

Deep Neck Space infections in Immunocompromised Patients: A Case Series

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Submission: September 19, 2015; Published: September 23, 2015

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Abstract

Deep neck infections (DNIs) are unique among infectious diseases for their versatility and potential for severe complications and is life threatening, particularly when associated with certain immunocompromised states. Complex head and neck anatomy often makes early recognition of DNIs challenging, and a high index of suspicion is necessary to avoid any delay in treatment. Aggressive monitoring and management of the airway is the most urgent and critical aspect of care, followed by appropriate antibiotic coverage and surgical drainage, when needed.

Keywords: Deep neck infections; Parapharyngeal abscess; Odontogenic infection; Sjogren's syndrome; Immunocompromised

Abbreviations: DNI: Deep Neck Infections; CT: Computerised Tomography; IJV: Internal Jugular Vein; MSSA: Methicillin Sensitive Staphylococcus aureus; CECT; Contrast Enhanced CT scans; MRI; Magnetic Resonance Imaging

Introduction

Deep neck infections (DNIs) lead to significant morbidity and mortality, particularly when associated with certain predisposing factors which may impair immunological responses. They are unique among infectious diseases for their versatility and potential for severe complications. The incidence of deep neck infections has drastically reduced since the advent of antibiotics [1]. The most common primary etiology of deep neck infections are odontogenic, salivary gland, tonsils, foreign bodies and malignancy [2,3,]. Microbiology typically reveals mixed bacterial flora, including anaerobic species, which can very rapidly progress to a fulminating necrotizing fasciitis [4]. In addition, an increasing number of patients who have immune dysfunction, viz. diabetes mellitus and HIV infection, are at risk for atypical and more complicated cases of DNI, the clinical course being more severe and demands prompt care, appropriate control of diabetes. The treatment revolves around securing the airway, neck exploration and abscess drainage along with appropriate antibiotics, and improving immunologic status. Empirical antibiotics should cover *K. pneumoniae* in patients with deep neck infection who have diabetes mellitus [5,6,7].

Here we report two cases of deep neck space abscesses in immunocompromised patients.

Case Report

Case 1

A 71 years old female was diagnosed with Sjogren's syndrome and Interstitial Lung Disease for the past 14 years and was on treatment with Azathioprine and Dexamethasone at the time of presentation. She presented with swelling on the left side of neck and face of ten days duration which started after a dental extraction a week prior to the onset of swelling. It was rapidly progressive and painful and associated with moderate grade, intermittent fever of same duration along with dysphagia, more to solids. However, there was no history of odynophagia or respiratory distress. She was referred to our center for unresolving neck and facial swelling after a course of oral antibiotics and attempt at pus aspiration from parotid region. On admission, the patient's general condition was poor with fever at the outset. Examination revealed multiple cutaneous purpura all over the body. Neck and face examination revealed a diffuse swelling at the left lateral side of the neck extending superiorly into the parotid region measuring about 8x10 cm. The swelling was soft in consistency, inflamed and tender. She had trismus, and oral hygiene was poor with oral candidiasis. Examination of the oropharynx showed a bulge in the soft palate region on the left. Further examination by flexible nasopharyngolaryngoscopy noted inflamed and edematous hypopharynx. Laboratory investigations revealed polymorphonuclear leucocytosis. Her liver and renal parameters and chest X-ray were within the normal range. Broad spectrum intravenous antibiotic was started empirically and Azathioprine and Dexamethasone were stopped. The patient developed rapid

increase in the swelling with induration within the next two days. An urgent CT scan (computerized tomography) was performed and revealed a large collection extending from the inferior part of left parotid gland to the level of left thyroid cartilage involving the left masticator space, parapharyngeal space and the carotid space. The lesion was displacing the left masseter muscle anteriorly. There was non opacification of left internal jugular vein (Figure 1).

Neck exploration and drainage of the abscess was done under general anesthesia. Intra-operative findings revealed multiple loculated areas in the left parapharyngeal space, also involving the left masticator space and carotid sheath and extending anteriorly to involve the submental and submandibular triangles,



Figure 1a: An axial CT scan showing collection in left parapharyngeal space.

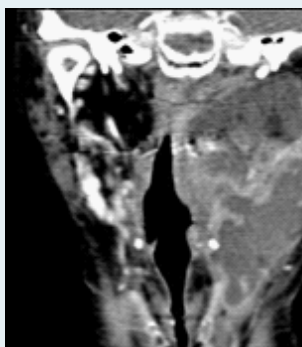


Figure 1b: A coronal CT scan showing collection in left parapharyngeal space.



Figure 1c: Intra operative view of drainage of pus from left parapharyngeal space.

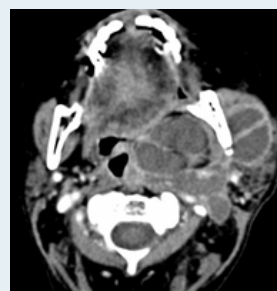


Figure 1d: An axial CT scan showing multiloculated lesion in left parapharyngeal space, left carotid space and in parotid region.

