Journal of Microbiology and Infectious Diseases / JMID
2013; 3 (4): 218-221
doi: 10.5799/ahinjs.02.2013.04.0113

**CASE REPORT**

# Chronic osteomyelitis of skull associated with necrotic injury after trauma: A case report

Şua Sümer[1], Mehtap Karameşe[2], Ender Köktekir[3], Onur Ural[1]

[1] *Department of Infectious Disease and Clinical Microbiology, Selçuk University, Faculty of Medicine, Konya, Turkey*
[2] *Department of Plastic and Reconstructive Surgery, Selçuk University, Faculty of Medicine, Konya, Turkey*
[3] *Department of Neurosurgery, Selçuk University, Faculty of Medicine, Konya, Turkey*

**ABSTRACT**

A 32-year-old male came to the emergency room with a crescentric 4x11 cm tissue defect at the right temporo-parietal region. Brain tomography showed a tissue defect in the right parietal region but bone integrity was preserved. A free flap procedure was performed to protect the cranial bones. Two months after discharge from the hospital, he presented with a draining dirty wound that appeared necrotic. Computed tomography showed a bone defect in the temporoparietal area. Empiric antibiotic treatment was initiated. The necrotic tissues were debrided as a first step and the patient was followed for granulation tissue development. Pseudomonas aeruginosa was identified from soft tissue and bone samples. Pathology results were consistent with chronic osteomyelitis. A rotation flap from the scalp was prepared after granulation tissue development. The patient's antibiotic treatment was completed in 6 weeks. After 6 weeks, three dimensional computed tomography showed osteoblastic activity and bone formation. *J Microbiol Infect Dis 2013;3(4): 218-221*

**Key words:** Antibiotic treatment, chronic osteomyelitis, infection

## Travma sonrası kafa kemiğinde nekrotik yara ilişkili kronik osteomyelit: Olgu sunumu

**ÖZET**

Otuziki yaşında erkek hasta acil servise sağ temporoparietal alanda 4x11 cm doku defekti ile getirildi. Beyin tomografisinde sağ parietal alanda doku defekti görüldü fakat kemik doku bütünlüğü korunmaktaydı. Kraniyal kemiklerin korunması amacıyla serbest flep operasyonu yapıldı. Hastaneden taburcu olduktan 2 ay sonra nekrotik görünümde kirli akıntılı yara ile başvurdu. Tomografide temporoparietal alanda kemik defekti görüldü. Ampirik antibiyotik tedavisi başlandı. İlk aşamada nekrotik dokular debride edilerek granülasyon dokusu oluşumu için hasta izlendi. Doku ve kemik kültüründe Pseudomonas aeruginosa üremesi saptandı. Patoloji sonuçları kronik osteomiyelit ile uyumlu geldi. Granülasyon dokusu gelişiminden sonra skalpten rotasyon flebi yapıldı. Hastanın antibiyotik tedavisi 6 haftaya tamamlandı. Altı hafta sonrasında 3 boyutlu tomografi görüntülemelerinde osteoblastik aktivite ve kemik oluşumu görüldü.

**Anahtar kelimeler:** Antibiyotik tedavisi, kronik osteomyelit, enfeksiyon

## INTRODUCTION

Chronic osteomyelitis is a severe and persistent infection of the bone and bone marrow.[1-3] Osteomyelitis of the skull bones is rare.[1,4] This condition usually develops due to contamination from a preexisting infectious focus, the presence of vascular insufficiency, or hematogenous spread. Treatment of chronic osteomyelitis involves a surgical approach and long term antibiotics that target the causative agent. Surgical treatment of osteomyelitis developing in the head is difficult due to anatomical and surgical factors.[1-3] Studies investigating the incidence, etiology, clinical findings, and management of osteomyelitis in this area are scarce.[2] This paper describes a case of chronic osteomyelitis due to a posttraumatic necrotic scalp injury.

