

MAIN RESEARCH ARTICLE

DEEP NECK SPACE INFECTIONS: PRESENTATIONS AND MANAGEMENT

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ABSTRACT:

Deep neck space infections include, infections involving para-pharyngeal, retropharyngeal and submandibular spaces. Intrinsic or deep neck space infections usually represent the overgrowth of the normal flora with most infections being polymicrobial. The infections are of dental origin in a majority of the cases. The purpose of this study was to determine the various presentation, diagnosis and management outcomes of deep neck space infections. This study was conducted in the department of ENT, Bangalore Medical College and Research Institute, Bangalore from January 2014 to December 2015. Fifty (50) cases presenting with signs and symptoms of deep neck space infections to our Centre in the above period were evaluated. Dental infections were the most common aetiology followed by recurrent tonsillitis. Ludwig's angina was the most common form of abscess, Incision and drainage was the most effective treatment. Diabetes mellitus (18%) was the most common associated systemic disease & complications encountered were airway obstruction and necrotizing fasciitis.

Key words: Deep neck space, infections, management.

INTRODUCTION:

Deep neck space infections include infections involving para-pharyngeal, retropharyngeal and submandibular spaces¹. Intrinsic or deep neck space infections usually represent the overgrowth of the normal flora; with most infection being polymicrobial². Deep neck infections spread along the fascial planes and spaces of the head and neck region. Despite the widespread use of antibiotics for the early treatment of cervical infections and improvements in dental care and oral hygiene, deep neck infections still remain relatively frequent³.

The management protocols of these infections have not been well defined and are often challenging due to the proximity of vital neck structures. Decision making between only medical management versus

surgical and medical management are very important in the management of deep neck space infections.

The objectives of this study to determine the following aspects with respect to deep neck space infections are:- **1. Aetio-pathogenesis and risk factors associated, 2. Clinical presentation, 3. Different diagnostic modalities available & 4. Management and outcome.**

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METHODOLOGY:

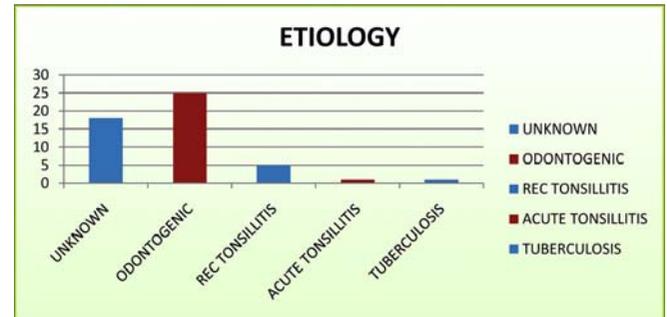
This study was conducted in the department of ENT, Bangalore Medical College and Research Institute, Bangalore from January 2014 to December 2015. The prospective study was conducted on patients with deep neck space infections, presenting with complaints of throat pain, dysphagia, odynophagia, fever, neck swelling, trismus, halitosis, and change in voice. A total of 50 patients with deep neck space infections were chosen for the study. A detailed physical examination was carried out to determine the extent and cause of the deep neck space infections. In cases where clinical diagnosis was uncertain, radiological investigations were done to confirm the diagnosis.

Only clinically or radiologically confirmed cases of deep neck space infections of all age groups and both sexes were included in the study. Needle aspiration or incision and drainage were done at the earliest stage in majority of the patients. Pus was sent for culture and sensitivity analysis. All patients were initially started on a combination of third generation cephalosporin and metronidazole. The antibiotics were modified on culture sensitivity reports or on clinical responses. Supportive therapy, in the form of intravenous fluid, analgesics, antipyretics, mouth washes was given.

RESULTS:

This study consists of 50 cases of deep neck space infections seen over a period of 3 years. Youngest patient seen was 6 yrs old and the oldest patient was 76 years old. It was observed that, the maximum numbers of cases were seen in the age group of 31-40. Of 50 patients studied, 34 were male and 16 were female. The male/female ratio is 1:0.47 with a slight male preponderance. The most common symptoms with which the patient presented were odynophagia (45 patients-90%), restricted mouth opening or trismus (40 patients 80%), pain in the throat (34 patients 68%), Neck Swelling (39 patients 78%), Neck pain (31 patients, 62%), difficulty in breathing (11 patients, 22%). 18 patients (36%) had associated systemic disease. 9 patients (18%) had history of diabetes mellitus and were on irregular treatment, 1 patient (2%) was on treatment for hypertension, 6 patients (12%) had coexisting diabetes mellitus and hypertension. 1 patient (3.3%) had Retroviral infection and 1 patient had tubercular infection. The most common clinical finding was

trismus, that seen in 40 patients (90%), followed by neck swelling (38 patients, 84%), poor oral hygiene (32 patients, 64%), and caries tooth (34 patients 68%). Cause was not known in 18 patients (36%). Dental infections were the cause in 25 patients (50%), followed by Recurrent Tonsillitis in 5 patients (10%) [Graph-1].



