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Eikenella corrodens tenosynovitis and osteomyelitis of the hand —A case report—

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Summary

A fourty-six-year-old man developed septic tenosynovitis and osteomyelitis of the hand following a laceration with oral contamination. Culture of the pus grew *Eikenella corrodens*, an organism that is normally found in oral secretions and has recently been recognized as pathogen. This is the first report in Japan of bone and joint infection caused by *Eikenella corrodens*. The significance of this organism in hand infection is also discussed.

Introduction

Eikenella corrodens, a small fastidious anaerobic gram-negative bacillus, is a part of the normal oronasopharyngeal flora and is recently recognized as an occasional pathogen[2,4]. It has been recovered as the infecting agent in cases of endocarditis[4,6], meningitis[2,4], subdural abscess[2,19] and pulmonary infections[8]. Several reports from western countries also deal with bone and joint infection[1,3,7,9,16,20] in orally contaminated wound. In our country, there are only a few reports of infection by this organism[23,24]. This is a report of a case in which *Eikenella corrodens* was isolated from an orally contaminated wound, in which tenosynovitis and osteomyelitis resulted, and to the best of our knowledge, there has been no report of skeletal *Eikenella corrodens* infection in Japan.

Case Report

On Jan. 25, 1983 a fourty-six-year-old male factory worker was admitted to Kokura Memorial Hospital with an infection in his right hand of 6 days' duration. The patient reported that his right ring finger was trapped between two garden stones while he was moving them at home. Just after injury, his friend put the wound in his mouth to draw out "dirty blood". The patient did not seek medical attention for five days.

Key Words: *Eikenella corrodens*, Hand, Infection, Tenosynovitis, Osteomyelitis.
索引語：*Eikenella corrodens*, 手，感染症，腱鞘炎，骨髄炎.
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A B

Fig. 1. (A) Necrotic ulcer over the third distal interphalangeal joint and edema of the right ring finger and dorsum of the hand 6 days after being wounded. (B) penetrating wound in the middle phalanx and swelling in the palmar aspect of the ring finger same time as in A.

Abnormal physical findings were limited to the right hand except for axillary temperature of 38.0°C. There was browny edema of the right ring finger and entire dorsum of the hand. A necrotic ulcer was seen over the ring finger's distal interphalangeal joint with fecal odor (Fig. 1-A). There was a small penetrating wound in the radial aspect of the middle phalanx and the volar aspect of the ring finger was red and swollen along the flexor synovial sheath. The ring finger could not be extended freely (Fig. 1-B). There was no palpable lymphadenopathy in the epitrochlear or axillary areas. Admission laboratory data included WBC 7000/cu mm with 50% polymorphonuclear leukocytes, ESR 25 mm/hr, blood glucose 124 mg/dl and CRP (+). Upon admission, intravenous cefazolin 4 g/day administered every 12 hours was begun, and the right hand was splinted and elevated. Glucose tolerance test revealed a diabetic pattern (75 g OGTT).

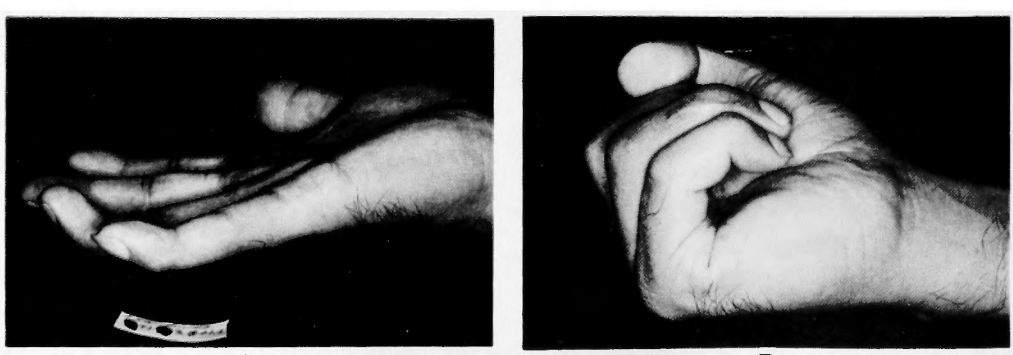
Eikenella corrodens was cultured from the wound on hospital days 2, 14, 22, 29 and 32.

Fig. 2. Antero-posterior roentgenogram of the middle phalanx of the right ring finger revealing bone resorption and periosteal reaction.

