Biomedical Journal of Indonesia
Journal Homepage: https://www.jurnalkedokteranunsri.id/index.php/BJI/index

Characteristics and Patterns of Deep Neck Infection in Dr. Mohammad Hoesin General Hospital Palembang 2020

Lisa Apri Yanti[1*]

1Department of Ear, Nose, Throat and Head and Surgery, Faculty of Medicine, Universitas Sriwijaya / RSUP Dr. Moh Hoesin, Palembang, Indonesia

ARTICLE INFO
Keywords:
Deep Neck Abscess
Bacterial Culture
Antibiotics

***Corresponding author:**
Lisa Apri Yanti

E-mail address:
lisa_apriyanti01@yahoo.com

All authors have reviewed and approved the final version of the manuscript.

https://doi.org/10.32539/BJI.v7i2.283

ABSTRACT

Intoduction: Deep neck infection is the accumulation of pus in the potential space and facial area in the deep neck. The incidence of deep neck space infections is 1/100.000 in adults and 2/100.000 in children. Risk factors such as age, oral hygiene, and comorbidities such as DM are predisposed factors in deep neck infection. Effective pus collection of specimens is essential, to obtain the organisms and determine the effective antibiotics. **Purpose:** The aim of this study was to describe the characteristics and bacterial patterns of abscess in Dr. Mohammad Hoesin General Hospital Palembang. **Methods:** This study was conducted retrospectively using medical records of patients who diagnosed deep neck infection in Dr. Mohammad Hoesin General Hospital Palembang during January to December 2020 who took pus collection and been checked in microbiology laboratory. Data recorded include gender, age, site, onset, risk factors, comorbidities, bacteria culture, antibiotic sensitivity, and complications. **Results:** Of the 36 patients, 23 (63.8%) were males, followed by 13 (36.1%) were female, and the age of 31-45 years old group were found in 13 subjects (36.1%). The onset was mostly found at 0-1 week as many as 19 subjects (52.7%). The highest complaints of dysphagia and odynophagia were found in 22 cases (26,2%), odontogenic factors were found in 35 cases (97,2%). Abscess location in multiple space were found in 17 cases (47,2%), while in single space there were 19 cases (52.7%), where the most location was in submandibular space in 7 cases. Diabetes was the most comorbid factors found in 6 subjects (50%). The most bacterial were Klebsiella pneumoniae in 4 cases (11.1%) and sensitive antibiotics including ciprofloxacin, meropenem, and tigecycline, in 6 cases (20%) respectively. And the most complication was mediastinitis in 6 cases (75%). **Conclusion:** Klebsiella pneumoniae is the most common found in deep neck infection with sensitive antibiotics including ciprofloxacin, meropenem, and tigecycline.

1. Introduction

Deep neck infection is defined as an infection in the potential space and facial planes in the neck, namely the accumulation of pus / pus in the potential space of the deep neck. With the current widespread use of antibiotics it has reduced the incidence of abscesses, but this condition is still common and a challenge because it can cause dangerous complications such as mediastinitis, airway obstruction, jugular vein thrombosis, pericarditis, pleural empyema, and even death. There are many factors that influence and become risk factors for deep neck abscesses, and in general, old age and comorbid factors such as diabetes mellitus are two important factors for the incidence of deep neck infections.[1,2]

Anatomically, the potential area of the deep neck is a very complex area, where the potential space in the inner neck region is divided into three parts, namely (1) the space along the neck; (2) suprahioid room and; (3) infrahioid room. Knowledge of the anatomy of the fascia and

potential neck spaces is very important in order to predict the process of infection and the spread of infection. It is also important to ask risk factors such as age, oral hygiene and comorbidities in order to determine weight or risk factors for the incidence of deep neck abscess in patients.[2]

