

Neck Space Infections: Clinical and Bacteriological Profile

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ABSTRACT

"*Pus in the neck calls for the surgeon's best judgment, his best skill and often for all his courage*". What Mosher said about deep neck infections in 1929 still holds true. Neck space infections are rare but serious illness causing much morbidity and mortality. Results of various similar studies conducted in different parts of world showed large variations in prevalence, pattern, source of infection, bacteriological profile, and sensitivity to antibiotics.

Aim of the study: To study the clinical profile, etiology, predisposing factors, complications and management of neck space infections.

Study design: Cross sectional study

Period: 2 years

59 patients with neck space infections treated in Govt. Medical College Thrissur were included. Data collected and analysis done with Epi Info.

Results: Middle aged men with low socioeconomic status were more affected. Major risk factors were diabetes mellitus, immunosuppression, and addictions. Submandibular space was the most commonly involved space, odontogenic infections being the most common etiology. Commonest organism was *streptococcus pyogenes*. Incidence of complications was 16.9% and was more in older age, patients with involvement of more than two spaces.

Conclusion: Neck space infections calls for prompt diagnosis and appropriate treatment for a good patient outcome.

Key words: Neck space infection, neck spaces, odontogenic, bacteriology, complications.

INTRODUCTION

Neck space infections (NSI) are bacterial infections usually originating from the upper aerodigestive tract involving the various neck spaces. These infections are uncommon, but if not treated adequately, may lead to serious complications and death.

The incidence of neck space infections and its complications were relatively high before the advent of antibiotics. Widespread uses of antibiotics, access to medical care and proper dental care have resulted in a significant reduction in the occurrence and the progression of this

disease. Even then they remain as one among the difficult emergencies encountered in clinical practice. Patients with other associated illness, a delay in presentation, and those who received improper treatment are more prone for complications. Inadequate treatment will modify the presentation and course of the disease.^[1] Most often patients are undertreated with ineffective dosage and inappropriate selection of antibiotics. To administer antibiotics effectively to a patient, microbiological data of the abscess must be obtained. However, it usually takes several days or longer to get the necessary

data, and consequently empirical antibiotic therapy is frequently launched before definite culture result is available. Different empirical antibiotics, which generally were combinations of multiple broad-spectrum antibiotics, have been reported in several studies. [2-8] It is widely variable in different places. The changing trends of deep neck abscess also have been described in several studies. Another crucial issue is the emerging resistance to antibiotics. For this reason, it is important to be aware of the coverage of different empirical antibiotics in the community.

Delay in diagnosis, or worse, a missed diagnosis, can lead to grave consequences including mediastinitis and death. Even in the modern antibiotic era, a mortality rate as high as 40% has been reported. In addition to systemic toxicity and localized respiratory and digestive tract disturbance, more serious complications, including airway obstruction, pneumonia, lung abscess, mediastinitis, pericarditis, septic shock, internal jugular vein thrombosis, and carotid artery erosion are reported in various studies. Most of these calamitous consequences are the result of the spread of infection tracking along fascial planes of the head and neck and damage to the adjacent vital neurovascular structures. It is therefore incumbent on the otolaryngologist to have a high index of suspicion, understand the biology of the disease, and be keenly familiar with the anatomic pathways for the spread of infection and the emergence of resistance to antibiotics. The aim is to intervene aggressively, both medically and if indicated, surgically, prior to the onset of complications. In general, coping with neck space infection remains a challenge to otolaryngologists. The present study deals with clinical and bacteriological aspects of neck space infections.

MATERIALS AND METHODS

This cross sectional study was conducted in Department of Otorhinolaryngology, Government Medical

College Thrissur, for a period of two year, from January 2014 to December 2015. Prior to commencement, the study was approved by the ethical committee of the medical college. Fifty nine patients who were diagnosed to have neck space infections and treated in this institution were included in the study.

Aim of the study: To study the clinical profile, etiology, predisposing factors, complications and management of neck space infections.

