Original Article

Deep Neck Abscess: Our experiences at a Tertiary Care Teaching Hospital of Eastern India

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Abstract

Background: Deep neck abscess is a life-threatening clinical entity. It can result in significant morbidity for the patients. Deep neck abscess continues to be commonly found in developing countries like India. **Methods:** A retrospective study was conducted at tertiary care teaching hospital in eastern India from September 2016 to October 2021. The medical records of patients diagnosed with deep neck abscesses with an age range between 18 years and 65 years were reviewed. This study analyzes the etiology, clinical manifestations, diagnosis, and treatment of the deep neck abscess. **Results:** There was a predominance of male patients with deep neck abscesses (62.12%) and a mean age of 32.4 years. The most common clinical manifestation was fever (26.51%), followed by odynophagia (23.48%), neck swelling (20.45%), restricted neck movement (13.63%), otalgia (12.12%), trismus (11.36%), neck pain (10.60%), and stridor (2.27%). The peritonsillar abscess (28.78%) was the most commonly affected space of the deep neck abscess of this study. The important life-threatening complication in this study was stridor (2.27%). **Conclusion:** Early diagnosis, aggressive surgical intervention, and proper airway management are important factors for reducing the morbidity and mortality associated with deep neck abscesses.

Keywords: Deep neck abscess, parapharyngeal abscess, peritonsillar abscess, retropharyngeal abscess, stridor

Introduction

Deep neck infections often affect the potential neck spaces and fascial planes of the neck and result in cellulitis or abscess formation.[1] Deep neck infection or abscess may lead to a serious and potentially life-threatening situation.[2] Untreated deep neck abscess can rapidly spread and result in airway obstruction, jugular vein thrombosis, mediastinitis, osteomyelitis, cranial nerve dysfunction, meningitis, and even death.[3] However, with improved diagnostic techniques, widespread availability of antibiotics, and early surgical intervention, the mortality rate due to deep neck abscess has reduced significantly in comparison to earlier reports.[4] However, deep neck abscesses are more common in older patients with systemic diseases.[5] The deep neck abscess usually involves the neck spaces which include parapharyngeal space, retropharyngeal space, peritonsillar space, submandibular space, and parotid space.[6] The complexity of the neck spaces makes diagnosis and exact localization of the abscess may be difficult. The complications of deep neck abscesses may result in the death of the patients. Despite the wide use of antibiotics, patients with deep neck abscesses should not be ignored. Many times, the clinical confirmation of the deep neck abscess is difficult as it may not be appreciated by palpation or inspection. The deep neck abscess may contribute to major health-care expenditure and morbidity of the patients.[3] Early diagnosis of deep neck abscesses with help of proper clinical assessment and imaging, followed by prompt treatment is crucial for managing such infections. During surgical intervention for deep neck abscesses, securing the airway is often challenging for anesthesiologists and otolaryngologists. Here, this study aims to assess the deep neck abscess including etiology, clinical presentation, diagnosis, and treatment.

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Methods

This retrospective study was conducted at the Department of Otorhinolaryngology and head-and-neck surgery of a tertiary care teaching hospital in eastern India between September 2016 and October 2021. The medical records of the patients with deep neck abscesses aged between 18 years and 65 years were analyzed retrospectively. This is an observational descriptive study. The categorical variables are presented as frequencies and percentages. This study was approved by the institutional ethics committee with reference number IMS/SOAU/14/22.03.2016. The consent from the patients was taken for this study. Deep neck abscess was established in the collection of the pus found at the potential spaces and fascial planes of the neck. Superficial cellulitis, limited intraoral abscess, cervical necrotizing fasciitis, and infection secondary to a surgical neck injury or penetrating injury were excluded from this study. Those patients who did not complete the treatment were also excluded from this study. There were 132 patients included in this study. Their etiology, associated systemic disease, bacteriology, treatment options, duration of the hospital stay, any complications, and outcomes were analyzed. The confirmation of the abscess was confirmed by computed tomography (CT) scan, needle aspiration, or surgery. Different neck spaces involved with abscess were confirmed by CT scan. All the patients were investigated by contrast-enhanced CT scans of the neck. The exact location of the deep neck space abscess was identified as the anterior triangle, posterior triangle, parapharyngeal space, retropharyngeal space, parotid space, submandibular space, and peritonsillar space. The site of the abscess was identified by imaging or surgical findings. The patients with deep neck abscesses presenting with complications were analyzed. The medical and surgical treatment of each patient was analyzed. The culture and sensitivity of the pus from the deep neck abscess were documented. Patients' outcome was analyzed based on the resolution of the abscess, hospital stay period, complications, and requirement of further surgical procedure. The Statistical package for the social science (SPSS) Statistics for Windows, version 20, was used for all statistical analyses (IBM-SPSS Inc., Chicago, IL, USA).

