

A Clinical Profile of Patients with Deep Neck Space Infection - A Prospective Study

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Abstract: *Deep Neck Space Infections considered to be challenging problem due to its complex anatomy, proximity to other neurovascular structures and communication of one space to other. It thus needs focused clinical, radiological & pathological correlation for accurate and early diagnosis and planning treatment strategy. This prospective study was carried out with 88 patients in tertiary care hospital, Central India from July 2020 to July 2022. Data was collected and analysed. Management depended on diagnosis, culture specific antibiotics to surgical drainage of abscess. AIM of this research is to study clinical profile, radiological investigations, microbiological profile, management and prognosis of patients with deep neck space infections undertaken at tertiary care centre.*

Keywords: Deep neck space infection, Odontogenic infection, Diabetes mellitus

1. Introduction

DEEP NECK SPACE INFECTIONS are defined as infection in the potential spaces and fascial planes of the neck. ⁽¹⁾ Infections of deep neck spaces has been a common challenging problem due to its complex anatomy, deep location, difficult access, proximity to other neurovascular structures and communication of one space to other and also with areas outside the head and neck (e. g. mediastinum up to the coccyx). ⁽²⁾

The complicated anatomic framework of the neck can make the process of diagnosis difficult. Hence clinical suspicion is essential during the diagnosis as several deep neck infections are not evident on palpation and can be life threatening if not treated early. ⁽³⁾

Dental infections are the most common cause of DNSI in adults, whereas oropharyngeal infections are the most common cause in children.

Common complications of DNSI (DEEP NECK SPACE INFECTION) include airway obstructin, jugular vein thrombosis, mediastinitis and sepsis. Treatment principally comprises airway management, antibiotic therapy and surgical intervention. ⁽⁴⁾ The diagnosis and treatment of deep neck space infections was associated with high morbidity and mortality. ⁽⁵⁾

The complication rate has been reduced in recent years due to the advent of modern medical protocols and surgical techniques. ⁽²⁾

Management includes broadspectrum antibiotics and surgical management. Surgical treatment consists intraoral drainage, external incision and drainage followed by tracheostomy if there is airway compromise and tooth extraction wherever necessary. This study has been conducted to study the aetiopathogenesis, risk factors, clinical features, complications, investigations modalities and treatment in our scenario.

2. Materials and Methods

The present study comprises of prospective analysis of Deep neck space infections. It was carried out in patients attending otorhinolaryngology OPD, casualty or referred to otorhinolaryngology department in a tertiary care centre from Nov 2020 to Nov 2022. Total 88 number of cases were included in these study.

All patients presented to ENT OPD, casualty or referred to ENT with complaints of neck swelling and pain, fever, throat pain, dysphagia, odynophagia, change in voice, breathing difficulty underwent detailed clinical examination and diagnosed clinically as deep neck space infections were included in these study. In cases where clinical diagnosis was uncertain radiological investigations such as ultrasonography head neck and face region, x - ray neck anteroposterior and lateral view, x - ray chest posteroanterior view, were done. CECT neck was done if required for detail assessment. Incision and drainage was done at the earliest in majority of the patients and pus was sent for culture and sensitivity analysis. Tracheostomy was done wherever required. All patients were initially started on broad spectrum antibiotics. The antibiotics were modified on culture sensitivity reports or on clinical unresponsiveness. Supportive therapy, in the form of intravenous fluids, analgesics, antipyretics, mouth washes etc. were given. Cleaning and dressing of wound cavity with povidone iodine and hydrogen peroxide was done for appropriate period of time till wound became healthy. In some wound cavities metronidazole and gentamicin antibiotic solution was used for cavity wash. Postoperatively cases with history of dental infection or dental caries referred to Dental OPD where dental extraction was done if needed.

Follow up was done on 7th, 15th day and at the end of 1 month after discharge. Results are presented in numbers and percentage.

