

AEROBIC MICROORGANISMS IN NONSPECIFIC NECK ABSCESS - A PROSPECTIVE STUDY IN A TERTIARY LEVEL HOSPITAL

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Abstract

Background: The knowledge of the local pattern of infection and microorganisms in non-specific neck abscess is essential to enable efficacious treatment for it.

Objective: To find out the pattern of bacteria responsible for developing non-specific neck abscess and to analyze the coverage rate of different empiric antimicrobial agents.

Materials and methods: It is prospective observational type of study carried out into Department of Otolaryngology & Head Neck Surgery, Dhaka Medical College Hospital, Dhaka and Department of Clinical Microbiology, ICDDR,B, Dhaka from 1st January, 2016 to 30th June, 2016. Total 100 (Hundred) patients were included in this study. Data were analyzed using computer based programmed statistical package for social science (SPSS).

Results: This study was done among 100 patients. In this study 42 cases (42%) were in the (31-45) years age group. The male patients were 60 (60%) and female were 40 (40%). Majority of patients 70 (70%) came from poor class family with 70 (70%) patients came from rural area, 50 (50%) patients had dental infection, 40 (40%) patients were smoker, 35 (35%) patients had diabetes mellitus, all the cases (100%) presented with dysphagia and fever. The major complication was necrotizing fasciitis 8 (8%), common space was sub mandibular space (45%), Streptococcus 30 (30%) was the most common organism.

Conclusion: The most frequently isolated organism in neck abscess is Streptococcus.

Key word: Non specific neck abscess, Neck spaces, Aerobic microorganism.

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Introduction

Neck space infection refers to an infection in the potential spaces and fascial planes of the neck, either to abscess formation or cellulites.¹ At least 11 deep spaces are part of the complex structure formed by the facial planes, providing possible infection sites. Based on their relationship with the hyoid bone, the deep spaces may be classified as follows: spaces localized above the hyoid level (peritonsillar, sub mandibular, parapharyngeal, buccal, parotid,

masticatory/ temporal); spaces that involve the entire circumference of the neck (retropharyngeal, danger space, prevertebral and carotid); and the anterior or pre tracheal visceral space, below the hyoid bone.²

Neck abscess are bacterial infections originating from the upper aerodigestive tract and involving the deep neck spaces.³ The most common primary sources of neck abscess are the dentition, tonsils, salivary glands, foreign bodies, and malignancies. Neck abscess often

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occur following preceding infections such as dental caries, tonsillitis, pharyngitis, trauma to the head and neck, or among intravenous drug abusers. Infections originating from teeth or their supporting structures, known as odontogenic infections, are among the most common diseases in the oral and maxillofacial region, especially in developing countries⁴. Previously, before the advent of antibiotics, tonsillar and peritonsillar infections were the source of infection in 70% cases of neck abscess⁵; but now the most common cause is considered to be dental in origin.⁶

All age groups may be affected. Patients are often elderly and young.

Mixed infections involving both aerobes and anaerobes are common. *Streptococcus viridans* was the most common pathogen followed by *Staphylococcus epidermidis*, *Staphylococcus aureus* and *Escherichia coli*. *Pseudomonas* spp, *Bacteroides* spp, *Fusobacterium* spp, *Actinomyces* spp and *Haemophilus influenzae* are also identified. A study identified *Streptococcus* (40.62%),

Staphylococcus (18.75 %), *E. coli* (12.5 %), *Pseudomonas* (9.37%), *Proteus* (2%), *Klebsiella* (1%) are the most common pathogen.^{7,8} But in this study we only discuss aerobic organisms.

