

Can a pin-tract infection cause an acute generalized soft tissue infection and a compartment syndrome?

Çivi dibi enfeksiyonu akut yaygın yumuşak doku enfeksiyonu ve kompartman sendromuna neden olabilir mi?

Haldun ORHUN, Gürsel SAKA, Meriç ENERCAN

A patient who developed soft tissue infection and osteomyelitis secondary to pin tract infection after skeletal traction was evaluated. Tibial traction was performed on a patient who had exposed to a femoral pertrochanteric fracture after falling from a tree in a rural public hospital. On the first postoperative day shortly after development of soft tissue swelling, redness, and tenderness in the affected leg, compartment syndrome was noted with subsequent removal of the pin at the same health center. After arrival of the case in our center surgical decompression with an open fasciotomy and proper antibiotherapy were instituted. Simultaneously hyperbaric oxygen was administered. After eradication of soft tissue infection we treated the fracture with a Richards compression screw-plate device. The patient was discharged with complete cure.

This case presented how seriously a simple pin-tract infection can cause a grave clinical entity resulting in potential loss of an extremity.

Key words: fracture, skeletal traction, pin-tract, infection, osteomyelitis, compartment syndrome

İskelet traksiyonu sonrasında çivi dibinden gelişen yumuşak doku enfeksiyonlu ve osteomyeliti olan bir olgu değerlendirilmiştir. Ağaçtan düşme sonucu femur kırığı olan hastaya kırsal bölgedeki bir hastanede tibia kemiğinden iskelet traksiyonu uygulanmıştır. Uygulamadan sonraki 1. günde hastanın traksiyon bölgesinde şişlik, kızarıklık ve ağrı semptomlarının gözlenmesini takiben kısa sürede kompartman sendromu gelişmiş ve aynı merkezde traksiyona son verilerek pin çıkartılmıştır. Olgu merkezimize geldikten sonra, cerrahi dekompresyon amaçlı fasiotomi ve küretaj uygulanmış olup, uygun antibiooterapi ile tedavi edilmiştir. Olguya aynı zamanda hiperbarik oksijen tedavisi başlanmıştır. Olgunun açık yaraları ve doku defektleri için gastrocnemius kas-deri flebi uygulanmıştır. Yumuşak doku problemleri ve enfeksiyon eradike edildikten sonra olgunun kırığı için Richards dinamik kalça çivisi ile osteosentez yapılmıştır. Olgu tam iyileşme ile taburcu edilmiştir. Olgumuz basit bir çivi dibi enfeksiyonunun ekstremitenin kaybına neden olabilecek nasıl ciddi bir tabloya dönüştüğünü gösteren çok önemli bir örnek olgudur.

Anahtar sözcükler: kırık, iskelet traksiyonu, çivi dibi, enfeksiyon, osteomyelit, kompartman sendromu

Skeletal traction is most commonly used in the treatment of fractures, and sometimes for the correction of the bone deformities, infection etc.^[1] It is not recommended for elderly patients because of the osteoporotic condition of their bones. The term skeletal traction implies that force or pull is being placed through bone. The most common sites of in-

sertion are os calsis, the distal and proximal tibia, the distal and proximal femur, metacarpals, radius, and ulna^[1]. Pins (Kirschner wire or Steinmann pin) should be inserted under sterile conditions. Pins should be placed in the metaphysis of the bone. It is recommended to use of a hand drill or a mallet.^[1] Power tools may cause bone necrosis.

Lütfi Kırdar Kartal Education and Research Hospital
I. Clinics of Orthopedics and Traumatology, Istanbul Turkey

Lütfi Kırdar Kartal Eğitim ve Araştırma Hastanesi,
I. Ortopedi ve Travmatoloji Kliniği, Istanbul

İLETİŞİM (Correspondence): Dr. Haldun Orhun, Uğur Sokak Polis Lojmanları A-Blok D: 24 Koşuyolu Istanbul 81190 Türkiye
e-posta: haldunorhun@hotmail.com Tel: 90 532 267 69 63 Address correspondence to: Fax: 90 216 442 99 55

The site is aseptically prepared, and a local anesthetic is infiltrated into the soft tissue and the periosteum.

Whenever pins are inserted in the septic condition, pin-tract infection can be seen in the site of the pin insertion. This condition should be prevented because of the development of other complications such as osteomyelitis, soft tissue infection, etc, secondary to pin-tract infection. [1-5]

In this case the pin was inserted for the skeletal traction in a non-sterile condition which caused an unusual example for complication.

