VALGUS-EXTENSION OSTEOTOMY FOR OSTEOARTHRITIS OF THE HIP

INDICATIONS AND LONG-TERM RESULTS

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We reviewed the results of 277 intertrochanteric valgus-extension osteotomies performed between 1973 and 1975 for primary or secondary osteoarthritis. The average age of the patients was 51 years and follow-up varied from 11 to 15 years. At the latest evaluation 67% of the hips were good or excellent on the Merle D'Aubigné scale. Better results were obtained in patients under 40 years of age with unilateral involvement and a mechanical (secondary) aetiology. An elliptical femoral head, minimal subluxation and an adequate pre-operative range of motion were also favourable. There was radiographic evidence of regression of the arthritic changes in 39% of the hips at final review.

Valgus-extension osteotomy is effective for secondary osteoarthritis of the hip in selected younger patients, but not for those with primary hip disease or a poor range of movement.

The treatment of degenerative arthritis of the hip in younger patients remains difficult and controversial. The early successes of total arthroplasty led to the rapid decline in the use of joint-sparing procedures such as the angulation osteotomies introduced by Pauwels in the 1950s (Pauwels 1950, 1976). However, the results of arthroplasties in younger individuals have been somewhat disappointing due to the high early incidence of loosening and need for revision (Chandler et al 1981), and there has been renewed interest in intertrochanteric osteotomies for this age group.

Varus osteotomies have been the most popular; some studies have suggested that overall results are better than those after valgus operations (Detenbeck, Coventry and Kelly 1972; Harris and Kirwan 1972; Weisl 1980; Castaing and Marcillaud 1981; Reigstad and Grønmark 1984). Other investigators, however, have shown preference for valgus corrections (Tillberg 1968; DePalma, Rothman and Klemek 1970; Bombelli 1983), but no long-term studies of large numbers of patients have been published. We have reviewed our valgus-extension osteotomies in an attempt to identify the significant prognostic factors at over 10 years.

MATERIALS AND METHODS

From 1973 to 1975, 530 intertrochanteric osteotomies were performed at the Busto Arsizio General Hospital in Italy, of which 389 were of the valgus-extension type. The main indication for this osteotomy was a significant degree of disability, caused by degenerative arthritis of the hip with radiographic evidence of either a superolateral or a medial form of osteoarthritis (Bombelli 1983). Another prerequisite was a flexion arc of at least 45° and at least 20° of passive adduction, to allow for the necessary valgus correction. Bilateral procedures were performed at a minimum of 12 weeks apart.

At review 277 hips (125 right, 152 left) in 263 patients were available for review, 21 patients having died and the remainder being lost to follow-up. Of these patients, 226 (87%) were personally examined while 37 were studied through detailed questionnaires and recent hip radiographs. There were 181 women (69%) and 82 men (31%); the average age at the time of osteotomy was 51.7 years (range 26 to 66). In 35 hips there had been revision of the osteotomy to a total arthroplasty, the other 242 hips (225 patients) had been followed-up for between 11.2 and 15.1 years (mean 11.9).
Clinical evaluation. We used the Merle D'Aubigné (1970) rating scale averaging the scores at five years postoperatively to determine the interim results. All the patients who required revision to a total arthroplasty were recorded as having a poor result from the osteotomy.

Radiographic evaluation. On the basis of pre-operative radiographs, we classified the hips according to aetiology, morphology, biological reaction and severity of the osteoarthritis (Kellgren and Lawrence 1957; Bombelli 1983).

Aetiology. We used the term mechanical osteoarthritis for all cases which showed congenital or developmental abnormalities such as acetabular dysplasia, slipped capital epiphysis, Perthes' disease or coxa vara. Cases with no apparent underlying abnormalities were classified as having primary or metabolic osteoarthritis.

Morphology. According to the shape and geometry on the radiographs we distinguished two basic types of osteoarthritis which were suitable for valgus extension osteotomy: the superolateral type and the medial type (Bombelli 1983). The superolateral type accounted for 95% of the osteotomies, being characterised by degenerative changes in the superior and lateral areas of the hip most commonly secondary to acetabular dysplasia or slipped femoral epiphysis. Three sub-groups were recorded, according to the geometry and position of the femoral head. These were: spherical, where the head maintained its concentric shape; elliptical, where the head was flattened (Figs 1a, 2a) and subluxed or dislocated, where there was a substantial break in Shenton's line due to marked acetabular insufficiency.

The medial form of osteoarthritis (in 5%) was characterised by narrowing of the medial joint space, often associated with coxa vara or protrusio acetabuli.

Biological reaction. The reaction of the joint to degenerative change was classified as: atrophic, intermediate or hypertrophic, in relation to the amount of osteophytosis. A hypertrophic category had usually produced a grossly osteophytic 'megahead'.

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<th>Table I. Mean Merle d'Aubigné scores in 277 hips before and after valgus-extension osteotomy</th>
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Surgical technique. All operations were performed or supervised by the senior author (RB), who used a uniform technique with a lateral approach and exposure of the anterior capsule. A 120° or 130° angled AO blade plate with a 4-hole side plate is directed into the lower half of the head and the osteotomy is performed in the intertrochanteric region approximately 2 cm below the site of entry of the blade. The iliopsoas tendon is released and a partial opening wedge osteotomy of the greater trochanter is used to increase the abductor lever arm (Maistrelli et al 1988).

