

Original Research Article

A clinical study of deep neck space infections

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ABSTRACT

Background: Deep neck space infections are usually due to excessive growth of normal flora, mostly of polymicrobial in origin. Patients present acutely with complaints of, throat and neck pain, raised body temperature. The clinical presentation depends on the deep neck space affected.

Methods: Current study was carried out in 25 patients who were diagnosed to have various deep neck infections

Results: It was observed that the maximum number of cases were seen in the age group of 31-40 at 28%, followed by 21-30 age group at 20%, 16% each between 41-50 years and above 60 years. The male to female ratio is 1:0.78. The most common presenting complaints included fever (24 patients; 96%) and dysphagia (18 patients; 72%). 13 patients (52%) had associated systemic disease, 5 patients (20%) had history of diabetes mellitus and were on irregular treatment, 4 patients (16%) was on treatment for hypertensive. The most common infection was Ludwig's angina seen in 13 patients (52%), followed by peritonsillar abscess 4 patients (16%). Out of 25 patients, 20 (80%) cases were treated successfully by incision and drainage. No growth was observed in 32% of the patients.

Conclusions: Early diagnosis of deep neck space infection based on symptoms in susceptible patients is advisable to prevent complications and early recovery.

Keywords: Deep neck infections, Ludwig's angina, Peritonsillar abscess

INTRODUCTION

Deep neck space infections comprise of infections involving parapharyngeal, retropharyngeal and submandibular spaces.¹ Deep neck space infections are usually due to excessive growth of normal flora, mostly of polymicrobial in origin.²

In these cases, dental infections are the most common cause, followed by other aetiologies such as, tonsillitis in the presence of peritonsillar abscess, tuberculosis, mandibular fracture, quinsy and foreign body ingestion. In the remaining cases no specific aetiology is diagnosed. Most of the bacterial organism cultures present to be polymicrobial in origin and the most common organism

isolated is *Streptococcus viridians* then followed by *Staphylococcus aureus* and *Staphylococcus epidermidis*. Anaerobes are also a part of the causative organisms for such infections. Patients present acutely with complaints of, throat and neck pain, raised body temperature. The clinical presentation depends on the deep neck space affected.

Complications most often occur due to delay in diagnosis or delayed treatment when the infection spreads from one region to another. Host factors such as diabetes also play a role and the medical condition of the patient must also be appropriately managed. Even in the antibiotic era, complications of deep neck space infections are occurring. The main complication being, airway

obstruction, mediastinal extension and venous thrombosis, which are life threatening. Initially most of the patients are started on antibiotic therapy orally as outpatients which causes masking of local signs like oedema, fluctuation and pointing of abscess resulting in a delay in the diagnosis of the complications.³

Diabetes mellitus is frequently cited as the most common associated systemic disease in DNI studies.⁴⁻⁸ Hyperglycemia has been found to impair neutrophil function and the complement pathway, and increase the virulence of certain pathogens. The immune dysfunction resulting from uncontrolled diabetes diminishes the ability to confine an infection, which is evident in the frequency of multispace involvement in diabetics with deep neck space infections.⁹

Evaluation of the patient with suspected deep neck infection usually starts with history and physical examination. An appropriate history should include inquiry into the duration and rate of progression of symptoms, with explicit inquiry about any tooth pain. It should also include specific questioning about any oral lesions, upper respiratory infections, blunt or penetrating trauma to the head or neck, including dental procedures and intravenous drug use. In addition, the physician should inquire about any possible immunosuppression including human immunodeficiency virus infections and medications including steroids and chemotherapy. Physical examination should include specific attention to the teeth, tonsils and airway, fever with local pain and edema are the hallmark findings of acute deep neck infection. The location and extent of induration and the presence of fluctuance should be documented and marked on the patient's neck skin for future reference. Transnasal fiberoptic vision often indicated to determine the degree of upper airway obstruction and to look for distortions that might lead to difficulties with intubation.

Airway management, empirical antibiotic coverage and surgical intervention are the treatment options available for deep neck space infections. Current study was carried out to analyses the cause, symptoms and signs of deep neck space infections, thus avoiding potential life threatening complications.

METHODS

Current study is a prospective observational study carried out in the department of otorhinolaryngology, D. Y. Patil medical college and hospital, Pune, Maharashtra over a period of two years from September 2018 to August 2020 in all patients with history and symptoms suggestive of deep neck space infections. A sample size of 25 patients was planned, all patients in the age group 2 years and above presenting with history, symptoms suggestive of deep neck space infections were included in the study.

Patients below 2 years and those diagnosed with neoplasm of nasal cavity, oral cavity and pharynx were

excluded from study. Data were analysed and expressed in fractions and percentage using Microsoft 2010.