CASE

Thirty-nine year-old female patient had a pertrochanteric fracture secondary to a fall from a tree (Figure 1). She was hospitalized in a rural public hospital, and a Kirshner wire was inserted inside tuberositas tibia for skeletal traction. When the skin changes was observed at the insertion place (bullose, erythema, and purulent drainage), the pin was removed and the patient was transferred to our hospital. When we saw the patient, she had painful swelling, tenderness, and redness on her leg (Figure 2). There were bullose changes on the skin and seropurulent drainage was seen from the pin-tract side, and crepitus, dermal gangrene was noted on the leg. The patient was febrile (39°C) and had tachycardia and confusion. Radiographs of the affected area demonstrated gas images. Laboratory

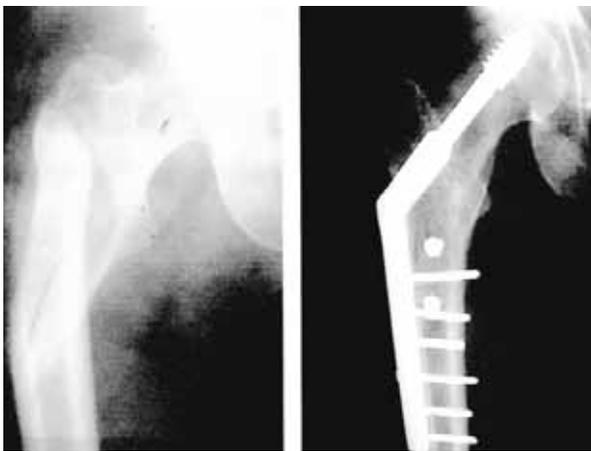


Figure 1: Anteroposterior view of the proximal femur.



Figure 2: Photograph of the leg. There are bullose changes on the skin and seropurulent drainage is seen from the pin-tract side.

findings were also abnormal (elevated erythrocyte sedimentation rate-120mm, WBC 15.700, C - reactive protein- 60 mg/L, serum creatine phosphokinase-31.200 IU/L), and urinalysis was consistent with rhabdomyolysis. Anterior and posterior leg compartments were tense with marked pain on passive ankle movements. The patient had paraesthesia of the calf muscles. She underwent surgery and we made anterior and posterior compartment fasciotomies in her leg for decompression in the compartments and debrided necrotic tissue. Although a surgical decompression was performed, the patient was also treated with hyperbaric oxygen (2.5 ATA; 90 minutes plateau time) for 18 sessions. Hyperbaric oxygen therapy is a good adjunctive treatment method for compartment syndrome. [6,7] Cultures had shown that she suffered from *enterobacter cloacae* infection.. She was treated with anti-enterobacter infection agents which were shown to be effective on antibiograms (imipenem; 2 gm/day, aminoglycoside; 160mg/day). Antibiotics were administered parenterally while the patient was in the hospital. We closed the fasciotomy incisions at 14th days postoperatively. After 40 days of hospitalization, we closed the necrotic wounds with musculocutaneous rotational flaps and skin mesh grafting at the posteromedial side of the cruris. We repaired the trochanteric fracture with a Richards's compression screw-plate device when we had the normal results of the blood tests of the patient and the patient's leg healed well. We found that the fracture was uniting at her last control (Figure 3), and no other complication was noted (Figure 4).

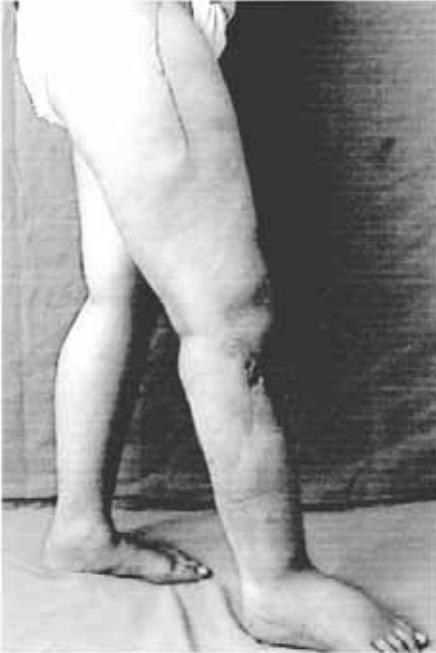


Figure 3: At the first year postoperatively, the patient healed completely without functional limitation.



Figure 4: Photographs of the leg at the end of the treatment.

DISCUSSION

The goal of the fracture treatment is to obtain union in the most anatomical position compatible with maximal functional return of the extremity^[1]. Skeletal traction is indicated in the treatment of fractures when reduction of the fracture or proper length of the limb cannot be maintained by the static immobilization provided by cast and splints. It can be applied with smooth Steinman pin or Kirschner wires. Preoperative skeletal traction can be more comfortable for reduction of the fracture fragments peroperatively.^[1] The reduction can be difficult during the surgery without preoperative traction because of the contractility of soft tissue and muscle.

