



## Tibial osteomyelitis following intraosseous infusion: a case report

### *Kemik içi infüzyonuna bağlı tibia osteomyeliti: Olgu sunumu*

Ali DOĞAN,<sup>1</sup> Hasan IRMAK,<sup>2</sup> Mustafa HARMAN,<sup>3</sup> Abdullah CEYLAN,<sup>4</sup> Fuat AKPINAR,<sup>1</sup> Nihat TOSUN<sup>5</sup>

<sup>1</sup>Orthopaedics and Traumatology Department; <sup>2</sup>Infectious Diseases and Clinical Microbiology Department; <sup>3</sup>Radiology Department; <sup>4</sup>Department of Children's Health and Diseases, Medical Faculty of Yüzüncü Yıl, <sup>5</sup>Orthopaedics and Traumatology Clinic, Muhtetin Ülker Paramedics and Traffic Hospital

Acil durumlarda, özellikle 0-2 yaş grubundaki çocuklara sıvı, ilaç ve kan ürünleri kemik içi infüzyonla hızlı bir şekilde verilebilir. Sepsis tanısıyla çocuk hastalıkları servisinde yatmakta olan beş aylık bir bebekte sağ tibia proksimalinden uygulanan kemik içi infüzyonundan 10 gün sonra aynı bölgede şişlik ve kızarıklık görüldü. Fizik muayenede sağ kruris proksimal anteromedialde fistül ağzı ve seröz renkte bir akıntı gözlemlendi. Röntgen graflerinde tibiada periost reaksiyonu ve proksimal metafizer bölgede osteolitik alanlar görülmesi üzerine hastaya akut osteomyelit tanısı kondu; drenaj ve medullar yıkama uygulandı ve paraneal antibiyotik tedavisine başlandı. Ameliyat sırasında alınan materyalin kültüründe *Candida albicans* üremesi üzerine hastaya dört hafta süreyle flukonazol (8 mg/kg) tedavisi uygulandı. Hastanın 12. aydaki kontrolünde klinik ve radyografik olarak tam iyileşme görüldü.

**Anahtar sözcükler:** Candida; mantar enfeksiyonu; bebek; infüzyon, intraosseöz/yan etki; osteomyelit/etioloji/ilâç tedavisi; tibia.

Fluids, medications, and blood products can be rapidly administered via intraosseous infusion under emergency conditions, particularly to pediatric patients aged from 0 to 2 years. A five-month-old infant who had been hospitalized with a diagnosis of sepsis developed swelling and hyperemia at the infusion site 10 days after an intraosseous infusion in the right proximal tibia. Physical examination showed a serous discharge from a fistula on the anteromedial side of the right proximal cruris. Plain radiographs demonstrated periosteal reaction in the right tibia and osteolytic areas in the proximal metaphysis. With a diagnosis of acute osteomyelitis, drainage and medullary irrigation were performed and parenteral antibiotic treatment was initiated. Cultures from the surgical site yielded *Candida albicans*, upon which fluconazole (8 mg/kg) treatment was administered for four weeks. A complete clinical and radiographic improvement was observed at the end of a 12-month follow-up.

**Key words:** Candida; fungi; infant; infusions, intraosseous/adverse effects; osteomyelitis/etiology/drug therapy; tibia.

Intraosseous infusion (IOI) is the quickest way to establish access for rapid administration of medications and liquids in emergency situations where vascular access is difficult to achieve. In recent years, it has been very widely used, particularly in resuscitation. Its complications, even though not frequent, are severe. This case report presents a patient who developed osteomyelitis due to *Candida albicans*.

### Case report

A five month-old female infant who was previously treated for prediagnoses of chronic gastroen-

teric and metabolic disease at the pediatrics clinic presented again with similar complaints one week after her discharge. The patient, who was admitted to the emergency service due to development of sepsis within a short period of time, underwent intraosseous infusion with Izomix \_ (Izomix 1/4, Biosel İlaç San. ve Tic; glucose monohydrate 3.75 gr + NaCl 0.225 gr in 100 ml) through the proximal of the right tibia when the vascular access failed. IOI was terminated after a few hours of administration when the vascular access was established. For the treatment of sepsis, vancomycin (4x40 mg) and

