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Emergency Management of Parapharyngeal And Retropharyngeal Abscess due to Right Submandible Abscess with Complications of Right Pulmonary Empyema: Case Report

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Abstract: ***Introduction:*** ***Parapharyngeal and retropharyngeal abscess are deep neck infection originating from various sources including the mouth, ear, nose, and throat, and cause a medical emergency upper airway obstruction*** ***Case Report:****A 39 years old male patient came to the Emergency Room (ER) Hasan Sadikin Hospital was complaining of swelling of the right cheek and lower right jaw, fever, headache, tightness, neck pain, and limited mouth opening. Routine blood tests revealed leukocytosis, elevated SGOT, ALT, and urea. Radiological examination of AP-lateral Neck Soft Tissue, radiolucent images in multiple air densities, suspected parapharyngeal, submandibular and retropharyngeal abscess, and leftward sliding airways. The patient was referred to an ENT colleague because of the constriction and impaired respiration, and a tracheostomy was recommended. Tracheostomy performed by ENT followed by oral surgery for submandibular abscess drainage incision through and through to the submental and tooth extraction 18,16,25,26,28,47 in general anesthesia. The patient was subjected to a thorax radiographic examination and re-swab sampling of bacteria because he was still short of breath on a ninth day and was found pleural effusion on chest X-ray, and cultures of Serratia marcescens and Acinobacterbaumanii in samples that were sensitive to meropenem antibiotics. The patient was placed on a chest tube to drain the pleural fluid.* ***Conclusion:****Parapharyngeal and retropharyngeal abscess treatment is carried out comprehensively with the teeth as a source of infection, namely incision drainage, extraction of focal teeth infection, and tracheostomy in case of emergency upper airway obstruction. Nosocomial infections due to the use of tracheostomy are influenced by various factors, are improper installation of the tools, the level of air sterilization in the room, and the cleanliness of the air hoses.*

Keywords: Parapharyngeal and Retropharyngeal Abscess, pleura effusion

1. Introduction

Deep CervicalAbscess is the formation of pus in one or more potential spaces between the fascia of the deep neck as a result of spreading infection from various sources such as teeth, mouth, throat, paranasal sinuses, and middle ear and neck. This abscess occurs as an accumulation of pus in a cavity as a reaction to the body's defense against foreign objects. There are some potential spaces in the deep neck that can be infectedsuch as the parotid space, peritonsillar space, retropharyngealspace, danger space, prevertebral space, and masticator space. According to Parhischar and colleaguesintheir research, the causes of 83.3%of cases of deep neck infectioncould be identified (175/210 cases). The most common cause was dental infection (43%), of which 61% were accompanied by submandibular abscesses and 76% of Ludwig's angina was caused by dental infections. [1,2] Complications of retropharyngealand parapharyngeal abscesses can affect its surrounding tissues, including inflammation and some damages. Thespread of infection to the mediastinum can result in a mediastinal abscess, mediastinitis, pericarditis, pyopneumothorax, pleuritis, or empyema.[4]

The use of antibiotics has reduced the mortality rate from DeepCervicalAbscess, but it was still a serious problem and cause complications that can be life-threatening. Late diagnosis or misdiagnosis can lead to delays in management which can lead to death due to complications of sepsis, the spread of infection to the mediastinum, and airway obstruction.[5]

The patient's condition at this time has returned to normal activities, but in his daily life, he still complains of a little shortness of breath during breathing. The purpose of this case report is to report the management of a deep cervical abscess with the tooth as the source of the infection so that it can be accurately and comprehensively treated, and to prevent the spread of infection as early as possible.

