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Deep Neck Infections: A Case Study of 12-Year

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Abstract: The aim of this retrospective study was investigating the anatomical position and causes of deep neck infections as well as detection of the relation of these variables with age and gender of the patients. In this study, patient with primary deep neck infections referred to ear, nose and throat ward during 1998 to 2009, were studied. After definite diagnosis of infection in head and neck spaces, the exact infection-causing agent and its complications were reviewed. Furthermore, age and sex of patients, co-existing symptoms, bacterial culture results causing the infection, disease background, presence or absence of addiction reviewed and information obtained in the questionnaire were recorded. For comparison Chi-square test was used. The most common cause of deep neck infection, was dental infection in 130 patients [(49%); 78, male; 52, female] followed by tonsillar infection in 44 patients (16.6%). The deep neck infection space types: simultaneous spaces includes sub-mandibular, sub-mental, sub-lingual (Ludwig's angina) in 59 patients (45.4%), then sub-mandibular space in 54 patients (41.5%) and parapharyngeal space in 32 patients (24.6%) were more common. Bacterial culture were done only in 50 patients, of which, 28 cases of bacterial growth occurred. The most common organism was *streptococcus viridians* in 18 patients. The deep neck infections are dangerous and life-threatening that often occurs due to dental infections. Therefore, it seems that promote public knowledge about oral health, to increase the need of dental and treatment centers, timely cure and manage the infections, which play an important role in reducing the deep neck infections.

Key words: Odontogenic infection, deep neck infections, bacterial culture, complications, anatomical spaces

INTRODUCTION

Deep neck infections are potentially life-threatening conditions that continue to occur despite widespread use of antibiotics (Ridder *et al.*, 2005). This disorder may cause otolaryngology emergencies such as foreign body aspiration, foreign body ingestion, otitis media and pharyngocutaneous fistula (Nikakhlagh and Saki, 2003; Saki *et al.*, 2007, 2008a, b, 2009). Before, antibiotic therapy originated, throat and adenoids were the main cause of deep neck infections in 70% of cases, while the dental infection was seen only in

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the 20% of cases (Wang, *et al.*, 2003). Although, the prevalence of neck space infection reduced following the use of new antibiotic and oral hygiene, but still its encounter as an important cause of death of the patients (Larawin *et al.*, 2006). Before, the widespread use of antibiotics in deep neck infection always serious complications and mortality with *streptococcus* in 80% of cases was the main etiologic factor in many infections (Schuster, 2009; Bottin *et al.*, 2003). After starting antibiotics therapy staphylococcus was presented in 20 to 25% of the infectious cases (Wang *et al.*, 2003; Myers *et al.*, 1988). Although, tonsillar infection is the common cause of deep neck infections in children, but in adults the oral hygiene and drugs abuses are the main causes. Other factors can be foreign bodies, trauma, ruptured of the esophagus and abscess of the ears (Larawin *et al.*, 2006; Baqain *et al.*, 2004). Fatal complications include; obstructive upper airway infection, mediastinitis, jugular vein thrombosis, shock and carotid aneurysm. It seems timely prevention and treatment of dental infections play a major role in reducing the prevalence of deep neck infection (Wang *et al.*, 2003; Ovassapian *et al.*, 2005).

To the best of our knowledge there are limited studies about the causes and factors, creating infection, complications, as well as the anatomical location of deep neck infections especially in our area. Herein, this study has been conducted to investigate the anatomical position and causes in different spaces of head and neck. Furthermore, the relationship between deep neck infection with age and sex of patients also was studied.

MATERIALS AND METHODS

In this retrospective study, the records of 314 patients from 1998 to 2009 with the complaint in the face and neck infections, in Imam Khomeini and Apadana Hospitals were analyzed. Forty-five files were excluded due to lack of the proper information and details. The remaining 265 patient's (162 male, 103 female, mean age of 31.9 years) records with deep neck infections were studied. Patients with peri-tonsillar infections and infections arising from the large salivary glands, as well as subjects with abscesses caused by blunt or perforating neck trauma were excluded from the study. The demographic data (age, sex), anatomical position involved in infection, symptoms were collected. Bacteriological cultures were obtained whenever pus was collected. The spaces involved in infection were classified based on the recent and earlier studies (Wang *et al.*, 2002).

The literature was primarily searched through some databases: (PUBMED, OVID, EBSCO, WILEY, SCOPUS, Cochrane and PROQUEST) using a number of reported cases worldwide. Most of the results came from PubMed (64 articles), while Wiley produced 5 results and the Cochrane database did not reveal any results of significant relevance (Table 3). The articles with relevant and significant findings were then adapted and used in this study.

