Original Article

Management of Deep Neck Space Infections in a Tertiary Center in North West Nigeria

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Abstract

Background: Deep neck space infection (DNSI) is a potentially fatal condition that more commonly results from dental and tonsillar infections. Timely intervention is, therefore, crucial when such patients present to the managing physician. **Objective:** The objective of this study is to review the etiology, clinical presentation, and treatment outcome of patients managed for DNSIs over a period of 7 years at National Ear Care Centre, Kaduna. **Methodology:** The record of patients managed for DNSIs over a 7-year period between January 2010 and December 2016 was reviewed. Data obtained included demographic characteristics such as age, sex, occupation, level of education, main presenting symptoms, duration of symptoms, etiology of the DNSI, location of the infection, comorbidity, bacteriology, duration of hospital stay, and type of treatment given. The data were analyzed using the Statistical Package of the Social Sciences version 23.0. **Results:** A total of 55 patients presented with DNSIs, and there were 34 (61.8%) females and 21 (38.2%) males, with a sex ratio of 1.6:1. The age range of the patients was 1–71 years, with a mean age of 30.7 years (standard deviation of 18.1). The most common etiologic factor among these patients was tonsillar-related infection which accounted for 24 (43.6%). The most common symptom at presentation was fever (96.4%), followed by odynophagia (60%). Peritonsillar space infection as seen in 25 (45.5%) patients was the most common region affected, followed by submandibular space infection. Of the 35 (64%) patients who had incision and drainage, *Staphylococcus aureus* was the most common organism isolated in 16 (45.7%), followed by *Streptococcus pneumoniae* (11, 31.4%). Majority (38, 69.1%) of the patients spent <5 days on admission. **Conclusion:** This study shows that oropharyngeal and orodental infections are the most common causes of DNSIs. Educating the populace about orodental health may help in reducing cases of DNSIs in Nigeria.

Keywords: *Deep neck space infection, etiology, Kaduna, outcome, treatment*

Introduction

Deep neck space infection (DNSI) refers to the infection of the potential facial spaces of the neck. The deep cervical fascia divides the neck into these potential spaces within which infections can easily spread.[1] Dental infection is believed to be the most common cause of DNSI.[2] Some studies, however, described tonsillitis as the most common infection in children.[3] DNSIs can lead to potentially fatal complications including mediastinitis, septic shock, jugular vein thrombosis, and airway obstruction.[4,5] Therefore, timely intervention is crucial. Diabetes, HIV immunosuppression, alcoholism, and drug abuse predispose to the development of complications.[6] It has been shown that DNSI requires significant resources in terms of cost of investigations, bed days, antibiotics, and surgery.[7]

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Access this article online

Quick Response Code:

Website: www.nigerianjsurg.com

DOI: 10.4103/njs.NJS_19_19

How to cite this article: Nasir SB, Shuaibu IY, Labaran SA, Inusa A. Management of deep neck space infections in a tertiary center in North West Nigeria. Niger J Surg 2019;25:183-7.

The aim of this study is to review the clinical presentation and treatment outcome of patients managed for DNSI over a period of 7 years at National Ear Care Centre (NECC), Kaduna. NECC is a tertiary health-care facility in North West Nigeria and is a referral center to many primary, secondary, tertiary, and private health facilities in Northern Nigeria.

Methodology

This was a retrospective descriptive study of patients who were managed for DNSI at the NECC, Kaduna, Nigeria. Ethical approval was obtained from the Ethics Review Committee of NECC, Kaduna. The record of patients managed for DNSI over a 7-year period between January 2010 and December 2016 was reviewed. All the patients included had complete clinical evaluation and treatment. Data obtained included demographic characteristics such as age, sex, occupation, level of education, main presenting symptoms, duration of symptoms, etiology of the DNSI, anatomical spaces involved, comorbidity, bacteriology, radiological findings, duration of hospital stay, and type of treatment. Excluded from the study were patients whose case records either were not found or did not have complete information. The data were entered into the spreadsheet and analyzed using the Statistical Package for the Social Sciences version 23.0 software (SPSS Inc., Chicago, Illinois, USA). Quantitative data were summarized as frequencies and percentages and presented as tables. Fisher's exact test was used to determine *P* value and to test statistical significance, which was set at $P < 0.05$.

