ORIGINAL ARTICLE

Deep Neck Space Infections: A Profile of Fifty Nine Cases

Parmod Kalsotra, Rohan Gupta, Tania Nazir, Nitika Gupta, Om Prakash, K.P Singh

Abstract

The present study was undertaken to analyse our experience with deep neck space infections and emphasize the importance of patient presentation, radiologic evaluation and early diagnosis and appropriate management. The records of 59 patients treated for deep neck space infections were evaluated. Odontogenic infections (35.59%) were found to be the most common cause of deep neck space infections followed by tonsillar infections (20.33%). Pain, fever, neck swelling and odynophgia were the most common clinical presentations. Radiological investigations were performed in all the patients (100%) while contrast enhanced CT - scan was performed in 35 patients (59.32%). The most commonly involved sites were the submandibular space and the parapharyngeal space, involving 14 patients and 11 patients respectively. All the patients (100%) were on intravenous antibiotics and fluids. Surgical intervention was done in 47 patients (79.66%) whereas 12 patients (20.33%) improved with conservative medical management alone. Despite the wide use of antibiotics, deep neck space infections are commonly seen. Early clinical and radiological diagnosis and appropriate management help to prevent the development of life threatening complications. Surgical drainage forms the mainstay of treatment, conservative medical therapy is also effective in selective cases.

Key Words

Deep Neck Space Infections, Odontogenic Infection, Submandibular Abscess, Parapharyngeal Abscess

Introduction

Deep neck space infection is infection in the potential spaces and facial planes of the neck, either with abscess formation or cellulitis (1).The layers of the cervical fascia create various potential spaces that can be involved by infection. These spaces can be categorized by location, as being: a) in the face: the buccal, canine, masticator, and parotid spaces; b) in the suprahyoid neck: the peritonsillar, submandibular, sublingual, and lateral pharyngeal spaces; c) in the infrahyoid neck: the anterior visceral space and; d) extending the length of neck: the retropharyngeal, prevertebral, and carotid sheath spaces (2).The incidence of this disease was relatively high before the advent of antibiotics(3). Antibiotics and improved diagnostic techniques resulted in a significant decrease in the occurrence and the progression of this disease. However, when not diagnosed and treated appropriately, these infections progress rapidly and are associated with high morbidity and mortality. In the preantibiotic era, most common deep neck space infections arose from tonsillitis or pharyngitis (4,5) but today dental infections are the most common cause of deep neck space infections (6-8). Septic shock is associated with a 40-50% mortality rate (9, 10). Furthermore, suppurative thrombophlebitis of the internal jugular vein associated with pulmonary septic embolism, thrombosis of the cavernous sinus and erosion of the carotid artery have been reported (11). Management of deep neck space infections is based on prompt surgical drainage of purulent abscesses through an external approach or non surgical treatment on the basis of appropriate antibiotics (12).

Material and Methods

This study is an analysis of 59 patients admitted to Department of Otorhinolaryngology and Head & Neck surgery, SMGS hospital, GMC Jammu. Data collection involved demography, the clinical presentation of the disease, the duration of hospital stay, laboratory examination, site of deep neck space infection, the etiology, the treatment and the complications.

Results

In the present study of 59 patients there were 37 (62.71%) male and 22 (37.28%) female patients, with a male to female ratio of 1.68/1. The age range was 3 - 67

From the Deptt. of ENT, Head and Neck Surgery, SMGS Hospital, Shalamar Road, Government Medical College, Jammu-India
Correspondence to : Dr Parmod Kalsotra Professor, Deptt. of ENT, Head and Neck Surgery, SMGS Hospital, GMC, Jammu, 180001-India

years (*Table-1*). Out of the 59 patients, 16 patients (27.11%) had diabetes with 7 patients on oral hypoglycemic and 9 patients having uncontrolled serum sugar levels. Tobacco chewing was present in 12 patients (20.33%) while 9 patients (15.25%) had smoking habit, all these 21 patients (35.59%) had poor orodental hygiene.

