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RESEARCH ARTICLE

DEEP NECK INFECTIONS: A PROSPECTIVE STUDY OF 56 CASES

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ABSTRACT

Background: Deep neck space infections (DNIs) continue to be a serious challenge largely owing to difficulties underlying prompt diagnosis and treatment. We evaluated the clinical presentations and etiological profile of DNIs. **Methods:** Evaluation of clinical data was performed on 56 consecutive patients presenting with symptoms and signs indicative of deep neck infections. **Results:** DNIs were predominant in the age group of 11 to 20 years and submandibular space was the commonest site involved. Swelling/Neck mass (58.9%) was the most common presentation followed by fever (46.4%). Aerobic pathogens were predominant, with *Staphylococcus aureus* being the most commonly recovered agent. **Conclusion:** DNIs are polymicrobial in nature. The variability of etiological agents range from aerobic gram positive cocci and gram negative bacilli to anaerobic gram positive cocci and gram negative bacilli.

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INTRODUCTION

Deep neck spaces are the potential spaces between the fascial planes that surround and invest the structures of the neck, and infections that spread along the planes and spaces of head and neck are known as deep neck space infections (DNI) (Marra *et al.*, 1996). DNIs present a potential challenge to modern antibiotic era owing to the complex anatomy, deep location, proximity to great vessels, nerves and communication with each other (Das *et al.*, 2003). Delay in diagnosis and treatment of DNIs could lead to notable complications such as airway compromise, jugular vein thrombosis, mediastinal involvement, pericarditis, pneumonia and arterial erosion (Larawin *et al.*, 2006, Eftkharian *et al.* 2009). Prior to the advent of antibiotics, 70% of DNIs evolved from tonsillitis and pharyngitis, and with the introduction of broad spectrum antibiotics, the incidence gradually decreased that ultimately changed the relative frequency of different causes and origin of DNIs (Eftkharian *et al.* 2009). Most of the superficial and deep neck infections arise as a sequel of pulp necrosis caused by dental caries, trauma, periodontitis (Fating *et al.* 2014). The origin of DNIs many a times remains obscure possibly because the primary source of infection might precede by weeks (Abdel-Haq *et al.*, 2006). On the other hand, individuals with immune impairment, such as HIV infection and immunosuppressive

treatment reportedly pose vulnerability to increased frequency of DNIs and associated complications, especially involving atypical agents (Larawin *et al.*, 2006, Tan *et al.* 2001, Rega *et al.*, 2006, Lee *et al.* 2007, Suebara *et al.* 2008, Poeschl *et al.* 2010). Tamir *et al.* has also demonstrated a higher percentage of occurrence of DNIs in intravenous drug users in comparison to non users (Tamir *et al.*, 2015).

DNIs involve all the potential deep neck spaces though the distribution is variable. Multiple space involvement is more commonly seen in elderly compared to adults (Chi *et al.*, 2014). Infections are usually polymicrobial with both aerobic gram positives and gram negatives as well as anaerobes being known etiologic agents (Martin Campagne *et al.*, 2006). May *et al.* had recently demonstrated the potential role of biofilms in the pathogenesis and recalcitrance of deep neck infections, particularly in larger abscesses (May *et al.*, 2014). We investigated the frequently infected anatomical locations, bacterial etiology involving DNIs at a tertiary care clinical setting in northern India.

MATERIALS AND METHODS

A total of 56 consecutive patients with clinically suspected DNIs were enrolled. DNI was suspected when any of the

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following, submandibular, submental, masticator, parotid and peritonsillar space were involved or cervical lymph node was inflamed. Cases were diagnosed based on clinical suspicion, physical findings and occurrence of pus on needle aspiration. Informed consents were obtained and the demographic and other relevant clinical data were collected using detailed questionnaires.

Pus specimens were collected adhering to standard aseptic precautions and promptly processed for aerobic and anaerobic culture. Bacterial isolates from cultures were identified and characterized following standard techniques.

RESULTS

Out of the 56 patients (age range 1 - 65 years) studied, 29 were males and 27 were females. The peak incidence of DNIs occurred in the age group of 11 to 20 years. All the participants were HIV seronegative and had no prior history of non-insulin-dependent diabetes mellitus, foreign body ingestion, intravenous drug (IVD) and tobacco usages and alcohol consumption.