2. Case Report

A 39-year-old male patient came to the Emergency Room (ER) Hasan Sadikin Hospital, Bandung with complaints of swelling of the right neck. Approximately 1 month before hospitalization, the patient had experienced toothache in the lower right jaw. The patient took 3 types of a drug at the pharmacy (Amoxycillin, mefenamic acid, and anti-swelling) and the pain was reduced. Approximately 3 days prior to hospitalization, the patient hadatoothache back and wasattended by swelling in the right lower jaw, butno treatment was done. The patient went to a private hospital in the Cimahi area a day prior to hospitalization because the swelling was getting bigger and worse.It spread to the neck, but nothing had been done on the patient at the private hospital. The patient was advised to the Hasan Sadikin

HospitalER for further action. There is a history of pain in the neck when looking to the right or left, a history of swallowing difficulty, a history of hoarseness and voice changes, shortness of breath, and no routine drug-taking history for 6 months.

Figure 1: Patient profile picture

On physical examination, the patient was in compos mentis awareness, temperature 38,9^{0}C, pulse 112x /minute, breathing frequency 26x/ minute, 92% SpO2 value with free air oxygen. The face was asymmetrical, with a swollen area in the right submandibular region extending to the submental et Collidextra with 12x7x5 cm^3 size, fever (+),reddish appearanceand positive fluctuation that was localized and palpable pain. On oral examination, trismus was found with approximately 1.5 cm mouth opening and calculus in the maxilla and mandible as well as pulp necrosis in tooth 47 and remaining tooth rootof teeth 16,25,26.

On radiographs, chest X-ray and Lateral Soft Tissue radiograph were performed and there was a swelling soft tissue in the right submandibular with radiolucent images at multiple air densities, with suspicion of parapharyngeal, submandibular and retropharyngeal abscesses and the airway shifted to the left.

Figure 2: Radiographic image of chest examination and lateral AP STL

Blood analysis test showed there was a picture of leukocytosis, 22.59/mm3 (N: 4.50-11.0), increased SGOT levels, 51 U/L (N: 15-37), increased SGPT, 64 U/L (N: 16-63), and increased of urea level, 45.0 mg/dL (15-39). The patient was then consulted to the otolaryngologist (ENT) section because of the tightness when the patient breathed. ENT assessed the patient had grade I upper airway obstruction et causa parapharyngeal abscess and suspect retropharyngeal abscess and right submandibular abscess extending to submentale et causa chronic apical periodontitis et causa pulp necrosis 47. ENTadvised observation of vital signs, O_2 Non-rebreather mask (NRM) 5 lpm, Intravenous Fluid Drops (IVFD) Ringer's lactate 15000 cc / 24 hours, pro tracheostomy, consul to Thorax and Cardiovascular and Internal Medicine.

Based on the history taking, physical examination, and prop examinations, the patient was diagnosed with parapharyngeal abscess et retropharyngeal abscess et submandibular abscess extending to the right submental and Colli region et causa pulp necrosis in tooth 47, and Chronic Apical Periodontitis et causa remaining root of 16,25,26 and dental pulp necrosis 18,28, as well as generalized chronic marginal gingivitis. Emergency management wasdone by administrating 5 lpm of O_2 NRM, IVFD RL mild rehydration 70 gtt/minute, catheter installation to calculate the first urine output for 6 hours with a target of 480 cc (target was achieved), and administration of intravenous (IV) drugs, including Ceftriaxone inj 1gr IV, Metronidazole inf 500 mg IV, Omeprazole inj 40 mg IV, Ketorolac inj 30 mg IV, as well as pro drainage incision and tracheostomy and culture swab in general narcotics.

Figure 3: Taping Pus, Durante, and Post Operation Drainage incision and tooth extraction

After the tracheostomy, the patient performed a drainage incision in the right submandibular region through and through submentale, and multiple tooth extractions. The patient was admitted to the hospital and consulted with the Cardiothoracic and Internal Medicine departments. Suggestions from the Internal Medicine section were giving

2 lpm of O_2 for tracheostomy, ceftriaxone and metronidazole antibiotics, and paracetamol 3x500 mg administrationif the temperature is above 38^0C, Cardiothoracic department advised vital signs monitoring every hour. On the first day, the production of pus was approximately 20 cc and the mouth opening was approximately 1.5 cm.