The incidence of deep neck space infections is 1/100.000 in adults and 2/100.000 in children. Diagnosis of deep neck space infection is enforced based on history, physical examination, and supporting examinations, such as laboratory tests of blood and pus culture, as well as radiological examinations. A pus culture examination is necessary if an abscess is suspected. The collection of abscess culture specimens is considered very important, because various organisms can be found. It is advisable to collect specimens at the time of surgical drainage or needle aspiration. The specimen is collected by aspirating a localized abscess or other surgical procedure. Abscess-causing bacteria are usually polymicrobial, consisting of a mixture of aerobic, microaerophilic, and anaerobic. Infections originating from the oropharynx are mostly caused by normal flora in the upper respiratory tract, such as Streptococcus and Staphylococcus. The most common organisms are aerobic S. viridans, h-hemolytic Streptococcus, Staphylococcus, Klebsiella pneumoniae, bacteriodes anaerobic, and peptostreptococcus.[3-9]

Management such as optimal abscess drainage is important in dealing with deep neck abscesses, and the role of using appropriate antibiotics is necessary for adequate therapy. It is estimated that the incidence of deep neck abscesses has decreased significantly since the widespread use of antibiotics. To get an effective antibiotic, it is necessary to examine the germ culture and test the sensitivity of the antibiotic to germs.[2.5]

2. Methods

This research is a retrospective descriptive study regarding the germ pattern of deep neck abscesses in the ENTKL section of Dr. Mohammad Hoesin (RSMH) Palembang. The data comes from the patient's medical records in the ENTKL Section of Dr. Mohammad Hoesin (RSMH) Palembang. This study describes patient demographic data including age, sex, abscess location, and abscess germ culture results. In addition, this study also describes the characteristics of disease onset, complaints, risk factors, comorbidities and complications.

The purpose of this study was to describe the characteristics and patterns of abscess germs in the ENTKL section of RSMH. It is hoped that the results of the study can become the basic data for future research. The research results are presented descriptively in the form of narration and tables. The place of research was conducted in the ENTKL department of Dr. Mohammad Hoesin (RSMH) Palembang. The time of research was carried out from January to December 2020.

The population and sample of this study were all patients with a diagnosis of abscess in the ENTKL RSMH laryngeal-pharyngeal division from January to December 2020. The sample of this study included the criteria for all patients diagnosed with deep neck abscess who went to ENTKL RSMH, which took action to take. abscess pus samples and checked in the RSMH microbiology laboratory. The criteria for patients who were not included in the study included patients with deep neck abscesses who did not take pus samples. The number of samples obtained was 36 patients.

3. Results

From the medical record data of patients who went to the ENTKL department of Dr. Mohammad Hoesin Palembang in January to December 2020, there were a total of 36 patients diagnosed with an abscess in the subdivision of the pharyngeal larynx. Based on gender, the number of male patients was 23 people (63.8%) and 13 women (36.1%) and the age distribution of the subjects of

this study with the lowest age was 3 months and the highest was 90 years. The age group of 31-45 years was mostly found, namely 13 people (36.1%), where in the children age group (0-15 years) it was found in 3 people (8.3%), while those over 60 years obtained 5 people (13.8%). (Table 1)

Based on the onset of events, the largest number of cases was 0-1 week onset, namely 19 people (52.7%), then 2 weeks of onset as many as 9 people (25%). There was also an onset of more than 1 month found in 1 case (2.7%). (Table 2).

From the history, it was found that patients with deep neck abscess who came to the ENTKL department of Dr. Mohammad Hoesin Palembang, found that complaints of difficulty swallowing (dysphagia) and painful swallowing (odynophagia) were the highest complaints found, namely as many as 22 cases (26.2%), then complaints of difficulty opening the mouth (trismus) as many as 20 cases (23.8%). Meanwhile, based on risk factors, almost all cases of infection were obtained from odontogenic factors, namely 35 cases (97.2%), while the risk factor for recurrence was found in 1 case (2.7%). (Table 3)

Based on the distribution according to the location of the abscess, the most spread was found in multispace, which involved more than one space in the deep neck, 17 cases (47.2%), while in single space there were 19 cases (52.7%), with the most locations being submandibular in 7 cases and peritonsil in 6 cases. (Table 4)

Based on the comorbid factors underlying the patient, most patients had a history of diabetes, namely 6 people (50%), then hypertension was found as many as 3 people (25%), pneumonia as many as 2 people (16.6%), and patients with pregnant conditions 1 people (8.3%). (Table 5).

