Use of a Portable Electronic Transducer to Measure Bone Marrow Pressure

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ABSTRACT : This brief report illustrates the potential of a portable electronic transducer that normally measures compartmental pressure in extremities, for using in measuring bone marrow pressure in femoral heads with avascular necrosis.

INTRODUCTION

Evaluation and treatment of early osteonecrosis of the femoral head requires thorough clinical and radiological assessment including plain radiographs, tomograms, computerised scans (CT scan), bone scans and magnetic resonance imaging (MRI). Often there may need to measure the bone marrow pressure (BMP) and perform a saline 'stress' test and phlebography as a preliminary physiological test before deciding upon the indication for core bone decompression with or without bone grafting or osteotomy[1,2,3].

Measurement of intra-osseous pressure is currently performed using bulky and complicated series of transducers with numerous connections and cannulas. The authors have used a portable electronic transducer (STIC-Stryker Intracompartmental pressure monitor system) for measurement of compartmental pressures in suspected cases of compartmental syndrome of the extremities. This simple and portable device has been used effectively intra-operatively to measure BMP in two patients with avascular necrosis of the femoral head prior to core decompression and bone grafting with an anterior trochanteric pedicle graft[4].

PROCEDURE

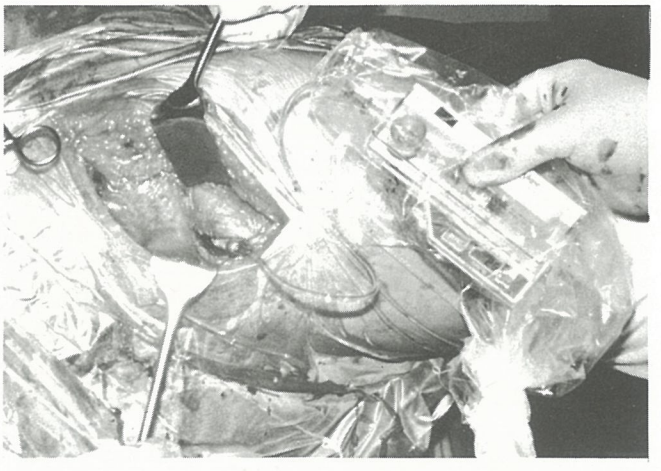
The trochanteric region of the hip is exposed through an antero-lateral approach. Under radiographic control, a fine tract is drilled into the femoral head from the greater trochanter. The drill is withdrawn and snugly replaced by a special needle which in turn is attached by sterile tubing to the portable electronic transducer (Fig.1). Intra-osseous pressure readings are recorded initially and after saline 'stress' test by injection of 5mls of saline into the femoral head. Similar tests were repeated and performed in other zones of the femoral head and the trochanteric region for comparison. (Table 1)

TABLE 1
Pressure (mmHg)

Site	Resting pressure	After saline challenge	5 mins later
Case 1			
Trochanteric region	33mmHg	10mmHg	10mmHg
Femoral head	83mmHg	158mmHg	52mmHg
Case 2			
Trochanteric region	29mmHg	12mmHg	10mmHg
Femoral head	65mmHg	135mmHg	46mmHg

In both cases, the resting intraosseous pressure in the trochanteric region was not elevated and decreased after injection of 5 mls of the saline showing no obstruction to the intraosseous circulation (saline challenge).

In the region of the femoral head, the resting intraosseous pressures were high and after the injection of the saline, there was delay in the reduction of the intraosseous pressure showing circulatory obstruction.



Fiture 1 : Measurement of bone marrow pressure in the trochanteric region in Case 1 using the portable electronic transducer.

CONCLUSION

In conclusion, this portable electronic transducer is a reliable and effective device to monitor bone marrow pressure in avascular necrosis of the femoral head. In addition, further studies are being conducted to confirm this using. There may be a role to study the bone marrow pressures in the other bones as well e.g. upper tibia in osteoarthritis of the knee prior to a high tibial osteotomy.

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