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DEEP NECK SPACE INFECTION- A CLINICAL INSIGHT

Correspondance to:Dr.Vijay Ebenezer [1], Professor Head of the department of oral and maxillofacial surgery, Sree balaji dental college and hospital, pallikaranai, chennai-100.

Email id*:* *drvijayomfs@gmail.com*, **Contact no: 9840136328**

Names of the author(s):

1)Dr. Vijay Ebenezer[1] ,Professor and Head of the department of oral and maxillofacial surgery, Sree Balaji dental college and hospital , BIHER, Chennai-600100, Tamilnadu , India.

2)Dr. Balakrishnan Ramalingam[2], professor in the department of oral and maxillofacial surgery, Sree balaji dental college and hospital, pallikaranai, chennai-100.

INTRODUCTION

Deep neck infections are a life threatening condition but can be treated, the infections affects the deep cervical space and is characterized by rapid progression. These infections remains as a serious health problem with significant morbidity and potential mortality. These infections most frequently has its origin from the local extension of infections from tonsils, parotid glands, cervical lymph nodes, and odontogenic structures. Classically it presents with symptoms related to local pressure effects on the respiratory, nervous, or gastrointestinal (GI) tract (particularly neck mass/swelling/induration, dysphagia, dysphonia, and trismus). The specific presenting symptoms will be related to the deep neck space involved (parapharyngeal, retropharyngeal, prevertebral, submental, masticator, etc).[1,2,3,4,5]

ETIOLOGY

Deep neck space infections are polymicrobial, with their source of origin from the normal flora of the oral cavity and upper respiratory tract. The most common deep neck infections among adults arise from dental and periodontal structures, with the second most common source being from the tonsils. Tonsil and pharyngeal sources is the most common in children. Streptococcus viridans, Staphylococcus aureus, Klebsiella, gram-negative rods, anaerobes, Fusobacterium species are all frequently encountered microorganisms, indicating pathologic overgrowth of expected oropharyngeal flora. Potential causative organisms but which are rare is Actinomyces, Mycobacterium, and fungi. Risk factors such as immunocompromised state, diabetes mellitus, intravenous (IV) drug use, as well as the site of origin of infection, determines the type of causative organism.[6]

PATHOPHYSIOLOGY

The cervical fascia can be divided into superficial and deep fascia. The superficial fascia is the subcutaneous tissue of the neck and contains the platysma. This layer completely envelops the head and neck. The deep fascia of the neck is divided into superficial, middle, and deep layers. The superficial layer of the deep fascia covers the submaxillary and parotid glands, the trapezius, sternocleidomastoid, and strap muscles. It is also termed the investing

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layer. Infections of odontogenic and submandibular origin affect this space, which includes the submandibular and masticator spaces. The middle layer encloses vital parts of the neck including the pharynx, larynx, trachea, upper esophagus, thyroid, and parathyroid glands. Infections of pharyngeal, tonsillar, and laryngeal origin affect this space, which includes the parapharyngeal and retropharyngeal spaces. This space can also become involved by odontogenic infections of the 2nd and 3rd molars, where infection can spread inferior to the dentate line of the mandible to penetrate the middle layer of deep cervical fascia. The deep layer of the deep cervical fascia, also called prevertebral fascia, covers the vertebral column and muscles of the spine. There is an alar fascia present in this space that forms the terminus of the retropharyngeal space and lies between the middle layer of deep cervical fascia and the prevertebral fascia proper. The space between this alar layer and the prevertebral fascia is the so-called "danger space," as it is in continuity with the mediastinum and infections of upper aerodigestive origin can spread freely to cause mediastinitis. True retropharyngeal infections can involve the deep layer of deep cervical fascia, but the hematogenous spread of other infections (i.e. in IV drug users) can lead to vertebral and prevertebral abscesses.