Results

A total of 66 patients presented with DNSIs within the years under review, but only 55 fulfilled the inclusion criteria, and there were 34 (61.8%) females and 21 (38.2%) males, with a sex ratio of 1.6:1. The age range of the patients was 1–71 years, with a mean age of 30.7 years (standard deviation of 18.1). The most common age group affected was 31–40 years (29.1%). Majority of the patients (30, 54%) have not attained educational status beyond primary school [Table 1]. There was a statistically significant relationship between the occurrence of DNSIs and the level of education (Fisher's exact test, $P < 0.05$). Only eight (14.5%) patients had associated comorbidity, and hypertension was the most common [Table 1].

The most common etiologic factor among these patients was tonsillar-related infection which accounted for 24 (43.6%). It was closely followed by dental infections (21, 38.2%). In up to 8 (14.5%) patients, no known etiologic factor could be found [Table 2].

Table 1: General characteristics of the study population

	Male	Female	Total (%)
Age group (years)			
1-10	5	5	10 (18.2)
11-20	3	2	5 (9.1)
21-30	3	9	12 (21.8)
31-40	5	11	16 (29.1)
41-50	2	3	5 (9.1)
51-60	1	3	4 (7.3)
61-70	1	1	2 (3.6)
71-80	1	0	1 (1.8)
Total	21 (38.2)	34 (61.8)	55 (100)
Level of education			
None	6	16	22 (40)
Primary	4	4	8 (14.5)
Secondary	7	10	17 (30.9)
Tertiary	4	4	8 (14.5)
Total (%)	21 (38.2)	34 (61.8)	55 (100)
Comorbidity			
Hypertension	1	3	4 (7.3)
Diabetes	1	1	2 (3.6)
HIV/AID	1	1	2 (3.6)
Nil	18	29	47 (85.5)
Total (%)	21 (38.2)	34 (61.8)	55 (100)

Table 2: Etiologic factors for the deep neck space infections

Etiology	Number of patients, *n* (%)
Tonsillar infection	24 (43.6)
Dental infection	21 (38.2)
Idiopathic	8 (14.5)
Foreign body impaction	1 (3.6)
Total	55 (100)

Table 3: Symptoms at presentation

Symptoms	Frequency (%)
Fever	52 (96.4)
Odynophagia	32 (60)
Neck selling	29 (52.7)
Throat pain	26 (47.3)
Dysphagia	25 (45.5)
Trismus	4 (7.3)

The most common symptom at presentation was fever (96.4%), followed by odynophagia (60%). Only 4 (7.3%) patients presented with trismus [Table 3].

Peritonsillar space infections as seen in 25 (45.5%) patients was the most common region affected, followed by submandibular space infection (Ludwig's angina) which accounted for 23 (41.8%), as shown in Table 4. An analysis to find if there is a relationship between occurrence of DNSIs and age of the patients was not statistically significant ($P > 0.005$).

Table 4: Spaces of the neck affected in relation to age group among the study patients

Age group (years)	Spaces			Total (%)
	Peritonsillar space	Submandibular space	Parapharyngeal space	
≤18	5	8	2	15 (27.3)
>18	20	15	5	40 (72.7)
Total (%)	25 (45.5)	23 (41.8)	7 (12.7)	100 (100)

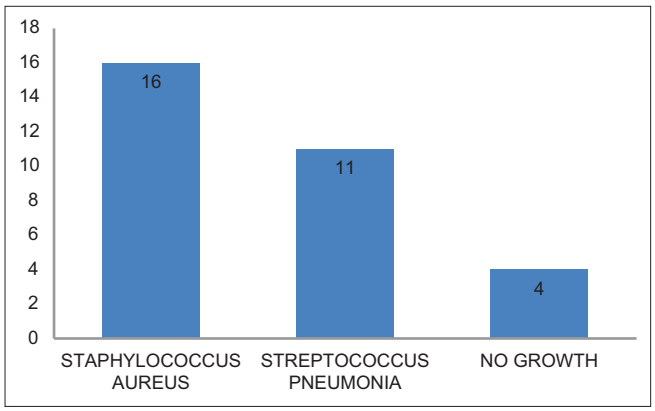

Figure 1: Chart depicting number of patients by the type of organisms isolated among the study patients

Majority (64%) of the patients had incision and drainage with subsequent daily wound dressing. The remaining patients had conservative treatment in the form of intravenous antibiotics.

Of the 35 (64%) patients who had incision and drainage, *Staphylococcus aureus* was the most common organism isolated in 16 (45.7%), followed by *Streptococcus pneumoniae* (11, 31.4%). Culture yielded no growth in 8 (22.9%) patients, as shown in Figure 1.

Majority (38, 69.1%) of the patients managed spent <5 days on admission. Only 7 (12.5%) admitted for >10 days. Leukocytosis was noted in 22 (40%) patients, and there was no statistically significant correlation between leukocytosis and duration on admission. No record of mortality was noted among the patients managed within the period under review.

