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개에게 물린 당뇨환자의 *Streptococcus agalactiae*, *Arcanobacterium haemolyticum*과 *Finegoldia magna*에 의한 괴사성 근막염 1예

이성실[1] · 노경호[2] · 김창기[1] · 용동은[1,3] · 최준용[4] · 이진우 · 이경원[1,3] · 정윤섭[1]

연세대학교 의과대학 진단검사의학교실 세균내성연구소[1], BK21 의과학사업단[3], 내과학교실[4], 정형외과학교실[5], 고려대학교 의과대학 진단검사의학교실[2]

A Case of Necrotizing Fasciitis Due to *Streptococcus agalactiae*, *Arcanobacterium haemolyticum*, and *Finegoldia magna* in a Dog-bitten Patient with Diabetes

Sungsil Lee, M.D.[1], Kyoung Ho Roh, M.D.[2], Chang Ki Kim, M.D.[1], Dongeun Yong, M.D.[1,3], Jun Yong Choi, M.D.[4], Jin Woo Lee, M.D.[5], Kyungwon Lee, M.D.[1,3], and Yunsop Chong, Ph.D.[1]

Departments of Laboratory Medicine and Research Institute of Bacterial Resistance[1]; BK21 Project for Medical Sciences[3], Internal Medicine[4], and Orthopedic Surgery[5], Yonsei University College of Medicine, Seoul; Department of Laboratory Medicine[2], Korea University College of Medicine, Seoul, Korea

We report a case of necrotizing fasciitis involving *Streptococcus agalactiae, Arcanobacterium haemolyticum*, and *Finegoldia magna* in a 36-yr-old female diabetic patient, which started after a minor dog bite to the toe of the patient. This case suggested that a trivial infection after a minor dog bite in an immunocompromised patient such as diabetes patient could result in a significant complication such as necrotizing fasciitis. The life-threatening infection was cured by timely above-the-knee amputation, as well as penicillin G and clindamycin therapy. *(Korean J Lab Med 2008;28:191-5)*

Key Words : *Necrotizing fasciitis, Streptococcus agalactiae, Arcanobacterium haemolyticum, Finegoldia magna, Diabetic patient*

INTRODUCTION

Necrotizing fasciitis (NF) is a rare infection that is invariably fatal if left untreated. The commom causes of NF are *Staphylococcus aureus* and *Streptococcus pyogenes*. *Streptococcus agalactiae* has rarely caused NF. Anaerobic bacteria were reported to be involved in polymicrobial infections[1-3]. *Arcanobacterium haemolyticum*, formerly classified in the genus *Corynebacterium*, is gram-positive, facultative anaerobic, catalase negative rods. Although a diabetic foot ulcer caused by *A. haemolyticum* was reported[4], a well-known infection by this organism is pharyngitis. *Finegoldia magna*, formerly *Peptostreptococcus magnus*, is a member of the gram-positive anaerobic cocci which is recognized as an opportunistic pathogen responsible for various infectious diseases.

Dog bites are common and carry a risk of infection, but the report of dog-associated NF in a diabetic patient is very rare[5]. We report a case of dog bite-induced NF in a 36-yr-old female diabetic patient. The NF was associated with

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교 신 저 자 : 용 동 은
우 120-752 서울시 서대문구 신촌동 134
연세대학교 의과대학 진단검사의학과
전화 : 02-2228-2446, Fax : 02-313-0908
E-mail : deyong@yumc.yonsei.ac.kr

S. agalactiae, *A. haemolyticum*, and *F. magna* and required amputation of the necrotized leg. To our knowledge, this is the first report in the world of NF simultaneously involving *S. agalactiae*, *A. haemolyticum*, and *F. magna*.

CASE REPORT

A 36-yr-old woman with uncontrolled diabetes was transferred to our hospital in March 2006, because of an aggravating leg pain during the previous two days while she was at another hospital. Her chief complaints at the time of admission to that hospital were painful, erythematous swelling of the left toe and calf during the previous five days, and fever, chills, nausea, vomiting, and abdominal pain for one day.

She was bitten on her left 2nd toe by her dog 10 days ago and left it without any treatment for 7 days. Pain and edema were aggravated but she had only applied a disinfectant cresol solution and an ointment without knowing the component on that toe wound 3 days ago. Those disinfectant solution and ointment were bought without a prescription at a drugstore.

