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Original Research Article

Clinicopathological, microbiological and radiological evaluation of deep neck spaces infections

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ABSTRACT

Background: More and more use of antibiotics and development of new antibiotics have helped in reducing the morbidity associated with "deep neck infections", but still their incidence is found in the general populations. Prompt diagnosis and early treatment are key. The objective of the study was to study deep neck infections regarding etiological factors, micro-biological features.
Methods: A total of 24 patients were identified and diagnosed at S.V.S Medical College and Hospital Mahabubnagar over a period of 3 years, among them 12 patients were picked up at random basis for detailed study.
Results: It has been observed that the incidence of deep neck space infection was 3% till June 2010 and then it reduced to 1.76% by June 2011 and remained constant till October 2011. Sub-mandibular abscess was the most common in 58.3% of the cases. The most common source of infection of deep neck space infections was odontogenic in 45.8% of the cases. Airway obstruction was seen in 29% of the cases and mediastinitis was seen in only two patients. The most commonly observed organism involved in the deep neck space infections was streptococcus pyogenes in 75% of the cases.
Conclusions: Deep neck space infections though rare, are associated with complications and most importantly antimicrobial resistance. Hence it is very important that these must not be neglected.

Keywords: Deep neck space infections, Complications, Antimicrobial resistance

INTRODUCTION

In the pre antibiotic era, it was very common to get the cases of "deep neck space infections" compared to the present antibiotic era and resulted in the significant morbidity and mortality.[1] Once it was said that pus discharge from the neck cells should alert the surgeon. More and more use of antibiotics and development of new antibiotics have helped in reducing the morbidity associated with "deep neck infections", but still their incidence is found in the general populations. Prompt diagnosis and early treatment are key. Now the focus of concentration for ear, nose and throat surgeons is the special high risk groups like patients suffering from immuno deficiency states. The immuno deficiency states are generally seen in HIV positive individuals, patients on corticosteroid therapy due to organ transplant or some other reason. In such individuals, due to the compromised immune status, infections are common and its severity is also more. Deep neck space infections are associated with complications such as airway obstruction, mediastinitis, septicemia and carotid artery hemorrhage if not treated properly.[1]

The most common mechanism by which such infections occurs is dissemination of bacteria, either haemato-genously or more commonly via lymphatic's to cervical lymph nodes. When local immunity is inadequate the

bacteria, suppuration of lymph nodes may progress to development of an abscess within the space.[2]

Today nearly 40% infections caused by mixed flora other causes include emergence of gram negative organisms, primarily *Klebsiella pneumonia* as well as increased prevalence of anaerobic infections. Not with standing streptococcal species, primarily alpha streptococci and staphylococci aureus are still most commonly isolated organisms. In the pre-antibiotic era the commonest organisms causing deep neck infections were *Staphylococci* and next common was *E. coli* showed high sensitivity to cloxacillin drug, and it was found in 1947 that it was resistant to penicillin. Then methicillin was the drug of choice later. At present commonest organisms causing deep neck infections are *Streptococcus pyogenus* and *H. influenza*.[3]

43% of deep neck space infections are of dental origin and 12% of these infections occur in I. V. drug abusers.[3] 70% of abscess involves sub-mandibular space and lateral pharyngeal space 12% of abscess involves retropharyngeal space.[3]

Present study was conducted with the objective to study deep neck infections regarding etiological factors, micro-biological features.

METHODS

Type of study: A hospital based cross sectional study was carried out.

Period of study: The study was carried out for a period of three years at a tertiary care hospital.

Sample size

A total of 24 patients were identified and diagnosed at S. V. S. Medical College and Hospital Mahabubnagar over a period of 3 years, among them 12 patients were picked up at random basis for detailed study.

Place of study

The place of study was department of ENT at S. V. S Medical College and Hospital Mahabubnagar. Institutional Ethics Committee permission was taken before the start of the study. Informed written consent was obtained from the selected patients.

Selection criteria

Inclusion criteria were patients with deep neck space infections; patients willing to participate in the present study; patients not suffering from serious systemic diseases.

Exclusion criteria were patients without deep neck space infections; patients not willing to participate in the present study; patients suffering from serious systemic diseases.