meropenem (20 mg/kg) were given vascularly. Consultation was required from the orthopaedics department because of the discharge at the right cruris from the site of IOI ten days later. Physical examination revealed swelling, edema and erythema at the right lower extremity and also fistula aperture and serous discharge at the proximal and forward part of the same extremity, corresponding to where the needle was inserted. Slight restriction was observed in the motion range of the knee joint. Plain radiographies showed signs of periost reaction in the tibia and osteolytic areas at the tibial proximal (Figure 1a, b). Laboratory findings were as follows; leucocytes 12900/mm<sup>3</sup>; sedimentation rate 44 mm/hour; CRP 21.3 mg/l; lymphocytes 49%. The patient underwent operation at the same day based on the diagnosis of acute osteomyelitis of the tibia. A window was opened at the proximal metaphysis of the tibia through a longitudinal incision from the right proximal of the tibia, including the fistula. Culture material was taken from the infection site, followed by medullary irrigation and drainage. The operation was terminated after a hemovac drain was placed, and the extremity was comforted by a long leg splint. The material was examined by the aerobic and anaerobe microorganism and fungal cultures. No cultivation was seen in the aerobic and anaerobe

cultures. When the *C. albicans* were isolated at the postoperative day 2, a treatment by fluconazole 8 mg/kg (50 mg/day) was initiated (Figure 2a, b). Early response was achieved in the treatment, which lasted for four weeks. No pathological abnormality was found in the patient by any of the clinic or radiographic studies one year after (Figure 3a, b).

## Discussion

Intraosseous infusion is recommended in emergency situations such as traffic accident, severe dehydration and resuscitation, particularly in children under the age of six years when the vascular access cannot be immediately achieved.<sup>[1]</sup> In recent years, it has also become common in adults.<sup>[2]</sup> Crystalloids, colloids, blood products, resuscitation drugs and antibiotics can be safely infused using this technique.



**Figure 1.** The periost reaction in the tibia and osteolytic areas in the proximal metaphysis are evident in the preoperative (a) antero-posterior and (b) lateral views.



**Figure 2.** The intensity growth and thickening in the right tibia are evident in the early postoperative comparative (a) antero-posterior and (b) lateral views.



**Figure 3.** (a) Anteroposterior views of the both tibia and (b) lateral view of the right tibia at the post operative month 12.

Usually the proximal region of the tibia is preferred for intraosseous infusion. The tibial distal, femur distal, superior iliac crest and sternum can also be used. In case of pelvic or thoracic trauma, calcaneus and stiloïd projection of the radius are suggested sites for infusion.<sup>[3]</sup> Intraosseous infusion is particularly recommended in infants because of its simple technique and higher success rate.<sup>[4-7]</sup>

Glaeser et al.<sup>[6]</sup> reported that 75% of intraosseous infusions they used in 152 children was successful, and the highest success rate was achieved in infants under the age of two years while the failures most commonly resulted from the inaccurate access site and bending of the infusion needle during the placement. In the conventional procedure, the site for cannulation is 1-3 cm below the tibial tuberosity on the anteromedial surface of the tibia. After the skin is cleaned by antiseptic solution, a small amount of local anesthetic is injected. Periost is reached through a small cutaneous incision. The needle is advanced into the bone by drilling motion or right-left guidance depending on the features of the tip of the needle. The angle of the needle should be toward the distal in order to avoid any injury to the growth plate and any misinsertion into the knee joint. Loss of resistance inside the needle when the cavity of the medulla is reached from the cortex is an indication of the correct employment of

the procedure. A small amount of liquid and blood discharge from the needle is usual. The correct position of the needle can be checked by bilateral views. The insertion site is frequently monitored for any liquid discharge out of the bone and development of compartment syndrome.<sup>[8]</sup> The risk for complication increases with hard pressure on the tissues during the placement of the needle, repeated trials and subcutaneous leakage of the agent.<sup>[4,9,10]</sup>

The complication rate is approximately 1% in the intraosseous infusion; subcutaneous extravazation is the most common complication.<sup>[8]</sup> Others include fracture, soft tissue infection, osteomyelitis, skin necrosis, fat emboli, growth plate injury, development of compartment syndrome and amputation.<sup>[11-17]</sup> Stoll et al.<sup>[4]</sup> indicated that the osteomyelitis developed 24 hours after IOI in a three-month old infant might have been associated with inflammation resulting from the high dosage of adrenalin. Rosetti et al.<sup>[10]</sup> found an osteomyelitis rate of 0.6% in a study including 4270 patients, developing in patients with bacteremia and when the intraosseous infusion lasted long.