Data collection method

Detailed histories of the complaints of all the patients fulfilling the inclusion criteria of the study were taken. A standard detailed examination of the neck, face, oralcavity, ear and nose was carried out on each patient in the outpatient and inpatient department of the hospital. All the details were entered. A minimum of 25 cases presenting with signs and symptoms of deep neck space infections were evaluated and provisional diagnosis were made.

Treatment procedure

Incision and drainage or needle aspiration was done at the earliest stage in majority of the patients, pus was sent for culture and sensitivity analysis. All patients were initially started on broad spectrum antibiotics, which were later modified on culture sensitivity reports or on clinical unresponsiveness. Supportive therapy, in the form of intravenous fluid, analgesics, antipyretics, mouth washes etc. was given. Dilute betadine and hydrogen peroxide wash were given along with betadine wick dressing till the wound healed.

RESULTS

Anatomic location of deep neck space infections

The most common infection was Ludwig’s angina seen in 13 patients (52%), followed by peritonsillar abscess 4 patients (16%) , Parapharyngeal abscess 3 patients (12%), Retropharyngeal abscess 2 patients (8%), submandibular abscess 2 patients (8%), parotid abscess 1 patient (4%) (Table 1).

Table 1: Anatomic location of deep neck space infections.

Location of DNSI	N	%
Ludwig’s angina	13	52
Peritonsillar abscess	4	16
Retropharyngeal abscess	2	8
Parapharyngeal abscess	3	12
Parotid abscess	1	4
Submandibular abscess	2	8

Age distribution

This study consists of 25 cases of deep neck space infection seen during the study period and fulfilled inclusion criteria. Youngest patient seen was 7 years old and the oldest was 62 years old. It was observed that the maximum numbers of cases were seen in the age group of 31-40 years (Table 2).

Table 2: Age distribution.

Age (years)	N	%
<10	1	4
11-20	3	12
21-30	5	20
31-40	7	28
41-50	4	16
51-60	2	8
>60	4	16

Sex distribution

In the present study of 25 patients, 14 were male and 11 were female. The male to female ratio is 1:0.78. A slight male preponderance was seen (Table 3).

Table 3: Sex distribution.

Gender	N	%
Male	14	56
Female	11	44
Total	25	100

Presenting complaints

The most common symptoms with which the patients presented were fever (15 patients; 60%), dysphagia (16 patients; 64%), odynophagia (14 patients; 56%), neck swelling (16 patients; 64%), reduced mouth opening (12 patients; 48%), neck pain (11 patients; 44%) (Table 4).

Table 4: Presenting complaints.

Complaints	N	%
Fever	15	60
Odynophagia	14	56
Dysphagia	16	64
Cheek swelling	1	4
Reduced mouth opening	12	48
Neck pain	11	44
Neck swelling	16	64
Change of voice	4	16
Cough	4	16
Dyspnea	4	16

Associated systemic illness

13 patients (52%) had associated systemic disease. Five patients (20%) had history of diabetes mellitus (DM) and were on irregular treatment. 4 patients (16%) were on treatment for hypertensive (HTN). 2 patients (8%) had coexisting diabetes mellitus and hypertension. 1 patient (4%) had HIV and 1 patient (4%) had tubercular infection (TB) (Table 5).

Table 5: Associated systemic illness.

Illness	N	%
DM	5	20
HTN	4	16
DM+HTN	2	8
HIV	1	4
TB	1	4
Nil	12	48

Etiology of deep neck space infections

Dental infections were the cause in 10 patients (40%), unknown in 9 patients (36%) and followed by recurrent tonsillitis in 3 patients (12%) (Table 6).

Table 6: Etiology of deep neck space infections.

Etiology	N	%
Odontogenic	10	40
Unknown	9	36
Recurrent tonsillitis	3	12
Acute tonsillitis	1	4
Tuberculosis	1	4
Foreign body	1	4

Treatment

Out of 25 patients, 20 (52%) cases of were treated successfully by incision and drainage. Out of them 11 cases were Ludwig’s angina, 4 peritonsillar abscess, 2 parapharyngeal abscess, 1 retropharyngeal abscess, 1 parotid abscess, 1 submandibular abscess. Five patients with minimal abscess were treated conservatively (Table 7).

Table 7: Treatment.

Treatment	N	%
Incision and drainage	20	80
Conservative	5	20

Table 8: Bacteriology.

Organism isolated	N	%
<i>E. coli</i>	1	4
<i>Pseudomonas</i>	3	12
<i>Klebsiella pneumoniae</i>	5	20
<i>Staphylococcus aureus</i>	5	20
<i>Streptococcus pneumoniae</i>	3	12
No growth	8	32

Bacteriology

In our study no growth was observed in 40% of the patients. *Klebsiella pneumoniae* and *Staphylococcus* each were isolated in 20% of the patients, *Pseudomonas* and *Streptococcus pneumoniae* each were isolated in 12% of

the samples and *E. coli* was noted in one patient (4%) (Table 8).