## CASE REPORT

A 32-year-old male came to the emergency room with serious tissue loss and bleeding in the right parietal and temporal areas after a traffic accident. Physical examination in the emergency room

**Correspondence:** Şua Sümer, Selçuk University, Faculty of Medicine, Department of Infectious Disease and Clinical Microbiology Alaeddin Keykubat Campus Konya, Turkey Email: suasumer@gmail.com / suasumer@mynet.com
Received: 26.03.2013, Accepted: 25.07.2013

showed that his vital signs were stable. He was conscious, oriented, and cooperative. There was a crescentic 4x11 cm tissue defect at the right temporo-parietal region and the frontal and maxillary regions were tender on palpation. Other physical examination findings and laboratory evaluations were normal. Brain tomography showed a tissue defect in the right parietal region but bone integrity was preserved. The patient was admitted to the brain surgery ward for follow-up. Cefazolin was started as an empirical treatment and no neurological pathology was detected during follow-up. The patient was referred to a plastic and reconstructive surgery clinic for tissue repair. A free flap procedure for plastic and reconstructive surgery was performed to protect the cranial bones. The patient was discharged on the postoperative 10th day. The wound site was clean and no findings for osteomyelitis were detected. The patient failed to appear for outpatient follow-up visits.

Two months after discharge from the hospital, the patient presented at a plastic and reconstructive surgery clinic with a draining dirty wound that appeared necrotic. Physical examination revealed stable vital signs; he was conscious, oriented, and cooperative. The necrotic wound on his scalp was tender and soft. Computed tomography showed a bone defect in the temporoparietal area (Figure 1). Laboratory test results were as follows: leukocyte count: 11.500/mm³ (4.000-10.000/mm³), polymorphonuclearleucocyte (PMNL): 85%, erythrocyte sedimentation rate (ESR): 90 mm/h (0-20 mm/h), and C-reactive protein (CRP): 45 mg/L (normal range 0-5 mg/L). A consultation was requested from the Infectious Diseases and Clinical Microbiology Clinic. Ampicillin-sulbactam (6 g/day) treatment was initiated. A two-step procedure was planned. The first step was debridement of the necrotic tissues and the patient was followed for granulation tissue development. Samples for culture and pathology were sent from both bone and soft tissues. On the postoperative third day, Pseudomonas aeruginosa was identified from the soft tissue and bone samples. The Infectious Diseases and Clinical Microbiology Department was consulted again, ampicillin-sulbactam was stopped, and ciprofloxacin (2 x 400 mg parenteral) was started based on the antibiogram results. Under treatment, the drainage stopped, granulation tissue formed, and a rotation flap was prepared from the scalp. The laboratory parameters significantly improved under treatment (leukocyte count: 8.700/mm³, PMNL: 65%, ESR: 65 mm/h, CRP: 18 mg/L).

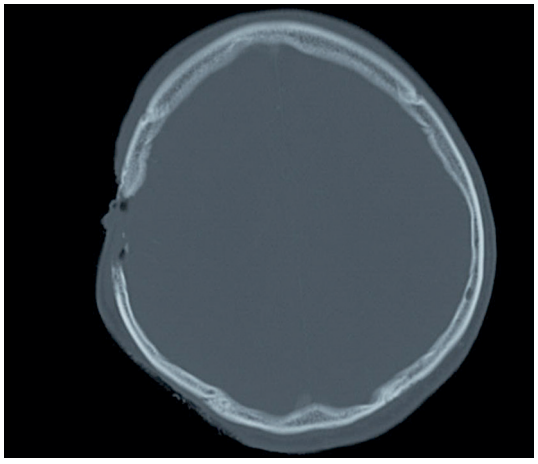

**Figure 1.** Computed tomography shows right temporoparietal bone defect

The general condition of the patient was good at follow-up and the pathology result was consistent with chronic osteomyelitis. The first 3 weeks of treatment was completed as IV therapy. The patient was discharged with oral antibiotic treatment (ciprofloxacin 2 x 750 mg, orally). The patient's treatment was completed in 6 weeks. After 6 weeks of treatment, the wound area was clean. Three dimensional computed tomography showed osteoblastic activity and bone formation (Figure 2). The patient's brain tomography was repeated 3 months after the operation. No complications were seen and he continues to be followed up.

