



Complication following intramedullary fixation with a Fixion nail in a patient with osteogenesis imperfecta A case report

Hayati ÖZTÜRK, Zekeriya ÖZTEMÜR, Okay BULUT, Tansel ÜNSALDI

From Cumhuriyet University, Sivas, Turkey

Osteogenesis imperfecta (O.I.) is a genetic disorder with increased bone fragility and low bone mass. We report the history of a 17-year-old male patient with O.I. who presented a fracture of his left femoral shaft. He had osteogenesis imperfecta type I A according to Silence. He had presented two years previously an ipsilateral cervical fracture of the femur which had healed. Intramedullary fixation with a Fixion intramedullary nail was elected. While the Fixion nail was being inflated to 70 bars with saline, a longitudinal fracture occurred in the femoral shaft. A conventional intramedullary nail and cerclage wire were applied for fixation. The fracture healed without complication in 10 weeks. Based on this observation, we do not recommend using the Fixion IM nail for fracture fixation in patients who have abnormal bone fragility such as in osteogenesis imperfecta.

INTRODUCTION

Osteogenesis imperfecta (O.I.), also known as fragilitas ossium congenita, osteopsathyrosis idiopathica and brittle bone disease is a hereditary condition. The incidence is 1:20000-50000 live births and about 36 per million population (1).

Osteogenesis imperfecta is characterised by increased bone fragility and low bone mass. There are large variations in severity, ranging from intrauterine fractures and perinatal lethality to very mild forms without fractures (5).

The Fixion nail is an inflatable intramedullary nail which expands within the medullary canal through inflation with pressurised saline (6).

Conventional nails rely on interlocking screws for axial and rotational stability. Such screws have poor fixation in patients with poor bone quality, whereas the Fixion nail does not depend on interlocking screws: axial and rotational stability is achieved by nail expansion. Therefore, this nail may be better suited for patients with poor bone quality (2).

CASE REPORT

A 17-year-old male presented with a fracture of his left femoral shaft and a supracondylar fracture of his left humerus following a fall. He had osteogenesis imperfecta Type I A according to Silence,

- Hayati Öztürk, MD, Assistant Professor.
- Zekeriya Öztemür, MD, Resident.
- Okay Bulut, MD, Professor.
- Tansel Ünsaldi, MD, Professor.

Cumhuriyet University, Faculty of Medicine, Department of Orthopaedics and Traumatology, Sivas, Turkey.

Correspondence: Hayati Öztürk, Cumhuriyet University Faculty of Medicine, Department of Orthopaedics and Traumatology, 58140 Sivas, Turkey.

E-mail: hozturk@cumhuriyet.edu.tr.

© 2005, Acta Orthopædica Belgica.



Fig. 1. — Preoperative radiograph of the left femur

and a healed cervical fracture of his left femur incurred two years previously. The supracondylar fracture of the humerus was treated conservatively. We opted for intramedullary fixation of the fracture of the left femur with a Dischotech Fixion intramedullary nail. While the nail was being inflated, a longitudinal fracture occurred in the femoral shaft. A conventional intramedullary nail with additional cerclage wires was applied for fixation. The fracture healed without complication after 10 weeks (fig 1).

DISCUSSION

Osteogenesis imperfecta is a connective tissue disorder which is genetically heterogeneous and comprises a number of distinct syndromes, some inherited as autosomal dominant traits, others as recessive traits, some occurring after spontaneous mutations (7-9).

In the open operative treatment of long bone deformities and fractures in O.I., the general goal is to minimise the duration of immobilisation and the amount of external support required (1). Our goal was early mobilisation of the patient without exter-



Fig. 2. — Anteroposterior radiograph 10 weeks after conventional nailing and additional cerclage wiring of the intra-operative longitudinal fracture.

nal support. We therefore planned intramedullary fixation with a Fixion nail.

The nail is inserted in a deflated state and, once in the medullary cavity with the fracture reduced and any rotational deformity corrected, the device is then inflated with normal saline to a pressure of 70 bars. This results in a press fit with the endosteum, which maintains fracture reduction and rotation (5, 6). We used this procedure, but the femur which was fragilised by osteogenesis imperfecta, presented a longitudinal fracture during expansion of the nail. We therefore reverted to conventional intramedullary nail fixation with locking screws and complementary cerclage wire. The fracture healed without complication within 10 weeks.

In theory, the method of “locking” an intramedullary nail through expansion rather than with interlocking screws should be suitable for the treatment of diaphyseal fractures in patients with osteoporosis, where there is concern that conventional locking screws may cut out (3) but, as seen in this case, marked fragility may also result in problems with locking through intramedullary expansion of a nail.

As a result, we do not recommend using the Fixion IM nail for fracture fixation in patients who

have abnormal bone fragility such as in osteogenesis imperfecta.

REFERENCES

1. **Duthie RB, Bentley G.** Developmental diseases of the skeleton. In Duthie RB (ed) : *Mercer's Orthopaedic Surgery. 9th ed.*, Bath Press, Avon, UK, 1996, pp 262-270.
2. **Franck WM, Olivieri M, Jannasch O, Hennig FF.** Expandable nail system for osteoporotic humeral shaft fractures : preliminary results. *J Trauma* 2003 ; 54 : 152-158.
3. **Ito K, Hungerbuhler R, Wahl D, Grass R.** Improved intramedullary nail interlocking in osteoporotic bone. *J Orthop Trauma* 2001 ; 15 : 192-196.
4. **Shapiro JR, Stover ML, Burn VE et al.** An osteopenic nonfracture syndrome with features of mild osteogenesis imperfecta associated with the substitution of a cysteine for glycine at triple helix position 43 in the pro alpha 1(I) chain of type I collagen. *J Clin Invest* 1992 ; 89 : 567-573.
5. **Shasha N, Blumberg N, Tauber M, Dekel S.** An expandable intramedullary nail for fixation in osteoporotic bone. In : Yuehuei, H.A.(Ed) : *Internal Fixation of Osteoporotic Bone*, Thieme, New York, 2002, pp 301-309.
6. **Shasha N.** The "Fixion" nail : Development and performance of a unique inflatable self-locking intramedullary nailing system. Thesis. Department of Biomedical Engineering, The Technion-Haifa, Israel ; 1999.
7. **Silence DO.** Bone dysplasia. Genetic and ultrastructural aspects with special reference to osteogenesis imperfecta. MD Thesis. University of Melbourne, Australia, 1977.
8. **Silence DO, Senna A, Danks, DM.** Genetic heterogeneity in osteogenesis imperfecta. *J Med Genet* 1979 ; 16 : 101-116.
9. **Tachdjian MO.** *Pediatric Orthopedics. 2nd ed*, WB Saunders, Philadelphia, 1990 vol 2, pp 758-787.