Clinical manifestations of neck abscess depend on the species involved, and include pain, fever, malaise, fatigue, swelling, odynophagia, dysphagia, trismus, dysphonia, otalgia, and dyspnea.⁹

Most of the patients have a dental infection and the rest usually have an upper respiratory tract infection. A rapidly progressive course of neck abscess with a fatal outcome may be seen, especially in immunocompromised patients with diabetes mellitus, chemo-therapy, steroid therapy, or HIV infection.² In the past, these infections were fairly common; however, with the advent of broad spectrum antibiotics, the incidence of these infections has decreased. Despite the extensive use of antibiotics, neck abscess still remains serious and is associated with significant morbidity. These infections are

potentially life threatening and spread rapidly, leading to severe complications. Potential life-threatening complications have been reported to occur at a rate of 10–20%, even in recent literature on neck abscess cases.^{10,11}

Common and potentially life-threatening complications include airway obstruction, jugular vein thrombosis, descending mediastinitis, pericarditis, pleural empyema, cavernous sinus thrombosis, sepsis, respiratory distress, disseminated intra-vascular coagulation, pleuropulmonary suppuration, and hematogenous dissemination to distant organs.¹²

Treatment of neck abscess includes antibiotic therapy, airway management and surgical intervention. Management of neck abscess is traditionally based on prompt surgical drainage of the abscess followed by antibiotics or nonsurgical treatment using appropriate antibiotics in the case of cellulitis.¹³ Proper diagnosis and prompt management can effectively overcome the disease and provide a cure without complications. However, for this to be possible, otolaryngologists must have detailed knowledge of the presentation, etiology, investigations and access to appropriate medical and surgical interventions. The main aim of our study was to share our experience in terms of presentation, clinical trends, common sites involved, bacteriology, management, complications, and outcomes. The most common predisposing factors for the development of neck abscess are carious and abscessed teeth, periodontal disease and extractions of the lower molars. Other etiology includes floor of the mouth trauma, mandibular fractures, peritonsillar abscess and sialoadenitis.¹⁴

For centuries, the diagnosis and treatment of neck abscess have challenged physicians and surgeons. The anatomical complexity of the neck region make the difficulties in diagnosis & management. These infections remain an important health problem with significant risks of morbidity and mortality. The overwhelming

complication rates of the past have been reduced with the advent of modern microbiology and hematology, the development of sophisticated diagnostic tools (eg. CT, MRI), the effectiveness of modern antibiotics and the continued development of medical intensive care protocols and surgical techniques.¹⁵

The diagnosis is based on the history and examination, and made on clinical grounds. The white cell count and the inflammatory markers, such as ESR and CRP, are usually raised. The ultrasound or CT scan will delineate the abscess and confirm diagnosis, although abscess formation is rare. Airway management is paramount and high-dose intravenous antibiotic therapy targeted to the causing bacteria should be commenced. Needle aspiration under ultrasound or CT guidance should be considered and may be helpful in some circumstances. However, established collections will require formal incision and drainage via an external approach. The collection is best accessed through a lateral transverse cervical incision at the level of the hyoid bone, and a drain should be inserted. Tracheostomy may be required for airway management in a significant proportion of patients with well-established neck abscess.¹⁶ Initial antibiotic therapy is targeted at gram-positive, gram negative organisms and oral cavity anaerobes. Empiric therapy is recommended before culture report is available.

This study will give us information about the common microorganisms that cause neck abscess by which we can test antimicrobial susceptibility and know effectiveness of different empiric antibiotics on neck abscess. This study will lead us to reduce complication and increase the treatment outcome and will be able to compare the findings with those of previous studies carried out at home and abroad.

Materials and Methods

This is a prospective observational type of descriptive study which was conducted in the

Department of ENT and Head Neck Surgery, Dhaka Medical College Hospital, Dhaka and Department of Clinical Microbiology, ICDDR,B Mohakhali, Dhaka with a sample size of 100 from January’2016 to June’2016 . Patients of different age & sex in the in-patient department who were diagnosed as non-specific neck abscess and who had no history of previous diagnosis & intervention were included in this study. Patients were randomly enrolled matching the inclusion and exclusion criteria.