DISCUSSION

The current study was carried to evaluate deep neck infections in patients presenting to ENT department of a tertiary care hospital in Pune. A total of 25 patients were studied who were diagnosed to have various deep neck infections. The study was conducted after obtaining clearance from the ethics committee and as well after taking informed consent of the patients who cleared the inclusion criteria of the study. The purpose of the study was explained to them in their native language. For children this was done after obtaining consent from parents or guardians whichever was applicable. The most common infection in the current study was Ludwig's angina seen in 13 patients (52%), followed by peritonsillar abscess in 4 patients (16%). Priyamvada et al observed in 40 patients that most common space infected was submandibular space (37.5%), followed by peritonsillar infections (12.5%). Boscolo-Rizzo et al noted that lateral pharyngeal and submandibular spaces were the most commonly involved spaces in deep neck infections.^{10,11} Kauffmann et al observed in 63 patients that most common manifestation was a parapharyngeal abscess in 24 patients (38.1%), followed by peritonsillar infections in 19 patients (30.2%).¹² Kataria et al observed most common presentation was Ludwig's angina (28.94%), following this was by peritonsillar abscess and submandibular abscess in 76 patients with deep neck infections.¹³

In the present study the youngest patient seen was 7 years old and the oldest was 62 years old. It was observed that the maximum number of cases were seen in the age group of 31 to 40 at 28%, followed by 21-30 years age group at 20%, 16% each between 41 to 50 years and above 60 years. As observed, there is no specific pattern of age wise distribution for occurrence of deep neck infections. In part it can be due to varied etiological factors contributing to the infections and immune status of the patients. Priyamvada et al conducted a study to evaluate the deep neck infections.¹⁰ In their study authors observed commonest age group affected was in second and third decade of life. Hence, as observed from the above mentioned studies the age of presentation can widely vary in different set of patients.

In the present study the male to female ratio was 1:0.78. A slight male preponderance was seen. Mungul et al evaluated a total number of 107 patients with deep neck infections.¹⁴ They noted that the female to male ratio was 1:1.14 indicating a slight male preponderance. There were 57 males and 50 females in this study. This closely matches with our study with a similar male:female ratio. Both the studies were in sync with regard to gender distribution.

Considering the most common infection in our study, it is expected that most of the patients will present with neck swelling. Das et al noted that commonest symptom presented was neck pain and neck swelling in 91.1% of the participants and the commonest space involved was submandibular space (66.6%) followed by sublingual space (44.6%) in a study where 45 patients with deep neck infections were evaluated.¹⁵ Kataria et al observed neck pain to be the most common presenting complaint in patients with deep neck infections at 89.47% of the 76 participants.¹³

In the present study, 13 patients (52 %) had associated systemic disease of whom 5 patients (20%) had history of diabetes mellitus and were on irregular treatment. Huang et al suggested that diabetes and presence of other underlying systemic disease increases risk for developing deep neck infections.¹⁶ Chen et al observed that diabetes not only increases risk for deep neck infections, it as well increases risk for more severe form of disease and higher rate of hospitalization or increased duration of hospitalization.¹⁷ In our study 5 patients with diabetes were not on regular treatment making them more susceptible to deep neck infections due to uncontrolled diabetes mellitus.

The most common etiology of deep neck space infections in children remains tonsillitis, whereas the most common etiology in adults is odontogenic origin.¹⁸⁻²¹ A study by Adoviča et al found that out of 263 patients hospitalized for deep neck space phlegmons and/or abscesses, 70.6% of the cases arose from dental infections.²²

In our study no growth was observed in 40% of the patients. *Klebsiella pneumoniae* and *Staphylococcus* each were isolated in 20% of the patients, *Pseudomonas* and *Streptococcus pneumoniae* each were isolated in 12% of the samples and *E. coli* was noted in one patient (4%). Mungul et al studied 121 culture specimens from deep neck infections and an identifiable microorganism in 71% samples, with no bacterial growth in 29%.¹⁴ *Staphylococcus aureus* was the most common microbe isolated, with a prevalence of 65% of positive pus cultures. All of these organisms were sensitive to cloxacillin, and were resistant to penicillin/ampicillin. Of total positive pus cultures, there was an overall sensitivity to cloxacillin of 67% and overall resistance to penicillin/ampicillin of 76%.

Limitations

Current study had following limitations; small sample size that cannot be extrapolated to regional and national level trends, there could be a selection bias as some of the paediatric patients might be handled by paediatrics department, outcome of the treatment measures and follow up of the patients for recurrence was not performed, complications of surgery and antibiotic therapy are not discussed.