Figure 4: Post Operation Day I

On the fifth day after surgery, the patient had a complete blood laboratorytest and the results still showed leukocytosis, 23.67/mm3 (N: 4.50-11.0), and the patient's condition had no significant changes and there was still cough and shortness of breath. Hereinafter, the patientwas advised back to the internal medicine department.It advised giving 10 lpm of O_2 in tracheostomy until SpO_2reached more than 95%, and antibiotic substitution to ceftazidime 3x2 g IV, levofloxacin 1x 250 mg IV, Paracetamol 500 mg if the temperature was more than 38^0 C and N-acetylcysteine 3x200 mg, as well as reassessed thorax radiograph after the fifth day of antibiotics, rerun complete blood counts, and blood gas analysis for 72 hours or if worsening occurred.

On a ninth day, the production of pus was approximately 30 cc and the mouth opening was approximately 2.5 cm, and the patient still had a difficultybreathing. The patient was then subjected to undergo chest X-ray examination, and in the chest X-ray image, there was a pleural effusion so that he was consulted to the Cardiothoracic department and a re-drainage incision and Necrotomy Debridement in general narcotics and a chest tube to remove the effusion fluid were planned. The results of bacterial culture contained the *Serratia marcescens* and *Acinobacterbaumanii* bacteria cultures which were sensitive to Meropenem, Ertapenem, Amikacin, so that the antibiotics were substituted with 3x1 g of meropenem antibiotics according to the results of a lab check for bacterial resistance to antibiotics and re-evaluated after 5 days.

Figure 5: (A) Post Operation Day IX (B) Pleural effusion on Thorax radiograph

On the fifteenth postoperative day, the production of pus is approximately 5 cc, and the mouth opening is approximately 3.5 cm. The extraoral drain was removed and the patient had reduced breathlessness with a respiratory rate of 21x / minute.

Figure 6: Post Operation Day XV (drain removal) and Pleural effusion on Thorax radiograph

3. Discussion

Deep neck infection is a neck infection in the (potential) spaces between the deep neck fascia due to infection transmission from various sources such as teeth, mouth, throat, paranasal sinuses, middle ear, and neck. An abscess occurs as an accumulation of pus in a pathological cavity that can occur in any part of the body in response to the body's defense against foreign objects. The most common source of infection in deep neck infections comes from infected tonsils and teeth. Dental infection includes the pulp and periodontal. The spread of microbes can extend through the apical foramen of the tooth to the surrounding area. The apex of the first molar, which locates above M. mylohyoid, causes the spread of infection to enter the sublingual first. Meanwhile, the tip of II and III molars are under the mylohyoid so that the microbes will spread faster to the submaxilla area.[1,2] In this case, neck infection occurs following the transmission of the right submandibular abscess to the parapharynx and retropharynx that results in difficulty breathing, and hyperemia in the neck area.

Systemic conditions predispose to parapharyngeal abscess are diabetes mellitus, autoimmune diseases (such as systemic lupus erythematosus), and HIV / AIDS infection. The source of infections for the parapharyngeal abscess in this patient was infection originating from the teeth, but there were no predisposing factors. Patients generally complain of fever, difficulty opening the mouth, sore throat, painful swallowing, difficulty swallowing, difficulty moving the neck, and voice changes. Empiric and specific antibiotic

therapy is necessary for the management of these infections. The use of antibiotics hinges on culture. Should the need arise, aspiration or incision and drainage of the abscess can be performed.[6] In this case, tracheostomy, drainage incision, and multiple dental extractions were done in general anesthesia therefore the patient can breathe normally. To treat the infection, the patient got antibiotic therapy.