All the patients fulfilling the selection criteria were explained about the purpose of study and a written consent was obtained from them to participate in the study before enrolment. Initial work up included collection of demographic data such as age, sex, address, detailed clinical history, general examination, ENT examination and systemic examination were done and recorded on a predesigned proforma. Computerised Tomography (CT) scan or Ultrasonography (USG) were advised in required cases. Pus collected from patients who underwent surgical drainage were sent for microbiological studies and sensitivity. All the samples were subjected to Gram stain and Acid fast stain. Aerobic culture was done on Mac Conkey agar, blood agar, and chocolate agar and anaerobic culture using Robertson's cooked meat medium. Sensitivity was checked for following drugs: Penicillin, Cephalosporins, Aminoglycosides, Cotrimoxazole, Ciprofloxacin, Erythromycin by using Kirby Bauer testing method. Empirical treatment was initiated with combination of Ampicillin, Gentamicin and Metronidazole as intravenous injections in appropriate doses. If there was possibility of aspiration or airway obstruction, endotracheal intubation or tracheostomy was carried out. Patients were followed up at 1 week and 1 month.

RESULTS AND OBSERVATIONS

Among the 59 patients, there were only 2(3.4%) patients below 20 yrs. 8 (13.6%) patients were between 21 to 30 yrs,

7 (11.9%) patients between 31 to 40 yrs, 18 (30.5%) patients between 41 to 50 yrs, 11 (18.6%) patients between 51 to 60 yrs, 8 (13.6%) patients between 61 to 70 yrs and 5 (8.5%) patients were above 71 yrs. Mean age is 48 years. (figure.1)

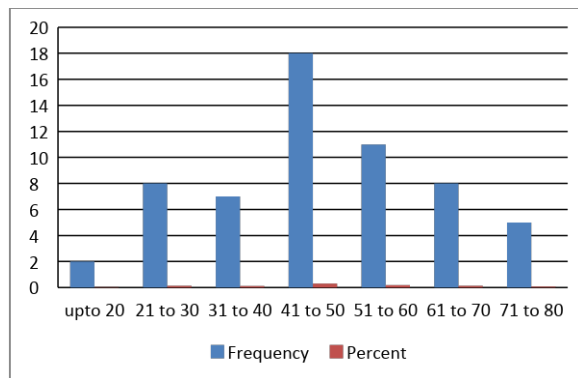


Figure 1: Age distribution

Out of the 59 patients 9 (15.3%) were females and 50 (84.7%) were males. (figure.2)

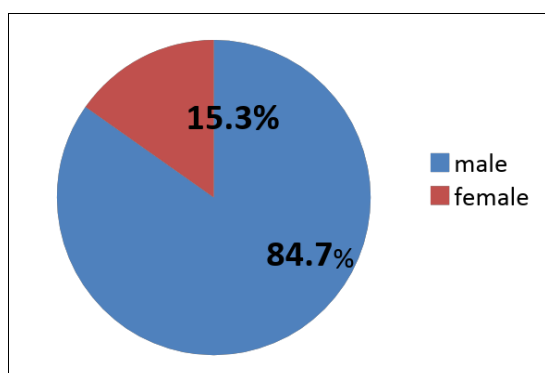


Figure 2: Sex distribution

Among the 59 patients, 56 patients (94.9%) had fever. Pain was the presenting complaint for 55 (93.2%), neck swelling for 46 (78%), trismus for 37 (62.7%), dysphagia for 50 (84.7%), toothache for 45 (76.3%), throat pain for 42 (71.2%), breathing difficulty for 3 (5.1%), weakness of upper limbs for 1 (1.7%), and ear discharge for 2(3.4%). Dental caries were present in 45 (76.3%) on examination.(table.1)

Considering associated factors, 18 (30.5%) had diabetes mellitus, 3 (5.1%) had systemic hypertension, 1(1.7%) had tuberculosis and 3 (5.1%) had hepatitis B infection. None were having HIV infection. 26 (44%) were

alcoholics, 27(46%) had smoking, 6(10%) had tobacco chewing.

In the present study, source of infection was odontogenic in 32 (54.2%), pharyngotonsillar in 12 (20.3%), otogenic in 2(3.4%), trauma or foreign body induced in 6 (10.2%), due to malignancy in 4 (6.8%), cervical spine tuberculosis in 1 (1.7%). Source not identified in 2 (3.4%).(table.2)

Presenting complaint	No.of patients	% of patients
FEVER	56	94.9
NECK PAIN	55	93.2
NECK SWELLING	46	78
TRISMUS	37	62.7
DYSPHAGIA	50	84.7
TOOTH ACHE	45	76.3
THROAT PAIN	42	71.2
BREATHING DIFFICULTY	3	5.1
WEAKNESS OF LIMBS	1	1.7
EAR DISCHARGE	2	3.4
DENTAL CARIES	45	76.3

Table 1: Presenting complaints.