Results

Table – I
Demographic factors (age, gender, socio-economic status and inhabitants) distribution of patients (n=100)

Demographic Factors	Percentage (%)
Age (in years)	
1-15	05
16-30	15
31-45	42
46-60	34
>60	04
Gender	
Male	60
Female	40
Socio economic status	
Poor (upto 5000 tk/month)	70
Middle Class(5000-10000 tk/month)	25
Rich(>10000 tk/ month)	05
Inhabitants	
Rural	70
Urban	30

Table-II

Clinical factors (aetiological, habit & co-morbidity, presenting symptoms, complications, location of neck abscess) distributions of patients (n=100)

Clinical Factors	Percentage (%)		
Aetiological factors	Dental infection	50	
	Tonsillar infection	30	
	Traumatic	4	
	Skin infection	2	
	Other	14	
Habit & co-morbidity	Smoking	40	
	Diabetes mellitus	35	
	Hypertension	15	
	Other	10	
Presenting Symptoms	Dysphagia	100	
	Fever	100	
	Odinophagia	80	
	Dental infection	70	
	Edema	60	
	Muffled voice	30	
	Foul smell	20	
	Trismus	10	
	Respiratory distress	2	
	Complications	Necrotizing fasciitis	8
		Septicemia	7
Mediastinitis		6	
Laryngeal oedema		2	
Death		2	
Location of neck abscess (Site of presentations)		Sub mandibular abscess	45
		Peritonsillar abscess	25
	Parapharyngeal abscess	05	
	Retropharyngeal abscess	10	
	Parotid abscess	05	
	Anterior triangle abscess	05	
	Posterior triangle abscess	05	

Table- III

Causative microorganism (n=100)

Strains	Name of organism	Number of cases	Percentage(%)
Isolated	Streptococcus	30	30
	Staphylococcus aureus	08	08
	Coagulase negative staphylococcus	10	10
	E coli	03	3
	Pseudomonas	07	7
	Proteus	08	8
	Klebsiella	09	09
	Mixed	20	20
	No organism	5	5
	Total	100	100

Table-III shows most common organism was streptococcus identified in 30 (30%) cases, mixed organism 20% & no organism 5% cases.

Discussion

Infection of the deep neck spaces remains a common, yet potentially devastating otolaryngologic process that requires an interdisciplinary approach. Intravenous antibiotic therapy and timely surgical intervention have markedly decreased the morbidity and mortality of neck space infections. Delay in diagnosis may lead to life-threatening consequences in the pediatric and adult population.²⁸

Regarding age distribution our study showed maximum cases were in the 35-45 years age group (42%) followed by 46-60 years age group (34%). (Table-I). Kataria et al²², Suehara et al²³, Yang et al²⁶ found majority of patients in this age group. So this study was consistent with all these studies.

In this study, male were affected more than female. The male and female ratio was 1.5:1. (Table-I). This study was consistent with the study by Kataria et al,²² Suehara et al,²³ Nikakhlagh et al²⁴, Bhise et al²⁵. All these studies were showing male predominance.

Most of the patients were poor socio-economic condition. (Table-I). Most of the patients (70%) were from rural areas. (Table I) . So this study was consistent with the study of Kataria et al²², Suehara et al²³.

In this study, most of the cases presented with dental infection 50(50%) followed by tonsillar infection 30(30%) (Table-II). 40% were smoker & 35 % cases presented with diabetes mellitus (Table-II). Dental problem was 60% & Diabetes mellitus was 30% in Villarinet et al,²⁷ Yang et al,²⁶ Bhise et al²⁵ have the same result. So this study was consistent with these studies.

In all the cases 100 (100%) presenting symptoms were dysphagia & fever. More than one symptom was present in all patients (Table-II). In Bhise et al²⁵ 98.59% having same symptoms. It was consistent with the study of Kataria et al,²² Suehara et al²³ with 99% & 100% patients with this symptoms.

Most of the complications were necrotizing fasciitis (8%) followed by septicemia (7%) and mediastinitis (6%). 2 patients were died due to

mediastinitis (Table-II). In many study like Kataria et al²², Suehara et al²³, Nikakhlagh et al²⁴ found fasciitis as a complication in 8%, 7%, 11% & 10% study population respectively.