Based on the results of culture, the highest number of germs found were Klebsiella pneumoniae ssp pneumoniae in 4 cases (11.1%), then Escherchia colli as many as 3 cases (8.3%), and Pseudomonas aeruginosa as many as 2 cases (5.5%). Meanwhile, 17 cases (47.2%) were found where sterile or non-growing pus cultures were obtained. (Table 6).

Based on the culture results, the highest sensitive antibiotics were ciprofloxacin, meropenem, and tigecycline in 6 cases (20%) respectively. Meanwhile, the distribution of other antibiotics is shown in table 7.

Based on the follow-up complications based on the study, it was found that there were mediastinitis in 6 cases (75%) and airway obstruction so that tracheostomy was carried out in 2 cases (25%). (Table 8).

Table 1.Distribution of subjects by demographic characteristics (n = 36)

Variable	Total (n)	Percentage (%)
Gender		
Male	23	63.8
Female	13	36.1
Group		
0 – 15	3	8.3
16 – 30	8	22
31 – 45	13	36.1
46 - 60	7	19.4
> 60 years	5	13.8

Table 2. Distribution of subjects according to the incidence of abscess onset (n = 36)

Variable	Total (n)	Percentage (%)
0 – 1	19	52.7
2 weeks	9	25
3 weeks	3	8.3
4 weeks	4	11.1
>1 month	1	2.7

Table 3. Distribution of subjects based on clinical symptoms and risk factors

Variable	Total (n)	Percentage (%)
Clinical symptoms		
Fever	15	17.8
Crowded	5	5.9
Difficulty opening your mouth (trismus)	20	23.8
Difficulty swallowing (dysphagia)	22	26.2
Painful swallowing (idynophagia)	22	26.2
Risk factors		
Perforated teeth	35	97.2
Repetition	1	2.7

Table 4. Distribution of subjects by location of the abscess (n = 36)

Variable	Total (n)	Percentage (%)
Multi-space	**17**	**47.2**
Parafaryngeal & submandibular space	12	33.3
Retrofaryngeal & submandibular space	2	5.5
Retrofaryngeal & pretracheal space	2	5.5
Temporal & submandibular space (prevertebral space)	1	2.7
Single-space	**19**	**52.7**
Retrofaring space	2	5.5
Parapharyngeal space	2	5.5
Submandibular space	7	19.4
The masticator room	1	2.7
Peritonsile space	6	16.6

Table 5. Distribution of subjects according to comorbid factors

Variable	Total (n)	Percentage (%)
Diabetes mellitus	6	50
Hypertension	3	25
Pneumonia	2	16.6
Pregnant	1	8.3

Table 6. Distribution of germ pattern based on pus culture results (n = 36)

Variable	Total (n)	Percentage (%)
Pseudomonas aeruginosa	2	5.5
Streptococcus gordoni	1	2.7
Pneumonia ssp	1	2.7
Klebsiella pneumonia ssp pneumoniae	4	11.1
Escherchia colli	3	8.3
Pseudomonas ssp	1	2.7
Staphylococcus capitis	1	2.7
Streptococcus windosus	1	2.7
Staphylococcus haemolyticus	1	2.7
Acinobacter baunami	1	2.7
Staphylococcus aureus	1	2.7
Streptococus sanguinis	1	2.7
Lactococcus garvieae	1	2.7
Sterile / not growing	17	47.2

Table 7. Distribution of sensitive antibiotics based on pus culture

Variable	Total (n)	Percentage (%)
Ciprofloxacin	6	20
Meropenem	6	20
Tigecycline	6	20
Ceftazidime	1	3.3
Cefepime	1	3.3
Ertepenem	2	6.6
Clindamycin	2	6.6
Erythromycin	2	6.6
Benzylpoenicilli	2	6.6
Vancomycin	2	6.6