Alpha-streptococcus was also isolated in most of the cultures. Although these organisms showed sensitivity to cefazolin, purulent discharge did not subside and the roentgenogram taken on the 20th hospital day revealed periosteal reaction and bone resorption in middle phalanx (Fig. 2). Surgical debridement of the ring finger was performed on 31 st day. The wound was opened through radial mid-lateral incision and flexor tendon sheath was incised as proxiaml as the proximal finger crease where tenosynovitis was noted. Necrotic part of the flexor tendon and middle phalanx were excised. The wound was packed open and antibiotics was changed to ceftizoxime i. v. to which these organism were also sensitive. Dressing change and gentle active exercise were begun on the 4th postoperative day. Intravenous antibiotics was administered for 8 days followed by parenteral antibiotics for 13 days. The culture on the 4th postoperative day revealed only microcuccus and on the 8th day, it was negative of any organism. The wound healed over in three weeks. Six months after operation, the hand kept fairly good function (Fig. 3-A, B) and there had been no subsequent evidence of recurrence sixteen months later.

Eikenella corrodens; History and bacteriology of the present case.

Eikenella corrodens is a gram-negative, microaerophilic bacillus which only lately has received attention as a possible pathogen. The late recognition is due to delay in identification and characterization of the bacillus as well as difficulty in culturing it. HENRIKSEN[10] in 1948 described anaerobic gram-negative bacilli which grew slowly on solid media as colonies depressed below the agar surface. In 1950, HOLM[12] provisionally named these organisms "the corroding bacillus" because the colonies resembled "small, mat, corroded patches on the surface of the blood agar". EIKEN[5], in 1958, studied similar organisms, reported them to be strictly anaerobic, and placed them among the *Bacteroides* species. He called his strain "*Bacteroides corrodens*" and declared them to be a new species of *Bacteroides*. KING and TATUM[18], in 1962, studied an organism they called HB-1. This group seemed almost identical to Eiken's *Bacteroides corrodens*, although HB-1 included both strictly anaerobic and facultatively anaerobic strains[22]. HENRIKSEN[11], in 1969, found Eiken's *Bacteroides corrodens* not to be a strict anaerobic and believed it should not be in the genus *Bacteroides*. JACKSON et al.[13], in 1971, stated that the aerobic growth of these organisms was



A B

Fig. 3. Active extension (A) and flexion (B) of the hand six months after surgery. Wound healed and fairly good function is preserved.

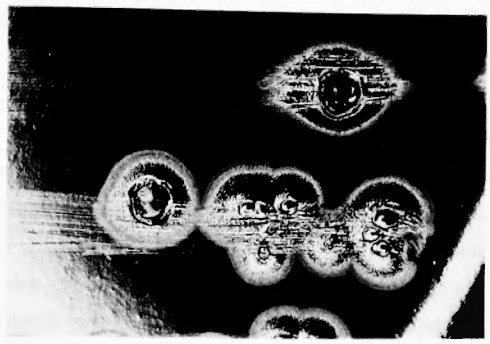


Fig. 4. Small crater-shaped colonies on chocolate agar with hemin, characteristic to *Eikenella corrodens* (×10).

dependent on the hemin content of the media. They also studied DNA base composition of this and related organisms and proposed that facultatively anaerobic, gram-negative rods called *Bacteroides corrodens* be transferred to a new genus, *Eikenella*, in honor of Eiken, because the facultatively anaerobic *Eikenella* organisms had a DNA guanine-plus-cytosine (G+C) content of 56-58 mol% and did not produce urease, whereas the anaerobic strains had DNA G+C content of 28-30 mol% and were urease positive[14]. Thus, there are apparently two different species which produce corroding colonies: (1) a strict anaerobe still carrying the designation of *Bacteroides corrodens*, although recently a plea has been made for its name to be changed to *Bacteroides ureolytics*[15], and (2) a facultative anaerobe which is microaerophilic and grows best aerobically if hemin is added to the medium (*Eikenella corrodens*).

Eikenella corrodens is characterized by JACKSON and GOODMAN[14] as follows: gram-negative rods 0.3-0.4 by 1.5-4 nm growing as aerobes and facultative anaerobes. The organism grows characteristically as small corroding or pitting colonies of pinpoint size, but dome-shaped, non-pitting variants also are encountered. Colonies on blood agar grow to 0.5 mm in 24 hours and are non-hemolytic. Growth during primary isolation is favoured by a 5-10% carbon dioxide atmosphere, and the organism typically requires hemin in concentration of 5-25 μg/100 ml of media for

Table 1. Biochemical assay of *Eikenella corrodens*

Test	Result	
	Organism from hand wound	ATCC 23834 (*Eikenella corrodens*)
Oxidase	+	+
Catalase	−	−
Nitrate reduction	+	+
Acid production from carbohydrate	−	−
Urease	−	−
Indole	−	−
H_2S production	trace	trace
Lysine decarboxylase	+	+
Ornithine decarboxylase	+	+
Arginine dehydrolase	−	−

optimal aerobic growth. *Eikenella corrodens* is oxidase-positive, catalase-negative, nitrate-reducing, urease-negative, gelatinase-negative, indole-negative, lysine-decarboxylase-positive, and does not ferment glucose or any other commonly used sugar.

