

“Study of Deep Neck Space Infections and Management”

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Abstract

OBJECTIVE: This study was done to identify the clinical findings, risk factors and complications of deep neck space infection (DNSI) among the 50 patients presented to ENT department, Government general hospital, Guntur during the period of two years from January 2018 to December 2019.

MATERIALS AND METHODS: This study was done on 50 patients who presented with neck swelling and fever during the period of two years to ENT department, GGH, Guntur who gave consent. Those patients with DNSI caused by neck trauma were excluded from the study. Data was categorized according to name, age, sex, clinical features, diagnosis and main stay of treatment given to the patients.

RESULTS: In our study analysis, females were more affected with DNSI with Ludwig's angina (42%), followed by submandibular abscess (28%). Dental infections were the most common cause of DNSI. Organisms involved in DNSI were streptococcus species (36%) followed by staphylococcus aureus (20%). Diabetes mellitus is most commonly associated with DNSI. Extension to other spaces was the most common complication of DNSI.

CONCLUSION: In spite of wide use of antibiotics DNSI are still occurring and they need emergency managements, both medical and surgical intervention like incision and drainage to avoid complication and tracheostomy in case of airway compromise.

Keywords: Ludwig's angina, submandibular abscess

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I. Introduction

Deep neck space infections are the infections of deep neck spaces formed by the cervical fascial layers. They are the life-threatening infections with increased risk of complications and with higher morbidity and mortality. Rapidly progressive course and fatal outcome can be seen in the immunocompromised patients. DNSI have become relatively uncommon due to wide spread use of antibiotics. Patients with odontogenic infections, diabetes mellitus, HIV infection, drug abusers, and patients on chemotherapy are more prone to complications. Medical management includes treatment with broad spectrum intravenous antibiotics. Incision and drainage is the mainstay of surgical treatment. Tracheostomy is last important aspect in the treatment of DNSI.

II. Materials And Methods

This is a prospective study design conducted in government general hospital, Guntur, Andhra Pradesh, India. From January 2018 to December 2019 a total of 50 cases of DNSI were included in the study. Data was categorized according to name of the patient, age, sex, clinical features, diagnosis and main stay of treatment given to the patient. The results obtained in this study were expressed as percentage of the total cases. Thorough history taking and detailed clinical examination and all routine investigations were done for every case. The cases were subjected to relevant investigations and started on broad-spectrum antibiotics which were later changed according to culture and sensitivity report. The deserving cases underwent surgical procedures and the results were analysed.

III. Result

Among the 50 cases of DNSI, the most common infection was found to be Ludwig's angina (42%), followed by submandibular abscess (28%).

TABLE-1: TOTAL NUMBER OF CASES OF DEEP NECK SPACE INFECTIONS AND SEX

DISTRIBUTION

S. No.	DEEP NECK SPACE INFECTION	No. of cases	Percentage	Male	Percentage	Females	Percentage
1.	Ludwig’s angina	21	42	9	18	12	24
2.	Submandibular abscess	14	28	7	14	7	14
3.	DNSI with multi space involvement	6	12	2	4	4	8
4.	Peritonsillar abscess	3	6	3	6	0	0
5.	Parapharyngeal abscess	2	4	1	2	1	2
6.	Parotid abscess	1	2	1	2	0	0
7.	Retropharyngeal abscess	1	2	1	2	0	0
8.	Ludwig’s angina with necrotizing fasciitis	1	2	1	2	0	0
9.	DNSI secondary to pulmonary tuberculosis	1	2	1	2	0	0
	TOTAL NO. OF CASES	50	100	26	52	24	48

In the present study , males were more commonly affected than females.

Table 2: Age Distribution of Deep Neck Space Infections

	Age group	Ludwig’s angina	Sub Mandibular abscess	Quinsy	Parotid abscess	RPA	PPA	DNSI with Multispace involvement	LudwigsWith NF	DNSI SecondaryTo PTB
1	0-10	1	2	1	0	0	0	0	0	0
2	11-20	0	2	0	0	0	0	2	0	0
3	21-30	2	3	1	0	0	0	1	0	0
4	31-40	1	2	1	0	1	0	0	0	1
5	41-50	5	2	0	0	0	0	1	0	0
6	51-60	4	0	0	0	0	1	2	1	0
7	61-70	7	2	0	0	0	1	0	0	0
8	71-80	1	1	0	1	0	0	0	0	0
	Total	21	14	3	1	1	2	6	1	1

In our study most common age group affected with DNSI are 41 to 70 years. ludwig’s angina occurs most commonly in age group 61 to 70 years.