Table 8. Distribution of subjects by complications

Variable	Total (n)	Percentage (%)
Mediastinitis	6	75
Airway obstruction	2	25

4. Discussion

Deep neck infection is defined as an infection in the potential space and facial planes in the neck, namely the accumulation of pus / pus in the potential space of the deep neck. Risk factors such as age, oral hygiene and comorbidities such as DM are contributing factors to deep neck abscesses in patients. Diagnosis of deep neck space infection is enforced based on history, physical examination, and supporting examinations, such as laboratory tests of blood and pus culture, as well as radiological examinations. A pus culture examination is necessary if an abscess is suspected. Collection of abscess culture specimens is considered very important, to obtain the causative organism and determine effective antibiotics. Deep neck abscess case at Dr. Hospital. Mohammad Hoesin Palembang, period January - December 2020. [1-4]

In this study, a total of 36 research subjects were obtained, consisting of 13 women and 23 men. In this study, the sexes that were often found to have deep neck abscesses were male, namely 23 people (63.8%) and 13 women (36.1%). And most of the ages came from productive adults, namely the age of 31-45 years as many as 13 people (36.1%), where in the age group of children (0-15 years) it was found in 3 people (8.3%), while 5 people were older than 60 years (13.8%). In the study of Brito et al. Reported that the incidence of children was relatively low, this may be due to a history of antibiotic use, especially in flu and other viral infections, which are more common in children than in adults. This is according to the study of Yang, et al, which reported that out of 130 patients, 79 (60.8%) were male and 51 (39.2%) were women with a mean age of 32 years. Syaiful, et al in their research in Surabaya reported that as many as 102 patients (62.96%) of men with neck abscesses and 60 patients (37.04%) were female, with the highest age coming from the 40-60 years age group of 55 patients (33.95 %). This is probably because men tend to ignore oral hygiene than women, and tobacco consumption is found to be higher in men which affects oral hygiene which can lead to dental infections and deep neck space infections.[1,3,5]

Based on the onset of the incident, in this research report the most incidence onset was found at 0-1 week, namely 19 people (52.7%), then the 2-week onset of 9 people (25%). There was also an onset of more than 1 month found in 1 case (2.7%). This is consistent with the report of Brito et al. In their study, the mean time from symptom onset to diagnosis was 8 days with a symptom range of 2-20 days and the main symptoms were fever and neck pain. Generally, deep neck infection occurs after infection that occurs due to

tonsillitis, dental infection, surgery, head and neck trauma or lymphadenitis after upper respiratory tract infection, in some cases sometimes it is difficult to diagnose the origin of deep neck infection because the primary source of infection may have occurred in several weeks.[10,11,12,13]

Based on complaints in cases of deep neck abscesses who came to the ENT-KL department of Dr. Mohammad Hoesin Palembang, complaints of difficulty swallowing (dysphagia) and painful swallowing (odynophagia) were the highest complaints that were found, namely as many as 22 cases (26.2%), then complaints of difficulty opening the mouth (trismus) as many as 20 cases (23.8%)). In Yang et al's study, fever, trismus, neck pain and odynophagia were the main complaints in cases of neck infections in both children and adults. Odinophagia was found in 47.7% in children and 66.3% in adults. Gujrathi et al, in their research report that most patients complained of pain in 81.48% of patients, followed by swelling in the neck 77.78%, pain in swallowing in 39.26% and pain in opening the mouth in 31.11% of patients. As with any other disease process, a history of complaints should be asked starting from the onset of symptoms, intensity, duration, and other inflammatory or systemic symptoms, such as pain, fever, swelling, or signs of inflammation such as redness. Complaints such as spasms, odynophagia, dysphagia, voice changes, trismus, and otalgia, will guide the diagnosis and characteristic signs of the infection site. The submandibular space is located between the mucous membrane at the floor of the mouth and the tongue on one side and in the superficial layer of the inner cervical fascia which extends between the hygienic bone and the mandible on the other. Infection in this area or in the area of the mouth floor will result in complaints of difficulty swallowing (odynophagia) and various degrees of trismus. When the infection is localized to the sublingual, the floor structure of the mouth becomes swollen and the tongue can be pushed up and back. When the infection spreads to the submaxillary space, the submental and submandibular areas will become swollen and give pain and hardness due to the swelling. Usually the initial symptoms can be found in the presence of cellulitis in the surrounding tissue.[1,6,7,11,14]

