side and has hearing that can't be aided on the bad side. The receiving BTE device on the bad side transmits the sound to a device on the good side. The user hears the amplified sound from the bad side in their good ear.* BiCROS - *is for a user with little or no hearing on one side and with some hearing loss in their better ear. It works just like the CROS implemenation, except that the device on the good side is actually a fully capable hearing aid for hearing sounds from the good side that is also capable of receiving the sound transmitted from the CROS aid on the other side.*
CIC transcranial CROS	comprises a bone conduction hearing aid completely in the ear canal (CIC). A high-power conventional air conduction hearing aid fits deeply into the patient's deaf ear. Vibration of the bony walls of the ear canal and middle ear stimulates the normal ear by means of bone conduction through the skull.
BAHA transcranial CROS	Bone Anchored Hearing Aid (BAHA): a surgically implanted abutment transmits sound from the deaf ear by direct bone conduction and stimulates the cochlea of the normal hearing ear.
Sound Bite Intraoral bone conduction	which uses bone conduction via the teeth. One component resembles a conventional behind-the-ear hearing aid that wirelessly connects to a second component worn in the mouth that resembles a conventional dental appliance.[8]

Cochlear implant has also been recommended in cases of USNHL (severe- profound) with intractable tinnitus. [11]

There have been very few studies comparing CROS systems. One study of the BAHA system showed a benefit depending on the patient's transcranial attenuation [11]. Another study showed that sound localisation was not improved, but the effect of the head shadow was reduced [12].

Conclusion

Limited work has been published on incidence and causes of Unilateral SNHL. The functional and psychological impact of USNHL is underestimated . Limited options are available to help and treat such patients. The usage adaptability and cost constraints of CROS hearing aid is a challenge to manage patients of USNHL. Further studies and research is required in the field of USNHL to know the incidence, functional and psychological impact and treatment options.

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Case Report

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Use of C-Arm in Neck: A Mandatory Tool for Locating Impacted Metallic Foreign Bodies

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Abstract

Penetrating foreign bodies in neck may be quite challenging to locate in edematous tissue planes and these require urgent surgical exploration. Retrieval of foreign bodies depends upon the size and location of foreign body and the surrounding anatomical structures. We are reporting an unusual case in which a scissor was stabbed into the patient's neck causing subcutaneous emphysema, hemetemesis and impaction of scissor tip in the cervical vertebra. The foreign body was removed by transverse cervical approach with the help of C-arm.

Keywords: Metallic Foreign Body; Neck Exploration; C-Arm; Scissor Tip.

Introduction

Penetrating injuries to head and neck region with varying objects have been reported in the literature [1-8]. Majority of these injuries occur due to interpersonal violence, bomb blasts or road traffic accidents. Even though, there is improvement in imaging technologies and surgical methods, penetrating injuries to head and neck region are quite challenging due to the proximity of impacted foreign body (FB) to vital structures and difficulties involved in removing the foreign body [9]. Following injury, the normal anatomy could be altered because of edema and tissue destruction, which makes the diagnosis or retrieval very difficult [9]. Removal of embedded foreign bodies in neck can be quite challenging and frustrating because location of the impacted FB is often quite difficult. Hence, while exploring for foreign bodies in neck, patience, high index of suspicion and repeated intra-operative imaging can help us to find the foreign body in edematous tissue planes. This is even more important in cases where the impacted body is made up of different materials with varying radiosensitivity.

We are reporting an unusual case in which a scissor was stabbed into the patient's neck causing subcutaneous emphysema, hemetemesis and impaction of scissor tip in the cervical vertebra. The foreign body was removed by transverse cervical approach with the help of C-arm. This case is being reported because of its rarity and to tell the advantage of using c-arm in locating metallic foreign bodies in neck.

Case Report

A 46 year old male was admitted in our emergency department with a history of stab injury with a scissor by his relatives and swelling in the neck. He had complaints of difficulty in swallowing and breathing.The patient was conscious, oriented and hemo-dynamically stable on general examination. On local examination, there was a 1cm wound over left anterior part of neck, lateral to the thyroid cartilage with mild edema present around the entry point (Figure 1). The x-ray showed a 2 x 1cm triangular radio-opaque shadow embedded in C5 vertebra (Figure 2). The shape of the object was corresponding

well with the tip of the scissor. As the impacted object was metallic in nature, contrast enhanced computed tomography (CECT) scan of the neck was done which revealed a hyper-intense shadow of about 2x1cm size embedded into C5 cervical vertebra (Figure 3). The foreign body was not breaching any vital structures in the neck. So, we planned for transverse cervical approach under general anaesthesia to remove the foreign body. Intra-operatively, there was lot of edema in the soft tissues and it was difficult to identify the planes. Hence, we took the help of C-arm to see the depth and trajectory of the foreign body (Figure 4). Foreign body was localized to the undersurface of pharynx impacted in the C5 vertebra after doing extensive dissection alongwith frequent finger palpation. The alar fascia was incised to expose the foreign body adequately which was then removed with an allis forceps (Figure 5). Prophylactic tracheostomy was done intraoperatively as patient had lot of subcutaneous emphysema in the neck. Patient did not have complications post-operatively and he was discharged after decannulation after 7 days.