Infections in any of these spaces can lead to clinical lymphadenopathy in the appropriate lymphatic chains, most commonly in the anterior and posterior cervical lymphatic chains. Host factors such as immunocompromised state, the presence of comorbid conditions such as diabetes, trauma, recent instrumentation in the area such as surgery or dental work, and IV drug abuse can further influence the spread of infection to deeper layers.[7,8,9,10,11]

CLINICAL EXAMINATION

Clinical presentation of these infections is variable based on the primary site of infection, the fascial plane involved, the extent of inflammation and infection, and the presence of abscess and local pressure effects and other systemic conditions. Most patients present with fever and neck pain. Associated symptoms such as dental pain, dysphagia, stridor, dysphonia, trismus, pain on neck movements, and respiratory distress can provide clues regarding the potentially affected facial plane. Predisposing factors such as immunocompromised state, recent oral/dental procedures, recent neck or oral trauma, recent neck surgery or radiation, IV drug use, or diabetes mellitus should be sought.

Patients may be febrile and may appear ill and toxic. Inspection of the neck may reveal asymmetry, redness, swelling, induration, and regional lymphadenitis. Torticollis may be present. Abscesses in this area are harder to diagnose clinically due to frequent absence of fluctuance due to the taut fascia, overlying muscles, and the deep location, but are easily demonstrated on computed tomography. Physicians should have a low threshold to obtain such imaging so long as the patient is able to lie supine and protect their airway.

Proximal deep neck infections (peritonsillar, parapharyngeal, parotid, and submandibular) infections and abscesses tend to present with a sore throat and sometimes with trismus. Trismus occurs due to the local inflammation of the muscles of mastication or the direct involvement of these muscles by the infection. On physical examination it may reveal neck or lower facial swelling, local erythema, tenderness, and regional lymphadenitis. Medial displacement of the uvula in conjunction with tonsillar asymmetry suggests peritonsillar abscess, whereas medial displacement of the pharyngeal wall is suggestive of parapharyngeal space infection. Dysphagia or odynophagia and may have associated inflammation in the

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cricoarytenoid joints. If the vagus nerve is affected, dysphonia and hoarseness can occur, the so-called "hot potato" voice. Infections in the submandibular space may occur after spreading from dental abscesses, sublingual or submaxillary salivary glands, or oral infections following trauma. Cellulitis in this space is also known as Ludwig's angina if it originates from the 3rd molars, which can lead to life-threatening airway obstruction if untreated. Ludwig's angina presents with drooling, inability to swallow, trismus, and induration and elevation of the floor of the mouth.

Parapharyngeal and retropharyngeal space infections are more common in children and usually are preceded by an upper respiratory infection. They often present with dysphagia, drooling, and stridor and can lead to airway compromise or spread into the chest to cause mediastinitis. Infections in the danger space (located posterior to the retropharyngeal space and anterior to prevertebral space) that has loose areolar tissue facilitates the rapid spread of infection to surrounding regions and often presents with complications such as mediastinitis, empyema, and sepsis.

EVALUATION

A complete blood count (CBC) usually shows leukocytosis, often with a left-shift, and chemistry may reveal evidence of dehydration if the patient's fluid intake is poor due to pain. A blood culture should be obtained if the patient is septic, and cultures should be obtained of any purulent discharge in the affected region.

Plain radiography of the neck in children may suggest retropharyngeal abscess when the prevertebral soft tissue shadow is greater than 7 mm at the C2 level or greater than 14 mm at C6 level. Among adults, the soft tissue shadow is greater than 22 mm at C6 level.[12] Additionally, plain x-rays may reveal a foreign body or subcutaneous air when present, and can importantly rule out such entities in the pediatric population, where accurate history can be challenging to obtain. A chest x-ray is indicated if there is suspicion for mediastinitis, pneumomediastinum, lower airway foreign body, or empyema.

IMAGING

Ultrasound is useful for relatively superficial infections to differentiate between phlegmon and abscesses but may not be adequate for deep infections. If the ultrasound results are questionable, a CT scan should be obtained so long as it is safe to do so.[13]

The gold standard imaging modality to diagnose the source and extent of the deep neck infection is computed tomography (CT) with contrast, with magnetic resonance imaging (MRI) also possible though logistically more challenging. There is little utility in obtaining a non-contrast CT scan as phlegmon versus abscess are not easily distinguishable.[14,15]

TREATMENT / MANAGEMENT

Directed antimicrobial coverage, surgical drainage for discrete abscesses and aggressive supportive care are the main management options. Empiric regimens that are based on the expected microbiology and local resistance data should be initiated and adjusted appropriately once the organism and its sensitivities become available. The choice of