The *Eikenella corrodens* isolated from the hand wound of our patient was first cultured aerobically on a blood agar plate containing 5% sheep red cells in trypticase soy agar. The organism grew aerobically and under 5-10% CO_2 on chocolate agar with hemin (Fig. 4) and anaerobically on Gifu anaerobic medium. For fermentation studies, cystine trypticase agar was used. The ATCC control organism (*Eikenella corrodens* 23834) were run in parallel with the strain from the present case to assure standardization and the results are listed in Table 1.

Discussion

Eikenella corrodens have recently been recognized increasingly as pathogens[4], however it is still unfamiliar to clinicians. Most of the cases are the infection of such sites as have a contact with oronasopharynx where this organism is part of the normal bacterial flora. It is natural that the early description of skeletal infection by this organism was that occurred in mandibula consequent to open fracture[3,17]. The other common site of skeletal infection is the hand, which is most likely to be contaminated by human bite. The first case of hand infection due to *Eikenella corrodens* was reported by JOHNSON and PANKEY[16] in 1976. Since then the number of the cases are increasing as its significance in the human bite wound is recognized[1,7,9,20]. GOLDSTEIN et al.[9] reports 20% incidence of *Eikenella corrodens* in fifteen cases of clenched-fist injury. Osteomyelitis of os calcis is also reported in that case a history of injury by tooth pick was noted[21].

The first report of *Eikenella corrodens* infection in our country was published in 1977 on a patient with lung abscess[23]. Since then only a few reports deal with this organism[24], and to the best of our knowledge, there has been no report on skeletal infection by *Eikenella corrodens* in Japan.

In the present case, culture from the wound yielded *Eikenella corrodens* five times although most of them were associated with other organisms, among which α-streptococcus was found three times. The bacillus is reported frequently found in association with other organisms, both aerobic and anaerobic, and these organisms are considered to cooperate to produce infection[2]. Diabetic status of this patient may also have contributed to the establishment of the infection. The organism isolated from the present wound formed characteristic pitting colony on blood agar and all the biochemical test run parallel with ATCC control organism showed reported character of *Eikenella corrodens*. Consequently, it is obvious that *Eikenella corrodens* was the pathogen in the present case.

The *Eikenella corrodens* infection did not seem to differ clinically from other infection. Diagnosis is impossible clinically and can only be established by laboratory examinations. Treatment is early surgical debridement and selection of proper antibiotics is of prime importance. The unusual antimicrobial susceptibility pattern of this organism must be considered in choosing therapeutic regimens. *Eikenella* is sensitive to chloramphenicol, gentamycin and erythromycin, and

singularly resistant to clindamycin[2]. Our result of the sensitivity test was in accordance with this (data not shown).

The frequency of isolation of a given type of bacteria depends upon the suspicion of the clinician, the obtaining of an adequate specimen and the thoroughness of culture techniques. Some hand infections have been referred as "sterile" and the term "sterile abscess" is commonly used. This erroneous assumption is made on the basis of incomplete data, i. e., the routine aerobic culture. *Eikenella corrodens* should be suspected as a possible cause of any infection originating in area contiguous with the oronasopharynx or that is contaminated by its secretion. All the injuries with a history of oral contamination should be cultured in aerobic, anaerobic, and 10% CO_2 atmosphere, assuming the presence of *Eikenella corrodens*.

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和文抄録

Eikenella corrodens を起炎菌とする手の化膿性腱鞘炎・骨髄炎の1例

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Eikenella corrodens による骨関節感染症としては本邦第1例と思われる症例を報告した．

症例は46歳男性で，庭石の間に右手環指をはさまれ受傷，直後に同僚が創を口に当て吸ったのち放置していた．疼痛と腫脹が強く，排膿がみられたため第6日に受診した．抗生剤投与と副子固定により症状は軽快したが，排膿が続き，5回にわたって *Eikenella corrodens* が分離された．また同時に α-streptococcus が分離され，混合感染が疑われた．X線上骨吸収像が現れたので，受傷5週目に，屈筋腱腱鞘切開と中節骨のデブリドマンを行った．創は開放のまま治癒させ，術後16カ月の現在，手の機能は良好で，炎症の再発もない．

Eikenella corrodens は，微好気性，グラム陰性の小桿菌で，人の口腔内などに常在菌として存在する．感染症の起炎菌として注目されたのが比較的最近であることと，培養に若干の手技を要するため，本菌による感染症の報告は多くはないが，欧米においては，人の咬創による骨関節感染症の報告がいくつかあり，本菌に対する認識が高まるにつれ，症例数は増加している．本菌は hemin 加チョコレート寒天培地で CO_2 存在下によく成育し，寒天表面上から凹んだ，特徴的な形状のコロニーを作ること，および生化学的性状により同定される．抗生剤感受性は良好であるが，一般菌と感受性がことなるため，正確な菌の同定と感受性検査が必要である．同時に適切な整形外科的処置が重要である．