CASE REPORT

A shelf procedure at a follow-up of 75 years

K. Rajakulendran,
F. Strambi,
J. Buly,
R. E. Field

From the South West London Elective Orthopaedic Centre, Epsom, United Kingdom

Developmental dysplasia of the hip predisposes to premature degenerative hip disease. A number of operations have been described to improve acetabular cover and have achieved varying degrees of success. We present the case of an 84-year-old woman, who underwent a shelf procedure to reconstruct a dysplastic hip 75 years ago. To date, the shelf remains intact and the hip is asymptomatic. We believe this represents the longest documented outcome of any procedure to stabilise the hip.

Developmental dysplasia of the hip (DDH) predisposes to premature degenerative hip disease.1,2 Longer term results of the Bernese osteotomy demonstrate that the natural history of DDH can be modified and the risk of degenerative disease mitigated.3 The evolution of peri-acetabular osteotomy can be traced back to the pioneering work of Franz König, who in 1891 proposed that augmenting the roof of the acetabulum, a shelf procedure, would stabilise the hip and prolong its natural life.4

We present the case of an 84-year-old woman who recently underwent revision of a total hip replacement (THR) for aseptic loosening. During consultation, it transpired that she had suffered from congenital dysplasia in the contralateral hip and had undergone a shelf procedure 75 years previously. This hip remains asymptomatic.

Case report

An 84-year-old woman recently presented with pain in the left hip. The joint had been replaced for degenerative disease 28 years previously using a cemented Stanmore THR. The radiograph taken before that procedure (Fig. 1) revealed some dysplasia. A fresh radiograph showed lucency around the acetabular component and proximal femoral osteolysis. The radiographs also showed a satisfactory shelf procedure in the right, asymptomatic hip.

She was born in 1925 with no perinatal complications, and at the age of nine, with no preceding trauma, developed pain in the right knee. She was seen at the Belgrave Children’s Hospital in London. Radiographs showed congenital dysplastic changes of the right hip. She was admitted to the old St George’s Hospital in Hyde Park Corner under the care of Mr Robert Burns, and underwent a shelf procedure to reconstruct the acetabulum. A hip spica was retained for three months, during which time she was confined to bed. After completing rehabilitation with physiotherapy, she resumed an active lifestyle. She subsequently went to college and became a secretary. Throughout her adult life she enjoyed rambling, swimming and dancing and had no residual pain or limp.

Following revision of the left hip replacement, the right hip remains free of pain. Examination confirms an excellent range of movement, with no signs of irritability. She was able to achieve 0° to 100° of flexion, 40° of abduction, 120° of rotation and full internal and external rotation.

Fig. 1
Anteroposterior radiograph showing the left hip prior to total hip replacement in 1982.
of abduction, 20° of adduction, 40° and 25° of external and internal rotation, respectively in active movements. Radiographs taken 48 and 75 years after the operation (Fig. 2) show signs of degenerative disease, with loss of the medial joint space, progressive subchondral sclerosis and osteophyte formation. However, the shelf has remained intact and maintains the position of the femoral head.

Discussion
Dysplasia of the hip describes a spectrum of developmental abnormalities that result in increased contact stresses and predispose the joint to degenerative disease. The choices of surgical management include pelvic osteotomy, arthrodesis and THR. Many argue that a joint-preserving osteotomy might delay degenerative changes and permit satisfactory reconstruction at a later stage. The shelf procedure is the oldest documented method of acetabular augmentation and has been considered a safe and reliable technique. After König described the operation in 1891, other surgeons have reported modifications, including Albee in 1915, Spitzy in 1933, Wiberg in 1953 and Wilson in 1974.

The aim of the procedure is to create a buttress to resist subluxation of the femoral head. Strips of bone from the outer cortex of the ilium are turned down over the capsule of the hip joint, to extend the roof of the acetabulum over the exposed lateral margin of the femoral head. Alternatively, bone graft, usually harvested from the adjacent ilium, is impacted into a prepared slot above the acetabulum. The shelf helps to maintain the stability of the hip and reduces shear forces between the femoral head and the acetabulum. Modifications include an associated femoral derotation osteotomy and the use of a plate and screws to support the acetabular graft.

The factors affecting the outcome of this form of surgery are contentious. In 1939, Compere suggested that
poor results were caused by inadequate construction of the shelf when placed too high above the femoral head or extending too laterally, incorrect pre- and post-operative skeletal traction causing capsular damage or necrosis, and intra-operative damage to the cartilage. Some critics feel that the bony augmentation cannot be made congruent with the original joint surface. The capsule under the shelf augmentation undergoes fibrocartilaginous metaplasia, which is not believed to offer the same quality as hyaline articular cartilage.11,12,16

The short and medium-term results are often satisfactory, but the long-term outcome is variable (Table I).13,16-20 Several authors have reported that progressive degenerative change is the most common mode of failure, especially if early degenerative changes were present at the time of the operation.12,13 They have recommended that the procedure should be reserved for mild dysplasia, without arthritic changes or a subluxed femoral head.

The age of the patient at the time of surgery and the height of the shelf have been identified as additional factors influencing outcome.19 Positioning of the shelf represents a careful balance between the risk of impingement on the femoral head and resorption of the graft due to inadequate loading.21 In 1981, Staheli described a modification with slotted acetabular augmentation,22 claiming greater precision of placement of the graft.16 This strategy has produced encouraging mid-term results.16,20

In the modern era, perinatal screening and greater awareness of developmental dysplasia of the hip have ensured that most cases are identified and treated at an early stage.23 Those with symptomatic dysplasia in adolescence and early adulthood are now usually treated with periacetabular osteotomy.

References