TABLE-3: ETIOLOGY AND RISK FACTORS OF DNSI

Risk factor	Ludwig’s angina	Sub mandibular abscess	Quinsy	Parotid abscess	RPA	PPA	DNSI with Multispace involvement	Ludwigs With NF	DNSI SecondaryTo PTB
Dental Caries	11	6	1	0	0	1	4	1	0
Diabetes Mellitus	7	3	0	0	1	1	2	0	0
Poor Immune Status	3	0	0	0	0	0	0	1	1

Dental caries was found to be the most common risk factor for most of DNSI, followed by diabetes mellitus. Below text refers to **Table No. 4**

Neck swelling was the commonest clinical feature found in 45 out of 50 DNSI cases followed by Fever and Dysphagia.

Airway compromise is the least common feature which was seen only in 8 cases.

All the cases underwent detailed history taking, clinical examination and routine blood investigations and urine examination. Blood samples were taken and sent for complete blood picture, ESR, bleeding time, clotting time, prothrombin time and INR. Biochemical investigations which include random blood sugar, blood urea, serum creatinine, liver function tests, serum electrolytes and viral markers were done in all the 50 cases.

Table 4: Clinical features in deep neck space infections

Clinical feature	Ludwig's angina	Sub mandibular abscess	Quinsy	Parotid abscess	RPA	PPA	DNSI with multispace involvement	Ludwigs with Necrotising fasciitis	DNSI secondary to PTB
Fever	17	9	3	0	1	2	5	0	1
Neck Swelling	21	14	0	1	0	2	6	1	1
Throat Pain	3	1	3	0	0	1	2	0	1
Dysphagia	16	7	3	0	1	2	5	1	1
Odynophagia	5	3	3	0	0	0	3	0	1
Trismus	14	6	2	0	1	1	5	1	0
Airway compromise	5	0	0	0	0	0	3	0	0
Cheek Swelling	2	3	1	1	0	0	5	1	0

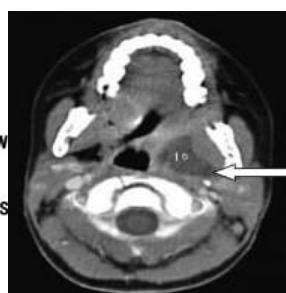
Out of 50 cases, one case was found to be positive for hepatitis B virus antigen and 2 cases were positive for HIV. Fasting and post prandial blood sugar tests were done in patients with diabetes mellitus.

Blood grouping and cross matching was done in 44 cases in whom surgical intervention (incision and drainage and tracheostomy) was necessary. Wide bore needle aspirates taken from the swelling were sent for gram stain, AFB stain and culture and sensitivity in all the cases. Out of 50 cases, culture and sensitivity report showed no bacterial growth in 12 cases.

X ray neck lateral view was taken in 20 cases to know the extent of airway compromise. Out of which 12 cases were males and 8 cases were females. Out of 20 cases, one case was diagnosed as retro pharyngeal abscess by the presence of pre vertebral widening and air fluid level on X ray neck lateral view. Chest X ray was taken in 10 cases to identify the complications like aspiration pneumonia, pleural effusion and mediastinitis.



X RAY NECK LATERAL VIEW SHOWING RETROPHARYNGEAL ABSCESS



CECT NECK AXIAL VIEW SHOWING LEFT PARAPHARYNGEAL ABSCESS

Ultrasonography of the neck was done in all the 50 cases of which 21 cases were diagnosed to have Ludwig's angina, 14 cases with submandibular abscess and one case was found to have parotid abscess. Ultrasonography differentiates abscess from cellulitis and identifies the presence of hypo echoic collection.

CT scan neck was done in only 7 cases to know the location, size and extent of abscess and also airway compromise. Out of 7 cases, 3 were males and 4 cases were females. All were adults and CT neck was not performed in any child. CT neck plain was taken in all the 7 cases and CECT neck was done in 2 cases. CECT neck identifies the extent of abscess, vascular complications like erosion of major blood vessels and thrombosis of internal jugular vein. Iodine based contrast agent iohexol, which is a non ionic water soluble agent was given intravenously. Renal function tests were performed prior to the CECT neck. Contrast was not given in other 5 cases as they had elevated blood urea and serum creatinine levels.

Out of 7 cases, 5 cases were found to have ludwig's angina with multi space involvement and one case with para pharyngeal space abscess. Out of these 7 cases, one case was identified to have the complication of left internal jugular vein thrombosis. One case also underwent CT scan chest which revealed the presence of fibro cavitory lesions with cicatricial bronchiectasis in left upper lobe of the lung with tuberculous etiology and also presence of mediastinitis.