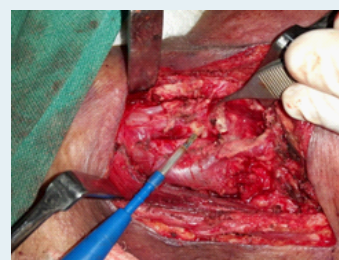


Figure 1e: Intra operative picture showing opening of carotid sheath up to the superior thyroid artery, branch of ECA.

filled with 150 cc thick pus. A suction drain was placed and the wound closed in layers. The pus culture and sensitivity revealed Methicillin Sensitive *Staphylococcus aureus* (MSSA), sensitive to Ceftriaxone. Post operative period was uneventful and on the ninth post operative day, the patient was discharged after drain removal and advised to come for daily dressing.

Case 2

A 72 years old male, who was diagnosed to have Type-II Diabetes Mellitus for 14 years presented with dysphagia of four days duration associated with moderate grade intermittent fever. However, there was no odynophagia, shortness of breath or stridor. On admission, the patient's general condition was poor. Examination revealed the patient to be hypotensive, associated with tachycardia and febrile, with a temperature of 101 deg F. Neck examination revealed a tender, swollen ill defined area involving the upper part of neck on the left side. Oral cavity and oropharynx examination revealed trismus and there was a bulge in the posterior pharyngeal wall. Laboratory investigations revealed polymorphonuclear leukocytosis with a deranged renal function test. Broad spectrum intravenous antibiotic was started empirically and septic shock was treated accordingly. An urgent CT scan (computerised tomography) was performed and revealed retropharyngeal fluid collection extending down from skull base to the mediastinum, displacing the parapharyngeal fat laterally. Another fluid collection was noted anteriorly under the left strap muscles at the level of larynx and left lobe of thyroid. The collection appeared to communicate with retropharyngeal fluid at the level of hyoid bone and thyroid cartilage (Figure 2).

A neck exploration and drainage was performed. Intra operative findings revealed abscess in the left parapharyngeal

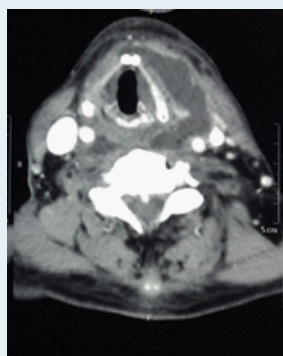


Figure 2a: An axial CT scan showing collection under the strap muscles on left and extension into the retropharyngeal space.

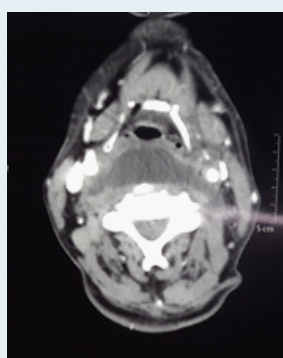


Figure 2b: An axial CT scan showing collection into the retropharyngeal space.

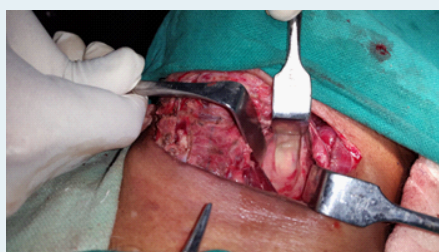


Figure 2c: Intra operative view of drainage of pus from left parapharyngeal space.

space involving the left carotid sheath and extending posteriorly to involve the retropharyngeal space. Approximately 100 cc of pus was expressed and the cavities given a meticulous wash with hydrogen peroxide and betadine following which the wound was closed in layers after putting a suction drain. Post operatively, strict blood sugar control was achieved and the patient made a rapid recovery leading to discharge from hospital after a week. Culture studies revealed *Klebsiella sp.* sensitive to amoxicillin-clavulanic acid.

Discussion

Deep neck infections are potentially life-threatening diseases and demand aggressive management. They are usually polymicrobial and often occur following preceding infections such

as tonsillitis/pharyngitis, dental caries or procedures, surgery or trauma to the head and neck [8]. Clinical manifestations of DNI depend on the spaces infected, and include a plethora of symptoms, viz. pain, fever, swelling, dysphagia, trismus, otalgia and dyspnoea. In our cases, the infection was odontogenic following molar extraction and spreading via buccal space to the deep neck spaces.

Retropharyngeal abscesses are deep neck space infections that can present as immediate life-threatening emergency and harbour potential for airway compromise and other catastrophic complications [9]. The retropharyngeal space is posterior to the pharynx, bound by the buccopharyngeal fascia anteriorly, the prevertebral fascia posteriorly, and the carotid sheaths laterally. Superiorly, it extends to the base of the skull and inferiorly to the mediastinum [10]. The pus can trickle down lateral and medial to the carotid sheath and trachea. The trachea has to be mobilized and lifted to drain the abscess.

Abscesses in this space can be caused by many organisms such as aerobic organisms (beta-hemolytic *Streptococci* and *Staphylococcus aureus*), anaerobic organisms (*Bacteroides*), or Gram-negative organisms (*Haemophilus parainfluenzae* and *Bartonella henselae*) [4].