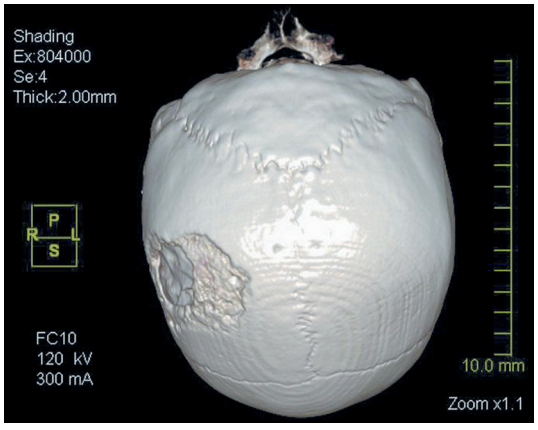


**Figure 2.** Osteoblastic activity in 3 dimensional computerized tomography

## DISCUSSION

Osteomyelitis is an inflammatory condition due to microorganisms that causes bone destruction.[1,5,6] Local spread from an infection area is a common

cause of chronic osteomyelitis. This condition may result from surgical interventions such as bone surgery or joint replacement, or it may be due to trauma as seen in our patient.[1] Prasad et al. investigated head and neck osteomyelitis in a series of 84 patients.[2] This was one of the largest studies on this topic. Seventy five of these 84 patients were followed with a diagnosis of osteomyelitis and the rate of posttraumatic osteomyelitis was 6%. In this study, the lesions due to posttraumatic osteomyelitis were located in the mandible, maxilla, and cervical vertebrae. Valeron-Almazan et al. reported a case of chronic osteomyelitis involving the occipital and parietal areas.[3] Our patient also had chronic osteomyelitis at the temporoparietal area.

Clinical findings of patients diagnosed with chronic osteomyelitis are usually mild. These patients may present with open wounds, draining fistulas, or sometimes with subcutaneous swelling and bone tenderness and softening in the absence of a skin lesion.[1,3,7] A prediagnosis of osteomyelitis was made in our patient due to softening and tenderness of the bone underlying necrotic wound tissue.

A definite diagnosis of chronic osteomyelitis is made with imaging methods and histopathologic evaluation. Imaging methods that can be used are X-ray, CT, and MRI, but high resolution CT and MRI are more sensitive methods than conventional radiography for showing periosteal reactions, cortical destruction, articular damage, and soft tissue involvement and they are helpful for early diagnosis.[1-3] These methods are also used to plan surgical treatment.[1] However, 10-21 days might pass before detection of bone destruction with conventional radiography.[8,9] Material for histopathological evaluation can be taken during debridement or with a biopsy. Neutrophil numbers greater than 5 in each high power field are reported to show infection with 43-84% sensitivity and 93-97% specificity.[1,10] Diagnosis of our patient was confirmed both with imaging methods and histopathologically.

The sensitivity and specificity are low for the laboratory methods used in the diagnosis and follow-up of chronic osteomyelitis. Chronic osteomyelitis can be associated with mild increases in ESR, CRP, leukocyte count, and alpha-1 acid glycoprotein levels.[11] ESR is elevated in many chronic osteomyelitis patients but its slow kinetics allows its use in following chronic osteomyelitis. CRP, an acute phase reactant, is a useful marker for following the treatment response.[1] We used CRP and ESR to evaluate the treatment response in our patient.