Results

Out of 132 patients with deep neck abscesses, 82 (62.12%) were male and 50 (37.87%) were female with a male-to-female ratio of 1.64:1. All of them are adult patients within the range of 18 years to 65 years with a mean age of 32.4 years. The age distribution of the patients is given in Table 1. The peritonsillar abscess (28.78%) was the most commonly affected space of the deep neck abscess of this study followed by parapharyngeal abscess [Figure 1] (21.96%), retropharyngeal abscess (15.90%), submandibular space abscess (15.15%), parotid abscess (14.39%), and thyroglossal cyst abscess (3.78%) [Table 2]. The causes of deep neck abscess were identified in 120 (90.09%) patients whereas idiopathic in 12 (9.09%) patients [Table 3]. Peritonsillitis was

Figure 1: An adult lady presenting with left side parapharyngeal abscess

the most common source of infection in 27 patients (20.45%) followed by odontogenic infection (19.69%), upper airway infection (13.63%), submandibular sialadenitis (9.09%), parotitis (8.33%), tubercular infection (14.39), and infection of the thyroglossal cyst (5.30%) [Table 3]. Forty-one patients (%) had the underlying systemic disease. Out of 41 patients with systemic diseases, 29 (21.96%) had diabetes mellitus, 4 (3.03%) had uremia or chronic renal failure/insufficiency, 3 (2.27%) with liver diseases/cirrhosis, 3 (2.27%) patients with myelodysplastic syndrome, and 2 (1.51%) patients with malignancy in head-and-neck region receiving chemotherapy treatment [Table 1]. In this study, the most common clinical manifestations were fever (26.51%), followed by odynophagia (23.48%), neck swelling (20.45%), restricted neck movement (13.63%), otalgia (12.12%), trismus (11.36%), neck pain (10.60%), and stridor (2.27%) [Table 4]. In all cases of deep neck abscess, pus was sent for cultures either during surgery or needle aspiration. Out of 132 patients, no growth was seen in 11 cases, and growth of bacteria was found in 121 cases. The cultures of the 10 (7.57%) patients were polymicrobial. The most common organism was *Streptococcus viridans* (19.69%) and followed by *Staphylococcus aureus* (18.93%), *Streptococcus pyogenes* (15.90%), and *Klebsiella pneumoniae* (11.36%) [Table 5]. Blood cultures were sent from patients with systemic symptoms such as fever or chills. Of these 42 (31.81%) available results, only 7 (5.30%) were positive.

All patients with deep neck abscesses underwent surgical drainages and received antimicrobial therapy. Out of 132 patients, 11 showed complications. Out of 11, 3 (2.27%) showed airway obstructions for which they underwent tracheostomies. Mediastinitis was found in 3 (2.27%) patients, 2 (1.51%) showed gastrointestinal bleeding, 2 (1.51%) developed pneumonia during the treatment period. Diabetes mellitus-related complications developed in 2 (1.51%) patients with hyperosmolar nonketotic hyperglycemia and 1 (0.75%) with diabetic ketoacidosis. One patient (0.75%) died because of sepsis.

Table 1: Details demographic profile of patients with deep neck abscess

Profile of patients	Number of patients (%)
Male	82 (62.12)
Female	50 (37.87)
18-30	42 (31.81)
31-50	63 (47.72)
51-65 years	27 (20.45)
Diabetes mellitus	29 (21.96)
Chronic renal disease	4 (3.03)
Liver disease	3 (2.27)
Myelodysplastic disorder	3 (2.27)
Malignancy	2 (1.51)

Table 2: Types of deep neck abscess

Types of deep neck abscess	Number of patients (%)
Peritonsillar abscess	38 (28.78)
Parapharyngeal abscess	29 (21.96)
Retropharyngeal abscess	21 (15.90)
Submandibular abscess	20 (15.15)
Parotid abscess	19 (14.39)
Thyroglossal cyst abscess	5 (3.78)

Table 3: Etiology of deep neck abscess

Etiology	Number of patients (%)
Peritonsillitis	27 (20.45)
Odontogenic	26 (19.69)
Upper respiratory tract infection	18 (13.63)
Submandibular sialadenitis	12 (9.09)
Parotitis	11 (8.33)
Tuberculous	19 (14.39)
Infection of thyroglossal cyst	7 (5.30)
Idiopathic	12 (9.09)

