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OSTEOTOMY IN DEGENERATIVE AND RHEUMATOID ARTHRITIS OF THE KNEE JOINT

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INTRODUCTION

Osteotomy in the region of the knee joint has been described for about a century. Only during the last ten years though have significant reports appeared on its use for degenerative arthritis, and less often, for rheumatoid arthritis. This recent development signifies a different aim for the operation. The older aim was essentially the correction of static deformities, including valgus, varus, or recurvatum, or the correction of flexion contractures of functionally significant degree. The aim in the treatment of rheumatoid and degenerative arthritis encompasses positional improvement of course, but relief of pain is also hoped for, and alteration of mechanics and of bone circulatory pattern so that a continuing disease process in the knee joint will be retarded, arrested, or to some degree, turned back.

A clinical Lecture on Antiseptic Osteotomy, by *Macewen*, appeared in *Lancet* in 1878 (*Steindler* 1940). From the textbook by *Jones & Lovett* (1924), it appears that at the turn of the century osteoclasis was still accepted, particularly in children, as well as forceful closed distal femoral epiphysiolysis. Of the latter the authors say "In unskilled hands it is definitely dangerous". Osteotomy, through limited incisions, or by means of driving a chisel straight in through the skin is also described here. For arthrosis deformans, debridement or arthrodesis is described, and osteotomy is not mentioned.

Osgood in 1913 published a report of brief experience with supracondylar femoral osteotomy for permanent knee flexion contracture. Wedge removal was performed and either a green stick or complete fracture of the posterior cortex made. *Milch* in 1934, also favored

osteotomy leaving one cortex un-osteotomized. He emphasized that in unsuccessful supracondylar femoral osteotomy one cause is that the original angular deformity is not corrected, but only compensated. He also emphasized that in osteotomy one must make certain that the upper and lower tibial articular surfaces are parallel to each other and perpendicular to the shaft.

Many types of osteotomies have been described, with or without wedge removal or wedge addition (*Agerholm* 1960, *Smillie* 1962, *Climescu & Antonesco* 1964). Simple linear osteotomy with angular displacement has been used in degenerative arthritis (*Wardle* 1962, 1964), as has the ball and socket type (*Jackson & Waugh* 1961). The osteotomies applicable to the subject of this paper are wedge osteotomies (*Torgerson* 1965, *Gothefors & Hult* 1964, *Coventry* 1965), or those of the telescoping type.

MATERIAL AND METHODS

Patients with rheumatoid or degenerative arthritis of the knee joint, who during the ten years from 1956–1965 were subjected to osteotomy of the distal femur or proximal tibia at the Orthopaedic Department of Malmö General Hospital have been re-examined. Twenty-eight knees were operated in twenty-eight patients. Six of the patients had died before the time of the final follow-up examination. The result of operation in these six cases was evaluated through study of the X-rays and the clinical record. The rest of the patients came for examination and were evaluated clinically and roentgenographically. Follow-up time varies between one and ten years, with a median time of four and one half years. Eleven patients had rheumatoid arthritis and seventeen degenerative arthritis (Table 1). The median age at operation was 63.7 years, with the oldest 76 and youngest 50. The age breakdown is shown in Table 2.

Table 1. *Material.*

	Male	Female
Rheumatoid arthritis	2	9
Degenerative arthritis	6	11

Table 2. *Age breakdown.*

	50–59	60–69	>69
Rheumatoid arthritis	4	5	2
Degenerative arthritis	7	2	8

Table 3. *Deformity*

	Valgus	Varus	Extension defect
Rheumatoid arthritis	8	2	1
Degenerative arthritis	7	10	2

Table 4. Osteotomy site.

	Tibia	Femur
Rheumatoid arthritis	2	9
Degenerative arthritis	10	7

Table 5. Results.

	Improved	Unimproved	Not evaluated
Rheumatoid arthritis	2	8	1
Degenerated arthritis	10	7	

In fifteen cases the deformity consisted of valgus deformity, in twelve of varus, and in one of a fixed extension defect. In two cases varus or valgus correction were performed together with correction of an extension defect (Table 3). Valgus deformity was most common in rheumatoid arthritis, varus in degenerative arthritis. The surgery was performed by a number of different surgeons and the technique varied. Twelve of the osteotomies were in the proximal tibia and sixteen in the distal femur (Table 4).