Most common site of infection was sub mandibular abscess 46% followed by peritonsillar abscess 25% (Table- II). It was consistent with the study of Velankar et al,¹⁹ Yang et al,²⁶ Suehara et al²³.

Mixed infections are common. Maran et al¹⁴ identified *Streptococcus viridans* (39%) was the most common pathogen followed by *Staphylococcus epidermidis* (22%), *Staphylococcus aureus* (22%) and *Escherichia coli*. Identified *Streptococcus* (40.62 %), *Staphylococcus* (18.75 %), *E.Coli* (12.5 %) were most common pathogen. Yang et al²⁶ identified the predominant aerobes were *viridans streptococci*, *Klebsiella pneumoniae*, and *Staphylococcus aureus*.

In this study, *Streptococcus* 30 (30%) was the most common organism followed by *staphylococcus aureus* (8%), Coagulase negative *staphylococcus* (10%), *Klebsiella* (09%), *Escherichia coli* (03%), *Pseudomonas* (07%), *Proteus* (08%) cases. Mixed infection was found (20%) of cases & no organism was found in (5%) cases (Table- III). Therefore, it was indicated that 5% patient took antibiotic before culture. Villarinet al²⁷ 41.59% Yang et al ²⁶ 43.56% having *Streptococcus* organisms. So this study was consistent with all these studies.

The variations of results among study to study may be due to regional variation, environmental factors, genetic susceptibility. However the current study was conducted among 100 patients only, not a large study to draw a definite conclusion. But from this study it revealed that *Streptococcus* was the most common isolated organism.

Conclusion

In Neck abscess, *Streptococcus* is the commonest pathogen. Though some factors may vary in different situations, from this study it can be concluded that early diagnosis and immediate treatment is the key for

successful management of neck abscess which need to be evaluated for better management. This study was carried over in short period and in small number of patients. So, further study with a larger number of sample and longer period is recommended to get a more accurate result.

Limitations

Considering significant outcome of the study, it has been tried to overcome the limitations as far as possible. Beyond the scope, following limitations were encountered in the study.

1. This study is conducted among a small number of cases within a short time frame in a center. The result of this study may not reflect the total scenario.
2. Since the facility to culture and sensitivity test for anaerobic bacteria is not available in ICDDR,B and Dhaka Medical College, the possibility of non-specific neck abscess due to anaerobic microorganisms were not considered in this study.
3. Immune compromised patients such as patient with HIV & specific infection like TB not included in this study.

References:

1. Wang LF, Kuo WR, Tsai SM, Huang KJ. Characterizations of life threatening deep cervical space infections: A review of one hundred ninety six cases. *Am J Otolaryngol* 2003; 24(2):111-7.
2. Vieira F, Allen SM, Stocks RSM, Thompson JW. Deep neck infections. *Otolaryngol Clin N Am* 2008; 12: 459-83.
3. Durazzo M, Pinto F, Loures M, Volpi E, Nishio S, Brandao L, et al. Deep neck space infections. *Rev Ass Med Brasil* 1997; 43:119-26.
4. Wong TY. A nationwide survey of deaths from oral and maxillofacial infections: the Taiwanese experience. *J Oral Maxillofac Surg* 1999; 57: 1297-99.
5. Weed H, Forest L. Deep neck infection. *J Otolaryngol Head Neck Surg* 1998; 3:2515-24.
6. Parhiscar A, Harel G. Deep neck abscess: A retrospective review of 210 cases. *Ann Otol Rhinol Laryngol* 2001; 110(11): 1051-54.
7. Ungkanont K, Yellon RF, Weissman JL, Casselbrant ML, Gonzalez VH, Bluestone CD. Head and neck

space infections in infant and children. *Otolaryngol Head Neck Surg* 1995; 112(3):375-82.