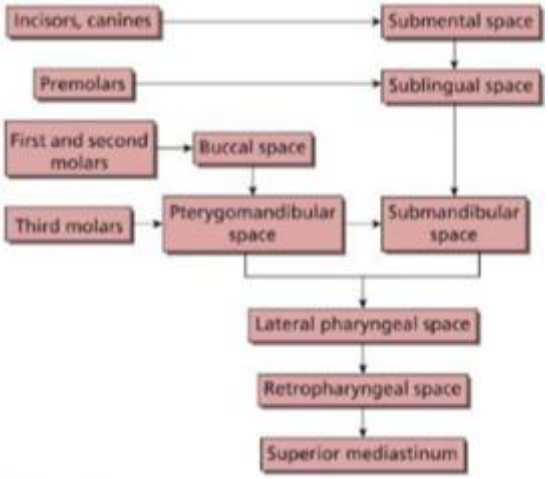
Streptococcus viridans, *Staphylococcus epidermidis*, *Staphylococcus aureus*, group A beta-hemolytic Streptococcus (*Streptococcus pyogenes*), Bacteroides, Fusobacterium, and Peptostreptococcus species are the most common causative organisms of these infections. In this case, the results of the patient's cultures are *Streptococcus mitis* and *Streptococcus oralis* at the time of the first swab after incision drainage and multiple extractions. *Streptococcus mitis* is one of the bacteria that causes infection in the oral cavity, oropharynx, and gastrointestinal tract. [9,10]

This patient experienced swelling and pain under the right jaw to under the chin accompanied by fever, difficulty swallowing, trismus, and shortness of breath. These are following Rana et al., which states that swelling and pain are the main complaints of most deep neck abscesses. Of the 50 patients with neck abscesses, 96% of patients complained of swelling, 92% of patients complained of pain, 66% complained of fever, and only a few cases featured trismus. Paolo Rizzo stated that the clinical symptoms that often occurred in patients with submandibular abscess were swelling in the neck (98.8%) and difficulty swallowing (35.8%). Other signs and symptoms which were found routinely were 23.5% of patients complained of fever, 24.7% complained of pain, and 17.3% complained of trismus.[5,7]

Poor oral hygiene and dental infection are predisposing factors in this patient. On the intra-oral image, there was pulp necrosis in teeth 47,28,18, and the remaining roots on teeth 16,25,26. Following the study results conducted by Rana et al., that infection originating from teeth is the most common cause of deep neck abscesses, namely 48% .7 Paolo Rizzo stated that laboratory tests would be able to point leucocytosis. In this patient, there was leukocytosis with a total of 22.59 0 / µL. Serial WBC examination is a great way to assess the response to therapy given to patients.[5]

Based on the physical examinations and diagnostic examinations as well as the consultation answer from the ENT, for patients was diagnosed with parapharyngeal abscess et causa retropharyngeal abscess et causa submandibular abscess extending to the right submental and Colli region et causa pulp necrosis in tooth 47, and Chronic Apical Periodontitis et causa remaining root teeth 16,25,26 and tooth pulp necrosis 18,28, and generalized chronic marginal gingivitis. Based on the chart, presented by Balaji, the spread of deep neck infection can be caused by the infected lower molars. The microbes spread towards the buccal space and into the pterygomandibular space and submandibular space, eventually into the deep neck area.[9]

Table 1: Spread of Infection in Mandibular Teeth (Balaji, SM, 2018)



The main goal of treatment, in this case, is to prevent complications. Although rare, complications of abscesses in the neck are high in morbidity and mortality, which are related to delays in diagnosis or treatment. One of the complications caused by abscesses in the neck area is the narrowing of the airway. It is necessary to provide appropriate antibiotics for 48 hours, routine observations, adequate control of blood vessels, wide incisions, and open drainage.[1,11]

