Original Research Article

A study on deep neck space infections- at tertiary care centre

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Abstract

Objectives: The purpose of this study is to determine the following aspects with respect to deep neck space infections:- 1. Aetiopathogenesis and risk factors associated. 2. Clinical presentation. 3. Different diagnostic modalities available. 4. Management and outcome. **Materials and methods:** Source of data – All patients attending OPD/admitted to department of E.N.T, MGM Hospital, attached to Kakatiya Medical College, Warangal, during the period from January 2021 to September 2021. Methods of collection of data. Study design**:** Prospective study. Study period- January 2021 to September 2021 Place of study – MGM Hospital, Warangal A minimum of 50 cases presenting with signs and symptoms of deep neck space infections were evaluated. **Methodology:** Data collection by detailed history taking and clinical examination, appropriate laboratory and radiological investigations, operative findings and follow up of cases. All patients with history and symptoms suggestive of deep neck space infections. **Results:** In this study, the most common age group presenting with deep neck space infection is31-40(24%), followed by third decade. There is male preponderance seen (68%), most common presenting symptom is odynophagia(90%), followed by restricted mouth opening(80%), the most common clinical finding is Trismus(80%) followed by neck swelling, Diabetes mellitus(18%) is the most common associated systemic disease, Dental infections is the most common etiology followed by recurrent tonsillitis, Ludwig's angina is the most common abscess followed by peritonsillar abscess, Single space infection is found in (47%), diagnosis is made clinically and radiological assistance was required in (80%) of cases, Incision and drainage is the most effective treatment, Pseudomonas is the commonest organim, complications encountered are airway obstruction and necrotizing fasciitis. **Conclusion:** Deep neck space infections are still prevalent despite of the use of modern antibiotics, with dental etiology being the most common cause, Early detection and prompt treatment in the form of Incision and drainage supplemented with antiobiotics and supportive treatment in the form of intravenous fluids, systemic steroids and mouth gargles results in better outcome of the disease.

Keywords: Deep neck lesions, Trismus, Diabetes mellitus,odynophagia, peritonsillar abscess.

Introduction

Deep neck space infections includes infections involving Parapharyngeal, Retropharyngeal and Submandibular spaces. [1] Intrinsic or deep neck space infections usually represent the overgrowth of the normal flora with most infections being polymicrobial. [2]

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 remain relatively frequent. [3]

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 centre and diagnostic dilemma posed in certain cases. [4]Failure to recognize deep neck infections early may be due to an altered clinical picture resulting from the misuse of antibiotics, increasing prevalence of patients with immunodeficiency and changes in the origins of deep neck infections and in its bacteriology.

The majority of deep neck infections before the era of antibiotics originated in the pharynx and tonsils. Since the advent of antibiotics, these oropharyngeal infections are no longer a significant etiology. Dental infections and regional trauma are now more common causes of deep neck infections. [5]

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] The management protocols of these infections have not been well defined and are often challenging due to 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 spaceinfections.

Objectives

The objectives of this study is to determine the following aspects with respect todeep neck space infections

1. Aetiopathogenesis and risk factors associated.
2. Clinical presentation.
3. Different diagnostic modalities available.
4. Management and outcome.

Material and methods

The study was conducted on patients presenting with complaints of throat pain, dysphagia, odynophagia, fever, neck swelling, trismus, halitosis, changein voice at Department of ENT, MGM

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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 was 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 cephalosporins and metronidazole. The antibiotics were modified on culture sensitivity reports or on clinical unresponsiveness. Supportive therapy, in the form of intravenous fluid, analgesics, antipyretics, mouth washes etc. was given. SPSS 16.0 was used for statistical analysis. Results are presented in numbers and percentage.

Results

This study consists of 50 cases of deep neck space infections seenover a period of 2 years.

Youngest patient seen was 6 yr s old and the oldest patient was 76 years old. It was observed that the maximum number of cases were seen in theage group of 31-40.