Statistical Analysis

Data were tabulated for descriptive and statistical analysis using the χ^2 -test. The SPSS 8 version 13.0 software was used.

RESULTS AND DISCUSSION

Causes of deep neck infection in have been mentioned in Table 1. The most causes of deep neck infection were with odontogenic origin in 130 (49%) patients followed by throat or tonsillar infection in 44 (16.6%) patients (Table 1). In 11 (4.1%) patients any specific factor

Table 1: Primary factors in deep neck infection in both males and females

Causes	No. (%)		p-value	Total No. (%)
	M	F		
Odontogenic	78 (29.4)	52 (19.6)	<0.05	130 (49)
Tonsillar	26 (9.8)	18 (6.7)	NS	44 (16.6)
Mandibular fracture	18 (6.7)	8 (3.01)	<0.01	26 (9.8)
Infected lymphadenopathy	11 (4.1)	9 (3.3)	NS	20 (7.5)
Drug injection (Addiction)	13 (4.9)	1(0.3)	-	14 (5.2)
Mastoid abscess	4 (1.5)	2 (0.7)	-	6 (2.2)
Foreign body	1 (0.3)	4 (1.5)	-	5 (1.8)
Parotid	2 (0.7)	3 (1.1)	-	5 (1.8)
Infected thyroglossal cyst	3 (1.1)	1(0.3)	-	4 (1.5)
Unknown	6 (2.2)	5 (1.8)	-	11 (4.1)
Total	162 (61.1)	103 (38.9)	-	265 (100)

NS: Not significant

Table 2: The anatomical space in deep neck infection in both males and females

Involved space	No. (%)		p-value	TotalNo. (%)
	M	F		
Ludwig's angina	36(13.5)	23(8.6)	<0.05	59 (22.2)
Sub-mandibular	34 (12.8)	20 (7.5)	<0.05	54 (20.3)
Para-pharyngeal	18 (6.7)	14 (5.2)	NS	32 (12)
Pterygo-mandibular	15(5.6)	12 (4.5)	NS	27 (10.1)
Maseter	11 (4.1)	11 (4.1)	-	22 (8.3)
Buccal	8 (3.01)	12 (4.5)	-	20 (7.5)
Sub-mental	9 (3.3)	7 (2.6)	-	16 (6)
Canine	3 (1.1)	8 (3.01)	-	11 (4.1)
Sub-lingual	6 (2.2)	3 (1.1)	-	9 (3.3)
Retropharyngeal	5 (1.8)	3 (1.1)	-	8 (3.01)
Temporal	2 (0.7)	5 (1.8)	-	7 (2.6)
Total	147(55.5)	118(44.5)	-	265 (100)

NS: Not significant

for deep neck space infection was not found. Swelling was the most common sign observed of infection in 264 patients (99.6%) followed by pain in 259 patients (97.7%), fever in 224 patients (84.5%) and trismus in 98 patients (36.9%). In 265 patients, we could detect a total of 50 causative organisms. There were only 28 positive cultures. The most common isolated microorganism was *Streptococcus viridians* in 18 patients (3/64%) followed by *Staphylococcus aureus* in 5 (17.9%), respectively. The most common causes of deep neck infection, most involved spaces and most common pathogens has been compared and discussed in details based on available literature across the word (Table 3). Table 2 shows the anatomical space in deep neck infection in both males and females. Age distribution of 265 patients with deep neck infections is shown in Fig. 1.

The results of this study were in agreement with previous studies in which deep neck infection was announced due to odontogenic origin (Parhiscar and El-Har, 2001; Meher *et al.*, 2005). As we realized in the available literature the most common odontogenic (Ridder *et al.*, 2005; Yen *et al.*, 2007; Lee *et al.*, 2007; Marioni *et al.*, 2008; Suehara *et al.*, 2008; Eftekharian *et al.*, 2009) following the upper airway infections (Wang *et al.*, 2002; Huang *et al.*, 2004; Rizzo *et al.*, 2006), in few cases drug abuse (Parhiscar and El-Har, 2001) and foreign body (Zheng *et al.*, 2005).

The present study was also, clearly shows that the deep neck infections in men significantly more than women. This finding is not in consistency with findings from earlier studies (Bottin *et al.*, 2003; Meher *et al.*, 2005). Perhaps this is because the women are paying more attention than men to their oral health care and problems during dental infection, so they attempt earlier to go to dental clinics. Earlier studies have shown that patients with major third and fourth life decade represent the most deep neck infections.