In this case, the patient was given intravenous empiric antibiotic therapy with 1 gr Ceftriaxone and 500 mg metronidazole. This is commensurate with a study conducted by Shih-Wei Yang et al., as the combination of ceftriaxone and metronidazole antibiotic therapy is the recommended antibiotic therapy for the management of deep neck abscesses. The coverage of this antimicrobial spectrum against aerobic and anaerobic bacteria is 70.79%.[10] In addition to being given antibiotic therapy, the patient is treated by ENT colleagues, namely the use of a tracheostomy aimed at making prolonged mechanical ventilation for acute respiratory failure and airway problems. The procedure includes making a hole in the front / anterior wall of the trachea for breathing. Fromoral surgery, it is common for patients in anesthetic conditions to undergo drainage incision in the right submandibular region through and through submental as well as extractions of teeth that become focal infections. The procedures taken on the patient are accordant with the study results by Rana et al., which found that most patients with deep neck abscesses needed incision and drainage (78% of patients), and only 22% of patients improved with medical therapy alone. Tooth extraction is part of abscess management. The procedure is consistent with the study of Rana et al., who found that the most frequent cause of deep neck abscesses was the infection of the teeth (40% of patients). The teeth that usually are the source of infection are mandibular molars with a prevalence of 22.7-43% as the submandibular space being the most common site of infection, namely 60% .[7]

The patient was hospitalized at Hasan Sadikin Hospital to evaluate and observe the general condition of the patient after the procedure and to monitor the production of pus. On the first day after surgery, the patient's condition had not

improved, the pus production was 20 cc, and the mouth opening was still less than 1.5 cm. Evaluation and observation of the patient's general condition up to the fifth day were done for repeated blood checks and Blood Gas Analysis examination and evaluation of antibiotic administration.

On a ninth day, a chest X-ray was performed, and samples were taken by swabbing his body fluids to check for bacterial culture and bacterial resistance to antibiotics. Chest X-ray showed pleural effusion, and the cultures result in *Serratia marcescens* and *Acinetobacter baumanii*. These bacteria showed sensitivity to the antibiotic meropenem. In this case, the patient was diagnosed with pulmonary empyema, supported by the chest X-ray examination and the results of bacterial culture. Empyema occurs in the right lung due to anatomical conditions in the thoracic region, namely the heart's position, the accumulation of pus influenced by gravity, and the process of breathing. *Serratia marcescens* bacteria is a type of opportunistic pathogenic bacteria from the Enterobacteriaceae family, which can cause pneumonia, generally found in hospitalized patients. The study results conducted by Waworuntu et al., in the NICU of RSAD Robert Wolter Monginsidi on room samples, room furniture, medical equipment, and air, showed that nine species of bacteria that can cause nosocomial infections were found, one of which was 7% *Serratia marcescens*.[12]

The possibility of nosocomial infection, in this case, including the use of a tracheostomy that does not fit properly (loose), lack of air sterilization in the inpatient room, as well as the equipment used, including the air hose for oxygen attached to the tracheostomy device. Apart from that, the extensive treatment time can be one of the long-term complications of using a tracheostomy device. According to Smeltzer and Bare, complications that occur in the management of the tracheostomy tube divided into two: [8]

1) Early Complications

a) Bleeding
b) Pneumothorax
c) Air Embolism
d) Aspirations
e) Subcutaneous or mediastinal emphysema
f) Recurrent laryngeal nerve damage or penetration of the posterior tracheal wall

2) Long-term complications:

a) Airway obstruction due to accumulated secretions
b) Infection
c) Inominata artery rupture
d) Dysphagia
e) Tracheoesophageal fistula
f) Tracheal dilatation or tracheal ischemia
g) Necrosis

After treatment with meropenem on a ninth day, the patient's condition gradually improved, and the complaints of shortness of breath had decreased.

4. Conclusion

In cases of deep neck infection that affects the right submandibular area, parapharynx, and retropharynx, the most common signs and symptoms are fever and neck pain accompanied by swelling under the mandible, fluctuating & trismus is also modest. In general, the source of infection comes from the teeth, so that the management includes drainage incisions for drainage of pus, extraction of (suspected) infected teeth, and insertion of tracheostomy if there is an upper airway obstruction as an emergency condition, as well as administration of antibiotics and analgesics. The length of stay of the patient,a lack of air sterilization in the inpatient room, as well as the equipment used are the factors that must be considered as the nosocomial infection that can affect the success in treating cases of deep neck infection.

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