CONCLUSION

Deep neck space infections (DNSI) continue to be a life-threatening condition in spite of the wide use of antibiotics. In our study, DNSI was commonly seen in middle aged group with male predominance, who most commonly presented with dysphagia and neck swelling. Ludwig's angina was the commonest DNSI. Patients with comorbidities like diabetes and hypertension had more risk of developing severe form of DNSI. Majority of the DNSI were of odontogenic etiology, with majority being infected with *Klebsiella pneumonia* and *Staphylococcus aureus*. Incision and drainage were the mainstay of the treatment. Antibiotics should be used based on the comorbid conditions of the patient, preferably a broad-spectrum antibiotic. The early detection and management of DNSI, especially in patients with co-morbid conditions should be meticulously planned and treated early in order to prevent the complications associated with it.

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REFERENCES

1. Michael C, George GB, Martin JB, Ray C, John H, Nicholas SJ. Scot Brown's otorhinolaryngology and head and neck surgery. 7th ed. Great Britain: Hodder Arnold; 2008:1785.
2. Charles WC, Paul WF, Lee AH, Bruce HH, Mark AR, Thomas K. Cummings otorhinolaryngology and head and neck surgery. 5th ed. United States: Elsevier; 2010:201.
3. Sethi DS, Stanley RE. Deep neck abscesses-changing trends. J Laryngol Otol. 1994;108:138-43.
4. Sethi DS, Stanley RE. Parapharyngeal abscess. J Laryngol Otol. 1991;105:1025-30.
5. Vieira F, Allen SM, Stocks RMS, Thompson JW. Deep Neck infection. Otolaryngol Clin North Am. 2008;41:459-83.
6. Meher R, Jain A, Sabharwal A, Gupta B, Singh I, Agarwal AK. Deep neck abscess: a prospective study of 54 cases. J Laryngol Otol. 2005;119:299-302.
7. Huang T, Tseng F, Liu C, Hsu C, Chen YS. Deep neck infection in diabetic patients: comparison of clinical picture and outcomes with nondiabetic patients. Otolaryngol Head Neck Surg. 2005;132(6):943-7.
8. Lin H, Tsai C, Chen Y, Liang G. Influence of diabetes mellitus on deep neck infection. J Laryngol Otol. 2006;120:650-4.
9. Brook I. Microbiology and management of peritonsillar, retropharyngeal and parapharyngeal abscesses. J Oral Maxillofac Surg. 2004;62:1545-50.
10. Priyamvada S, Motwani G. A study on deep neck space infections. Indian J Otolaryngol Head Neck Surg. 2019;71(1):912-7.
11. Boscolo-Rizzo P, Marchiori C, Montolli F, Vaglia A, Da Mosto MC. Deep neck infections: a constant challenge. J Otorhinolaryngol Relat Spec. 2006;68(5):259-65.
12. Kauffmann P, Cordesmeier R, Tröltzsch M, Sömmer C, Laskawi R. Deep neck infections: A single-center analysis of 63 cases. Med Oral Patol Oral Cir Bucal. 2017;22(5):e536-41.
13. Kataria G, Saxena A, Bhagat S, Singh B, Kaur M, Kaur G. Deep neck space infections: a study of 76 cases. Iran J Otorhinolaryngol. 2015;27 (81):293-9.
14. Mungul S, Maharaj S. Microbiology of paediatric deep neck space infection. Int J Pediatr Otorhinolaryngol. 2019;123:116-22.
15. Das R, Nath G, Mishra A. Clinico-pathological profile of deep neck space infection: a prospective study. Indian J Otolaryngol Head Neck Surg. 2017;69(3):282-90.
16. Huang TT, Liu TC, Chen PR. Deep neck infection: analysis of 185 cases. Head Neck. 2004;26(10):854-60
17. Chen MK, Wen YS, Chang CC. Deep neck infections in diabetic patients. Am J Otolaryngol. 2000;21(3):169-73.
18. Conrad DE, Parikh SR. Deep neck infections. Infect Disord Drug Targets. 2012;12(4):286-90.
19. Chang L, Chi H, Chiu NC, Huang FY, Lee KS. Deep neck infections in different age groups of children. J Microbiol Immunol Infect. 2010;43 (1):47-52.
20. Wang LF, Tai CF, Kuo WR, Chien CY. Predisposing factors of complicated deep neck infections: 12-year experience at a single institution. J Otolaryngol Head Neck Surg. 2010; 39(4):335-41.
21. Poeschl PW, Spusta L, Russmueller G, Seemann R, Hirschl A, Poeschl E, et al. Antibiotic susceptibility and resistance of the odontogenic microbiological spectrum and its clinical impact on severe deep space head and neck infections. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2010;110(2):151-6.
22. Adovica A, Veidere L, Ronis M, Sumeraga G. Deep neck infections: review of 263 cases. Otolaryngol Pol. 2017;71(5):37-42.

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