Table 3: The available literature and researches about deep neck infection

Most common pathogen	Most common cause	Most common involved space	Mean age (year)	M/F	No. of cases	Duration (year)	Country (reference)
<i>Streptococcus viridians</i> , <i>Staphylococcus epidermidis</i> and <i>Staphylococcus aureus</i>	Odontogenic and drug abuse	Sub-mandibular	35.9	127/83	210	17 (1981-1998)	USA (2001)
<i>Klebsiella pneumonia</i>	Upper airway and Odontogenic	Peri-tonsillar space, Para-pharyngeal space, sub-mandibular space, and retropharyngeal space	41.7	122/62	184	6 (1996-2002)	Taiwan (2002)
<i>Streptococcus viridians</i> and <i>Klebsiella pneumonia</i>	Upper airway and Odontogenic	Para-pharyngeal	49.5	109/76	185	5 (1997-2002)	Taiwan (2004)
<i>Streptococcus viridians</i>	Esophageal foreign body	Sub-mandibular	38.1	34/19	50	5 (1997-2002)	China (2005)
<i>Staphylococcus aureus</i> and <i>S. intermedius</i>	Odontogenic	Para-pharyngeal and sub-mandibular	44.5	131/103	234	8 (1997-2005)	Germany (2005)
<i>Staphylococcus</i> and <i>Streptococcus</i> sp.	Upper airway and Odontogenic	Para-pharyngeal and Sub-mandibular	49.6	95/72	167	8 (1995-2003)	Italy (2006)
<i>Streptococcus viridians</i>	Odontogenic	Sub-mandibular	32.8	32/20	52	10 (1997-2007)	Taiwan (2007)
<i>Klebsiella pneumonia</i> and <i>Streptococcus</i> sp.	Odontogenic	Para-pharyngeal and Sub-mandibular	34.5	89/69	158	9 (1995-2004)	Korea (2007)
-----	Odontogenic	Sub-mandibular	41.3	64/21	85	6 (2000-2006)	Italy (2008)
<i>Staphylococcus aureus</i> and <i>Streptococcus</i> sp.	Odontogenic	Sub-mandibular and Para-pharyngeal	41.65	55/25	80	6 (1997-20003)	Brazil (2008)
Anaerobic <i>Pepto-streptococcus</i> sp.	Odontogenic	Sub-mandibular	28.2	70/42	112	11 (1996-2007)	Iran (2009)
<i>Streptococcus viridians</i> and <i>Staphylococcus aureus</i>	Odontogenic	Ludwig's angina, sub-mandibular and para-pharyngeal	31.9	162/102	265	12 (1998-2009)	Iran (Present study)

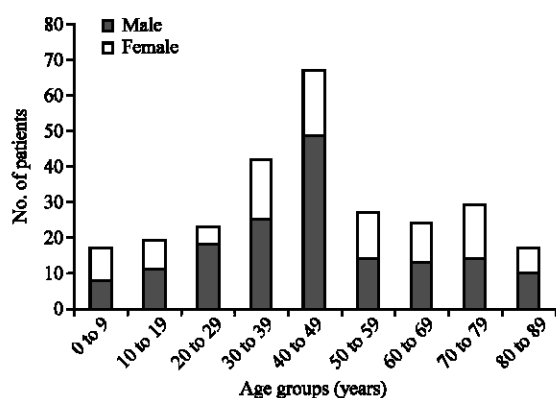


Fig. 1: Age distribution of 265 patients with deep neck infections

In this study, we discovered that patients referred to our hospitals were in the third life decade and this was entirely associated with the infection. In this study, anatomical location of infection in space sub-mandibular and Ludwig's angina were the most common involved parts. In the study conducted by Wang *et al.* (2003), determined that the para-pharyngeal space was the most conflict area. Another study indicated that involvement of para-pharyngeal was more common spaces and Ludwig's angina and sub-mandibular were next (Parhiscar and El-Har, 2001; Meher *et al.*, 2005). Bottins *et al.* (2003) has been reported show that the most common sign of deep neck infection was swelling followed by pain, odynophagia, dysphagia and trismus. Some studies reported that pain is the most common complication of infection in all patients followed by dysphagia and trismus as second and third complications (Meher *et al.*, 2005; Huang *et al.*, 2004).

CONCLUSION

In the present study, the most common complication was swelling followed by pain. The result is that the deep neck infections are dangerous and often life-threatening infections. Therefore, appears that increased public knowledge about oral hygiene, dental centers, timely treatment and correct dental infections play an important role in reducing deep neck infections and the complication.

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