International Journal of Otorhinolaryngology and Head and Neck Surgery
Save SL. Int J Otorhinolaryngol Head Neck Surg. 2023 Feb;9(2):157-160
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937

DOI: https://dx.doi.org/10.18203/issn.2454-5929.ijohns20230101

Original Research Article

Deep neck space infections: a study of 20 cases

Sneha L. Save*

Department of ENT, Dr. V. M. Govt. Medical College, Solapur, Maharashtra, India

Received: 19 August 2022
Revised: 18 October 2022
Accepted: 13 January 2023

***Correspondence:**
Dr. Sneha L. Save,
E-mail: snehasave12@gmail.com

ABSTRACT

Background: Deep neck space infections is defined as infection in the potential spaces and fascial planes of the neck. Deep location and complexity of these spaces make diagnosis and treatment difficult. Proper diagnosis and immediate treatment is necessary to attain cure without any complications. Treatment principally comprises of airway management, surgical intervention i. e.; incision and drainage of the abscess and appropriate antibiotic treatment as per culture and sensitivity report.
Methods: Present study was performed from June 2015 to June 2016 and comprised of 20 cases. All patients coming to the OPD of tertiary care centre with suspected deep neck space infections. The demographic characteristics, presenting symptoms, etiology, imaging and treatment of each case was reviewed.
Results: We evaluated 20 patients with deep neck space infections. The mean age was found to be 40 years. Diabetes was found to be a co-morbid condition in 25% of the patients. Male: female ratio was 1:1.5. In the majority of cases, the etiological factor was found to be odontogenic infections (50%). *Streptococcus pyogenes* was the organism which was most commonly isolated. Ludwig's angina was the most common clinical presentation (20%).
Conclusions: Deep neck space infection is a life-threatening condition in diabetics, immune-compromised and elderly patients. Odontogenic infections were the most common etiology for deep neck space infections. There is need to establish secure airway before initiating surgical intervention. The widespread use of antibiotics has decreased the incidence of deep neck space infections, but remains a fairly common problem.

Keywords: Odontogenic, Dysphagia, Submandibular, Peritonsillar

INTRODUCTION

Deep neck space infections is defined as infection in the potential spaces and fascial planes of the neck. Diagnosis and treatment of deep neck space infections have been challenging since centuries for surgeons. Deep location and complexity of these spaces make diagnosis and treatment difficult.[1]

Deep neck spaces can be categorized by location as being: in the face: the buccal, canine, masticator and parotid spaces; in the suprahyoid neck: the peritonsillar, submandibular, sublingual and lateral pharyngeal space; in the infrahyoid neck: the anterior visceral space; and extending the length of the neck: the retropharyngeal, prevertebral and carotid sheath spaces. When the natural resistance of the fascial planes is lost, the infection spreads along the adjacent fascial boundaries. The stages of infection include cellulitis, abscess formation and necrotising fascitis. Infections from dental origin and submandibular glands affect the submandibular and masticator spaces. Pharyngeal, tonsillar and laryngeal infections which are more common in children affect the peritonsillar, retropharyngeal and parapharyngeal spaces.[2] Infections in the danger space promotes spread of infection to adjoining spaces and may result in complications such as pleural empyema, mediastinitis and sepsis.

Deep neck space infections may arise from a multitude of causes. The common causes are dental caries, tonsillitis, pharyngitis and iatrogenic.[2] Predisposing factors include trauma, cervical lymphadenopathy, diabetes, recent oral and dental procedures, radiation, intravenous drug abuse etc. Presence of co-morbid conditions such as immune-compromised state, diabetes etc. can result in spread of infection to deeper spaces. A rapid progressive course of these infections with a fatal outcome is seen in especially immune-compromised patients.[3]

Patients usually present with symptoms of fever, swelling, dysphagia, odynophagia, localised pain, etc. Signs may include trismus, stridor, hot potato voice, drooling of saliva, cervical lymphadenopathy, and upper respiratory tract infections etc.[3]

The most common organisms encountered are Streptococcus viridans and pyogenes, *Staphylococcus aureus*, Kleisella, *Pseudomonas aeruginosa*, gram negative rods, *Mycobacterium tuberculosis*, anaerobes etc.[8] Rarer organisms which may be found are actinomyces, mycobacterium and fungi.