The symptoms of DNI were pain in all 59 patients (100 %) followed by fever in 48 patients (81.35%), neck swelling in 39 patients (66.01%), odynophagia in 26 patients (44.06%), trismus in 24 patients (40.67%), dysphagia in 23 patients (38.98%), dental pain in 18 patients (30.50%), bad breath in 16 patients (27.11%)and restricted neck movements in 9 patients (15.25%).Dysphonia, dyspnea and otalgia were present in 6 patients each (10.16%) with draining fistula in neck in 3 patients (5.08%) (*Fig 1*). Complete blood counts were done in all the 59 patients. The mean total Leucocyte count was 15,800 cells/mm3, with 17 patients (28.81%) having counts > 18,000 cells/ mm3. Radiologic evaluations were performed in all the patients to identify the site, extent and the character of infection. X-ray soft tissue neck were done in all the 59 patients (100%), CECT neck was performed in 35 patients (59.32%), Orthopantogram was done in 11 patients (18.64%), USG Neck was done in only 3 patient (5.08%) while MRI was not done in any of the patients. The results of bacterial culture were positive in 14 patients (36.84%) out of the 38 patients whose samples were sent for culture. The cultures of 12 patients (31.57%) were polymicrobial with streptococcus viridans and staphylococcus aureus predominating in almost all the cases.

Based on the clinical and radiological data the causes were identified in 48 patients (81.35%). In 21 patients (35.59%), dentoalveolar infection came out to be the most important cause followed by tonsillar infection in 12 patients (20.33%). Salivary gland infection was found as a cause in 9 patients (15.25%) while parotid and skin infection were identified in 3 patients (5.08%) each. The cause remained unclear in the remaining 11 patients (18.64%) (*Table 2*).

According to clinical, surgical and radiological findings 42 (71.18%) patients had one space involved. The most common one involved site was the submandibular space with 14 patients (23.72%) followed by the parapharygeal space with 11 patients (18.64%). The peritonsillar space was involved in 9 patients (15.25%). Parotid space and retropharyngeal space were involved in 3 patients (5.08%) each while pretracheal and caroid space infection involvement were seen in 1 patient (1.69%) each. In 17 patients (28.81%) the infection involved more than one space, out of which 9 patients (15.25%) were evaluated as ludwig's angina (simultaneous involvement of sublingual, submandibular and submental spaces) and remaining 8 patients (13.55%) had involvement of both submandibular and parapharyngeal spaces (*Fig 2*).

Conservative treatment in the form of Intravenous fluid therapy to maintain hydration along with broad spectrum Intravenous antibiotics covering both aerobic and anaerobic infections were started in all the patients on the basis of culture report and sensitivity. Antipyretics to control fever, analgesics to reduce pain and inflammation, mouth wash to maintain oral hygiene and intravenous steroids to control edema and dyspnea, if present were also prescribed to the patients. Surgical drainage was performed in 47 patients (79.66%) with 12 patients (20.33%) treated with conservative medical therapy alone. Surgical drainage was performed both by means of transoral (peritonsillar abscess) and external approach. When surgical drainage was indicated both the primary space involved and the secondary compartments where the infections had spread were properly drained with an incision which was large enough to permit ample exposure and had loosened and well retracted flaps. As the anatomic relations were distorted by inflammation and edema, safe surgical intervention relied on fixed surgical landmarks (eg. Tip of greater cornu of hyoid bone, cricoid cartilage, the styloid process). Surgical drainage to external approach were based on identification of the carotid sheath. After culture for both aerobic and anaerobic bacteria was taken, copious irrigation with saline was done followed by insertion of well placed penrose drains. The drains were advanced over several days and were removed when local and general signs of inflammation and sepsis had disappeared. Patients with abscesses caused because of odontogenic factors were referred to department of Oral and Maxillofacial Surgery, Government Dental College, Jammu for further evaluation and management. The duration of hospital stay varied from 2 - 21 days. There were 7 patients who developed life threatening complications. 6 patients (10.16%) developed upper airway distress, out of these 3 patients had ludwig's angina, 2 patients had parapharygeal abscess while 1 patient had retropharyngeal abscess. All the 6 patients underwent a temporary tracheostomy. 1 patient (1.69%) developed thrombosis of internal jugular vein (Lemierre's syndrome) (*Fig 3*) for which heparin anticoagulation was also done in addition to the medical and surgical treatment .

Discussion

Deep neck space infection describes the infection developing within or spreading into the deep cervical spaces and should always be distinguished from the infection involving skin and superficial structures of neck.

