ECTOPIC BONE FORMATION DUE TO A DISTAL VENTING HOLE IN INTRAMEDULLARY NAILING

S. VERFAILLIE[1], J. STUYCK[1]

A case report is presented on ectopic bone formation around a distal venting hole drilled in the femur to prevent pulmonary embolism. We no longer recommend this technique, because it is ineffective and has its own complications.

Keywords : intramedullary nailing ; ectopc bone ; venting hole.
Mots-clés : enclouage centro-médullaire ; ossification hétérotopique ; trou de décompression.

INTRODUCTION

Intramedullary reaming and nailing of the femur may cause pulmonary embolism. Indeed, during medullary nailing the intrafemoral pressure increases up to 200-600 mm Hg. As a result there is an infiltration of medullary fat and coagulation-promoting substances into the circulation (5).

One of the theoretical possibilities to reduce the intramedullary pressure is to make a distal venting hole in the femur. This technique was successfully used in total hip replacement (2).

We report on a complication of a distal venting hole in the femur that has not been discribed in the literature before.

CASE REPORT

A 31-year-old male patient was referred to our department for pain in his right hip without a history of trauma. Radiographs showed multiple cystic lesions in the right hip region. CT and MRI confirmed the radiological diagnosis of polyostotic fibrous dysplasia. Because of an impending fracture through the lesion it was decided to perform prophylactic intramedullary nailing after biopsy. In similar previous cases a fall in the systemic blood pressure had been noted during reaming. Therefore it was decided to make a venting hole in the distal lateral femoral cortex, using a 3.5 mm drill, before reaming was started. Bone marrow was noted to escape through the venting hole during reaming. The systemic blood pressure dropped from 125/70 mm Hg to 115/60 mm Hg. After reaming the femoral canal up to 12.5 mm, a 11 mm $\times$ 350 mm Zickel nail was inserted. There were no immediate postoperative complications. Histological sections confirmed the diagnosis of fibrous dysplasia. Radiographs on day 10 showed a cloudy soft tissue opacification around the distal venting hole. At three months the patient complained of vague pain over the distal lateral thigh during quadriceps exercises. On examination a tender bony mass was palpated and a flexion deficit of the knee of 30° was noted. Radiographs at that time showed a calcified mass lateral to the venting hole (fig. 1).

Because of persistent pain excision of the ectopic bone was performed one year after the nailing. Indomethacin was administered for 6 weeks. Histological examination showed mature trabecular bone. At final follow-up two years after the second operation, the patient was asymptomatic with normal knee function and without radiographic signs of recurrence (fig. 2).

[1] University Hospital, Department of Orthopedics, Katholieke Universiteit Leuven, U.Z. Pellenberg, Weligerveld 1, B-3212 Pellenberg, Belgium.
Correspondence and reprints : J. Stuyck.

Fig. 1. — Xray of the calcified mass lateral to the venting hole.