Proper diagnosis and immediate treatment is necessary to attain cure without any complications. Complications include airway obstruction, disseminated intra-vascular coagulation, cavernous sinus thrombosis, septicaemia, mediastinitis, pleural empyema etc.[2] Treatment principally comprises of airway management, surgical intervention i.e. incision and drainage of the abscess and appropriate antibiotic treatment as per culture and sensitivity report.

Aim and objectives

The aim and objectives of this study were (a) to study the spectrum of deep neck space infections in patients coming to tertiary care centre; and (b) to evaluate the outcome following appropriate intervention.

METHODS

Present study was performed from June 2015 to June 2016 and comprised of 20 cases. All patients coming to the OPD of tertiary care centre with suspected deep neck space infections were admitted. Those presenting with malignancy were excluded from the study.

Study type

The study was observational descriptive type.

Study duration

The study duration was of 1 year.

Sample size

The sample size was 20.

Formula used to calculate sample size

Assuming the power to be 80% and type of error I (a)=0.05.

The sample size formula is given as-

$$N = \frac{z^2 P\ (1-P)}{w^2}$$

Where, P: expected proportion; w: width of confidence interval; z: value of normal distribution representing confidence interval (z=1.96 for 95% confidence); E: margin of error

$$w = 2E$$

$$E = \frac{w}{2}$$

In terms of 'E' the above formula can be written as:

$$N = \left(\frac{z}{E^2}\right) P\ (1-P)$$

Patients were assessed by taking through history and clinical examination.

The demographic characteristics, presenting symptoms, etiology, imaging and treatment of each case was reviewed. All patients were investigated in the form of routine blood and radiological investigations (X-ray neck or CT scan neck).

All patients were started on intravenous antibiotics such as amoxicillin and clavulanic acid or piperacillin and metronidazole and treatment changed as per pus culture and sensitivity report.

RESULTS

We evaluated 20 patients with deep neck space infections. The majority of patients were found in the age group of 31-60 years. The mean age was found to be 40 years. Diabetes was found to be a co-morbid condition in 25% of the patients. Out of the total 20 patients, 8 were male and 12 were female; with a male: female ratio of 1: 1.5 as shown in Table 1.

In the majority of cases, the etiological factor was found to be odontogenic infections (50%), while it was unknown in 2 patients. Other causes included pharyngeal and peritonsillar infections as seen in Table 2.

Fever was the most common symptom, found in all the patients, followed by trismus and dysphagia. Other presenting complaints were odynophagia and localised pain. 5 patients presented with stridor as depicted in Table 3.

Streptococcus pyogenes was the organism which was most commonly isolated from the pus of 25% of the patients. *Staphylococcus aureus* was present in 20% of patients. *Streptococcus viridans* was discovered in 15%.

Mycobacterium tuberculosis was found in 15%. Kleibsella, *Pseudomonas aeruginosa* and gram negative rods were identified in rest of the patients as shown in Table 4.

Ludwig's angina was the most common clinical presentation (20%), followed by masticator and parotid abscess. Other spaces involved were submandibular, submaxillary, peritonsillar and parapharyngeal. Retropharyngeal abscess was found in only 1 patient as depicted in Table 5.

Table 1: Distribution of age and gender.

Age (years)/sex	Male	Female	Total
0-20	1	2	3
20-40	3	3	6
40-60	3	5	8
60-80	1	2	3
Percentage	40	60	20/100

Table 2: Etiological factors.

Causes	N	Percentage
Odontogenic infections	10	50
Pharyngeal infections	6	30
Peritonsillar infections	2	10
Unknown	2	10

Table 3: Presenting signs and symptoms.

Presentation	N	Percentage
Fever	20	100
Trismus	16	80
Dysphagia	15	75
Odynophagia	13	65
Localised pain	10	50
Swelling	8	40
Stridor	5	20

Table 4: Bacteriology.

Organisms	N	Percentage
Streptococcus pyogenes	5	25
Staphylococcus aureus	4	20
Streptococcus viridans	3	15
Mycobacterium tuberculosis	3	15
Kleibsella	2	10
Pseudomonas aeruginosa	2	10
Gram negative rods	1	5

Table 5: Location of abscess.