3. Result

3.1 Age Distribution

Table 1: Age Distribution

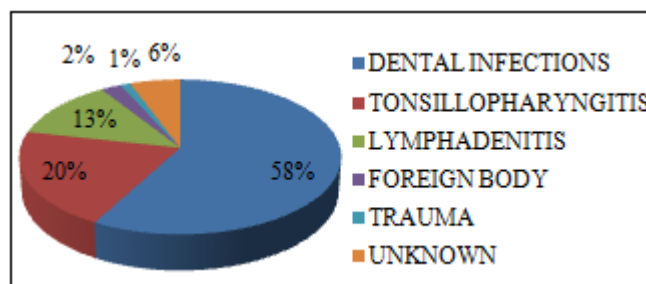
Age in years	No. of cases (n=88)	Percentage
1 - 10 years	8	9%
11 - 20 years	8	9%
21 - 30 years	12	13.63%
31 - 40 years	19	21.59%
51 - 60 years	9	10.22%
61 - 70 years	10	11.36%
71 - 80 years	9	10.22%
81 - 90 years	1	1.1%

In the present study, 88 cases (55 - male, 33 - female) of deep neck spaces are studied over a period of 2 years in a tertiary care hospital from July 2020 to July 2022. Youngest patient was 4 years old and oldest seen was 88 years old. It was observed that the maximum number of cases belonged to age group of 31 - 40 years.

3.2 Etiopathogenesis of Deep Neck Space Infections

Dental infection was the most common cause in 51 (57.9%) cases, followed by tonsillopharyngitis in 18 (20.45%).

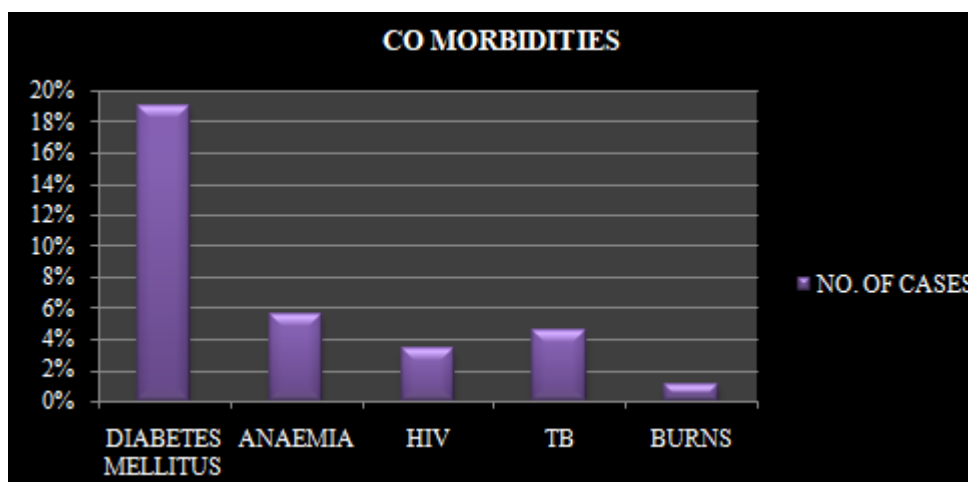
Lymphadenitis was the third most common cause. Among 51 cases of dental infection 25 cases had tooth caries and 7 cases had recent history of tooth extraction, all these patients had poor oral hygiene. In 15 cases of Ludwig's angina, spread of dental infection resulted into sublingual and submaxillary space involvement.



Graph 2: Etiopathogenesis (n=88)

Co Morbidities

The most common co morbidity was diabetes mellitus in 17 (19%) cases. In 5 (5.6%) cases anaemia was detected and 3 (3.4%) cases presented with immunocompromised state like HIV.



Graph 3: CoMorbidity

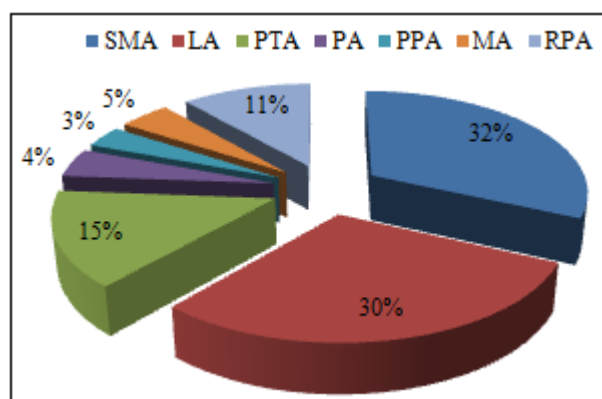
Table 2: Clinical Features

Clinical Features	No. of Cases (n=88)	Percentage
Neck Swelling	63	71.5%
Fever	57	64.7%
Neck Pain	53	60.2%
Dental Complaints	48	54.5%
Odynophagia	37	42%
Dysphagia	37	42%
Throat Pain	25	28.4%
Breathlessness	14	15.9%
Voice Change	1	1.1%

