Constrained total hip arthroplasty in a paediatric patient with cerebral palsy and painful dislocation of the hip

A CASE REPORT

We describe a patient with cerebral palsy, of normal intelligence, who could not walk but who by the age of 16 had been successfully managed with a staged bilateral total hip arthroplasty using a constrained liner.

The management of instability of the hip in children with cerebral palsy who cannot walk is complex. Subluxations and dislocations secondary to muscle imbalance\(^1,2\) may cause severe pain and problems with sitting, making care difficult.\(^3,4\) Methods of treatment include physiotherapy, bracing, muscle releases and transfers,\(^5\) proximal femoral and pelvic osteotomies,\(^5\) proximal femoral excision with or without interpositional arthroplasty,\(^6\) arthrodesis\(^7\) and total hip replacement (THR).\(^8\) In the adult with cerebral palsy THR is not uncommon\(^9\) but it is rarely undertaken in the paediatric patient. To our knowledge, the use of a constrained liner to prevent dislocation in a THR has not been described previously.

Case report

A young man of normal intelligence with spastic quadriplegia first presented to our hospital at the age of 14 years. He could not walk and required assistance to transfer. He had not had previous orthopaedic surgery and had been managed with orthotics and physiotherapy. He had increasing pain in both hips with frequent sleep disturbance and a progressive pelvic tilt due to a combination of abnormality of the hip and lumbar scoliosis. Plain radiographs showed a dislocated left hip and dysplasia on the right side (Fig. 1). The duration of dislocation was unknown. Radiographs of the spine showed a long right thoracolumbar curve of 68° between T10 and L4. Examination under anaesthesia revealed a 30° fixed flexion deformity of his hips, which were in a windswept position with the left held in 10° of fixed adduction. He also had 60° of fixed flexion in both knees. An injection of local anaesthetic and steroid into the left pseudo hip joint relieved all pain for a number of weeks. Total hip replacement (THR) was advised as a viable option for treatment. Through a small Smith-Peterson incision,\(^10\) the adductor psoas, sartorius and the straight head of rectus femoris were released. The patient was placed in the right lateral position and a constrained hybrid replacement using a cemented femoral component, and an uncemented acetabular prosthesis was inserted via a standard anterolateral approach, with osteotomy of the greater trochanter. The femoral component was a small CDH V40 Exeter stem (Stryker Howmedica, Newbury, United Kingdom), with a 33 mm offset and a 22.2 mm diameter head, inserted using a third generation cementing technique. The acetabular component was an Osteonics (Stryker Howmedica) uncemented Secur-Fit hydroxyapatite-coated acetabular shell, with a constrained liner supplemented with cancellous screws. A stable reduction was obtained without undue tension. The greater trochanter was re-attached with two wires over a bone graft. The patient had an uneventful post-operative recovery and at follow-up was pain-free, with an improved sitting position. His lumbar scoliosis was corrected using the Luque Galveston technique.\(^11\) Unfortunately, the right hip continued to sub-lux and became painful. A similar hybrid THR was performed to correct this (Fig. 2). It was not felt necessary to preserve the abductor mechanism, so the proximal femur was divided at the sub-trochanteric level. Recovery was uneventful and he left hospital after seven days. At the last review, two years and three months after the first operation, he is still pain free, with a good sitting posture.

Discussion

The frequency of hip involvement in a child with cerebral palsy is directly related to the severity of their condition,\(^12\) and the incidence varies from 25% to 75%.\(^13\) The mechanisms
Fig. 1
Radiograph of the pelvis before operation.

Fig. 2
Radiograph following bilateral total hip replacement.
which result in the acquired condition of subluxation and dislocation of the hip are complex and are present early in the child's development. There is usually excessive valgus of the femoral neck and increased anteversion. In addition, there is muscle imbalance caused by the strong hip flexors and adductors overpowering the weaker hip abductors and extensors.\textsuperscript{1,2} If these deformities are not addressed, the femoral head rotates to the superior margin of the acetabulum and its antverted position allows progressive subluxation to occur. Following dislocation the epiphysis is subject to a number of deforming forces. The capsule and spastic abductors can notch the supra-lateral portion of the femoral head and the hypertrophied ligamentum teres can cause medial notching. Pain ensues, secondary to the head being dislocated and deformed. In addition to pain, dislocation may result in sitting imbalance with the risk of pressure ulcers,\textsuperscript{3,4} will limit hip mobility, affect perineal care\textsuperscript{5} and can potentially increase the risk of femoral fractures.\textsuperscript{3,4,14}

The treatment of subluxing or dislocated hips in children with cerebral palsy can be non-operative, by physical therapy or orthotics, or by surgery employing muscle releases and transfers,\textsuperscript{4} proximal femoral and pelvic osteotomies,\textsuperscript{3} proximal femoral excision\textsuperscript{6} with or without interpositional arthroplasty, arthrodesis\textsuperscript{7} and THR.\textsuperscript{8} In cases of painful subluxation or dislocation, operative treatment is more likely to yield a favourable outcome.\textsuperscript{3,5,15,16} In a patient who is not mobile and has painful bilateral hip disease and significant lumbosacral scoliosis, THR is a viable option.\textsuperscript{7} Although this is not a new concept,\textsuperscript{6-8} the literature does not describe its use in paediatric patients with cerebral palsy who cannot walk. There are many concerns regarding THR in the young patient.\textsuperscript{9} It was thought those with cerebral palsy would produce excessive heterotopic ossification after THR,\textsuperscript{6} but it has been shown that this is not the case.\textsuperscript{7}

Dislocation after THR is a major concern in these patients, given the abnormal forces across the joint. In our case we felt that a constrained acetabular component would be most effective in reducing this risk. We also aimed to minimise the risks of loosening of the implant by using a hydroxyapatite-coated acetabular component with supplemental screws in addition to a femoral component which had proven positive results.\textsuperscript{17,18} The case highlights the difficulties and complex decision-making involved in treating such patients. We suggest that in the older paediatric patient with cerebral palsy who has spinal deformity and bilateral painful hip dislocation, a single stage THA will greatly improve the quality of life and care.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

References