Source of infection	Frequency	Percentage
ODONTOGENIC	32	54.2
PHARYNGOTONSILLAR	12	20.3
OTOGENIC	2	3.4
TRAUMA/FB	6	10.2
IV DRUG ABUSE	0	0
MALIGNANCY	4	6.8
CERVICAL SPINE TB	1	1.7
OTHERS	2	3.4

Table 2: Source of infection.

Among the 59 patients, submandibular space was involved in 28 (47.5%). 17 patients (28.8%) had Ludwig’s angina. Parapharyngeal space was involved in 11(18.6%), retropharyngeal space in 16(27.1%), prevertebral space in 3(5.1%), peritonsillar space in 14(23.7%) and superficial abscess in 2(3.4%)

Among these, 29 (49.2%) patients had involvement of single space, 24 (40.7%) patients had involvement of 2 spaces, 5 (8.5%) had involvement of 3 spaces, and 1 patient (1.7%) had involvement of 5 spaces. More than 2 spaces were involved in 6 patients (10.1%).

Among the 59 patients, pus was sent for culture from 44 patients. Pus from 32 patients (54.2% of the total patients and

72.7% of whom pus was sent) showed positive culture.

Among the samples sent for culture from 44 patients, 12 samples (27.27%) were sterile. Samples from 15(34%) patients yielded *Streptococcus pyogenes*, 2 (4.54%) *Pseudomonas aeruginosa*, 4(9.09%) *Enterococcus* species, 4(9.09%) *Klebsiella pneumoniae*, 3(6%) *Staphylococcus aureus* and 4(9.09%) showed mixed growth. Acid fast bacilli growth was negative in all samples.

In 2 samples, (3.4%) aerobic culture was sterile but in Gram stain, Gram negative bacilli were demonstrated, probably anaerobic origin. Anaerobic culture by Robertson's cooked meat medium yielded no growth.

Streptococcus species isolated were 100% sensitive to Penicillin, and Erythromycin. *Pseudomonas aeruginosa* growth was 100% sensitive to Amikacin, Gentamicin, Ciprofloxacin, and Ceftazidime. *Klebsiella pneumoniae* was 100% sensitive to Cotrimoxazole, 75% sensitive to Ceftriaxone and 50% sensitive to Gentamicin. *Enterococcus species* showed 75% sensitivity to Ampicillin. *Staphylococcus aureus* was 100% sensitive to cloxacillin.

Histopathology report from biopsy of 4 (6.8%) patients who were suspected to have malignancy of hypopharynx came as Squamous cell carcinoma of which one patient was having post radiotherapy recurrence.

Among the 59 patients, 26 (44.1%) were already on antibiotics. 56 (94.9%) underwent surgical treatment and 3 (5.1%) underwent conservative treatment.

Hospital stay was more than 14 days in 24 (40.7%), between 8 to 14 days in 24 (40.7%) and 7 days or less in 11(18.6%) patients. Mean hospital stay was 12.1 days.

Among the 59 patients, 10 (16.9%) had complications. 7 (12.3%) patients had mediastinal extension of abscess and 9 (15.3%) had airway obstruction. 5 (8.5%) patients underwent tracheostomy. One

patient (1.7%) had sepsis. 4 (6.8%) succumbed to death.

Dental caries is a risk factor for development of submandibular abscess, the commonest abscess obtained in the present study. Relation is statistically significant. There is 19.4 times increased risk when compared to people without dental infection. There is 100 % risk for retropharyngeal abscess after foreign body impaction from the study. It is statistically significant with $\chi^2 = 7.95$ and p value is 0.00 There is high chance of getting *Klebsiella pneumoniae* infection in people having Diabetes mellitus than nondiabetic people. This relation has a strong statistical significance.

DISCUSSION

Results of this study are compared with similar studies conducted in other places and is shown in table below.