The most common clinical feature with which the patients presented were swelling (in 63 (71.5%) cases) followed by fever in 57 (64.7%) cases and pain in 53 (60.2%) cases.

Sites of infection

Submandibular abscess was found to be the most common abscess comprising of 28 (31.81%) cases, followed by Ludwig's angina constituting 26 (29.54%) cases.



Graph 4: Site of infection (n=88)

Table 3: Microorganism

Microorganisms	No. of Cases (n=88)	Percentage
No Growth	38	43.18%
Staphylococcus Aureus	21	23.8%
Klebsiella	15	17.04%
Mycobacterium Tuberculosis	4	4.5%
Anaerobes	3	3.4%
Mixed Flora	3	3.4%
Streptococcus Viridens	2	2.2%
Streptococcus Pyogenes	2	2.2%

Out of 88 cases 38 patients (43.18%) showed no organism growth on culture media. 21 cases (23.8%) showed growth of staphylococcus, 15 (17.04%) cases showed growth of klebsiella which was commonly seen in patients with raised blood sugar. Anaerobes and mixed flora was also grown in some.

Table 4: Investigations

Investigations	No. of Cases (n=88)	Percentage
USG	55	62.5%
CECT	7	7.9%
USG+CECT	4	4.5%
NO Radiological Investigations Required	22	28.4%

Radiological investigations:

Ultrasonography was done in maximum cases 55 (62.5%). CECT along with USG was required in 4 cases to assess extension and to look for impending airway compromise.

X-ray chest posteroanterior view done in all 88 cases were found normal except in 2 cases which showed widening of mediastinum whereas lateral view neck done in parapharyngeal and retropharyngeal abscess cases revealed widening of prevertebral space.

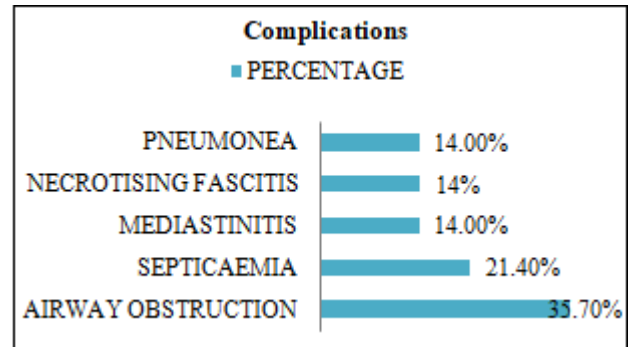
Graph 5: Management

All patients were initially started with empirically broad spectrum antibiotics which optimized according to culture sensitivity. 78 (89%) cases were surgically managed. Out of these in 25 cases tooth extraction was done. Tracheostomy was done in 11 cases. 10 (11%) cases were managed conservatively with the broad spectrum antibiotics.

Complications

Most common complication (35.7%) was airway obstruction due to compression of airway for which tracheostomy was done. 3 cases (21.4%) went into septic shock & 2 (14.2%) cases complicated with necrotising fasciitis who later succumbed. 2 (14.2%) cases of retropharyngeal abscess progressed to mediastinitis and lead to demise.

Complications

**Table 5: Outcome**

Outcome	No. of Cases (n=88)	Percentage
Recovered	84	95.5%
Death	4	4.5%

84 cases (95.5%) recovered with surgical and conservative management.