Graph- 1: Showing the etiology of dental space infection.

The most common infection was Ludwig's angina seen in 32 patients (64%), followed by peritonsillar abscess (12 patients, 24%), parapharyngeal abscess (3 patients, 6%), sub mental abscess (1 patient, 2%), Retropharyngeal Abscess (3 patients, 6%), Parotid Abscess (2 patients, 4%). In 47 patients (94%) single space was involved. In 3 patients, more than one space was involved. All three patients had co-existing Ludwig's angina (fig 1) and parapharyngeal abscess. Clinical diagnosis was certain in 20 cases (40%) and



Fig. 1: Photograph showing Ludwig's angina.

patients improved symptomatically. In the remaining cases, diagnosis was made radiologically (fig. 2). Ultrasound was used in 2 cases (35.71%) of parotid abscess, 5 cases (10%) of Ludwig's angina. In 40 cases (80%) X-rays neck, antero-posterior and lateral views were taken to assess the airway.



Fig.-2: Photograph showing submandibular And parapharyngeal abscess.

Table-1: Showing the percentage of different complications.

Complications	No. of patients	Percentage
Airway obstruction	5	10.0
Necrotizing fasciitis	2	4.0
Multiorgan failure	1	2.0
Nil	42	84.0
Intra-uterine death	1	2.0

In 9 (18%) patients of Ludwig's angina Computerized Tomogram (CT) was used to diagnose and in three cases contrast was used. Of the 50 patients, 36(72%) cases were treated successfully by incision and drainage (fig 3). Out of them 27 cases were Ludwig's angina, 6 cases of peritonsillar abscess and one case of parotid abscess. 10(20%) patients were treated with needle aspiration. 4(8%)patients with minimal abscess were treated conservatively. Nine patients developed

complications [Table-1]. Two patients had necrotizing fasciitis requiring repeated dressing and skin grafting. Five patients with Ludwig's angina developed airway obstruction and expired. One patient with HIV positive status developed multi-organ failure and expired. The complications were seen in patients with immunocompromised status Of the 8patients, 2 patients had coexisting DM+HTN (4%), 3 patients had DM(2%), 1 patient had HIV(2%), one patient had HTN(2%).

All patients were under antibiotic coverage. Pus was sent for culture and sensitivity in 46 patients. It was sterile in 16 samples (32%). Organisms were isolated in 34 samples (68%). Culture yielded growth of polymicrobial organisms in 2 samples (4%) [Table-2].

DISCUSSION:

The cervical fascia represents the condensation of connective tissue lying between adjacent anatomic structures and are generally described as being composed of a superficial layer and a deep layer.⁴ The greatest clinical importance of the cervical fascia is that it divides the neck into potential spaces that function as a unit but are anatomically separated.

For those infections involving the neck, the hyoid bone is considered the most important structure limiting the spread of infection. For this reason, infections of the neck are classified by dividing the potential spaces into three general divisions. Spaces involving entire length of the neck, Suprahyoid spaces, Infrahyoid spaces.^{4,5,6,7}

Spaces of head and neck:

Spaces of the face:

Maxillary spaces, Buccal space, Canine space, Mental space.

Spaces of the neck:

1. Spaces involving the entire length of the neck.

Superficial space (space 1), Deep neck spaces (all involve only posterior side of neck), Retropharyngeal

space (space 3, posterior visceral space, Danger space (space 4) Prevertebral space (space 5), Visceral vascular space (within carotid sheath).

2. Suprahyoid spaces

Masticator space, Superficial temporal space, Deep temporal space, Masseteric space, Pterygomandibular space, Mandibular spaces, Submandibular space, Submental space, Sublingual space, Space of the body of the mandible, Lateral pharyngeal space (pharyngomaxillary, peripharyngeal or parapharyngeal), Peritonsillar space, Parotid space.

3. Infrahyoid spaces (involves anterior aspect of the neck only)

Pretracheal space, Suprasternal space of Burn, Supraclavicular space.

The etiology of deep neck infections varies depending on the space involved such as Dental infections, Oropharyngeal infections, Upper aero digestive tract trauma, Retropharyngeal lymphadenitis, Pott's disease, Sialadenitis, Bezold's abscess, Infections of congenital cysts and fistula, Injection of illicit drugs, Malignancies.

