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A Clinical Analysis of Infections of Deep Neck Space With Respect To Bacteriology and Antibiotic Sensitivity

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Abstract: *Deep neck space infection refers to an infection in the potential spaces and fascial planes of the neck, either with abscess formation or cellulitis. This is a prospective study of 40 patients diagnosed and undergoing treatment for deep neck space infections in the Department of ENT, Gauhati Medical College and Hospital for a period of 6 months from 1st May 2018 to 31st Oct 2018.The aim was to study the prevalence, clinical features and associated risk factors of the deep neck space infections and the management and outcome on the basis of microbiology and culture sensitivity reports. In this study, the most frequent etiologies were bacterial tonsillitis (31.68%) and odontogenic infections (23.7%). The most common cervical areas affected were the peritonsillar (26.7%), submandibular (22.7%) and parapharyngeal spaces (18.8%). The main organism isolated was Staphylococcus spp.(20%) and no growth seen in 35% of cases. Klebsiella spp. was commonly seen in cases presenting with Type II Diabetes Mellitus(70%). 33(82.5%) cases were sensitive to Amoxycillin with Clavulanic acid. Most cases responded to 3rd Gen. Cephalosporins 35(87.5%), Piperacillin with tazobactam 38(95%), Ciprofloxacin 36(90%), Amikacin 36(90%), Meropenem 38(95%), Cotrimoxazole36(90%), Colistin 36(90%) and Tigecycline 36(90%). With broad spectrum antibiotics, majority of infections were successfully treated, but a need for further study on antibiotic resistance is to be stressed upon.*

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I. Introduction

Deep neck space infection refers to an infection in the potential spaces and fascial planes of the neck, either with abscess formation or cellulitis. (1) It can be categorized into peritonsillar, masseteric, parotid, parapharyngeal, retropharyngeal, submandibular, parotid abscesses. 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 and coccyx).(2)Previously, before the advent of antibiotics, tonsillar and peritonsillar infections were the source of infection in 70% cases(3); but now the most common cause is considered to be dental in origin. (4) Extended spectrum Beta lactamase enzymes are becoming increasingly common in hospital practice.(5) It is suspected that biofilm phenotypes could play a crucial role in the recalcitrance of large deep neck abscesses. (6) A rapidly progressive course with fatal outcome may be seen, especially in immunocompromised patients (e.g. diabetes mellitus, HIV infection, steroid therapy, chemotherapy). (7,8)

II. Material And Methods

Study design-A hospital based prospective analytical study.
Study population- 40 patients diagnosed and undergoing treatment for deep neck space infections in the department of ENT, Gauhati Medical College and Hospital.

Inclusion criteria:
Patients of all age groups and both sexes presenting with deep neck space infection in the department of ENT, Gauhati Medical College and Hospital during the course of study.

Exclusion criteria:
1. Patients presenting with Superficial neck space infections.
2. Patients who were not willing to give consent.

Procedure methodology
We included 40 patients in our study according to the inclusion and exclusion criteria. Data was collected based on following variables: Age, Sex, Etiology, Clinical features, Systemic diseases, Management, Complications, Investigations, Neck spaces involved, Duration of hospital stay and Outcome of treatment. A

detailed history and physical examination were carried out. Needle aspiration or incision and drainage were done at the earliest stage in most of the cases. Patients were initially started on empirical antibiotic therapy and pus was sent for culture, gram staining and AFB staining and sensitivity analysis. Antibiotics were modified on the basis of these reports if necessary. Routine hematological investigations like CBC, RBS, S. Creatinine, Viral markers were done and supportive therapy in the form of intravenous fluid, analgesics, antipyretics given. USG, CT Scan or MRI was done as and when necessary. Progression of disease was observed during hospital stay and adequate stress was given on the management of underlying systemic conditions.

III. Results and Observations

AGE DISTRIBUTION:

The present study shows age ranged from 2 months to 65 years with a mean of 29.75 ± 10.65 years and the commonest age group was seen to be in the range of 31-40 years.

Age distribution (yrs)	No of cases (n=40)	Percentage
<1 Yr	2	5
1-10 Yrs	1	2.5
11-20 Yrs	3	7.5
21-30 Yrs	10	25
31-40 Yrs	15	37.5
41-50 Yrs	7	17.5
51- 60 Yrs	1	2.5
61-70 Yrs	1	2.5

SEX DISTRIBUTION:

In our study there were 27(67.5%) males and 13(32.5%) females. The male to female ratio was 2.07:1

Sex	No. of patients(n=40)	Percentage
Female	13	32.5
Male	27	67.5

RESIDENCE

In this study, the majority of cases 33(82.5%) were from rural area and 7(17.5%) cases were from urban area.