TABLE-5 CULTURE AND SENSITIVITY

S.No.	Organism isolated in culture and sensitivity	No. of cases	percentage
1.	Streptococcus species	18	36
2.	Staphylococcus aureus	10	20
3.	Coagulase negative Staphylococcus aureus	3	6
4.	MRSA	0	0
5.	Gram negative organisms	6	12
6.	Mycobacterium tuberculosis	1	2
7.	No bacterial growth	12	24
	Total	50	100

Streptococcus species were the most common organisms isolated from the pus which was sent for culture and sensitivity. Staphylococcus aureus was isolated in 10 cases, coagulase negative Staphylococcus aureus was isolated in 3 cases and gram negative organisms were isolated in 6 cases. Mycobacterium tuberculosis was isolated in one case. Culture and sensitivity report showed no bacterial growth in 12 cases out of 50. According to the culture and sensitivity report the empirical antibiotic therapy was changed in 1 case in which Mycobacterium tuberculosis was isolated



TABLE-6 MEDICAL MANAGEMENT

S.No.	ANTIBIOTIC GIVEN	NO. OF CASES	NO. OF MALES	NO. OF FEMALES
1.	Ceftriaxone + Metronidazole + Amikacin	24	13	11
2.	Ceftriaxone + Metronidazole + Gentamycin	3	2	1
3.	Piperacillin + Tazobactam + Metronidazole	8	5	3
4.	Amoxycillin + Clavulanic acid + Metronidazole	3	0	3
5.	Cefoperazone + Metronidazole	2	1	1
6.	Meropenem + Metronidazole	4	1	3
7.	Ampicillin	1	0	1
8.	Ceftriaxone + Metronidazole	4	3	1
9.	ATT	1	1	0
	TOTAL	50	26	24

Majority of the cases were given combination of the intravenous antibiotics that are active against gram positive, gram negative and anaerobic bacteria. A combination of third generation cephalosporins, aminoglycosides and metronidazole are effective in the treatment of DNSI. This combination of intravenous antibiotics was given in 27 cases. Renal function was monitored when aminoglycosides like amikacin and gentamycin were given. 4 cases out of 50 were given combination of ceftriaxone and metronidazole only as these patients had elevated serum creatinine levels.

Metronidazole was given in 48 cases as it is effective against anaerobic bacteria. 3 cases were given intravenous amoxicillin in combination with beta lactamase inhibitor clavulanic acid and metronidazole. Higher antibiotics like piperacillin with tazobactam, cefoperazone and imipenem in combination with metronidazole in 14 cases. They were given in patients with immunocompromised state, DNSI with multispace involvement and suspected cases of septicemia.

Later the empirical antibiotic therapy changed according to the culture and sensitivity report. Anti Tuberculosis treatment was started in one case based on culture and sensitivity report. Ampicillin was given in only one case as she was a pregnant female with 12 weeks of gestation period.

TABLE-7 TREATMENT MODALITY

S.No.	TREATMENT MODALITY	NO. OF CASES	Percentage
1.	Medical management with antibiotics	6	12
2.	Incision and drainage + Antibiotics	41	82
3.	Airway management (Tracheostomy)	3	6
	TOTAL	50	100

Empirical antibiotic coverage was given in all the 50 cases. 6 cases (12%) were managed with antibiotics alone as they appeared early to an OPD. Out of these 6 cases, 5 were females and one case was male. All the 6 cases were adults. Out of 6 cases, one patient had Ludwig's angina, 3 patients had submandibular abscess, one patient had peritonsillar abscess and one patient had DNSI with multispace involvement. One patient was pregnant female out of 6 cases and she was managed with IV ampicillin. All these 6 cases recovered well with antibiotics alone.

41 cases (82%) out of 50 were managed with incision and drainage along with IV antibiotics. Out of 41 cases, 24 cases were males and 17 cases were females. 4 cases were children less than 10 years age and remaining 37 cases were adults. Out of 4 paediatric cases, 3 were male children and one was female child. Out of 41 cases, incision and drainage was done in 18 cases of Ludwig's angina, 11 cases with submandibular abscess, 4 cases with DNSI with multispace involvement, 2 cases with parapharyngeal abscess, 2 cases with peritonsillar abscess, 1 case each with parotid abscess, retropharyngeal abscess, DNSI secondary to PTB and Ludwig's with necrotizing fasciitis.