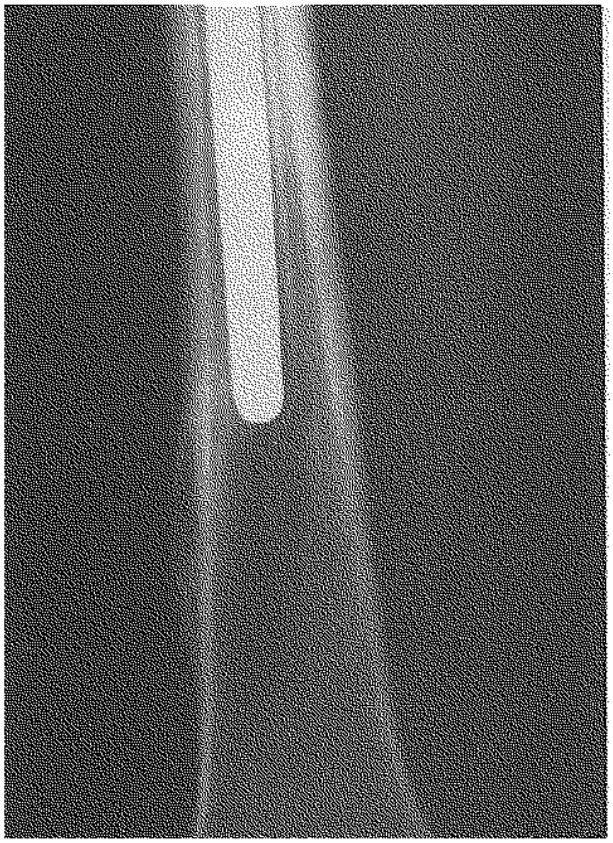

Fig. 2. — Xray two years postoperatively.

DISCUSSION

Intramedullary reaming and nailing increase the intrafemoral pressure which may lead to pulmonary embolism. In fractures the pressure partially "escapes" through the fracture gap and the pressure rises mainly after the reamer has passed the fracture (5). However, in impending fractures the medullary fat, blood and bone debris cannot escape during reaming and the intrafemoral pressure rises immediately. Theoretically this can be avoided by drilling a venting hole through the distal lateral femoral cortex.

Recent studies (1, 5) however do not confirm good results with a distal venting hole in intramedullary nailing as described in total hip replacement (2). Indeed, measurements in vitro and in animal experiments did not show a significant reduction in the intramedullary pressure. Due to the high viscosity of the medullary cavity contents the local peak pressure which occurs as the reaming head passes cannot be reduced by a more distal venting hole.

On the other hand a distal venting hole has its own possible complications, such as the risk of fracture due to stress concentration and ectopic bone formation as described in the present report.

For all these reasons we no longer recommend this technique.

REFERENCES

1. Heim D., Schlegel U., Perren S. Intramedullary pressure in reamed and unreamed nailing of the femur and tibia — an in vitro study in intact, human bones. Injury, 1993, 24, 56-63.

2. Kallos T., Enis J., Gollan F., Davis J. Intramedullary pressure and pulmonary embolism of femoral medullary contents in dogs during insertion of bone cement and a prosthesis. J. Bone Joint Surg., 1974, 56-A, 1363-1367.
3. Pape H., Dwenger A., Regel G. et al. Pulmonary damage after intramedullary femoral nailing in traumatized sheep is there an effect from different nailing methods ? J. Trauma, 1992, 33, 574-581.
4. Sturmer K. Measurement of intramedullary pressure in an animal experiment and propositions to reduce the pressure increase. Injury, 1993, 24, 7-21.
5. Wenda K., Ritter G., Ahlers J., von Issendorff W. Nachweis und Effekte von Knochenmarkeinschwemmungen bei Operationen im Bereich der Femurmarkhohle. Unfallchirurg, 1990, 93, 56-61.
6. Wenda K., Runkel M., Degreif J., Ritter G. Pathogenesis and clinical relevance of bone marrow embolism in medullary nailing — demonstrated by intraoperative echocardiography. Injury, 1993, 24, 73-81.
7. Wozasek G., Simon P., Redl H., Schlag G. Intramedullary pressure changes and fat intravasation during intramedullary nailing : an experimental study in sheep. J. Trauma, 1994, 36, 202-207.

SAMENVATTING

S. VERFAILLIE, J. STUYCK. Ectopische botvorming ter hoogte van de decompressie opening gedurende intramedullaire nageling.

De auteurs rapporteren een casus van ectopische botvorming na endomedullaire nageling van het femur en dit ter hoogte van de distale decompressie opening in de cortex gemaakt ter preventie van longembolen. Deze techniek wordt niet meer aangeraden aangezien hij niet efficient blijkt te zijn en zijn eigen complicaties heeft.

RÉSUMÉ

S. VERFAILLIE, J. STUYCK. Ossification hétérotopique au niveau d'une trou de décompression pratiqué avant enclouage médullaire.

Les auteurs rapportent un cas d'ossification hétérotopique après enclouage médullaire du fémur au niveau du trou de décompression fait pour prévenir une embolie pulmonaire. Cette technique n'est pas à conseiller vu son inefficacité et ses complications propres.