Location of abscess	N	Percentage
Multispace space	3	15
Masticator space	4	20
Parotid space	4	20
Submandibular space	3	15
Ludwig's (submandibular+submaxillary)	4	20
Retropharyngeal space	1	5
Parapharyngeal space	2	10
Peritonsillar space	2	10

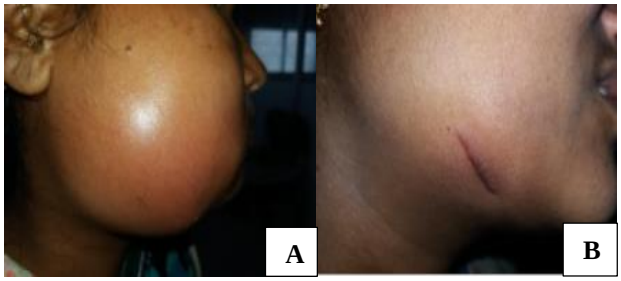

Figure 1: Parotid abscess (A) pre OP; and (B) post OP.

Figure 2: Peritonsillar abscess.

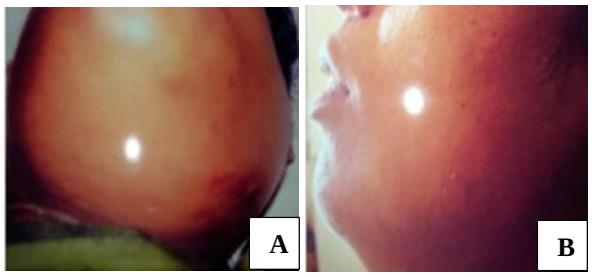

Figure 3: Ludwig's angina.

DISCUSSION

The majority of the patients were found to be between 30-40 years. This correlates with studies carried out by Kataria et al where most of the patients were in age group of 31-50 years.[1] Males accounted for 40% of the cases and females for 60% with a ratio of 1: 1.5. A study by Gujrathi et al found that the majority of their patients were in

the third decade (21.85%) followed by the fourth decade of life (18.15%).[2]

In the present study, diabetes was associated with 25% patients, which is very high as compared with studies done by Kataria et al where they encountered diabetes in 11% of cases.[1] 4 patients were diabetic for whom sugar levels were controlled with the help of insulin.

The most common etiological factor was odontogenic infection (50%) followed by pharyngeal and peritonsillar infections. Gujrathi et al found that dental (42.2%) was the major site of origin, followed by pharynx (14.5%) and salivary glands (13.2%).[2] Bottin et al found that the most common cause was dental infection, occurring in 35 cases (42%).[8] In 12 cases (14%) deep neck infection was a complication of oropharyngeal infection. Odontogenic and salivary origins were the most common sources of infection as per Shivesh et al.[4] Fever, trismus, dysphagia and odynophagia were the most common symptoms as found by Yang et al.[5]

Streptococcus pyogenes was found to be the most common microorganism (39.3%) followed by *Staphylococcus aureus* (21.3%). In the present study, *Streptococcus pyogenes* was found in most of the patients (25%) followed by *Staphylococcus aureus* which was seen in 20%.[6] Early stages of deep neck infections were initially treated with broad spectrum antibiotic coverage and in patients who presented with clinical features and radiological investigations suggestive of abscess formation surgical management done according to site of abscess and pus sent for culture and sensitivity. Surgical intervention was done in 90% of the patients. The cavity was washed and packing done daily. The patients who had presented with odontogenic infection were posted for tooth extraction following which mouth opening was adequate.

3 patients were encountered with multiple space infection. These patients were immediately posted for surgical drainage after securing airway with elective tracheostomy. Decannulation of tracheostomised patients was done after 15 to 20 days once the spaces became free of pus and got obliterated.

Limitations

The sample size could be increased by increasing the duration of research to include more population. Malignancy cases should have been included.

CONCLUSION

Deep neck space infection is a life-threatening condition in diabetics, immunocompromised and elderly patients. Odontogenic infections were the most common etiology for deep neck space infections. There is need to establish secure airway before initiating surgical intervention. The widespread use of antibiotics has decreased the incidence of deep neck space infections, but remains a fairly common problem.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Save SL. Deep neck space infections: a study of 20 cases. Int J Otorhinolaryngol Head Neck Surg 2023;9:157-60.