Residence	No of cases(n=40)	Percentage
Rural	33	82.5
Urban	7	17.5

CLINICAL PRESENTATION

In this study, the most common presenting symptom was found to be pain 38(95%), followed by neck swelling 31(77.5%), followed by pain while swallowing or odynophagia in 26(65%) cases and fever in 27(67.5%) cases. Dental infection was found in 16 (40%) cases.

Clinical feature	No of patients(n=40)	Percentage
Pain	38	95
Swelling	31	77.5
Fever	27	67.5
Pain in swallowing	26	65
Dental infection	16	40
Trismus	13	32.5
Respiratory difficulty	4	10
Change of voice	3	7.5
Stridor	1	2.5

ETIOLOGY

In the present study out of 40 cases, 18(45%) cases presented with underlying systemic condition mainly Type II Diabetes Mellitus, Odontogenic causes in 16(40%) cases, Upper respiratory tract infections in 15(37.5%) cases and Foreign body oesophagus in 5(12.5%) cases.

Etiology	No of patients(n=40)	Percentage
Underlying systemic condition (Type II Diabetes Mellitus)	18	45
Odontogenic	16	40
Upper respiratory tract infection	15	37.5
Foreign body (Oesophagus)	5	12.5
Unknown causes	10	25
Suppurative lympadenopathy	7	17.5
Trauma	3	7.5
IV Drug abuse	1	2.5
Underlying growth	2	5
Tuberculosis	1	2.5
Unsafe CSOM	2	5

INVOLVEMENT OF NECK SPACES-

In the present study the most common space to be involved was the submandibular space 16(40%), followed by peritonsillar space 15(37.5%) and parotid space 11(27.5%), parapharyngeal space 6(15%), retropharyngeal space 6(15%), mixed space in 5(12.5%) cases and ludwigs angina in 3(7.5%) cases.

Neck space involved	No of cases(n=40)	Percentage
Submandibular space	16	40
Peritonsillar space	15	37.5
Parotid space	11	27.5
Parapharyngeal space	6	15
Retropharyngeal space	6	15
Mixed space	5	12.5
Ludwigs angina	3	7.5
Masticator space	2	5
Submental space	1	2.5
Pretracheal space	1	2.5

INVESTIGATIONS

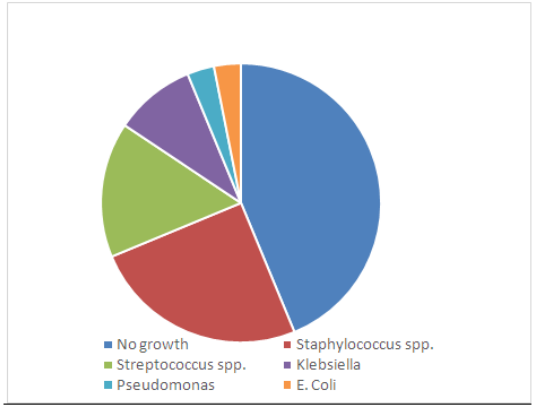
In this study baseline investigations- Routine blood examination, Blood sugar, S. Creatinine, Bleeding profile and viral markers were done in all cases. Selective cases required radiological investigations to evaluate extent of infection and involvement of any vital underlying structures. X-ray soft tissue neck was done in 27(67.5%) cases, USG neck in 18(45%) cases, X Ray OPG in 15(37.5%) cases, CECT neck for 3(7.5%) cases and MRI for 1(2.5%) case respectively.

Radiological investigation	No of cases(n=40)	Percentage
X-Ray soft tissue neck	27	67.5
USG Neck	18	45
X-Ray OPG	15	37.5
CECT Neck	3	7.5
MRI	1	2.5

CULTURE AND BACTERIOLOGY:

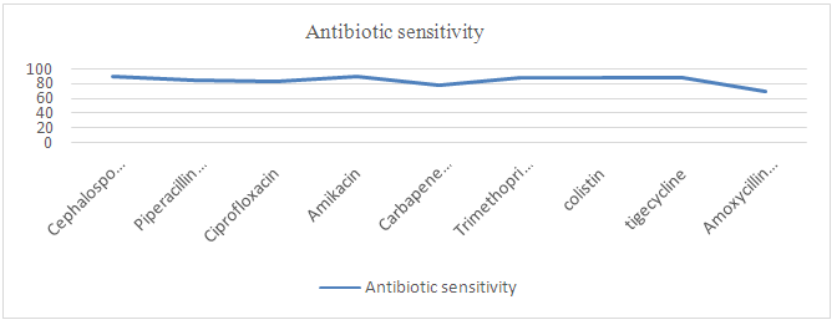
Out of 40 cases, pus culture and sensitivity were sent in 32 cases and majority cases 14(35%) showed no growth (as most cases were undergoing antibiotic treatment prescribed outside prior to admission) or showed gram positive cocci 8(20%) (Staphylococcus aureus), Streptococcus in 5(12.5%) cases, Klebsiella Pneumoniae in 3(7.5%) cases, Pseudomonas in 1(2.5%) cases and E. Coli in 1(2.5%) cases.