Emergency tracheostomy was done in 3 cases (6%) with airway compromise. All the 3 cases were adults. Out of 3 cases, 2 were females and one case was male. Out of these 3 cases, 2 cases had Ludwig's angina and one had DNSI with multispace involvement. Medical management includes empirical antibiotics, systemic corticosteroids of short duration (2 to 3 days) to relieve airway oedema, injectable analgesics, antacids and IV fluids. Regular wound dressings and debridement were done.

IV. Discussion:

DNSI are the infections within the deep neck spaces which are the spacial compartments formed by divisions of the cervical fascia of the neck. These days, prevalence of DNSI has been reduced due to widespread use of antibiotics. In our study of deep neck space infections and management in a tertiary care hospital, 50 cases were included. The male to female ratio was 1.08:1. Both males and females are almost equally affected. Age group ranged from 3 to 80 years. Most of them were between 51 to 60 years of age.

Majority of the patients were referred to our center, which is a tertiary care hospital for effective treatment. Poor communication and lack of knowledge were responsible for delayed presentation of patients with deep neck space infections to our hospital.

Atish Kumar B. Gujrathi et al. done a study on deep neck space infection between 2013 to 2016 on 270 cases. Odontogenic infection was found to be the commonest etiological factor in majority of cases similar to our study (48%).

Dr. Arthur Nwas Hindi et al. performed a study on 98 cases in which Ludwig's angina has the highest frequency among all the DNSI similar to our study.

Gaurav Kataria, Adithi Saksena et al. studied on 76 cases between 2010 and 2013 in which most common age group affected is between 31 to 50 years. The male to female ratio of the cases was 1.23:1. The

most common age group affected in our study was found to be between 51 to 60 years. The male to female ratio in our study was 1.08:1. In both the studies males were most commonly affected

T.D.Thimmappa and S. Ramesh et al. from Shivamogga institute of medical sciences performed a cross sectional study on deep neck space infections in which majority of patients belonged to low socio-economic group which is similar in our study also.

Gerd Jurgen Ridder et al. performed a study on 234 cases in 8 years duration. They found that out of 234 cases 13 cases were secondary to malignancy and 6 cases were secondary to tuberculosis. In our present study of DNSI, out of 50 cases one case was found to be secondary to pulmonary tuberculosis.

Ah Eftekharian et al. performed a study on 112 patients with deep neck space infections in which the most common symptom was neck swelling in 88.4% of cases, which is similar to our study in which neck swelling was in 45 cases (90%) out of 50.

In the study conducted by Har-El (1994) and Parhiscar (2001), tracheostomy was performed in 75% of the cases of Ludwig's angina with airway compromise. In our study tracheostomy was performed in 3 cases (6%) out of 50

V. Conclusion:

DNSI are the life-threatening infections involving potential spaces of the head and neck. Early diagnosis, culture sensitive antibiotics, and surgical drainage are the mainstay of treatment for DNSI. In our study, the diagnosis of DNSI was established based on history, detailed clinical examination, laboratory investigations and radiological investigations. The most common etiological factor for DNSI was odontogenic infection. Age group between 51-60 years were most commonly affected. Out of 50 cases, 4 cases were children with less than 10 years age. Males were most commonly affected than females in both paediatric and adult age group. Male: female = 1.08:1. Ludwig's angina was the most common deep neck space infection in both males and females. Submandibular abscess was the most common DNSI in paediatric age group. The most common clinical features were neck swelling, fever and dysphagia. Aspirates from the swelling are sent for culture and sensitivity. Streptococcus species was the commonest organism causing DNSI in both paediatric and adult age group followed by Staphylococcus aureus. Incision and drainage along with antibiotics was the mainstay of the treatment which was given in majority of our cases in both paediatric and adult age group. Emergency tracheostomy was done in 3 cases (6 percent) with airway compromise and all the 3 cases were adults. Supportive measures like intravenous fluids, enteral feeding with nasogastric tube are important for early recovery of the patient. Out of 50 cases, 6 patients (12 percent) died with complications like septicemia, mediastinitis and acute renal failure. All the 6 patients were adults, out of which 4 were females and 2 were males and there was no mortality in paediatric age group. All other 44 patients recovered well with the given treatment and were discharged. Average period of hospitalisation was 7 days.

Abbreviations:

DNSI – Deep Neck Space Infections, RPA – Retro Pharyngeal Abscess,
PPA – Para Pharyngeal Abscess, PTB – Pulmonary Tuberculosis,
NF – Necrotizing Fascitis

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