Figure 1 shows the clinical presentation of the participants with swelling being the most common manifestation observed in 58.9% of the cases, followed by fever (46.4%). Submandibular space was the most frequent site affected, observed in 21 cases (37.5%), followed by cervical lymph node inflammations (21.4%) which is followed by submental (14.3%), peritonsillar (12.5%), masticator (10.7%) and parotid space involvement. Besides cases of unknown etiology, odontogenic infections remained the most common cause of DNIs accounting for 30.4% cases, followed by upper respiratory tract infections (12.5%) and trauma (10.7%).

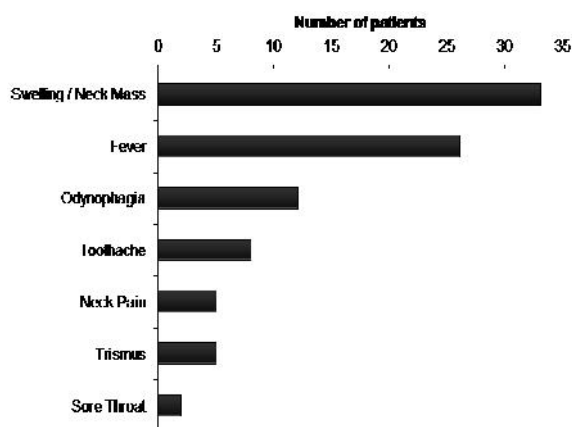


Figure 1

Clinical presentation of deep neck infections (DNIs) observed in the study group

Out of the 53 bacterial strains isolated from aspirated specimens, 16 involved the submandibular (30.2%), 11 from cervical lymph nodes (20.7%), 10 from submental (18.9%), followed by the peritonsillar, masticator and parotid spaces. *Staphylococcus aureus* was the most common isolate accounting for 49% of all the bacterial isolates. While methicillin-susceptible isolates were recovered from all the six neck spaces investigated, the MRSA isolates primarily

confined to the sites of infection namely, the submandibular, submental and peritonsillar spaces. The microbiology of isolates recovered from aspirated pus specimens from the sites of infection is listed in table 1.

Table 1 Etiological profile of deep neck infections (DNIs) in the study group

Bacterial aetiology	No. of isolates
<i>Staphylococcus aureus</i>	26 (49)
-haemolytic Streptococcus – Group A	9 (16.9)
-haemolytic Streptococcus – Group F	2 (3.8)
-haemolytic Streptococcus – Group G	1 (1.9)
<i>Gemella morbillorum</i>	1 (1.9)
<i>Streptococcus mitior oralis</i>	1 (1.9)
<i>Enterococcus faecalis</i>	1 (1.9)
<i>Pseudomonas aeruginosa</i>	1 (1.9)
<i>Escherichia coli</i>	2 (3.8)
<i>Klebsiella pneumoniae</i>	2 (3.8)
<i>Peptostreptococcus</i> sp.	6 (11.3)
<i>Bacteroides</i> sp.	1 (1.9)

Table 1: Numbers in parentheses indicate percentage

DISCUSSION

DNIs have significantly been reduced ever since the advent of broad spectrum antibiotics and improved dental care. However, these infections still pose a serious threat due to challenges in diagnosis, multi-portal entry of infectious agents, vital structures adjacent to the fascial planes involved and many such distinct factors. These infections could exert fatal effects by causing local airway obstruction or extension to vital areas like mediastinum or carotid sheath (Das et al. 2003, Larawin et al, 2006, Eftkharian et al 2009). There were no statistical differences between the male and female patients as reported in similar investigations (Rega et al 2006). Most organisms involved in infections of the head and neck are of odontogenic origin and bacteria isolated comprised both of aerobic and anaerobic spectrum. Our study demonstrated a predominance of aerobic bacterial isolates over anaerobes. The most commonly involved sites of infection in our study were the submandibular spaces as reported by others (Eftkharian et al 2009, Suebara et al 2008).

CONCLUSION

It must be emphasized that notwithstanding extensive clinical and microbiological studies, 46.4% of cases remained with unknown origin. With improved medical care facilities available, the rate of unknown origin still warrants further comprehensive investigations to figure out the right causes.

Conflict Of Interest: The authors have no conflict of interest to declare.

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