Regarding risk factors, in this report almost all cases of infection were found from odontogenic factors, namely 35 cases (97.2%), while the risk factor for recurrence was found in 1 case (2.7%). This is consistent with the study of Syaiful et al, who reported that the main cause of deep neck infections was odontogenic and other dental infections, namely as many as 112 patients from a total of 162 subjects studied (69.14%). Regarding the etiology of deep neck infections, odontogenic infections originating from the teeth were the most common etiological factors and in the study report of Gujrathi et al., It was found in 24.07% of patients due to dental infections and followed by causes of suppurative lymphadenopathy in 21.49%, salivary gland infections and tonsillopharyngitis in 13.33 %. Deep neck infection caused by foreign body impaction was found in only one case of retrofaryngeal abscess, namely fishbone foreign body found on the posterior pharyngeal wall.[1,5,11]

Multispace involvement in deep neck infections was common in all age groups, similar to that of Brito et al., Who had multispace involvement in 41.8% of adults with deep neck infections. In accordance with this case report, the most spread was found in multispace, which involved more than one space in the inner neck, 17 cases (47.2%), while in single space there were 19 cases (52.7%), with the most locations being submandibular in 7 cases and peritonsil in 6 cases. Deep neck infections in adults often involve a lot of space, causing serious complications and are more clinically severe than in children. The anatomy of the inner neck space is a free space that is interconnected between its spaces, causing the rapid spread of infection from one room to another. Yang et al. Reported that the most common location in children was the parapharyngeal space in 18 patients (40.9%), followed by submandibular space in 8 patients (18. 2%), retrofaryngeal space in 5 patients (11.4%). In the adult group, the most frequent sites were multispace in 30 patients (34.9%), followed by parapharyngeal in 17

patients (19.8%), submandibular space in 12 patients (14.0%), whereas adult patients had more frequent infections on multispace than children. Parafaryngeal space is the space most often involved in children, because infection in the peritonsilar, submandibular, masticator, and parotid spaces can usually spread to the parafaryngeal space. [1, 3, 10, 12]

The comorbid factors that underlie deep neck infections, mostly found a history of diabetes in patients, namely in 6 people (50%), then hypertension was found as many as 3 people (25%), pneumonia as many as 2 people (16.6%), and patients with the condition. pregnant 1 person (8.3%). Among the main diseases associated with deep neck infections the most common namely diabetes mellitus was found in 36.30% and found in 1.48% of cases of deep neck infections with pregnancy in the case report of Gujrathi et al. In Yang et al's study, of 27 patients with comorbid factors, 17 of them had diabetes mellitus. Many studies have shown an association between diabetes mellitus and deep neck infections, where elderly patients with DM have a susceptibility to the incidence of deep neck infections. In DM patients, hyperglycemia conditions can interfere with several body defense mechanisms, such as the function of neutrophils as adhesions, chemotaxis and phagocytosis which are disturbed and have an impact as a predisposition to infection and complications in deep neck infections, so that any condition interferes with the immunity of host cells, will predispose the individual to develop a deep neck infection. Due to changes in immune status and hormonal balance during pregnancy, the immune reaction to odondogenic infections differs in the state of pregnancy. Pregnancy can cause impaired immune response so that it has the potential to form abscesses.[1,3,10,11,15]