Study by	Place	Year	Sample size
Paduranga et al ^[9]	Kasthurba Medical College, mangalore	2002	29
Alexandre et al ^[10]	Brazil	2008	80
George et al ^[11]	Christian Medical College, Ludhiana	2011	137
Zamiri et al ^[12]	Iran	2012	297
S.V Bhise et al ^[13]	Maharashtra	2014	54
Gaurav et al ^[14]	Rajasthan	2015	76

Most common age group in this study was 41 to 50 years (30.5%). This is similar to other studies like study by George C Mathew et al^[11] in Ludhiana (2011) where the mean age was 40 years. Age is having significance since odontogenic infections are more and are neglected in this age group. In older persons as age progresses there is reduction in number of teeth and hence less incidence of odontogenic infections. But the proportion of complications increases as the age advances and it is statistically proven in this study.

Associated illness and risk factors will alter the progression of neck space infections. Increased association of complications with diabetes and longer

hospital stay are clearly stated. In this study increased risk of complications in diabetic patients is statistically proven. But association with other factors like smoking, alcoholism, and tobacco use had no statistical significance. It may be due to the small sample studied. Infection with *Klebsiella* species is more seen in diabetic patients, because its virulence is determined by function of host macrophages and the function of macrophages vanishes in hyperglycemic condition. Statistically significant association was obtained from this study regarding increased incidence of infection with *Klebsiella* species in diabetic patients. 3 among the 4 persons with *Klebsiella* species in pus in this study were diabetic.

Involvement of various spaces depends mainly upon the source of infection. In this study most commonly affected space was submandibular space. Second most common was Ludwig's angina affecting submental space with submandibular extension. In some of them sublingual space involvement with elevated floor of mouth was seen. This may be because most common source of infection was dental caries. Similer pattern was also seen in studies by Hassan et al, Zamiri et al [12], George et al [11], Gaurav et al [14] and Alexandre et al. [10] S V Bhise [13], Sakaguchi [4] and Kaled et al found maximum involvement of peritonsillar space. Parapharyngeal space was most affected in studies of Joon Kyoo Lee, Parhiscar and Paduranga et al. [9] Superficial space abscess is excluded in most studies. In this study 3 patients had prevertebral abscess and one of them had tuberculosis of cervical spine.

Source of neck space infection are mainly from dental caries and infection of upper aerodigestive tract. It is comparable with other studies.

Involvement of multiple spaces is considered as poor prognostic factor. In this study 50.8% had more than one space involvement. George et al [11] also reported 88% involvement. Incidence of sepsis was

less. But cases detected to have airway narrowing were more in this study. Mediastinal extension, rate of tracheostomy and overall complications are comparable with other studies. Mean hospital stay in this study is 12.1 days and it is similar to study by Joon Kyoo Lee and Alexandre et al. [10] Mortality rate appears to be high though there are higher rates reported as in studies by Sethi and Alexandre et al. [10] There were 4 deaths in this study. One was due to sepsis, 2 were due to poor general condition associated with malignancy and one due to mediastinitis.

Among the treatment options, most of the patients (94.9%) required a surgical drainage of abscess either by aspiration or incision and drainage. Only (5.1%) patients who didn't have a well defined collection underwent conservative treatment with antibiotics and supportive measures. They responded well. Surgical intervention is also the main stay of treatment in studies by George (68.6%), Gaurav (84.6%), Paduranga (100%), Alexandre (97.5%), Joon Kyoo Lee (76.6%). In a study by Sichel J Y [3] only conservative treatment was done. But it was done in 12 pediatric patients with early disease, in an attempt to avoid surgery in children. Mc Clay et al also conducted a similar study in 11 children in America using intravenous antibiotics only in 91%. All the other studies supported early surgical intervention to prevent complications.

CONCLUSION

Neck space infections are rare but serious illness causing much morbidity and mortality. They call for early diagnosis and prompt management.

By comparing the results of various studies conducted in different parts of world it is understood that the prevalence, pattern, source of infection, bacteriological profile, sensitivity to antibiotics, disease progression and occurrence of complications varies to a great extend. It is important to know the pattern of disease in our part of country to offer a better and effective treatment.

This study was conducted to understand the clinical and bacteriological profile of neck space infections in patients attending our institution, which will help in early diagnosis, detection and prevention of complications.

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