4. Discussion

In this study of 88 cases, males preponderance seen and the age distribution ranged from 4 yrs to 88 years, which was nearly similar to Vinayak Kuradagi and Gaurav Kataria Study male predominance was seen and age group with maximum incidence was noted to be 31 – 40 years in both of this study. ^(11, 4)

This study showed Submandibular abscess (31.18%) was a commonest type of deep neck space infection followed by Ludwig's angina (29%), which was similar to Rumpa Das study. In this study the most common etiology of deep neck space infection was dental infection followed by pharyngotonsillar infection which was similar with Venkatesh Patil study and varied with thiago pires study where the most common etiology was tonsillitis. ^(5, 13)

In this study neck swelling was the most common clinical presentation which was present in 63 (19%) of the patients varied from Weiqiang Study but similar to Dakheelallah study followed by fever in 57 (17%) patients, neck pain 53 (16%), dental complaints in 48 (14%) patients and least common presentation was voice change which was seen in only 1 patient. (3, 1)

In this study 30 cases were with other associated diseases as a secondary cause. Among those Diabetes Mellitus was the commonest co morbidity found in 17 cases, Burns in 1 case as co morbid conditions, culture and sensitivity of the discharge aid in the management of deep neck space infections. In this study radiological investigations of choice was ultrasonography done in 55% of the cases was helpful in differentiating between cellulitis and abscess. X - ray neck anteroposterior and lateral view helped to show compression of airway. CECT was done in 7% cases to see the extension of DNSI and 25% cases managed on the basis of clinical evaluation only.

In this study most common microorganisms causing deep neck space infection was Staphylococcus aureus found in 21 cases (23.8%) followed by Klebsiella which was similar to Santosh Kumar Swain study in which Staphylococcus aureus found in 13 cases (36.11%) and 8 cases showed

Streptococcus pyogenes. This study showed no growth in 38 cases (43%) due to antibiotics used prior to culture varied from Nirmal Kumar study which showed *Klebsiella* as most common microorganisms found in 46% cases. (6, 9)

This study showed that medical treatment was sufficient to cure DNSI in 10 cases (11%), Incision Drainage and Antibiotics for 78 cases (89%), 5 cases presented with stridor and was tracheostomised followed by incision and drainage and antibiotics. Tracheostomy was also done in another 6 cases, indicated from anaesthesia side for general anaesthesia as intubation was not possible. Tooth extraction was done in 25 cases. (6)

In this study most common complication was airway obstruction in 5 patients (5.6%) presented in stridor, septicaemia in 3 cases (3.4%), mediastinitis in 2 cases (2.2%), necrotizing fasciitis in 2 cases (2.2%) and pneumonia also seen in 2 cases (2.2%). Due to mediastinitis and necrotizing fasciitis death occurred in 4 cases (4.5%).

In a study done by Harsimran Tiwana 2019 - 2020 complications occurred in 4.5%. Among those septic shock (2.7%), mediastinitis (0.9%) and death occurred in 0.9%.

In a study done by Paolo - Boscolo - Rizzo 2012 (100) complication occurred in 18.4% patients. Among these, airway obstruction in 31 (8.5%), septicemia 22 (6%), mediastinitis 16 (4.4%), pneumonia 12 (3.3%). (10)

In a study by Joon - Kyoo et al 2007 (17) 23 (14.55%) patients developed life threatening complications, mediastinitis 14 (8.86%), septicemia 06 (3.79) cases, airway distress 09 (5.69) cases, death occurred in 03 (1.89) cases due to septic shock. (7)

In a study by Hassan Abshirini et al 2010 (19) 24 cases developed life threatening complications. In those 10 cases developed necrotizing fasciitis, 14 cases developed dyspnea, 7 cases developed septic shock, 5 cases developed mediastinitis, 8 patients expired due to these complications.

5. Conclusion

- Deep neck space infection remains life - threatening condition since long time. Odontogenic infections are the most common cause. Submandibular abscess is the commonest.
- The commonest clinical feature were Neck Swelling and Neck Pain. Diabetes Mellitus is the most common comorbidity. Early presentation and modern techniques have led to a decrease in morbidity and mortality. Ultrasonography and CECT are most useful in diagnosis and assessment.
- Intravenous antibiotics as per culture sensitive report followed by Incision and Drainage is the mainstay of treatment for deep neck space infections.

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