An important step in treatment of chronic osteomyelitis is isolation of the causative microorganism. Therefore, samples should be collected directly from the bone during debridement and a blood culture should be made if hematogenous spread is suspected.[1,3,12,13] The causative agents of chronic osteomyelitis are bacteria and less frequently fungi, mycobacteria, parasites, and viruses. *Staphylococcus aureus* is the most frequent bacterial microorganism, followed by other gram positive and negative organisms.[1-3,7,14] Prasad et al. also found *S. aureus* to be the most frequent, with a 49% frequency, followed by *Streptococcus pyogenes*, *Streptococcus pneumoniae, Mycobacterium tuberculosis, Klebsiella* spp., *Pseudomonas* spp. and *Bacterioides* spp.[2] Valeron-Almazan et al reported *Proteus mirabilis* and *Peptostreptococcus* spp. as causative agents in their case.[3] Our patient underwent effective treatment because *P. aeruginosa* was identified in appropriately obtained cultures and treatment was chosen accordingly.

The basic approach for chronic osteomyelitis treatment should be surgery, and prognosis depends on surgical debridement.[1-3,7,11] Surgical treatment involves debridement of necrotic bone and tissue, obtaining appropriate cultures, dead space management, and if necessary, establishment of bone stability.[1-3,14] The ischemic nature and avascularity of infected tissue, and the low oxygen level due to the presence of sequestra, cause inadequate penetration of antibiotics into the infected tissue.[2,14] Inadequate surgical debridement of chronic osteomyelitis is a reason for its high recurrence rate.[1,2] The treatment of necrotic tissue and chronic osteomyelitis in the present case involved a large debridement area and tissue sampling. Thus, the blood supply and oxygenation of the area were improved.

Effective debridement of chronic osteomyelitis may lead to formation of dead spaces and the development of bone instability. Reconstruction is needed for both bone and soft tissue. The management methods reported in the literature are divided into five groups: the first is primary or secondary closure using cancellous bone grafts. The second is filling dead tissue with antibiotic polymethyl methacrylate beads, followed by reconstruction. The third method uses local muscle flaps to control infection. The fourth method uses microsurgical techniques to make composite tissue transfers, thereby closing bone, muscle, and skin defects. Bone defects are closed using vascularized fibular grafts and osteocutaneous iliac flaps. The fifth method is the use of Ilisarov techniques to close bone defects.[1,7,15]

In the present case, beginning at the first admission of this patient to the emergency service,

attempts were made to close deperiosted calvarial bones using vascularized tissue. A scapular flap was transferred using microsurgical techniques. Although venous grafts were used to avoid the presence of anastomoses in the traumatic zone, this flap was lost. Poor environmental conditions, aggravated by inadequate blood supply, led to the development of osteomyelitis. A bone graft was not considered for replacement of the bone lost due to the aggressive debridement used in the beginning. The reason for this decision was the low chance of graft survival in a region where vascularization and local environmental conditions were deficient. Local flaps were prepared from scalp tissue to close the calvarial defect. The detection of osteoblastic activity in late term was encouraging.

No consensus yet exists regarding the duration of antibiotic treatment for chronic osteomyelitis. The general approach is to give broad spectrum antibiotics for 4-6 weeks (at least 2 weeks parenteral). Because revascularization in bone starts at the 3rd-4th week, treatment should be given parenterally at the beginning.[1,11] When an infection is confirmed with culture results, the antibiotic choice should take into account the antibiotic sensitivity pattern. If infection is not confirmed with culture results, two points should be considered. First, the chosen antibiotic should be effective against staphylococci. Second, if hospital-acquired or surgical infection is suspected, the chosen antibiotic should also cover resistant microorganisms (gram negative and gram positive). In our patient, antibiotic treatment was chosen based on the culture results. The patient's clinical and laboratory findings continued to improve under treatment. A follow-up visit after 6 weeks of treatment showed that the bone defect had started to close and the soft tissue defect had improved.

In conclusion, although chronic osteomyelitis is a difficult to treat infectious disease with a high relapse risk, cure is possible with appropriate treatment choices. Antibiotic treatment will provide more benefit if it is combined with appropriate and timely surgical treatment.

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