Upon admission to our hospital, the patient looked acutely ill, but was mentally alert. Her complaints included a painful, edematous left leg up to proximal thigh. Physical examination revealed a temperature of 39.1°C, a heart rate of 135 beats/min, blood pressure of 109/64 mmHg, height 173 cm, body weight 66 kg, and audible crepitation of the lesion. The skin of the lesion was violet and had blisters. Her peripheral blood leukocyte count was 34,900/μL, with 95% neutrophils, and a platelet count was 199,000/μL. Prothrombin time and activated partial thromboplastin time were within reference range, 13.7 sec and 33.6 sec, respectively. Levels of random glucose and hemoglobin A_{1c} were elevated to 300 mg/dL and 9.9%, respectively. X-ray findings of the left lower extremity showed gas formation in the subcutaneous tissue. For 2 days, the serum glucose level was above 300 mg/dL and she had not been aware that she had diabetes mellitus. The human insulin 300 I.U per day was injected to control the blood glucose and she was diagnosed as a type I diabetes mellitus after admission.

Immediately after her admission, a wound swab and three blood cultures were taken, and intravenous vancomycin 1.0 g every 12 hr, and meropenem 0.5 g every 8 hr were start-

Table 1. Characteristics of bacterial isolates from the patient with necrotizing fasciitis

Specimens	Characteristics of isolates	Identification	MIC (μg/mL)‡	
			Penicillin G	Clindamycin
Wound*	Heavy growth of small, pleomorphic, gram-positive bacilli after 24 hr aerobic culture Colonies were small in size with a narrow zone of hemolysis Positive CAMP-inhibition reaction with *S. aureus*	*Arcanobacterium haemolyticum* by API Coryne strip†	0.008	0.06
	Heavy growth of gram-positive cocci in chain after 24 hr aerobic culture Colonies were small with incomplete hemolysis Positive latex-agglutination test with group B reagent of Streptex test (Remel, Lenexa, KS)	*Streptococcus agalactiae* by Vitek GPI card†	0.064	0.06
	Heavy growth of gram-positive cocci in clusters after 48-hr anaerobic culture Small nonhemolytic colonies	*Finegoldia magna* by ATB rapid ID 32A strip†	Not tested	Not tested
Blood	All three aerobic blood cultures (BacT/ALERT 3D†) yielded *S. agalactiae*. Anaerobic blood cultures using thioglycollate broth (Micromedia, Busan, Korea) did not yield any anaerobe	*S. agalactiae* by Vitek GPI card†	0.064	0.06

*, Both of the two wound specimens taken at the time of hospitalization and operation yielded the same organisms; †, The culture and identification systems were from bioMerieux (Marcy l'Etoile, France); ‡, MIC determination: penicillin G by the Etest and clindamycin by the agar dilution method of Clinical and Laboratory Standards Institute using 5% blood supplemented Mueller-Hinton agar.
Abbreviation: MIC, minimum inhibitory concentration.

ed empirically. Because of the patient's rapidly declining general condition and the underlying diabetes, amputation of the leg was seriously considered. Following careful deliberation, an above-the-knee amputation, with complete debridement of the posterior compartment of the infected thigh muscle, was performed seven hours after admission.

Table 1 shows bacterial isolates from wound cultures taken at the time of hospitalization and operation, and those from all three blood cultures, together with the results of their susceptibility. Penicillin G and clindamycin susceptible *S. agalactiae*, *A. haemolyticum*, and *F. magna*. were isolated from the wound cultures, and penicillin G and clindamycin susceptible *S. agalactiae* from the blood cultures. Based on the susceptibility of the isolates, intravenous clindamycin (300 mg every 8 hr) and intravenous penicillin G (2,400,000 units per day) were added on the 2nd and 6th hospital days, respectively, and the treatment was continued until the 30th hospital day, while all other antimicrobial agents were removed on the 6th hospital day (Table 1). Insulin and biguanide were used to treat diabetes. Seven days after surgery, she became afebrile, leukocyte count declined to 14,500/μL, and C-reactive protein declined from 21.4 mg/dL to 7.5 mg/dL. After 34 days of postoperative care, the patient was discharged with an uneventful recovery.