Pin should be inserted in an aseptic condition⁴. Without proper technique for pin insertion and meticulous pin tract care, pin tract infection can be the most common complication, occurring 30% of patients¹. The presence of a characteristic finding, the ring sequestrum, is virtually diagnostic of this abnormality². When a narrow ring sequestrum is surrounded by a radiolucent halo, there is an associated infection². Sometimes pin-tract infection can be difficult to diagnose clinically, despite gross

infection of the tract, and that bacteria can spread within the medulla.^[6-8] It presents as acute soft tissue swelling, redness, and tenderness about the pin or as moderate seropurulent drainage.^[5] These symptoms can be treated with a simple debridement.^[5] Drainage ceases following local treatment, antibiotic administration, and/or pin removal. But sometimes it can be worst. When the osteomyelitis is seen at the tract place, curettage or sequestrectomy can solve the problem.^[5] In our case, the patient's disease was different than a simple pin tract infection. The leg was painful and there were bullose changes on the skin and seropurulent drainage was seen from the pin-tract side and crepitus, dermal gangrene and compartment syndrome were seen on the leg. Compartment syndrome is defined as acute peripheral ischemias.^[9] Ischemia results from obstruction of major vessels or decreased blood flow in the microcirculation following stasis, tissue injury or occlusion, and tissue necrosis.^[9] Decreased oxygen availability promotes infections and dehiscence of the wounds. Edema also contributes to hypoxia. In our case, the pin-tract infection involved the soft tissue. This infection caused edema, tissue necrosis and obstruction

of the vessels, and compartment syndrome. We believed that open fasciotomy can helpfully eradicate the infection and compartment syndrome, and hyperbaric oxygen therapy has also beneficial effects.^[9,10] But sometimes the fasciotomy can not be adequately effective in the treatment of these conditions. Hyperbaric oxygen interferes on different levels in the pathogenesis of acute peripheral ischaemias, which makes it a useful, adjunctive therapeutic modality.^[10] The most important effect is the hyperoxygeneration following significantly increased portion of plasmatic dissolved oxygen. Leucocytes require an oxygen tension of 30 mm Hg for oxidative bursting which is responsible for the indirect anti-infective effect of hyperbaric oxygen.^[10] This oxygen tension promotes wound healing and prevents infection. It inhibits the growth of anaerobic infections. It has a preventive function for development of compartment syndrome and mixed tissue infection.^[9,10] In our case, the patient's compartment syndrome and infection has been treated successfully with fasciotomy and hyperbaric oxygen therapy.

Compartment syndrome is not a usual problem seen after the pin tract infection, and it has not been reported previously. Our patient carries very important implications in that a simple pin-tract infection can become a serious problem.

REFERENCES

1. Christian CA. General Principles of Fracture Treatment. In: Canale TS. ed. Campbell's Operative Orthopaedics, 9th ed. Louis, C.V St. . Mosby; 1998. p. 1993-2041.
2. Nguyen VD, London J, Con RO 3rd. Ring sequestrum: radiographic characteristic of skeletal fixation pin-tract osteomyelitis. *Radiology* 1986; 158: 129-31
3. Clasper JC, Parker SJ, Simpson AH, Watkins PE. Contamination of the medullar canal following pin-tract infection. *J Orthop Res* 1999;17: 947-52
4. Althausen PL, Hak DJ. Lower extremity traction pins: indications, technique, and complications. *Am J Orthop* 2002; 31: 43-7
5. Edwards CC. Complications of external fixation. In: Charles H Epps, Jr ed. *Complications in Orthopaedic Surgery*, 2nd ed . Philadelphia: Lippincott Co; 1986.p. 103-26
6. Green SA, Ripley MJ. Chronic osteomyelitis in pin tracks. *J Bone Joint Surg Am* 1984; 66:1092-8
7. Moroni A, Vannini F, Mosca M, Giannini S. State of the art review: techniques to avoid pin loosening and infection in external fixation. *J Orthop Truma* 2002; 16:189-95
8. Ahlborg HG, Josefsson PO. Pin-tract complications in external fixation of fractures of the distal radius. *Acta Orthop Scand* 1999; 70:116-8
9. Assenza M, Borromeo C, Moschella CM, Romagnoli F, Clementi I, Portieri M, et al. Compartment syndrome or gas gangrene? A case report. *G Chir* 2001; 22:345-7.
10. Van Poucke S, Leenders T, Saldien V, Verstreken J, Beaucourt L, Adriaensen H. Hyperbaric oxygen (HBO) as useful, adjunctive therapeutic modality in compartment syndrome. *Acta Chir Belg.* 2001;101:73-80