Table 1: Age distribution

Age in years	No. of cases (n = 50)	Percentage
< 10 years	3	6.0
11 – 20	1	2.0
21 – 30	1	20.0
31 – 40	12	24.0
41 – 50	1	20.0
51 – 60	8	16.0
> 60 years	6	12.0
Total	**50**	**100.0**

Table 2: Sex distribution

In the present study of 50 patients, 34 were male and 16 were female. The male / female ratio is 1:0.47. Slight male preponderance was seen.

Gender	No. of cases	Percentage
Male	34	68.0
Female	16	32.0
Total	30	100

Table 3: Presenting complaints

The most common symptom with which the patient presented was odynophagia (45 patients 90%), Restricted mouth opening(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%),

Presenting complaints	No. of patients	Percentage
Pain in throat	34	68.0
Odynophagia	45	90.0
Fever	24	48.0
Neck swelling	39	78.0
Restricted mouth opening	40	80.0
Neck pain	31	62.0
Change in voice	7	14.0
Swelling	8	16.0
Difficulty in breathing	11	22.0
Cough	7	14.0

Table 4: Associated systemic disease

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. 1patient (3.3%) had HIV infection and 1 patient had tubercular infection.

Associated systemic disease	No. of patients	Percentage
Diabetes Mellitus(DM)	9	18.0
Hypertension(HTN)	1	2.0
DM+HTN	6	12.0

HIV	1	2.0
Tuberculosis (TB)	1	2.0
NIL	**32**	**64.0**

Table 5: Etiology of Deep Neck Infections

Cause was not known in 18 patients (36%), Dental infections were the cause in 25 patients (50%), followed by Recurrent Tonsillitis in 65 patients (10%).

Etiology	No. of patients	Percentage
Odontogenic	25	50.0
Uknown	18	36.0
Recurrent tonsillitis	5	10.0
Acute tonsillitis	1	2.0
Tuberculosis	1	2.0
Total	**50**	**100**

Table 6 : Anatomic Location of Deep Neck Space Infections

The most common infection was ludwig's angina seen in 32 patients (64.0%), followed by peritonsillar abscess (12 patients 24.0%), Parapharyngeal Abscess (3 patients 6%), submental abscess (1 patients 2%), Retropharyngeal Abscess (3 patients 6%),Parotid Abscess (2 patients 4%).

Location of DNSI	No. of patients	Percentage
Ludwig's Angina (LA)	32	64.0
Peritonsillar Abscess (PTA)	12	24.0
Retropharyngeal Abscess (RPA)	3	6.0
Parapharyngeal Abscess (PPA)	3	6.0
Parotid Abscess (PA)	2	4.0
Submental Abscess (SMeA)	1	2.0

Table 7: Number of spaces involved

In 47 patients (94%) single space was involved. In 3 patients more than one space was involved, All three patients had co-existing ludwigs angina and parapharyngeal abscess.

No. of spaces involved	No. of patients	Percentage
Single space	47	94.0
Multiple space	3	6.0

Table 8: Diagnosis

Clinical diagnosis was certain in 20 cases (40%) and patients improved symptomatically. In the remaining cases, diagnosis was made radiologically. Ultrasound was used in 2 cases (35.71%) of parotid abscess, 5 cases (10%) of Ludwig's angina. In 40 (80%) cases x-ray neck antero-posterior and lateral viewa were taken to ascess the airway. In 9 (18%) patients of ludwig's angina CT was used to diagnose and in three contrast was used.

Diagnosis	No. of patients	Percentage
Clinical	20	40.0
Radiological	30	60.0

Of the 50 patients, 36 (72%) cases of were treated successfully by incision and drainage. 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 treatedconservatively.All patients were under antibiotic cover.

Table 9: Treatment

Treatment	No. of patients	Percentage
Incision and drainage (ID)	36	72.0
Needle aspiration (NA)	10	20.0
Conservative	4	8.0

Table – 10 : Bacteriology

Due to the unavailability of the facilities in our settings, anaerobic culture was not done. 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%).