Fig. 1: Clinical picture showing entry point on left anterior part and swelling in the neck

Fig. 2: X-ray (AP and lateral view) showing foreign body embedded in C5 vertebra

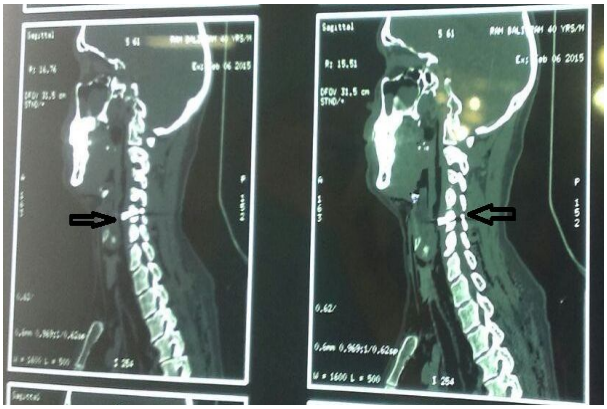

Fig. 3: Computed tomography (CT) picture showing foreign body embedded in C5 vertebra

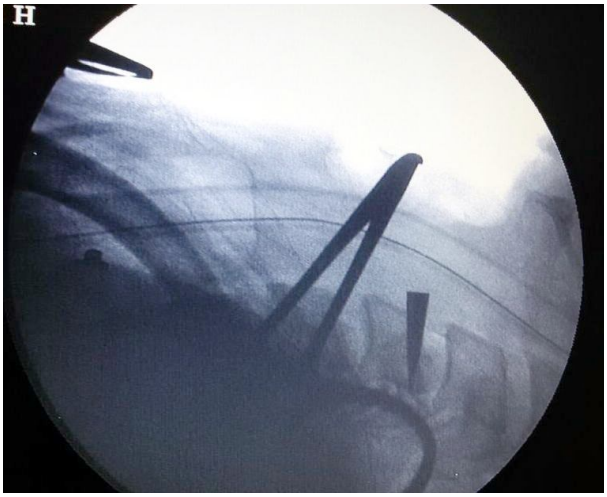

Fig. 4: C-arm picture taken intra-operatively which helped us to locate foreign body in neck

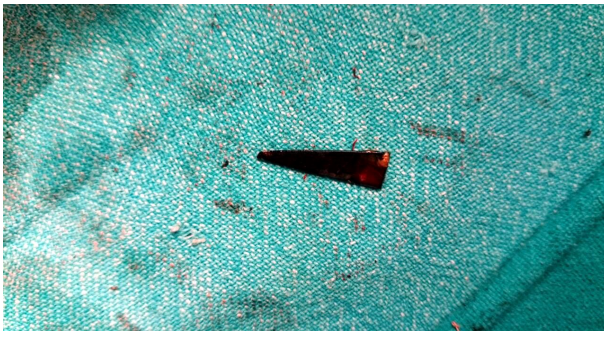

Fig. 5: Picture showing foreign body taken out after surgery

Discussion

Though soft tissue injuries to the head and neck are very common, penetrating injuries resulting in the impaction of foreign bodies are still rare and are usually secondary to a gunshot or stab wound. [1] Accidental falls leading to penetration of foreign body is another source of trauma to the neck [10]. There have been reports of impacted chopsticks also [2]. Parapharyngeal or prevertebral space is an unusual

place for lodgment of foreign bodies and in these cases the usual point of entry is the oral cavity, cheek or neck [9]. However retention of scissor tip in the neck has not been reported till date.

The foreign body incidences are usually common in infants and young children due to their habit of mouthing and exploring everything with their mouth. In adults risk factors include alcohol influence, psychiatric illness and sheer carelessness etc [11].

The diagnosis of penetrating neck trauma with an associated foreign body in-situ is generally quite obvious from history and clinical examination. However, identifying a foreign body on CT scan can be very challenging at times, especially in cases where the impacted body is very thin or where foreign body is not very clear on imaging [3].

Precise localization of the foreign body is essential for complication free removal. Plain radiographs are essential at the initial assessment. When there is delay between the injury and surgical exploration, repeat films immediately prior to surgery are mandatory, to assess any further migration in the interim period [12]. Both CT and MRI have been described as useful techniques for detecting the presence of a foreign body in the soft tissues of the neck [4] and provide sufficient information to enable location of the foreign body and determination of the relation between the foreign body and the major vessels. However, CT scans are not without their drawbacks. The soft tissues of the neck are mobile in relation to the bony and cartilaginous structures. Thus, at the time of surgery, the foreign body may not be situated exactly as where it is seen in the CT [13], though in our case, due to impaction, the foreign body was found at exactly the same place as was seen in CT scan. Thus, C-arm is also recommended to localize the foreign body in the neck intra-operatively when it is difficult to locate [12].

There is currently no consensus among surgeons regarding the management of cervical foreign bodies. There are advocates for both mandatory explorations and exploration in selected cases [5,6]. Asensio et al [7] in their study have performed a thorough review of the literature on the subject of "mandatory exploration versus selective exploration. They found no advantage of one approach over the other. Proponents of mandatory exploration favour removal of foreign bodies at the earliest as they are known to migrate [8] and can cause secondary complications such as haemorrhage or hematoma, infection and neurovascular compromise. In our case, the part of scissor left inside acted as a portal of entry for contaminants / infection to deeper tissues.

Conclusion

Preoperative imaging is very important in deciding upon the surgical approach for the retrieval of impacted foreign bodies and CT and MRI are equally efficient for it. In spite of having both CT and MRI, it is also advantageous to have the C-arm intra-operatively for metallic foreign body detection. Thus, exploration of foreign bodies in neck requires patience, high index of suspicion and repeated intra-operative imaging to find impacted foreign bodies in edematous tissue planes.

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Article in supplement or special issue

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Unpublished article

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[9] National Statistics Online—Trends in suicide by method in England and Wales, 1979-2001. www.statistics.gov.uk/downloads/theme_health/HSQ 20.pdf (accessed Jan 24, 2005): 7-18. Only verified references against the original documents should be cited. Authors are responsible for the accuracy and completeness of their references and for correct text citation. The number of reference should be kept limited to 20 in case of major communications and 10 for short communications.

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