Successful Treatment of Severe Odontogenic Infections which Caused Septicemia

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Introduction

The advancement of chemotherapy with antimicrobial agents to which gram-positive cocci are highly sensitive has brought with it a marked decline in severe odontogenic infections. However, if the primary treatment is inadequate or a patient is immunocompromised, odontogenic infections easily develop into serious conditions. This is the report of two cases of odontogenic infections which caused airway obstruction, septicemia and disseminated intravascular coagulation (DIC). The patients survived.

Case Report

Case 1

An 88-year-old man visited Tokai University Hospital on April 10th, 1992, because of swelling of the mouth floor, limited mouth opening and difficulty in swallowing. He had been diagnosed at a medical check up as having diabetes mellitus which was not under treatment. On April 7th, 1992, because he had severe pain around the left 3rd molar tooth of the mandible, he visited a local dentist, who treated him. On April 8th, he experienced difficulty in opening his mouth and the floor of his mouth began to swell, which made it difficult for him to swallow. He had not been given any antimicrobial agents until then.

On admission, he seemed to be in a good nutritional state and was of medium build. His temperature was 37.7°C and nothing was wrong with his vital signs. There was marked diffuse swelling in the bilateral mandibular region. He had difficulty in swallowing. The maximum mouth opening was 7 mm, which is very seriously limited mouth opening. Because of the swelling, his mouth grew a so-called double tongue. Fluctuation from the intra or extra oral cavity was felt. Following are the results of medical examination: white blood cell count 10,700/µl with marked shift of the nuclei to the left (band from 52%, segmental form 36%). CRP was 23.28 mg/dl. Since the level of glucose was 105 mg/dl, of ureanitrogen 38.5 mg/dl and of creatinine 1.2 mg/dl, he was in a state of dehydration. Electrolyte and other chemical test findings were normal.

Treatment and course (Fig. 1)

Ampicillin, 4 g/day, was started and drainage was carried out from the oral cavity. A large quantity of pus was discharged; however, the swelling was not reduced. On April 13th, the 4th day, the inflammation spread and airway obstruction occurred. Blind nasal intubation was carried out and administration of cefoperazone, 2 g/day, was added. On the 5th day, because the swelling in the mandibular region had increased, skin incision and drainage was performed. From the pus cultured on this day, Streptococcus milleri, Peptostreptococcus sp. and Prevotella sp. were isolated and identified. The sensitivity of these strains...
to ampicillin and cefoperazone was quite favorable. On the 6th day, considering the drop in blood pressure (56 mmHg), a fever spike (39.8°C) and sudden decrease in platelets as well as a hemorrhagic tendency, there was evidence of adult respiratory distress syndrome, septic shock and DIC.

*S. milleri* was isolated from the blood culture of this day. Artificial ventilation, vasopressor support and fluid administration were started. An additional antimicrobial agent, imipenem/cilastatine, 1 g/day, was prescribed. Because DIC continued to develop in spite of these treatments, the left 3rd molar tooth which was the odontogenic focus was extracted on the 9th day. After the tooth extraction his good general condition was quickly restored and he quickly recovered from the local infection. Weaning from the respirator and removal of the endotracheal tube were possible on the 16th day. Even though the acute symptom was greatly improved, discharge of pus from the extra oral wound and dysphagia continued. On
May 12th debridement was performed under general anesthesia (Fig. 2). *Pseudomonas aeruginosa*, which was highly sensitive to ciprofloxacin was isolated from the tissue cultured on this day. To attack the biofilm, ciprofloxacin together with clarithromycin were prescribed. As there was no fear of recurrence of inflammation, the patient was released from the hospital on June 30th.

**Case 2**

A 32-year-old man was referred to the Tokai University Hospital emergency room because of limited mouth opening and dysphagia on February 11th, 1992, as the day happened to be a national holiday. He felt severe pain around the right 3rd molar tooth of the mandible on February 9th and was treated by a neighborhood dentist. He was not given any antimicrobial agent. Later he began to experience difficulty in opening his mouth, so he went to Hiratsuka emergency Dental Clinic and was referred to our hospital. He seemed to be in a good nutritional state and was of medium build. There was nothing wrong with his vital signs including his temperature. There was a slight reddish diffuse swelling in the bilateral submandibular region; however no fluctuation was felt. The distance between the incisal teeth at maximum opening was 5 mm. Swelling was not seen inside the oral cavity. Following are the results of medical examination at hospitalization: white blood cell count 24,000/µl, red blood cell count 4,780,000/µl, hemoglobin 16.4 g/dl, hematocrit 46.8%, platelets 197,000/µl and ureanitrogen 22 mg/dl. The increase in white blood cell count was marked and dehydration was suspected. The results of other blood chemical tests proved normal.