Organisms isolated	No. of patients	Percentage
Psuedomonas(P)	17	34.0
Beta haemolytic streptococcus (BHS)	10	20.0

Staphylococcus aureus (SA)	5	10.0
Klebsiella(KL)	2	4.0
No growth(NG)	16	32.0

Table 11 : Complications

9 patients developed complications. 2 patient had necrotizing fascitis requiring repeated dressing and skin grafting. 5 patient with Ludwig's angina developed airway obstruction and expired.

1 patient with HIV positive status developed multiorgan failure and expired. The complications were seen in patients with immunocompromised states , 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%).

Complication	No. of patients	Percentage
Airway obstruction	5	10.0
Necrotizing fasciitis	2	4.0
Multi organ failure	1	2.0
Nil	42	84.0
IUD	1	2.0

Discussion

Age incidence

In this study, out of 50 patients, the youngest was 6 years old and oldest patient was 76 years. The maximum number of patients were seen in their third to fourth decade of life, About 64% of patients were in the age group of 21-50. The least number of cases were seen in the age group of 11 – 20 years.

In the study conducted by Afshin Parhiscar, almost 50% of theirpatients were in their third or fourth decade of life. [6]

Sex distribution

In the study by Dharambir. S. Sethi, there were 35 male patients (55%) and 29 female patients (45%), showing male prepondernance. [7]

Studies by Afshin Parhiscar, [6] have also shown male preponderance. In this study also male preponderance was seen (68%).

Associated systemic disease

Lin et al and Huang et al have concluded that deep neck infections in Diabetic patients have higher complicatiorates, require more aggressive treatment and have longer hospital stay. [7,8]

In this study complications like necrotising fasciitis, airway obstruction and multi organ failure were seen to be associated with diabetes

In our series of 50 patients, 18 patients had associated systemic disease.

1. Out of the 18 patients 15 patients had diabetes and were on irregular treatment , Of them 6 patients also had hypertension, Multiple space involvement , increased incidence of complications and prolonged course of the disease was seen in such patients
2. One patient was Retrovirus positive and he succumbed due tomulti organ failure.

Clinical presentation

The most common presenting complaints in our series was Odynophagia (90%) This was followed by pain in throat(68%) , difficultyin opening mouth and neck swelling.

DS Sethi, study have also shown neck pain, odynophagia and fever to be the commonest presenting complaints [3].

Clinical findings

In this study trismus was the most common sign seen followed by fever, oropharyngeal condition like poor oral hygiene, caries tooth, hallitosis and neck swelling.

In study by Kamath [9] neck swelling was the main finding followed by oropharyngeal abnormalities and fever.

Etiology of deep neck infections

In more than 50% of cases etiology was found to be of Dental etiologyas cause for deep neck infections in our study.

In the preantibiotic era, pharayngotonsillitis was the cause in nearly 70% of deep neck infections, where as dental infections was the cause in only 20%.

Parhiscar [6], DS Sethi [3] and Kamath [9] have found dental infections as the commonest etiology in their studies. Decline in the role of pharyngotonsillitis is generally attributable to the wide spread use of antibiotics.

Location of deep neck space infection

Ludwig's Angina was the commonest deep neck space infection in our series, followed by peritonsillar abscess. 3 patients had co-existingludwig's anginaand para parapharyngeal abscess

In studies by P. Kamath [9] and Parhiscar [6] parapharyngeal space was the commonest space involved, where as in our study, it was the third commonspace involved.

Bacteriological study

In our study culture was negative in 16 cases (32%), which might beattributed to improper or inadequate use of antibiotics prior to presenting to ourcentre.

Psuedomonas aeruginosa was the commonest organism isolated, followed by Staphylococcus and Beta hemolytic streptococcus. Polymicrobial infections were diagnosed in 2 cases.