The results of the present study were compared with those in the literature (1-27).The mean age that was affected most by infection in the literature varied from 36-57yrs (4,9,10,16-20) which was similar to our findings.

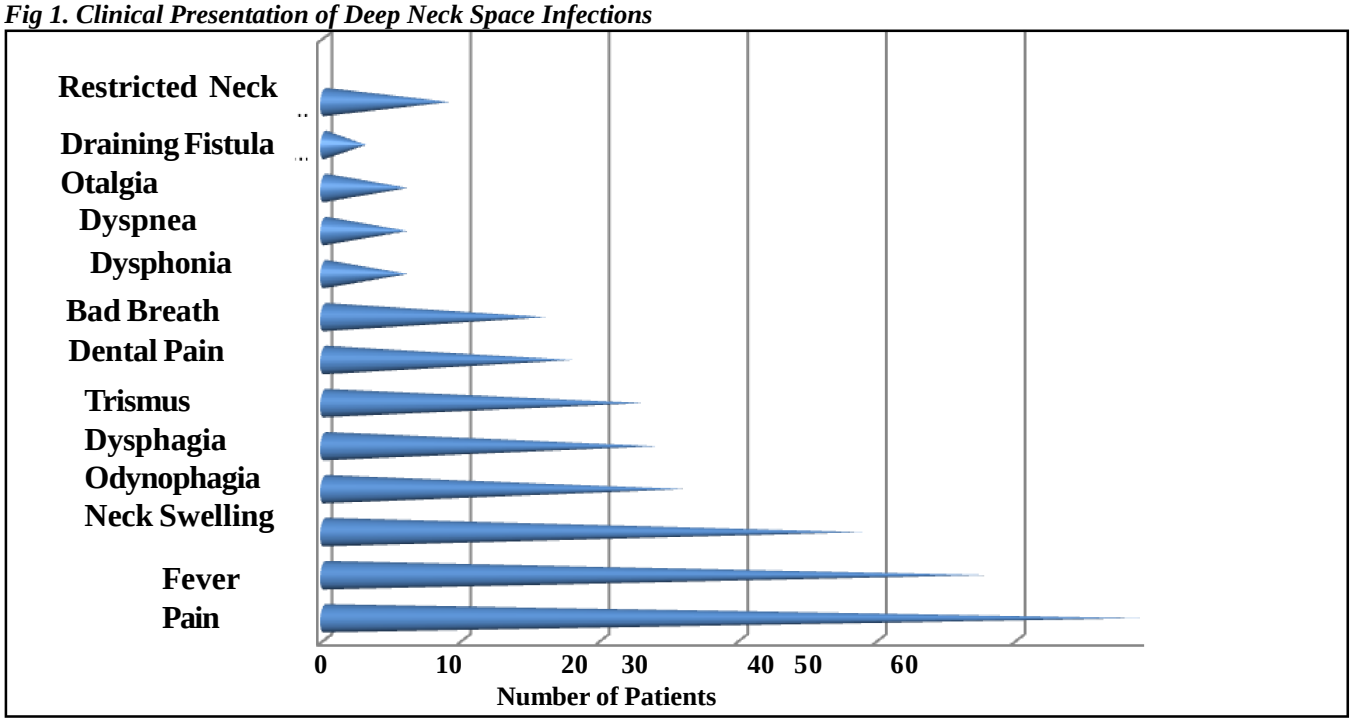
Table 1. Distribution According to Age

Age group (years)	Number of patients
0 – 10	5
11 – 20	3
21 – 30	9
31 – 40	14
41 – 50	11
51 – 60	9
61 – 70	8

Table 2. Distribution of Etiology

Etiology	Number of patients
Odontogenic infection	21
Tonsillar infection	12
Salivary gland infection	9
Parotid infection	3
Skin infection	3
Unknown	11

Fig 1. Clinical Presentation of Deep Neck Space Infections



The disease was more common in males in the present study and the same was reported by many authors (4,16-18,21).Tobacco chewing, smoking were the commonly associated social habits.