DISCUSSION

Foot infections in diabetic patients are most commonly due to *S. aureus* and may lead to the amputation of a lower extremity[6]. It is interesting that, in our case, the NF started after a minor dog bite and that the isolates from the wound were *S. agalactiae A. haemolyticum*, and *F. magna* but not *Pasteurella multocida* and *Capnocytophaga canimorsus*, which are commonly associated with a dog bite[7]. In our patient, all three blood cultures also yielded *S. agalactiae*. It was assumed that this patient's wound was not properly managed by susceptible antibiotics immediately after the dog bite. Two factors of the delayed treatment and the uncontrolled diabetes condition may have caused a rapid growth of bacteria and development of the NF in this case patient[8].

Some NF cases due to *S. agalactiae* have been reported for a few decades although *S. agalactiae*, normal flora of female genital tract, mainly causes sepsis and meningitis in neonate and postpartum infections in adult. It is known that *S. agalactiae* infection in other adults usually reflects a compromised state of the patient and includes bacteremia, pneumonia, endocarditis, arthritis, and skin and soft tissue infections as in this case patient[9, 10]

It was reported that the smooth biotype of *A. haemolyticum* predominates in wound infections, whereas the rough biotype is common in respiratory tract infections[11]. Our isolate had rough type colonies on the blood agar plates. We assumed that the rough type *A. haemolyticum* of the dog was transmitted to the patient. However, we could not confirm whether the dog bite wound preceded the *A. haemolyticum* infection which was secondarily transmitted later through that wound as a widespread parasite of domestic animals or *A. haemolyticum* was directly transmitted to the patient wound through the dog bite itself at the same time with infection. As *A. haemolyticum* produces a phospholipase D, which is known to cause tissue damage[12], the isolate in our case may have played a role in inducing the NF in association with other organisms.

F. magna, formerly *P. magnus*, is a member of the gram-positive anaerobic cocci which is most commonly associated with infection of skin, soft tissue, bone and joint, but it has also been isolated from cases of diabetic foot infection [13] and one of the predominant organisms associated in polymicrobial NF in children[14]. In our case, it is difficult to speculate about the source of the isolates. *S. agalactiae* and *F. magna* are more frequently isolated from foot ulcers than other streptococci and anerobic gram-positive cocci, respectively[15]. It was reported that the bio-phenotype of *S. agalactiae* of canine origin seemed to be more closely related to human than to bovine isolates of this species[16]. The isolate of *A. haemolyticum* in our case probably originated from the dog, as it has been reported that the bacterium is a widespread parasite of domestic animals[17], whereas it is not the oral flora of man[18].

S. agalactiae strains are frequently resistant to ery-

thromycin and clindamycin[19], but remain uniformly susceptible to penicillins and cephalosporins in vitro; therefore, penicillin G is the drug of choice. Macrolides- and clindamycin-resistant *A. haemolyticum* strains have been reported[11]. In our case, the isolates of *S. agalactiae* and *A. haemolyticum* were inhibited by low concentrations of penicillin G and clindamycin and these antimicrobial agents were effective in treating the patient.

This case demonstrates that a minor dog bite can cause a polymicrobial foot infection, resulting in NF and requiring leg amputation, when a patient has underlying diabetes mellitus. Considering the above mentioned two factors enhancing rapid bacterial growth, the significant complication may have been minimized or prevented by a strict blood sugar control and immediate antibiotics treatment. To our knowledge, this is the first report in the world of polymicrobial NF in a diabetic patient simultaneously involving *S. agalactiae*, *F. magna*, and *A. haemolyticum* as a result of a dog bite.

요 약

본 증례는 36세 여자 당뇨환자가 애완견에게 발가락을 물린 후 속발된 *Streptococcus agalactiae*, *Finegoldia magna*와 *Arcanobacterium haemolyticum*에 의한 괴사성 근막염으로 왼쪽 하지를 절단한 예이다. 이 증례는 당뇨병과 같은 면역저하 환자에서 애완견에 의한 사소한 감염이 괴상성 근막염과 같은 심각한 합병증을 유발할 수 있음을 보여준다. 생명에 지장을 초래하는 매우 위중한 이 같은 감염은 시기 적절한 응급 하지 절단술과 penicillin G 및 clindamycin 투여로 치료되었다.

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