CASE REPORT

Intra-operative arthrography facilitates accurate screw fixation of a slipped capital femoral epiphysis

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We report the case of a 13-year-old obese child presenting with bilateral stable slipped capital femoral epiphyses, which were managed by percutaneous single screw fixation in situ under image intensifier control using arthrography.

It is widely accepted that the treatment of choice for slipped capital femoral epiphysis (SCFE) is percutaneous pinning with a single screw.1-3 Chondrolysis is a well recognised complication of this procedure and can result from penetration of the joint by the screw.2,4,5 Obesity is common in patients with SCFE. This factor, combined with the abnormal position of the femoral epiphysis and varying quality of intensified images makes accurate intra-operative visualisation of the articular margin of the epiphysis difficult.6 The aim of this case report is to demonstrate the use of intra-operative arthrography in facilitating the placement of the screw without violating the hip joint.

Case report
A 13-year-old obese boy presented with a one-year history of limp and bilateral knee pain, worse on the left than the right. Radiographs confirmed the diagnosis of bilateral, stable, slipped capital femoral epiphysis of mild and moderate extent. Percutaneous internal fixation with a screw was advised.

It was difficult to visualise the edge of the epiphysis with the image intensifier intra-operatively (Fig. 1). A 10 ml injection of contrast, diluted to half strength with normal saline, made a very significant contribution to safe screw placement (Fig. 2). The articular margin of the epiphysis was clearly outlined and this allowed the screw to be advanced to an optimal position with confidence (Fig. 3). This technique was repeated when pinning the contralateral epiphysis and was again found to be a useful adjunct to safe optimal screw placement (Fig. 4).

Discussion
The importance of accurate screw placement in treating slipped capital femoral epiphysis cannot be over-emphasised, particularly when contemplating prophylactic pinning of the contralateral hip. Failure to engage the epiphysis sufficiently may lead to further slippage and/or the need for further surgery.7 Penetration of the screw into the joint may lead to the devastating complication of chondrolysis.4,5 Lehman et al1 and Koval et al2 have described a technique whereby contrast is injected through a cannulated screw once it has been fully inserted, to ascertain if joint penetration has occurred. In cases where the joint had been penetrated an arthrogram would result.

The position of the epiphysis in patients with a moderate to severe slip, combined with the usual obese body habitus of this patient population, makes accurate intra-operative visualisation of the articular margin of the epiphysis difficult using image intensification.8 The authors are unaware of any other reports (anecdotal or in the literature) of the use of intra-operative arthrography as an adjunct to percutaneous pinning of SCFE. We found it to be a quick and easy procedure providing precise identification of the articular margin of the capital epiphysis for accurate screw placement and a reduction in operative time. It must be remembered that the arthrogram demonstrates the joint line, so an extra 5 mm must be allowed to avoid penetration of the articular cartilage, compared with visualisation of the margin of the epiphysis without utilising contrast. If the articular cartilage on the femoral head is penetrated by the screw, degenerative changes in the joint and a suboptimal clinical outcome are to be expected.4,5

Furthermore, care must be taken to avoid a failed arthrogram or the use of excessive amounts of contrast as this could obscure rather than enhance the image of the hip. However, in the current climate of increasing sub-specialisation in orthopaedics, it is likely that increasing numbers of slipped capital femoral epipyses will be treated by surgeons who are familiar with the technique of hip arthrography, lessening the risk of error.

Walters and Simon5 and Jeffrey and Hollis8 have shown that penetration of the joint may still occur when the screw appears to be inside the femoral head on two radiographic views. The closer the tip of the screw is to the centre of the femoral head in both anteroposterior (AP) and lateral planes, the closer the correlation between the apparent position of the screw on radiograph and its actual position. Thus, while the technique described in this paper helps to visualise the joint line, it should be emphasised that the screw must be positioned centrally on both AP and lateral views to minimise the likelihood of pene-
tration of the joint. With these provisos intra-operative arthrography represents a simple effective adjunct to accurate screw placement in the treatment of the slipped capital femoral epiphysis.

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References