Retropharyngeal abscesses have a high mortality rate associated due to airway obstruction, mediastinitis, aspiration pneumonia, IJV thrombosis, necrotizing fasciitis, sepsis, and extension into the carotid artery [11]. In a study of 234 adults with deep space infections of the neck in Germany, the mortality rate was 2.6% [12]. The cause of death was primarily sepsis with multi organ failure.

Parapharyngeal abscesses have many sources because of the vast number of neighboring deep neck compartments. The parapharyngeal space is an inverted pyramidal area bounded inferiorly by the hyoid bone. Superiorly, it is limited by the skull base. Its medial border is formed by the lateral pharyngeal wall comprising of the superior pharyngeal constrictor and the tonsillar fossa. Posteriorly, it is bounded by the prevertebral fascia. The lateral border is the ramus of the mandible and the deep lobe of the parotid [13,14]. Anteriorly, it is bounded by the pterygomandibular raphe. The parapharyngeal space can be subdivided into two compartments by the styloid process and the muscles attached to it.

An odontogenic infection can cause a parapharyngeal abscess [1,15,16]. It usually spreads contiguously from the mandible or maxilla into the sublingual, submandibular or masticatory spaces and then spread into the parapharyngeal space eventually. The most common symptoms are notably odynophagia, dysphagia, neck swelling, fever and trimus. Lateral pharyngeal wall medialization is the most common presenting sign in parapharyngeal abscesses [17]. In PPS infection, the abscess is usually found anterior and medial to the carotid sheath. The importance of opening the carotid sheath cannot be overemphasised. The carotid sheath should be opened upto the bifurcation of the carotid and external carotid artery has to be exposed till at least the superior thyroid artery branches after mobilising the IJV.

Broad-spectrum intravenous antibiotics should be started as soon as the diagnosis is suspected ideally in combination with an anaerobic cover, keeping in view of the wide spectrum nature of the involved microorganisms. The prescribed antibiotic should cover the suspected offending bacteria which can be later modified according to clinical response and bacteriological culture and sensitivity results.

Contrast-enhanced CT scans (CECT) is the gold standard in the evaluation of deep neck infections. CT scan provides important valuable information of the site and extent of infection. It has a sensitivity of 100% in determining the precise location of an infectious process (abscess) and a sensitivity of 88% to 95% in the ability to differentiate between cellulitis from an abscess [18]. It is also valuable in locating the relative position of the major vessels. CT scan of the chest may be helpful if extension of abscess into the mediastinum is suspected. The role for magnetic resonance imaging (MRI) is under debate. MRI was shown to be superior to CT in demonstrating disease extension, the spaces involved and source of infection as it is less degraded by artifacts. However, it can only be used in selected cases in which there is no airway compromise as it is time consuming. Also, It is more expensive [19]. Orthopantomogram may provide useful information in parapharyngeal abscess of odontogenic origin [17].

The conventional method of surgical approach for the parapharyngeal space incision and drainage is through an external skin incision made about two finger breath below the mandible. This provides a wide surgical access to drain the abscess and complete surgical control of the great vessels of the neck. A retrospective review comparing intraoral and external drainage of parapharyngeal abscess has been done previously and concluded that intraoral drainage of parapharyngeal abscess is a safe and effective procedure. The only prerequisite is that a CT must be obtained preoperatively which shows the abscess to be medial to the great vessels of the neck. They also noted that patients who had undergone intraoral drainage had a substantial reduction in duration of anaesthesia and further hospital stay [20].

Further in the conventional approach, the sternocleidomastoid muscle and great vessels are retracted and the parapharyngeal space is entered anterior to the posterior belly of the digastric along with exposure under the submandibular gland. A blunt dissection is used to break up all loculations [14]. Airway management is a crucial part of management of patients with neck abscess. An emergency tracheostomy may be required in cases where the patient develops stridor, respiratory distress or when the airway is narrowed or deviated which can be seen by fiberoptic nasopharyngoscope or by CT scan. In cases where there is bilateral disease or intraorally there is a swelling which is lifting the tongue or compressing the pharyngeal walls or involvement of the pre tracheal space. Tracheostomy can be avoided in few cases where the surgeon is sure of near removal of disease and tracheal space is relatively free. Such patients can be kept overnight intubated which was done in our case series. Meticulous dressing in the post operative period enhances the recovery phase and shortens hospital stay.

Conclusion

Patients who are immunocompromised or on long term steroids and immunosuppressive drugs are very prone to develop the odontogenic abscess post teeth extraction which can rapidly spread to the deep neck space. In such patients, a deep neck space infection usually ends up in involving multiple neck spaces. Patients presenting with signs and symptoms of deep neck infections should be treated urgently with an external incision and opening of involved deep neck spaces meticulously. Airway management must always be part of our preliminary assessment as some of these patients do present with acute or imminent airway obstruction that needs to be attended to promptly. The thumb rule is that an abscess needs to be drained and the suction drain has to be kept minimum for a week and in some cases up to two weeks. A wide spectrum antibiotic is started empirically and changed according to the bacteriological culture and sensitivity reports. By making an early diagnosis and treatment and addressing the patient's underlying disease we can then avoid complications and reduce the mortality rate of neck abscess.

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