**Treatment and the course:** (Fig. 3)

Immediately after admission, intravenous drip of cefpiramide, 1 g, was started. Within two hours the floor of his mouth swelled rapidly, and dyspnea, a fever spike (41.2°C) and vasopressure depression occurred. These symptoms suggested airway obstruction due to swelling of the mouth floor and septic shock. Blind nasotracheal intubation and general treatment of the shock were started. Drainage from the extra oral cavity was also performed at the same time because fluctuation was felt. Artificial ventilation was started because there was evidence of adult respiratory distress syndrome. Medication was changed from cefpiramide to minocycline, 200 mg/day and cefoperazone, 2 g/day. Blood was cultured on the first and the
second day, however no microorganisms were isolated. The swelling was greatly reduced after the drainage. On February 13th (the 3rd day), he was weaned from the respirator, and the endotracheal tube was removed on the 4th day because the swelling of floor of his mouth and the pulmonary edema had disappeared. On the 7th day, the odontogenic focus of his right mandibular 3rd molar tooth was extracted, and the passage through the mandibular incised region to the extraction wound made irrigation possible. On the 14th day, the discharge of pus stopped. On the 17th day, the white blood cell count was normal and CRP was negative, so he was discharged from the hospital. There has been no recurrence of inflammation since then.

**Discussion**

In both of these cases the infection began around the 3rd molar of the mandible and finally caused septic shock, and successive DIC in Case 1. (Bacteria were isolated in Case 1. In Case 2, there was no growth). *S. milleri* was isolated from the pus collected from the focuses of both cases. The organism showed good sensitivity to the antimicrobial agents that were administered. Pus and blood were cultured twice in Case 1. Considering the sensitivity of the isolated strains, it seemed that the *S. milleri* strains were the same kind.

To examine for the strains tolerance, two approaches were adopted. 1. One platinum loop of each of a series broth dilutions was plated on drug-free agar. The concentration which yielded less than 5 colonies was selected as the minimal inhibitory concentration (MIC). 2. The rest of each dilution was mixed with drug free broth, to give a 100 times larger quantity. The minimum dilution at which no organisms grew was determined; this was called the minimum bactericidal concentration (MBC). The measurement by both methods gave similar values and we concluded that there was no tolerance (Table 1). In Case 2, drug sensitivity tests according to the one dilution disk method was performed. The results were as follows: penicillin G 2+, ampicillin 3+, cefazolin 3+, cefotiam 2+, minocycline 3+, erythromycin 3+, clindamycin 2+, fosfomycin 2+, norfloxacin 1+, imipenem 3+ and ofloxacin 1+.

Endotoxin was not detected by the limulus test in either case. The strains did not differ from those usually isolated in odontogenic infections.

As to Case 1, thought the patient was elderly and had slight diabetes mellitus, he felt no inconvenience in the activity of his daily life. Blood sugar control which depended only on diet therapy was maintained quite well. As to Case 2, the patient had no underlying disease and was leading an active life as a firefighter. Therefore, we cannot attribute the cause of the disease to host factors.

Odontogenic infections, as long as patients are given adequate antimicrobial agents and undergo proper drainage, have in most cases a good prognosis. Oral streptococci are major causative organisms of odontogenic infections. In fact they account for 50% of the isolated strains. Generally these strains show good sensitivity to various antimicrobial agents. Ampicillin, which is usually the first choice, showed an MIC of 0.10 μg/ml to MIC 100 in 1988. Currently the MIC of ampicillin sometimes turns out to be 12.5 μg/ml, or for some of the strains even 25 μg/ml. In Case 1, the MIC of ampicillin for the isolated *S. milleri*...
strain was 0.20 μg/ml, which was considered satisfactory when we think of the oral tissue penetration of ampicillin. In case 2, because it was a national holiday the patient was referred to the emergency room of our hospital, where he was administered cefpiramide. Though sensitivity to cefpiramide was not tested in Case 2, in spite of the fact that its sensitivity is as good as that of ampicillin, the patient developed septicemia.

*S. milleri* is a virulent organism that can cause pneumonitis as well as pyelothorax\textsuperscript{2,3,4,5,6}. *S. milleri* group organisms rarely cause meningitis; however when they do, it is often preceded by trauma or purulent infection at another site\textsuperscript{7,8}. These organisms have been isolated not only from these central nervous system infections but also from acute spinal epidural abscesses and a subdural empyema\textsuperscript{4,9,10,11}. This organism is occasionally isolated from obstetrical infections and neonatal sepsis\textsuperscript{12,13}. Subcutaneous abscesses in intravenous drug abusers and hidradenitis caused by these organisms have also been reported\textsuperscript{14,15}. Community-acquired *S. milleri* group bacteremia secondary to probable tricuspid endocarditis in a patient with AIDS was reported\textsuperscript{16}. The patient, an intravenous drug abuser, developed secondary meningitis but responded well to a six-week course of therapy with vancomycin.

The *S. anginosus-milleri* should be given much attention in odontogenic infections. This is because while other oral streptococci cause odontogenic infections together with other organisms, the mixed *S. anginosus-milleri* group can be the cause of infectious diseases without other organisms.

References

敗血症を起こした歯性感染症の2例

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要旨
智歯周囲の炎症より気道閉塞，敗血症およびDICを来発したが，救命できた2例を経験した。2例とも宿主因子となる重篤な基礎疾患はなく，初期治療時に適切な抗菌剤の投与が行われなかったため重篤化したものと考えられた。2例とも膿汁よりS. milleriが検出されたが，細菌学的に特殊な菌株とは考え難かった，しかし，本菌は下気道感染や髄膜炎等だけでなくoral streptococciの混合感染が多い歯性感染症においても単独で感染を起こし得る菌株として重要な位置を占める。

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