Discussion

Majority of our patients were between the ages of 21 and 40 years and were mostly female. Tonsillar infection was the most common etiologic factor, and almost all the patients presented with fever. The peritonsillar space was involved in majority of the patients, and *Staphylococcus* was the most common organism isolated.

In this study, the most common cause of DNSI is from tonsillar infections. Although many studies have identified odontogenic as the most common cause of DNSI,[8-10] other studies identified oropharyngeal infections as the most common cause.[7,11,12] Odontogenic infection is the second most common cause of DNSI in this study. Tonsillar infection has also been identified as the most common cause in young patients.[13] The predominance of the younger age groups in our patients, with over 78% being younger than 40 years of age, may explain why tonsillar infection is the most common cause.

Several studies have shown that low socioeconomic status and education predispose an individual to developing DNSI.[14,15] This was also the case in this study as most of the patients have low educational level. Fifty-four percent of our patients have not attained educational status beyond primary school. We found a statistically significant relationship between the occurrence of DNSIs and the level of education.

Fever and odynophagia are the most commonly presenting symptoms among our patients occurring in 96.4% and 60%, respectively. These are closely followed by neck swelling (52.7%). These symptoms are also very common in numerous other studies.[7,13,16,17]

The most affected space in this group of patients is the peritonsillar space. This is in keeping with other studies that reported tonsillitis as the common cause of DNSI. The submandibular space and the parapharyngeal space had 41.8% and 21.7%, respectively. Literature review shows that the peritonsillar and parapharyngeal spaces are the most common sites of DNSI for patient groups having mostly peritonsillitis as a cause, whereas the submandibular space is more commonly affected in studies with odontogenic infection as the most common cause.[7,14,17] Peritonsillar abscess (PTA) has an incidence of 1 in 100,000.[18] However, a higher incidence (30 in 100,000) has been reported in the United States.[19] Although PTA can occur at any age group, it has been reported to be more common among individuals 20–40 years of age,[20] which is the case in our study. PTA can directly extend to the parapharyngeal space through the lymph traversing the superior constrictor muscle.[21] Submandibular space infection usually arises from dental origin and may be associated with extensive edema to the floor of the mouth which can be life threatening.[18] We recorded two patients with retropharyngeal abscess but were excluded from this

study due to incomplete records. We did not encounter cases of parotid abscesses in this study.

Sixty-four percent of the patients had incision and drainage, whereas 36% were managed conservatively with a nonsurgical approach. All the patients managed for peritonsillar infection with incision and drainage including a patient with foreign body (fishbone) subsequently had tonsillectomy. The policy of our center is to perform tonsillectomy on all the patients with a history of PTA as many of them may be lost to follow-up. All patients with dental infection were subsequently referred to dental surgeons for definitive treatment. In established cases of abscess of the deep neck space or those not responding to an intravenous antibiotic, a formal incision and drainage is the best approach.[22,23] Most series have shown majority of the patients as in this study, or sometimes, all patients with DNSI were managed surgically usually through incision and drainage.[8,9,14,16] A few studies, however, reported majority of their patients doing well with medical treatment alone.[24] Various surgical approaches to drain DNSI were described in the literature. In our patients, we used transoral approach to drain abscesses from the peritonsillar and parapharyngeal spaces with good outcome. External approach with through-and-through drain connecting oral cavity and skin of the neck was used to drain submandibular abscess.

Of the 35 cases who had culture of the pus aspirate done, 16 (45.7%) yielded *S. aureus*, 11 (31.4%) yielded *S. pneumoniae*, whereas the rest yielded no growth. Gram-positive cocci are often the most commonly isolated organism in studies of deep neck infections.[8,13,22,25] However, other studies reported mixed infections from aerobic and anaerobic infection to be the most common.[26,27]

About 60% of the patients had leukocytosis, and this is comparable to other studies.[16,17] It was found that the presence of leukocytosis did not influence the duration of admission; this is not surprising as raised white cell count is a nonspecific finding.[28]

Conclusion

This study shows that majority of our patients are younger than 40 years and are mostly female. Oropharyngeal and orodental infections are the most common causes of DNSIs and appear to be associated with low educational level. Fever and odynophagia are the most common symptoms at presentation. The peritonsillar space was involved in majority of the patients, and *staphylococcus* was the most common organism isolated. The prognosis of DNSIs is good if timely intervention is employed. It is important to educate the populace about orodental health to help reduce cases of DNSIs.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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