Pain and swelling of upper neck are the commonest symptoms present in all patients. Other symptoms were fever, odynophagia, respiratory distress. Trismus is present when the anterior (prestyloid) compartment is involved, because of inflammation of the pterygoid muscles but trismus may be absent when only the posterior (post-styloid), compartment is involved.^{5,6}

These infections are frequently accompanied with systemic toxicity and localized aero-digestive tract compromise, and sometimes by life-threatening sequelae like severe airway obstruction, mediastinitis, pericarditis, internal jugular vein thrombosis, epidural abscess and carotid artery erosion. These are attributable to the delayed presentation of the patient to a tertiary care center and diagnostic dilemma posed in certain cases.⁴

They present with a wide variety of symptomatology ranging from vague throat pain to

severe respiratory embarrassment and dysphagia. Hence the treating surgeon should have a high index of suspicion in making the diagnosis of deep neck space infections. Clinical examination alone seems to underestimate the extent of disease in 70% of cases, hence appropriate radiologic imaging can reveal infection spreading between spaces.³

In this study, out of fifty patients, the maximum numbers of patients were seen in their third to fourth decade of life. About 64% of patients were in the age group of 21-50, which correlates with the study conducted by Parhiscar⁸ in which almost 50% of their patients were in their third or fourth decade of life⁶. The most common presenting complaints in our series was odynophagia (90%). This was followed by pain in throat (68%), difficulty in opening mouth and neck swelling. Earlier studies have also shown neck pain, odynophagia and fever to be the commonest presenting complaints.^{3, 8,9,10}

In more than 50% of cases etiology was found to be of dental etiology as the cause for deep neck infections in our study. Parhiscar⁸, DS Sethi³ and Kamath¹⁰ have found dental infections as the commonest etiology in their studies.

Ludwig's Angina was the commonest deep neck space infection in our series, followed by peritonsillar abscess. 3 patients had co-existing Ludwig's angina and para parapharyngeal abscess. In our study culture was negative in 16 cases (32%), which might be attributed to improper or inadequate use of antibiotics prior to presenting to our Centre. *Pseudomonas aeruginosa* was the commonest organism isolated, followed by *Staphylococcus* and *Beta hemolytic streptococcus*. Polymicrobial infections were diagnosed in 2 cases. Most of the organisms isolated in our study showed good susceptibility to Cephalosporins, Gentamycin and Amoxicillin + clavulanic acid potassium.

Out of the 50 cases, 36(72%) cases were treated with Incision & Drainage, 10 cases were treated with needle aspiration, and 4 cases were treated conservatively. All cases received antibiotic treatment

empirically with third generation Cephalosporins, gentamycin and metronidazole later modified according to sensitivity report.

In study by D. S. Sethi³, 19% of patients developed complications, 6 developed necrotizing cervical fasciitis. One had aspiration pneumonia, two developed acute myocardial infarctions, and four patients developed septicemia and multi organ failure. Mortality rate was 8%.

In our study, we encountered two cases of necrotizing fasciitis, five cases of airway obstruction, one case of multi organ failure.

In our study six patients (12%) expired, amongst whom five patients expired due to cardio respiratory arrest & one patient due to multi organ failure. Mortality rate was 12%.

CONCLUSION:

Deep neck space infections continue to occur despite the wide spread use of antibiotics. In our study, Deep neck space infections have a male preponderance and are more common in third and fourth decade of life. Ludwig's angina is the commonest deep neck infection. Patients with coexisting immunocompromised states such as Diabetes Mellitus and HIV tend to have severe presentation, prolonged course and higher complication rate.

Contrast enhanced computed tomography (CECT) is essential in the appropriate management of deep neck infections especially in those involving Parapharyngeal and Retropharyngeal spaces. Early presentation of the patients to the hospital, has led to a decrease in the morbidity and mortality.

Antibiotic coverage should include Gram positive, Gram negative and anaerobic microorganisms. A combination of third generation Cephalosporins, Aminoglycosides and Metronidazole are effective in the treatment of deep neck space infections. Incision and drainage as a treatment for deep neck space infections is successful and cost effective in most of the cases. Smaller abscesses can be managed either by needle

aspiration or conservatively. The complications of deep neck infection although less common now are still present and are higher in immunocompromised patients requiring aggressive management.

Table 2: Showing Organisms isolated.

Organism isolated	No. of patients	Percentage %
Pseudomonas(P)	17	34.0
Beta haemolytic streptococcus	10	20.0
Staphylococcus aureus(SA)	5	10.0
Klebsiella(KL)	2	4.0
No growth(NG)	16	32.0
Total	50	100%

DISCLOSURES

- Competing interests/Interests of Conflict- None
- Sponsorships - None
- Funding - None
- Written consent of patient- taken
- Animal rights- Not applicable

ABBREVIATIONS:-

- DM-diabetes melitus
- HTN-hypertension
- HIV-human immune deficiency virus

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