Table 4: Clinical presentations of deep neck abscess

Clinical presentations	Number of patients (%)
Neck swelling	27 (20.45)
Fever	35 (26.51)
Odynophagia	31 (23.48)
Neck pain	14 (10.60)
Restricted neck movement	18 (13.63)
Trismus	15 (11.36)
Ear pain (otalgia)	16 (12.12)
Stridor	3 (2.27)

Discussion

Deep neck abscess is a life-threatening clinical condition found in otorhinolaryngology and head-and-neck practices. It may result in serious complications because of rapid spread and compromise of the airway, mediastinitis, and septic shock.[7] Hence, it often poses a challenge to clinicians, particularly otolaryngologists. In deep neck abscesses, the bacteriologic pattern is often polymicrobial, including aerobes, microaerophilic, and anaerobes.[8] The most common microorganisms seem to be aerobic *S. viridans*, *h-hemolytic streptococci*, *Staphylococcus*, *K. pneumoniae*, anaerobic Bacteroides, and *Peptostreptococcus*.[9] In this study, the bacterial cultures of the abscess showed 10 (7.57%) patients were polymicrobial. The most common organism was *S. viridans* (19.69%) and followed by *S. aureus* (18.93%), *S. pyogenes* (15.90%), and *K. pneumoniae* (11.36%). Infections in the deep neck space include infections of the deeper tissues in the neck which are covered by several layers of the deep cervical fascia along with potential spaces between them. Infections in the potential fascial planes of the neck are described as deep neck infections.[10] The anatomy of the neck is complex and consists of several spaces which are interconnected to each other. Lymphatic drainage of the oral cavity, facial area, superficial compartment of the neck occurs to deep neck spaces, so infections in this area result in cervical lymphadenopathy.[10] Suppurative changes may happen due to cervical lymphadenopathy. Penetrating type of injury to the neck can result in infection of the neck spaces and lead to abscess formation. The abscess in the neck spaces can spread through fascial planes and potential neck spaces in between the different layers of the deep cervical fascia. The drainage of the abscess from different deep neck spaces is usually complex as the neurovascular structures are in proximity to the spaces and communications to the other parts of the body like the mediastinum and coccyx.[11] Tonsillar and peritonsillar infections were common sources for deep neck infections before the antibiotic era, however, odontogenic infection is the common source of infection in the present days.[4] One study documented that tonsillar infection is the most common etiology for deep neck infection and abscess in the pediatric age group, whereas odontogenic infection is the most common etiology for deep neck space infections in adults.[12] Odontogenic infections usually spread from mandible or maxilla to sublingual, submandibular, or masticatory spaces, which directly spread into the parapharyngeal space.[13] In this study, peritonsillitis was the most common source of infection in 27 patients (20.45%) followed by odontogenic infection (19.69%), upper airway infection (13.63%), submandibular sialadenitis (9.09%), parotitis (8.33%), tubercular infection (14.39%), and infection of the thyroglossal cyst (5.30%).

The clinical manifestations of deep neck abscess depend on the mass effects of inflamed tissues or the presence of abscess and direct involvement of the surrounding structures of the neck. Patients with deep neck abscesses often present with a sore throat, neck swelling, ear pain, dysphagia, odynophagia, fever, trismus, and air obstruction. Neck swelling was the most common symptom in this study. The most important life-threatening clinical manifestation is stridor because of airway compromise.[14,15] The patients with quinsy or peritonsillar abscesses usually present with odynophagia, fever, trismus, enlargement of the tonsils, and deviation of the uvula. In this study, the most common clinical manifestation

Table 5: Identification of bacteria in deep neck abscess

Causative bacteria	Number of patients (%)
S. viridans	26 (19.69)
S. aureus	25 (18.93)
S. pyogenes	21 (15.90)
Streptococcus species other than pyogenes	18 (13.63)
Klebsiella pneumoniae	15 (11.36)
Polymicrobial infection	10 (7.57)
MRSA	2 (1.51)
Anerobes	4 (3.03)
No growth	11 (8.33)

S. viridans: Streptococcus viridans, S. aureus: Staphylococcus aureus, S. pyogenes: Streptococcus pyogenes, K. pneumonia: Klebsiella pneumonia, MRSA: Methicillin-resistant *S. aureus*

was fever (26.51%), followed by odynophagia (23.48%), neck swelling (20.45%), restricted neck movement (13.63%), otalgia (12.12%), trismus (11.36%), neck pain (10.60%), and stridor (2.27%). The knowledge of clinical manifestations in deep neck abscesses will surely alert the clinicians for getting early diagnosis and treatment without manifestations life-threatening complications.