Type of organism	No of cases	Percentage
No growth	14	35
Staphylococcus spp.	8	20
Streptococcus spp.	5	12.5
Klebsiella	3	7.5
Pseudomonas	1	2.5
E.coli	1	2.5



ANTIBIOTIC SENSITIVITY REPORTS OF CASES-

In the study, most cases showed sensitivity to Cephalosporins (Ceftriaxone, Ceftazidime, Cefoperazone) 35(87.5%), Piperacillin with tazobactam 38(95%), Ciprofloxacin 36(90%), Amikacin36(90%), Meropenem38(95%) and Imipenem38(95%), Trimethoprim and sulphomethoxazole 36(90%), Colistin36(90%) and tigecycline36(90%). It was noticed that some of the cases had developed resistance to Amoxycillin with Clavulanic acid, 33(82.5%) cases were sensitive.



TREATMENT

In our study, empirical antibiotics were initiated in all cases until the arrival of culture and sensitivity reports, Incision and drainage(external) was done in 24 cases, Intraoral drainage done for 8 cases, 14 cases required dental checkup and tooth extraction, 1 case required tracheostomy. Plastic surgery opinion with split skin grafting was required in 8 cases. Endocrinology, Cardiology and Nephrology opinions were taken for underlying conditions of diabetes mellitus (18 cases, 45%), Hypertension (16 cases, 40%) and chronic kidney disease (7 cases, 17.5%) respectively and subsequent management done accordingly.

Complications were encountered in few cases. 4 cases progressed to necrotizing fasciitis, 3 cases suffered from septicaemia, 1 case had mediastinitis, 2 cases had airway obstruction and 1 case expired due to underlying comorbidities. The duration of hospital stay was minimum 3 days and maximum 40 days.

Treatment modality	No of patients	Percentage(%)
Incision and drainage(External)	24	60
Incision and drainage(Intraoral)	8	20
Tooth extraction	14	35
Tracheostomy	1	2.5
Split skin grafting	8	20

IV. Discussion

In this case majority of cases was found to be in the range of 31-40 years(37.5%). This correlates with the studies by Parischar et al. and Meheret al.(2001) in which 50% and 60% patients were in the third and fourth decade of life, respectively.(4, 9,10)In the study done by R. Das et al (2017), most common presenting symptom was neck pain and neck swelling (91.1%) (2). Here, Neck pain and neck swelling comprised of 90% and 77.5% of cases respectively. In the study done by Brito T. et al(2017),(11) the most common cervical areas affected were the peritonsillar (26.7%), submandibular/mouth floor (22.7%) and parapharyngeal spaces (18.8%). Here, odontogenic infections comprised of 40% of cases while upper respiratory tract infection comprised of 37.5% of cases. Submandibular space was involved in 40% cases and Peritonsillar space was involved in 37.5% of cases respectively. In the study done by A. Shah et al (2016)(12),Streptococcus viridians was the most common microbe isolated followed by Staphylococcus aureus (16%) and Klebsiella pneumoniae (11%). Maximum resistance was observed for amoxicillin (83.3%), whereas ceftriaxone, imipenem showed minimum resistance (16.7%) to all three antibiotics.

Here, Staphylococcus aureus was detected in 20% and Streptococcus in 12.5% of cases, Klebsiella in 7.5% cases and pseudomonas and E.coli in 2.5% cases each. In the study of K. Sharma et al(2018), Klebsiella pneumonia was the commonest organism isolated through pus cultures in cases of Type II Diabetes Mellitus patients (64.4%).(13) In this study this particular co-orelation was found in 70% of cases. Furthermore, 90% cases were found to be sensitive to cephalosporins while 70% cases were sensitive to Amoxycillin and clavulanic acid.

V. Conclusion

Deep neck space infections remain a common challenge to be tackled in the setting of a tertiary care hospital. With the advent of advanced imaging techniques, better antibiotics and improved surgical techniques, the incidence of these cases has substantially reduced but the new danger to be faced at present is the antibiotic resistance which has developed due to injudicious use of antibiotics. In the present study, the main organism isolated was Staphylococcus spp.(20%) and most patients also showed no growth(35%) as they were referred from other centers and were already under antibiotic course.

Recent research is dealing with the role of biofilms which are found mainly in deep seated infections and contribute to the development of antibiotic resistance. Proper maintenance of personal and oral hygiene and environmental cleanliness, early diagnosis of cases, better imaging methods, use of proper antibiotics based on culture and sensitivity reports and management of comorbid conditions, would invariably go a long way in preventing complications and improve the well being and productivity of the individuals as a whole.

VI. Photographs

Fig 1. Showing a case of Left peritonsillitis

Fig 2. X-ray soft tissue neck showing Retropharyngeal abscess

Fig 3. Right Parotid Abscess

Fig 4. Right Submandibular abscess with healthy granulation tissue

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