ISSN 2515-8260 Volume 07, Issue 03, 2020

antimicrobial regimens for the treatment of deep neck space infections has not yet been studied in clinical trials. Intravenous nafcillin or vancomycin plus gentamycin or tobramycin combination, ampicillin/sulbactam, or clindamycin are generally accepted initial choices. For methicillin-resistant Staphylococcus aureus (MRSA) infections, vancomycin or linezolid plus cefepime (alternates are metronidazole, imipenem, meropenem, piperacillin-tazobactam) can be used. MRSA coverage must be included as part of the initial treatment regimen for patients that are at risk for MRSA carriage or infection, such as those with comorbid disease (for example, diabetes mellitus), history of intravenous drug use, and in communities or hospitals where there is a substantial incidence of MRSA. For the majority of deep neck infections especially parapharyngeal, retropharyngeal, or prevertebral space infections, antibiotic treatment should generally be continued for 2 to 3 weeks, and longer courses may be required when complications are present. Antibiotics can be administered via oral route once there is significant clinical improvement and patient able to tolerate oral intake. Consultation with head and neck surgeons is recommended as surgical drainage may become necessary if there is no improvement after 48 hours of antibiotic therapy. All but the smallest deep neck abscesses typically warrant surgical drainage, while small or questionable abscesses and phlegmon often respond well to appropriate aggressive medical management.[17]

Nonetheless, in the acute setting, the airway always comes first. Patients with deep neck infections, particularly those with submandibular or odontogenic infections, as well as those with any airway symptoms or difficulty handling their own oral secretions, should have their airways adequately secured first and foremost via elective intubation. This frequently requires awake fiberoptic intubation. The use of glucocorticoids for symptomatic relief in patients with acute airway obstruction remains controversial and lacks supporting evidence, and any patient with a deep neck abscess and even minimal airway symptoms should be electively intubated and the abscess drained.[4]

DIFFERENTIAL DIAGNOSIS

Differential diagnosis of deep neck infections may vary based on presenting symptoms. Neck pain with fever can be caused by meningitis, apical pneumonia or subarachnoid hemorrhage. Acute neck pain, especially with asymmetry, can be a result of trauma causing cervical fractures/dislocations, neck muscle hematomas or neck muscle strains. Among, patients presenting with stridor, acute epiglottitis, bacterial tracheitis and croup should be considered, and for those with significant odynophagia or dysphagia, foreign body ingestion and acute esophagitis need to be considered. In the patient with a neck swelling and/or mass, the astute clinician will remember malignancy as a potential etiology.

COMPLICATIONS

In case of lateral pharyngeal space infections it can spread to the carotid sheath and cause septic thrombophlebitis (Lemierre syndrome) and erosion. Retropharyngeal or danger space infections can spread to the mediastinum and cause acute Mediastinitis that may further spread and cause empyema and pericarditis. An obstructed airway can occur from respiratory failure and spread into the systemic circulation can result in sepsis and intracranial infections.

CONCLUSION

Maintenance of oral hygiene and early treatment for dental caries and dental infections can help prevent deep neck infections. Deep neck infections most commonly arise from a nearby infectious focus, with odontogenic and tonsil/pharyngeal sources being the most common. Clinicians should be aware of these infections and not underestimate their potential to cause life-threatening complications. A thorough knowledge of the anatomical compartments and spaces of the neck is essential for understanding the pathogenesis, clinical manifestations, and potential routes of spread of infections. Deep neck space infections typically have a polymicrobial origin, originating from the oral cavity and oropharynx. Empiric antimicrobials should cover these species. Deep neck infections has the potential to cause many complications that can be life-threatening, hence appropiate treatment is necessary. The prognosis depends on the age of the patient, the severity of the infection, immune status, response to antibiotics, and other comorbidities.[17] Computed tomography WITH IV contrast is the best suited imaging modality of choice for the diagnosis of deep neck space infections. There is little to no utility in obtaining a non-contrasted scan.

The treatment of deep neck infections include appropriate antibiotics based upon the likely microbiology of the infection along with drainage of the abscess collection, if present, via either aspiration or surgical drainage.

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