The commonly found systemic disease was Diabetes and the present study found a higher incidence (27.11%) as compared to literature incidence of 16-20% but our findings were consistent with Huang *et al* (6) who reported 30.3% incidence. The present study has not shown association with intravenous drug abuse, chemotherapeutic treatment, trauma, renal insufficiency, autoimmune disease, or HIV infection, which were described in some of the studies (6, 7). Poor dental hygiene has emerged as an important cause of Deep Neck Space Infection as reported in literature (23,24) and similar findings were seen in the present study.

The clinical presentation of infection was pain, swelling neck, odynophagia, dysphagia and trismus and was similar to reported literature (7, 8, 12). Fever (81.35%) and Leukocytosis were seen in most of the patients but neither fever nor leukocytosis are constant finding in Deep Neck Space Infection (8). Although the frequency of dyspnea is not common relatively than the other symptoms, the presence of dyspnea may be a sign of serious complications (22).

Bacterial culture was positive in 14 patients (36.84%) out of 38 patients whose samples were sent for culture and most of them were polymicrobial. Streptococcus viridans and staphylococcus aureus predominated in almost all the cases and these findings were consistent with the literature (4,11,18). There was no growth in 24 cultures and the rate was high as compared to other studies (27-40%) (18,21). Contrast enhanced CT Scan

Fig 2. Distribution of Involved Spaces and Sites

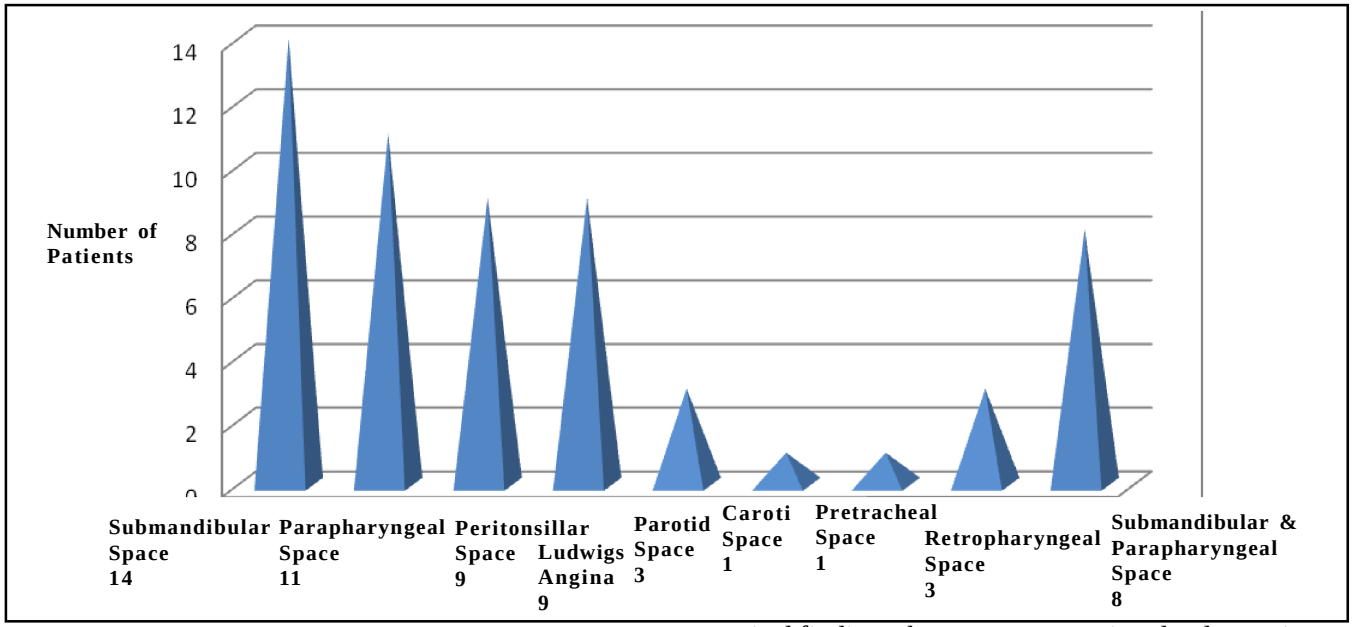
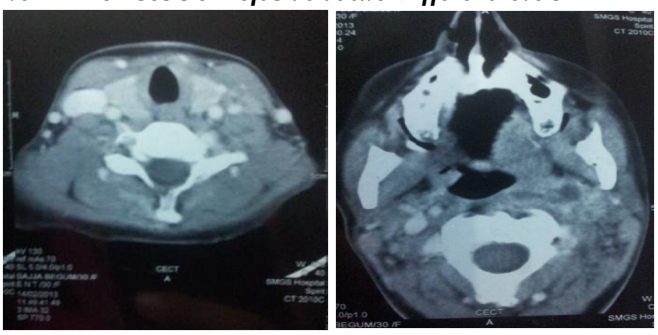