Intraosseous infusion has become widely used in our country in the last decade, like all over the world. So, it is hardly possible to use this procedure or experience its complications for most of the physicians and

orthopedists. *C. albicans* was isolated from the material taken during the operation in our case. Although acute hematogenous osteomyelitis is common, development of osteomyelitis following the IOI procedure and *C. albicans* as determinant factor made it a specific case. The only case with fungal infection following the IOI procedure was reported by Platt et al.<sup>[18]</sup> in the literature.

Intraosseous infusion is a life-saving procedure allowing rapid administration of the medications and liquids into the systemic circulation in situations where vascular access is failed in children. Follow up of complications resulting in serious sequela is usually insufficient since the procedure is mostly performed by the pediatricians. Using the technique and monitoring the complications accompanied with an orthopedist and termination of the procedure as soon as possible would be helpful in reducing the complications such as compartment syndrome, osteomyelitis and fracture.

## References

1. Paediatric advanced life support. Illinois: American Academy of Paediatrics; 1997. p. 5-11.
2. Lavis M. Prehospital adult intraosseous infusion. *Pre-hospital Immediate Care* 1999;3:89-92.
3. McCarthy G, O'Donnell C, O'Brien M. Successful intraosseous infusion in the critically ill patient does not require a medullary cavity. *Resuscitation* 2003;56:183-6.
4. Stoll E, Golej J, Burda G, Hermon M, Boigner H, Trittenwein G. Osteomyelitis at the injection site of adrenaline through an intraosseous needle in a 3-month-old infant. *Resuscitation* 2002;53:315-8.
5. Glaeser PW, Losek JD. Emergency intraosseous infusions in children. *Am J Emerg Med* 1986;4:34-6.
6. Glaeser PW, Hellmich TR, Szewczuga D, Losek JD, Smith DS. Five-year experience in prehospital intraosseous infusions in children and adults. *Ann Emerg Med* 1993;22:1119-24.
7. Helm M, Breschinski W, Lampl L, Frey W, Bock KH. Intraosseous puncture in preclinical emergency medicine. Experiences of an air rescue service. *Anaesthetist* 1996;45:1196-202. [Abstract]
8. Hurren JS, Dunn KW. Intraosseous infusion for burns resuscitation. *Burns* 1995;21:285-7.
9. Simmons CM, Johnson NE, Perkin RM, van Stralen D. Intraosseous extravasation complication reports. *Ann Emerg Med* 1994;23:363-6.
10. Rosetti VA, Thompson BM, Miller J, Mateer JR, Aprahamian C. Intraosseous infusion: an alternative route of pediatric intravascular access. *Ann Emerg Med* 1985;14:885-8.
11. Launay F, Paut O, Katchburian M, Bourelle S, Jouve JL, Bollini G. Leg amputation after intraosseous infusion in a 7-month-old infant: a case report. *J Trauma* 2003;55:788-90.
12. Spivey WH. Intraosseous infusions. *J Pediatr* 1987;111:639-43.
13. Moscati R, Moore GP. Compartment syndrome with resultant amputation following intraosseous infusion. *Am J Emerg Med* 1990;8:470-1.
14. Hoelzer MF. Recent advances in intravenous therapy. *Emerg Med Clin North Am* 1986;4:487-500.
15. Gayle M, Kissoon N. A case of compartment syndrome following intraosseous infusions. *Pediatr Emerg Care* 1994;10:378.
16. Vidal R, Kissoon N, Gayle M. Compartment syndrome following intraosseous infusion. *Pediatrics* 1993;91:1201-2.
17. Gunal I, Kose N, Gurer D. Compartment syndrome after intraosseous infusion: an experimental study in dogs. *J Pediatr Surg* 1996;31:1491-3.
18. Platt SL, Notterman DA, Winchester P. Fungal osteomyelitis and sepsis from intraosseous infusion. *Pediatr Emerg Care* 1993;9:149-50.