8. Huang TT, Liu TC, Chen PR, Tseng FY, Yeh TH, Chen YS. Deep neck infection: Analysis of 185 cases. *J Otolaryngol Head Neck Surg* 2004; 26(10):854-60.
9. Hasegawa J, Hidaka H, Tateda M, Kudo T, Sagai S, Miyazaki M, et al. An analysis of clinical risk factors of deep neck infection. *Auris Nasus Larynx* 2011; 38(1):101-7.
10. Bakir S, Tanriverdi MH, Gun R, Yorgancilar AE, Yildirim M, Tekbas G, et al. Deep neck space infections: A retrospective review of 173 cases. *Am J Otolaryngol* 2012; 33(1):56-63
11. Boscolo RP, Stellin M, Muzzi E, Mantovani M, Fuson R, Lupato V, et al. Deep neck space infections: A study of 365 cases highlighting recommendations for management and treatment. *Eur Arch Otorhinolaryngol* 2012; 269(4): 1241-49.
12. Wills PI, Vernon RP. Complications of space infections of the head and neck. *Laryngoscope* 1981; 91(7):1129-36.
13. Mayor GP, Millan JMS, Martinez VA. Is conservative treatment of deep neck space infections appropriate? *J Head and Neck* 2001; 23(2): 126-33.
14. Simo R., Jeannon J. Benign neck disease. In: Watkinson JC, Gilbert RW, ed. *Stell and Maran's Text Book of Head and Neck Surgery and Oncology*. 5th Edition. London; Hodder Arnold, 2012: 229-230.
15. Winters M. Evidence Based Diagnosis and management of ENT Emergencies. *American academy of emergency medicine*. February 2007; 5:2: 12-14
16. Rao DD et al. Comparison of maxillofacial space infection in diabetic and nondiabetic patients. *Oral surgery, oral medicine, oral pathology, oral radiology, endodontology*. 2010 Oct; 110(4):7-12
17. Parhiscar A, Har-El G. Deep neck abscess: A retrospective review of 210 cases. 2001 Nov; 110(11):1051-4.
18. Lee Y Q, Kanagalingam J. Bacteriology of deep neck abscesses: a retrospective review of consecutive. *Singapore medical journal*. 2011; 52(5): 351-355
19. Velankar H K, Sancheti P, Mody N, Dabholkar Y G, Bhalekar S B, Saberwal A. Deep neck space infection . *The internate journal of otolaryngology*, 2015 volume 18 number 1.
20. Oliver ER, Gillespie MB. Deep neck space infection . Chapter -14 : 201-208.
21. David E, Conrad & Sanjay R, Parikh : Deep neck infection, *Infectious disorders- Drug targets*, 2012, 12, 286-290.

22. Kataria G, Saxena A, Bhagat S, Singh B, Kaur M, Kaur G. Deep neck space infection: A study of 76 cases, IJO, 2015 Jul; 27(81): 293-299. ISSN: 2279-0853, p-ISSN: 2279-0861, Vol-13, Issue-9, Ver-II (Sep-2014), PP 41-47.
23. Suehara AB, Gonclav AJ, Alcadipani FAMC Kavabata NK, Menezes MB. Deep neck infection-analysis of 80 cases, rev, Bras, Otorrinolaringol, vol-74. no-2, sao Paulo Mar/Apr-2008.
24. Nikakhlagh S, Rahim F, Saki G, Khosravi A, Rekabi H, Saki N, 2010. Deep neck infections: A case study of 12 years, Asian journal of Biological Science, 3: 128-133.
25. Bhise SV, Rahmani F, Pawde AM: Clinical study of neck abscesses in rural population, IOSR-JDMS, e-26. Yang SW, Lee MH, See LC, Huang SH, Chen TM, Chen TA. Deep neck abscess: an analysis of microbial etiology and the effectiveness of antibiotics, 2008, 1, 1-8
27. Villarin SR, Barro JCV, Gonzalez-Botas JH. Deep neck infections: Etiology, Bacteriology & Treatment, Serviciode otorhinolaryngology, 2006; 57(7): 324-8.
28. Garce M F, Budak A, Demir N, Cankaya H, Kiroglu A F. Characteristics of deep neck infection in children according to weight percentile. Clinical & experimental otorhinolaryngology. 2014 Jun; 7(2): 133-137.