The important investigations in deep neck abscess include X-ray of the neck with the lateral view, ultrasonography, and CT scan of the neck.[16] A CT scan with contrast is helpful to find the presence of air, which indicates an abscess. CT scan is also useful to differentiate the retropharyngeal adenitis from the retropharyngeal abscess, which avoids unnecessary surgical interventions. A contrast-enhanced CT scan has 64%–100% sensitivity for establishing the extent and characteristics of the deep neck abscess.[16] If a deep neck abscess spread rapidly, the preoperative CT findings may underestimate the risk of a difficult airway.[17] The location of the abscess in the neck has more impact on the anatomy of the airway than its size alone, which are critical factors to secure the airway in deep neck abscess.[18]

The management of the deep neck abscess is often challenging to the clinicians and should be done by a multidisciplinary approach.[19] There is no such gold standard and established treatment option for deep neck abscess of the patients. The treatment option usually includes appropriate antibiotics with proper durations and doses along with appropriate surgical intervention.[20] The treatment of deep neck abscess includes surgical drainage of the abscess with securing of the airways and antimicrobial therapy. Early open surgical drainage is the most appropriate treatment method for managing deep neck abscesses. If there is a minimal abscess with no impending complications, conservative management may be tried. In the case of deep neck abscess of patients with diabetes mellitus, control of their blood glucose is important for spreading the infection.[21]

In deep neck abscess, life-threatening complications such as upper airway obstruction, jugular vein thrombosis, descending mediastinitis, venous septic emboli, carotid artery rupture, and respiratory distress syndrome, septic shock, and disseminated intravascular coagulopathy.[22] If a deep neck abscess spread toward the mediastinum, the chance of mortality increases.[23] The propensity toward mediastinitis is commonly associated with retropharyngeal abscess. Fatal pyothorax occurs due to secondary involvement of pleura following mediastinitis may be seen massive acute retropharyngeal abscess.[24] Complications such as cavernous sinus thrombosis have been documented in patients with parapharyngeal abscess.[25] Sometimes, vascular complications are found because of the extension of deep neck abscess into vascular space which results in a life-threatening situation. Further spread of abscess into the mediastinum can occur through the carotid sheath (Lincoln highway).[26] One study suggested that rupture of a major artery in the neck secondary to deep neck abscess has a mortality rate of 20%–40%, regardless of the treatment provided.[27] Another study reported endovascular occlusion of a carotid pseudoaneurysm in a pediatric patient with a deep neck abscess.[28] A similar type of study described a case of carotid artery erosion in a 4-year-old child following parapharyngeal space infection which was successfully managed by carotid ligation.[29] The advent of modern antibiotics and surgical methods has resulted in minimal complications and death following deep neck abscess. However, lack of infrastructure at the primary health-care level particularly in developing and underdeveloped countries is the cause of complications due to deep neck abscess. The unhygienic living conditions in urban slums and lack of awareness among patients lead to a higher incidence of deep neck abscesses. A significant amount of money, manpower, and resources can be saved by enhancing the quality of primary health-care standards. Higher levels of literacy and awareness about deep neck abscesses among the public can decrease the number of deep neck abscesses associated with other diseases. The cost of prevention of deep neck abscess is much lower than that of care, and this is more relevant in developing and underdeveloped countries.

Conclusion

Deep neck abscess is often challenging to clinicians and otolaryngologists. Although administration of broad-spectrum antibiotics in routine clinical practice decreases the incidence of deep neck abscess, it is still a relevant problem in pediatric and immunocompromised patients. Close attention should be given to the patients with deep neck abscess as they may land in life-threatening conditions like airway obstruction. Appropriate management of the deep neck abscess includes a combination of early surgical interventions and systemic antibiotics. The primary preventive measures include avoidance of deep neck space infections with awareness for dental and oral hygiene and improving body immunity for preventing upper respiratory tract infections.

Limitation of the study

The limitation of this study is the small sample size because of the low prevalence of deep neck abscess in the clinical practice, retrospective study design, and performing study at

a single medical institute. Further studies may be required to cover basic research, multicentric, and prospective studies with the evaluation of different characteristics of the patients with deep neck abscess for overcoming these limitations.

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Conflicts of interest

There are no conflicts of interest.

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