![Fig. 1a](image1.png) ![Fig. 1b](image2.png)

Figure 1a – Pre-operative radiograph of a 48-year-old man with a long history of hip pain. Figure 1b – Fifteen years after valgus-extension osteotomy, he has an excellent result and radiological improvement.
The rationale of the valgus-extension osteotomy is to use the non-innervated medial 'capital drop' osteophytes as a fulcrum or new contact area, to reduce the lever arm of the body weight by shifting the centre of rotation medially, to improve congruity and increase the weight-bearing surface area and to reduce the joint load by the iliopsoas release and trochanteric osteotomy. The addition of an extension correction in the sagittal plane by posterior rotation of the femoral head is designed to increase the anterior coverage of the femoral head and to eliminate any fixed flexion contracture. In the whole series, both valgus and extension corrections ranged from 20° to 35° with mean valgus of 28° and mean extension of 26°.

Postoperative management. Mobilisation with a walking frame began on the fourth or fifth postoperative day and progressed to partial weight-bearing with crutches. This continued until there was definite evidence of bony union, usually at four to five months after operation. Exercises in bed began on the first postoperative day and active exercises continued after discharge from hospital at about 14 days. Clinical and radiographic evaluation was at six months and at one year. At five years all patients were sent a detailed questionnaire or asked to return for examination. The final evaluations for our study were made from February 1986 until June 1988. The chi-squared test was used for statistical evaluation.

RESULTS

According to the Merle D'Aubigné rating the results at the latest follow-up were excellent or good in 188 (67%) and fair or poor in 89 (32.2%) of the hips. At five years, the mean score for pain had improved from 2.3 to 5.3 points, that for walking from 2.9 to 5.0 but the score for range of movement had decreased from 3.7 to 3.4. Final follow-up (Figs 1 and 2) showed a decrease in all scores but the difference was not significant (Table I).

Clinical factors. (Table II). The final outcome was not influenced by the sex or weight of the patient, but those aged less than 40 before operation had a significantly better result than those over 55 years (p < 0.005). The clinical outcome was also significantly better in hips with
pre-operative flexion range of over 60° (p < 0.001). At the latest follow-up 39% of hips had a range of less than 60° as against 12% pre-operatively (Fig. 3). Decrease in hip mobility was one of the major reasons for dissatisfaction.

**Radiographic factors.** The relationship between the clinical result and pre-operative radiographic analysis is summarised in Table III. Hips with a mechanical aetiology, elliptical morphology and normal or increased biological reaction responded significantly better to the osteotomy than did the others. Particularly poor responses were seen in subluxated or dislocated hips with a very oblique and shallow acetabulum. Unsatisfactory results were also associated mostly with severe forms of osteoarthritis with bilateral involvement.

At final follow-up radiographic evidence of deterioration of the osteoarthrosis was seen in 46% of the hips, although in many cases this was not associated with an unsatisfactory rating. In 15% of the hips there was no change in radiographic grading. Radiographic improvement was seen in 54% of the hips at five years and in 39% (all with excellent or good results) at the latest evaluation.

**Complications.** There were no peri-operative deaths, but 10 of the 277 reviewed hips had wound complications which included one deep infection requiring early debridement and intravenous antibiotics but these resolved after eventual removal of the blade plate. Three patients had postoperative pulmonary emboli.

There was delayed union in four hips; two which developed pseudarthrosis had re-operation, an unsatisfactory outcome and eventual joint replacement. There were two fractures of the femoral neck after blade insertion which required spicas for three months but healed with no radiographic evidence of avascular necrosis. Both patients had stiff hips. One patient had a postoperative peroneal nerve palsy with only partial recovery.

**DISCUSSION**

Valgus osteotomy was first introduced by Pauwels, who recommended this procedure whenever better congruency of the hip could be achieved in adduction. Langlais, Roure and Maquet (1979) were the first to report longer term results in a series of 150 valgus osteotomies performed according to Pauwels' principles for severe osteoarthrosis. At an average follow-up of six years they found 68% good results. Santore and Bombelli (1983), reviewing 40 valgus-extension osteotomies followed for an average period of 11 years, found 75% satisfactory results. Immediate congruency did not appear to be necessary as improvement was often achieved later by osteophytic growth stimulated by the osteotomy (Bombelli 1983).

In our review, the best long-term results were obtained in younger patients with mechanical osteoarthrosis and a good pre-operative range of movement. Better results were also seen in hips with superolateral as compared to medial degenerative changes. The principal reason for the unsatisfactory results in the medial sub-group was the poor pre-operative flexion range, which was again reduced after the osteotomy, a fact that may be related to the prevalence of early protrusio in this sub-group. Failure of bony reaction in the atrophic hip and contralateral involvement were both indicators of a poor prognosis. Our findings agree with those of Langlais et al (1979) and Santore and Bombelli (1983). They also show that early satisfactory pain relief and increase in walking ability tend to persist, although a substantial decrease in the range of hip movement is to be expected. We now feel that pre-operative flexion of less than 60° is a relative contra-indication to osteotomy.

The effectiveness of the valgus-extension osteotomy is confirmed by comparison of our results with the natural history of osteoarthritis. Danielsson (1964) reported that...
only 33% of patients with osteoarthritis of the hip had spontaneous reduction of pain in a 10-year period, and worse results were seen in the superolateral form of osteoarthritis. We therefore believe that the long-term effect of osteotomy is due solely to improved mechanics in a hip with mechanical overload.

In order to be effective, the biplane correction should be at least 20°. This was rarely, if ever, achieved in other series; this may account for the opinion that the results of intertrochanteric osteotomy are not long-lasting (Collert and Gillström 1979; Weisl 1980; Reigstad and Grønmark 1984).

Our results also indicate that valgus-extension osteotomy alone may not be adequate in a hip with severe acetabular dysplasia. In these cases combined pelvic and femoral varus osteotomy may be better (Morscher 1980; Bombelli 1983). For patients over 55 years of age we recommend total joint replacement: the overall results of osteotomy in this group are clearly inferior.

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REFERENCES