The data was entered in the pre designed, pre tested, semi structured questionnaire. Detailed history was collected from each and every patient for the present study. Each and every subject underwent detailed physical examination for presence of clinical signs and symptoms by the data collector who was an expert in the ear, nose and throat diseases in the present study.

Each and every patient was subjected to the X-ray of neck for soft tissues: AP and Lateral views. C. T. scan with contrast: coronal and axial cuts were taken for each and every case included in the present study to confirm the diagnosis and act as inclusion or exclusion criteria.

Statistical analysis

Data was entered in Microsoft Excel worksheet and analyzed using percentages.

RESULTS

Table 1: Incidence of deep neck space infections (DNSI).

Year	Total patients admitted in ENT ward	Patients with deep neck space infections	Incidence of DNSI (%)
June 2009 - June 2010	426	13	3.05
July 2010 - June 2011	453	8	1.76
July 2011 – October 2011	170	3	1.76

Table 1 shows incidence of deep neck space infections from June 2009 to October 2011. It has been observed that the incidence was three percentages till June 2010 and then it reduced to 1.76% by June 2011 and remained constant till October 2011.

Table 2: Incidence of specific neck abscesses.

Site of abscess	Number	Percentage (%)
Sub-mandibular abscess	14	58.3
Retropharyngeal abscess	7	29.16
Para pharyngeal abscess	3	12.5
Total	24	100

Table 2 shows incidence of specific neck abscesses. Sub-mandibular abscess was the most common seen in 58.3% of the cases, followed by retropharyngeal abscess in 29.2% of the cases. The least common type of neck

abscess was para pharyngeal abscess in 12.5% of the cases.

Table 3: Source of infection of DNSI.

Source of infections	Number	Percentage (%)
Odontogenic	11	45.8
Pharyngo tonsillar	6	25
Traumatic	2	8.3
Otogenic	2	8.3
Unknown	3	12.5
Total	24	100

Table 3 shows the source of infection of deep neck space. The most common source of infection of deep neck space infections was odontogenic in 45.8% of the cases followed by pharyngo tonsillar in 25% of the cases. Traumatic and otogenic was 8.3% each and 12.5% cases were unknown source of infection.

Table 4: Incidence of complications of DNSI.

Complication	Patients	Percentage (%)
Airway obstruction	7	29
Mediastinitis	2	8.3
Septic thrombophlebitis	-	-
Hemorrhage	-	-
Cranial nerve palsies	-	-

Table 4 shows the incidence of complications of deep neck space infections. Airway obstruction was seen in 29% of the cases and mediastinitis was seen in only two patients. But complications like septic thrombophlebitis hemorrhage and cranial nerve palsy was not seen in any case at all.

Table 5: Microorganisms found commonly in deep neck space infections.

Organism	Number	Percentage (%)
Streptococcus pyogenes	18	75
Staphylococcus aureus	13	57
Streptococcus pneumoniae	4	16.6
H. influenza	3	12.5
Anaerobes	8	33

Table 5 shows microbiology of deep neck space infections. The most commonly observed organism involved in the deep neck space infections was *Streptococcus pyogenes* in 75% of the cases. This was followed by *Staphylococcus aureus* in 57% of the cases. 16.6% of the cases it was found that *Streptococcus pneumoniae* was the causative organism.

DISCUSSION

In the present study it has been observed that the incidence was three percentages till June 2010 and then it reduced to 1.76% by June 2011 and remained constant till October 2011. Sub-mandibular abscess was the most common seen in 58.3% of the cases in the present study, followed by retropharyngeal abscess in 29.2% of the cases. The least common type of neck abscess in the present study was para pharyngeal abscess in 12.5% of the cases. The most common source of infection in the present study of deep neck space infections was odontogenic in 45.8% of the cases followed by pharyngo tonsillar in 25% of the cases. Traumatic and otogenic was 8.3% each in the present study and 12.5% cases were unknown source of infection. Airway obstruction was seen in 29% of the cases in the present study and mediastinitis was seen in only two patients. But complications like septic thrombophlebitis hemorrhage and cranial nerve palsy was not seen in any case at all. The most commonly observed organism involved in the deep neck space infections was *Streptococcus pyogenes* in 75% of the cases in the present study. This was followed by *Staphylococcus aureus* in 57% of the cases. 16.6% of the cases it was found that *Streptococcus pneumoniae* was the causative organism in the present study.