Fig 3. CECT Neck, Axial view Showing Internal Jugular Vein Thrombosis on left side at two Different levels



is highly sensitive (91%) and very useful to identify the extent of the Deep neck infections and distinguish cellulitis from abscess (5). CECT helps to decide whether surgical intervention is indicated (27). In the present study Contrast enhanced CT scanning was performed in 35 (59.32%) patients.Deep Neck Space Infection originate from variety of sites in the Head and Neck, these include the teeth, the salivary glands, lymphoid tissue and the tonsils. The teeth were the most common primary site (31-80%), followed by tonsils (1.5-3.4%) in most of the studies (3,4,16-18,20,21). The latter was more frequent in children (25,26). Dentoalveolar infections were the most important cause in the present study (35.59%) followed by tonsillar infection (20.33%). The cause remained unclear in 11 patients (18.64%), notwithstanding a detailed clinical history, physical examination, laboratory examination and radiological studies. This is in accordance with other studies (4,17,18) which reported 16-39% proportion of unknown origin. Based on the clinical, radiological and surgical findings the most common involved areas in our study was the Submandibular space followed by the parapharyngeal space which is consistent with most of the past studies (5,8).

According to our group and most investigators worldwide, management of deep neck space abscess has usually been based on prompt surgical drainage of purulent abscess through an external approach (1,4-8) on the contrary Plaza Mayor *et al* (12) suggested broad spectrum intravenous antibiotics and high-dosed oral or intravenous corticosteroids for almost all patients with any DNI. In the present study 12 (20.33%) patients were treated with medical therapy alone and in remaining 47 (79.66%) patients surgical procedures were required in addition to medical management. Whenever a deep neck space infection patient is admitted, empirical antibiotic therapy should be started before the culture reports are available. Empirical antibiotic must cover gram-positive, gram-negative, aerobic and anaerobic pathogens (13). In the present study third generation cephalosporin plus metronidazole combination was used in most of the cases. If required, the antibiotics were modified depending upon culture and sensitivity report. In addition to antibiotics, supportive medical treatment was provided in the form of intravenous fluids, antipyretics, analgesics and mouth wash to take care of complaints of odynophagia, fever, pain, inflammation. Even intravenous steroids were used in some of the patients having dyspnea. The decision of medical treatment versus medical and surgical treatment was taken on the basis of clinical presentation, radiological evidence, presence of complications and repose to antibiotics in the first 48 hours. In patients with significant

abscess formation seen on CT, early open surgical drainage is the most appropriate method of treating a neck infection (6). Surgical exploration may also be required when there is airway compromise, clinical signs of sepsis occur or if there is poor response to antimicrobial therapy within the first 48 hours (8,13,23).

The main life threatening complications include descending mediastinitis, respiratory obstruction, pleural effusion, pneumonia, pericarditis, jugular vein thrombosis, venous septic emboli, carotid artery rupture, hepatic failure, adult respiratory distress syndrome, septic shock and disseminated intravascular coagulopathy (6,7). In the present study the complications were airway distress in 6 patients and thrombosis of internal jugular vein in 1 patient. All the 6 patients who developed difficulty breathing required tracheostomy. In our study the duration of hospital stay varied from 2-21 days which was similar to that reported in literature (7). No death was reported in the present study because of deep neck space infections and this was consistent with Marioni *et al* (13). Despite the decrease in death rate, complications of deep neck space infections should not be underestimated (22).

Conclusion

Deep neck space infections are common. Odontogenic and tonsillar causes are the most common factors involved in the etiology with parapharyngeal and submandibular spaces being the most frequently involved sites. Clinical presentation and CECT-scan provide valuable information. Although surgical drainage is the main stay of treatment in deep neck space infections, conservative medical therapy is also helpful in some cases. The combination of appropriate antibiotics, securing the airway and surgical drainage are the cornerstones of treatment.

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