In Ravi Meher studies also culture was negative in majority of their cases. Commonest organism isolated in their study is Staphylococcus aureus. [10]

Studies by DS Sethi showed increase in the isolation of gram negative organisms like Klebsiella and Pseudomonas.

In the recent studies by Megalamani [11] the most common isolate were Klebsiella. These findings correlate with our findings that incidence of gram negative organisms in deep neck infections are increasing.

Most of the organisms isolated in our study showed good susceptibilityto Cephalosporins, Gentamycin and Amoxyclav.

Few studies have isolated anaerobes in deep neck infections.

In a study by Anthony et al [12] anaerobes were isolated in 35% and aerobes in 65%. The commonest anaerobe was prevotella and aerobe was streptococcus viridans.Itzhak Brook[13] in their studies isolated 91 anaerobic and 32 aerobic isolates. The predominant isolates were pigmented prevotella.Due to unavailability of the facilities in our settings, anaerobic culture wasnot done.

Management

Out of 50 patients, 46 (92%) patients were admitted as inpatients, admitted patients were stabilized with supportive care like intravenous fluids, systemic steroids whenever necessary.

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.

Studies comparing needle aspiration and incision drainage in the treatment of abscess have shown no statistical significance.

Complications

In study by DS Sethi [3] 19% of patients developed complications,6 developed necrotizing cervical fascitis. One had aspiration pneumonia, two developed acute myocardial infarction, four patients developed septicemia and multiorgan failure. Mortality rate was 8%. [5]In study by Parhiscar et al there was one death from aspiration pneumonia, two cases of mediastinitis one case of cervical discitis and one case of injury to the innominate artery during a "slash tracheostomy". [6]In our study we encountered 2 cases of Necrotizing fasciitis, 5 cases of Airway obstruction, 1 case of Multi organ failure, 1 case of Intra uterine death.

In our study 6 patients (12%) ex pired, 5 patients ex pired due to cardiorespiratory ar rest, 1 pa t i e n t d ue t o m ul t i or g a n f a i l ur e . M o r t al i t y r at e w as 1 2 % .

Radiological investigations:Appropriate radiologic imaging can reveal infection spreading between spaces and multi space involvement, which may not be clinically apparent.

In our cases plain x-ray AP and lateral view was done and ultrasound and CT scan with and without contrast were done depending on the affordability andseverity of the disease.

In 9 of our cases ultrasound was able to identify the abscess correctly. In rural setting where all patients cannot afford contrast enhanced CT, ultrasound can be used effectively in cases like Ludwig's, Submandibular abscess.

Contrast enhanced CT is currently considered the radiologic investigation of choice in deep neck infections.

In cases where Parapharyngeal and Retropharyngeal abscess are suspected CECT not only helps in diagnosis, but also helps in identifying impending airway complications before they are clinically detectable, thereby reducing the complications.

Miller et al have concluded in their study that CECT has a high sensitivity and low specificity, which may lead to needless surgery for some patients if used in isolation. Clinical examination and CECT together is the most accurate test to determine the extent of DNI. [14]

CECT not only helps in diagnosing but also in planning treatment. There are recent reports of successfully treating small abscesses (< 2000 mm^3 on CECT) with intravenous antibiotics alone. [15]

Conclusion

From our study we conclude that:

- ✓ Deep neck space infections continue to occur despite the widespread use of antibiotics.
- ✓ Deep neck space infections have a male preponderance and are morecommon 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, Hypertension and HIV tend to have severe presention prolonged course and higher complication rate.
- ✓ Contrast enhanced computed tomography(CECT) is essential in appropriate management of deep neck infections especially in those involving Parapharayngeal and Retropharyngeal spaces.
- ✓ Early presentation of the patients to the hospital, has led to a decrease in the mobidity and mortality.
- ✓ Antibiotic coverage should include gram p o s iti v e ,gram n eg at i v e and anaerobic micro organisms. 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.

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