Baba et al reported a case of abscess in the deep neck that was also known case of diabetes as well as he was having swelling.[3] On doing CT scan it was found that the infection in the deep neck was from epipharynx to hyoid bone. The authors under trans-nasal endoscopy carried out the drainage of the abscess. The patient was observed for half an hour. It was found that there was no recurrence as well as there was no complication reported. Thus the author concluded that surgical drainage of the deep neck infections should be done under trans-nasal endoscopy. They recommended this one as a standard method even though the patient may be having diabetes or severe swelling.

Huang et al studied 185 cases.[4] Majority were males. The mean age was around fifty years. Majority of the patients were above fifty years of age. 34.1% of the patients were found to have some or the other systemic diseases. 88.9% of the cases were the known cases of diabetes. The author reported that 38.4% of the cases were having para pharyngeal space infection. But in the present study we found that sub-mandibular abscess was the most common seen in 58.3% of the cases. The author found that upper respiratory tract infection was the cause of deep neck space infections in 30.5% of the cases and odontogenic infections was the cause of deep neck space infections in 53.2% of the cases. These findings are in accordance with the present study findings. We also found that odontogenic infections were the cause of deep neck space infections in 45.8% of the cases. The authors reported that *Streptococcus viridians* and *Klebsiella pneumoniae*

were the most common organisms involved in the deep neck infections. We also found that the most commonly observed organism involved in the deep neck space infections was *Streptococcus pyogenes* in 75% of the cases. The authors concluded that a proper attention should be given to the prevention of development of complications in these patients.

Lee et al in their studied applied the multiple linear regressions and found that duration of hospitalization among patients with deep neck space infections was significantly associated with presence of diabetes mellitus, development of complications and the number of spaces involved in the deep neck infections.[5] More the number of spaces involved in the deep neck infections more was the duration of the hospital stay. The authors also found that the incidence of complications was significantly associated with spaces involved in the deep neck infections. The authors recommended that the patients having diabetes mellitus as well as >2 spaces involved in the deep neck infections should be categorized as high risk patients. They should be given more proper due attention to reduce the number of complications and as well as to reduce the hospital stay among them.

Nikakhlagh et al found in their study that in 49% of the cases the cause of deep neck space infections was dental infection.[6] These findings are in accordance with the present study findings. We also found that odontogenic infections were the cause of deep neck space infections in 45.8% of the cases. The author reported that 41.5% of the cases were having sub-mandibular space infection. We also found that sub-mandibular abscess was the most common seen in 58.3% of the cases. The authors found that streptococcus viridians were the most common organism responsible for deep neck space infections. We also found that the most commonly observed organism involved in the deep neck space infections was *Streptococcus pyogenes* in 75% of the cases.

Rega et al reported that the sub mandibular space was commonly and the first and foremost place of abscess.[7] These findings are in accordance with the present study findings. We also found that sub-mandibular abscess was the most common seen in 58.3% of the cases. The authors found that *Streptococcus viridians* were the most common organism responsible for deep neck space infections. We also found that the most commonly observed organism involved in the deep neck space infections was *Streptococcus pyogenes* in 75% of the cases. The authors concluded that the risk of development and involvement of multiple deep neck spaces was common among patients who had undergone surgical incision and drainage. Hence such patients should be given proper antibiotic coverage.

Bakir et al found that the most common cause of deep neck space infections was dental infection in 48.6% of the cases.[8] These findings are in accordance with the present study findings. We also found that odontogenic infections were the cause of deep neck space infections in 45.8% of the cases. In their study the other common causes of deep neck space infections were peri-tonsillar infections and tuberculosis. The patients in their study presented with pain, dysphagia, fever and odynophagia. In their study also the most commonly involved space in the deep neck was sub mandibular region. These findings are in accordance with the present study findings. We also found that sub-mandibular abscess was the most common seen in 58.3% of the cases. The authors reported an incidence of 13.8% of the cases. We found in the present study that the airway obstruction was developed in 29% of the cases.

CONCLUSION

Deep neck space infections though rare, are associated with complications and most importantly antimicrobial resistance. Hence it is very important that these must not be neglected.

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