Germs that cause deep neck infections from various studies are generally polymicrobial infections, which are caused by various mixtures of bacteria, both aerobic, microaerophilic, and anaerobic, especially gram-positive. Based on the results of this case report, the most common germs found were 4 cases of Klebsiella pneumoniae ssp pneumoniae (11.1%), 3 cases of Escherchia colli (8.3%), and 2 cases of Pseudomonas aeruginosa (5,5). %). From the research report, some of the dominant aerobic bacteria are Streptococcus viridian, Klebsiella pneumonia, Staphylococcus aureus, while the dominant anaerobic bacteria are Prevotella, Peptostreptococcus, Fusobacterium and Bacteroides. Although many previous studies reported Streptococcus species as bacteria that are often isolated in deep neck infections, geographic factors and the use of antibiotics can influence the variety of types of bacteria isolated in culture results from various studies. Furthermore, the second most common germ that is often isolated is Klebsiella pneumoniae, where this type of bacteria is higher, especially in people with diabetes mellitus, both adults and children. Tiwana et al., In their study reported a bacteriological growth pattern in patients with necrotizing fasciitis that differed from deep neck space infections. The most common organisms found were Eschercia coli at 16.7%, while the bacteria that caused Klebsiella pneumoniae, Streptococcus windosus, and Acinetobacter baumannii had the same incidence of 5.5%. In this case report, sterile or non-growing pus cultures were also obtained in 17 cases (47.2%). Based on the study, of all patients studied by Gujrathi et al, 14.5% did not show any bacterial growth in culture, while Tiwana et al. Found that the majority of culture results were sterile, namely 42.6%, this could be due to the use of high doses of intravenous antibiotics or empiric antibiotics. before the abscess drainage procedure, so that the abscess culture is sterile or does not grow.[1,3,10]

Principles of treatment in deep neck infections include adequate resuscitation, drainage and management of complications, combined with appropriate antimicrobial therapy. Although it is better to get the germ culture results before antibiotic administration, patients are often given empiric antibiotics according to existing local guidelines or according to international guidelines. Based on the culture results of this case report, it was found that the highest sensitive antibiotics were ciprofloxacin, meropenem, and tigecycline in 6 cases (20%)

respectively. Based on Rijal et al, the results of the antibiotic sensitivity test for pus culture showed the highest sensitivity rates, namely the meropenem of 73.58%, cefoperazone-sulbactam 69.36%, and 66.67% oxacillin. whereas the Beka et al. report, the antibiotic agents used in Greece include the administration of a single intravenous antibiotic or a combination of penicillin, amoxicillin-clavulanic acid, ampicillin-sulbactam, clindamycin, and metronidazole.[1,5,12]

Life-threatening complications of deep neck infections can be found despite the use of antibiotics, including mediastinitis, jugular vein thrombosis, pericarditis, pleural empyema, arterial erosion, upper airway obstruction, and sepsis. Based on this case report, further complications were found including mediastinitis in 6 cases (75%) and the incidence of upper airway obstruction so that tracheostomy was performed in 2 cases (25%). In the study report of Brito et al, there were two cases with mediastinitis (1.9%), namely in adults and involving multiple neck spaces. In mediastinitis, patients often complain of chest pain or tightness. As for the research report, upper airway obstruction due to respiratory failure requiring emergency tracheostomy was found in 8 patients (7.9%). Har-el et al. Described that involvement of the oral floor and retrofaryngeal space was more associated with the incidence of airway obstruction and the great need for tracheostomy. Intubation using a rigid laryngiscopy may be difficult in a patient with a deep neck abscess because of possible distortion of the anatomy of the airway, stiffness of the loop and limited access to the mouth area. Sometimes intubation can worsen the condition of a disturbed airway, therefore tracheostomy is always considered if an upper airway obstruction is found.[1,10,11,16]

5. Conclusion

Deep neck infection is a common disease and a challenge for an authorinolaryngologist, and this condition must be treated in an emergency. In this study odontogenic was the most common etiological factor in cases of deep neck infection. Therefore, prevention of deep neck infections can be done by providing awareness to the public about oral and dental hygiene and routine dental examinations. In addition, it is also important to pay special attention to high-risk groups such as the elderly and people with diabetes mellitus, where systemic disease conditions can cause complications that can be life-threatening.

The main keys in the management of deep neck infections are controlling and controlling the airway, administering antibiotics, and drainage incisions. A good history is very important because it determines the location of the infection and differentiates it from other serious conditions that can be the differential diagnosis and management of deep neck infections. Early diagnosis and treatment are essential, so all patients should be started on treatment with empiric intravenous antibiotic therapy, which is then adjusted according to bacterial culture results and sensitivity. In this case report, the most common bacteria found was Klebsiella pneumoniae ssp pneumoniae, with sensitive antibiotics including ciprofloxacin, meropenem, and tigecycline. Tracheostomy should be considered if necessary and a drainage incision is the preferred procedure for deep neck infections.

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