RESULTS

The results have been divided into two groups: improved and unimproved. In the first group are patients whose pain was gone or clearly decreased, and whose walking ability was significantly improved. All other patients were judged as unimproved. Ten of the seventeen patients with degenerative arthritis were improved and only two of eleven patients with rheumatoid arthritis (Table 5). One patient died of pulmonary tuberculosis three months after surgery and so could not be evaluated. The other five patients who died, died between six months and six years after operation. Three of the six patients who died had rheumatoid arthritis, three degenerative arthritis. All of the patients that died were over 67 years (average 72.2).

Local complications occurred in six cases. In three cases dislocation of the osteotomy occurred, and in one of them re-operation with internal fixation was needed. All of these three were in telescoping supracondylar femoral osteotomies without internal fixation. Three pseudarthroses occurred, requiring re-operation; one in the distal femur, two in the proximal tibia.

The range of flexion in the knee joint was only in four cases less than 90° where it was 90° or more pre-operatively. These four had significantly decreased motion after operation. Three of them were supracondylar, and one proximal tibial, osteotomies. In two of the cases pseudarthrosis had occurred, and in one, postoperative dislocation

of the fragments. In one case synovectomy was performed at the same time as supracondylar femoral osteotomy.

DISCUSSION

Improvement after surgery has taken place in fewer than half of our cases. The patients with rheumatoid arthritis have noticeably responded poorly to osteotomy. The patients evaluated as improved have, however, shown a very significant improvement. Other authors have presented good results in many cases (Table 6). Choice of indications for osteotomy and of surgical technique are of considerable significance in obtaining good results, and through uniformity and discrimination in these factors the value of osteotomy should increase considerably.

Osteotomy in rheumatoids is only sparsely described in the literature (*Coventry 1965*). Of the eleven cases in our series only two showed significant improvement. These patients had symptoms chiefly localized to a knee joint with pronounced deformity, while the other joints were rather well preserved and the patients' general condition was good. The remaining patients in this group were severely incapacitated in several joints, and the operated knee showed pronounced destruction pre-operatively. When surgery is planned in these advanced cases arthrodesis should be strongly considered. In a few cases synovectomy was performed together with osteotomy. These patients became pain-free, but motion was severely limited. It does not seem advisable to carry out these operations together, because osteotomy demands a period of immobilization, while early mobilization is desirable after synovectomy. In one case surgery produced improved walking and weight-bearing ability on the operated extremity, which led to rapid destruction with central dislocation of the already disease-destroyed hip joint. The hip joint requires special evaluation before considering knee osteotomy. Of special significance are abduction and adduction ability, because correction of valgus or varus deformity results in an altered axis in the hip joint with walking.

The results of osteotomy in degenerative arthritis were better than in the group with rheumatoid arthritis. In the cases which did not improve, the cause was pronounced destruction preoperatively in the operated knee, co-existing difficulty with other joints (hip, ankle) or complications in the form of delayed union or dislocation of the osteotomy. The cases suitable for surgery are those with significant

valgus or varus deformity with destructive changes and symptoms from the concave side of the joint and in which the range of motion is at least 60–70°.

The surgical technique varied in our cases. The determining factor for whether distal femur or proximal tibia osteotomy was chosen was the joint surface. The surfaces of the ankle joint and knee joint should be parallel (Figure 1). In tibial osteotomies done more recently, a wedge was removed proximal to the tibial tuberosity, and fixation was achieved with staples (Figure 2). Good fixation was obtained in this way and plaster fixation was required for only about four weeks after which joint motion training was possible. In the two cases with pseudarthrosis of the tibia osteotomy was distal to the tuberosity and internal fixation was not used.

Most of the distal femoral osteotomies were of the so-called telescoping type (Figures 3 and 4). Dislocation took place postoperatively in three and pseudarthrosis in one. This high complication rate can be explained by technical errors. It is very important that the osteotomy be made sufficiently distally, so that the tip of the shaft fragment is located immediately above the broadest portion of the condylar flare. The point is located on the deformities' convex side. On the concave side a cortical bridge of about 2 centimeters width is preserved and not osteotomized. This bridge is broken as the deformity is corrected by means of pressing the point of the shaft fragment into the condylar fragment. In this way the position is so stable that internal fixation is not required. A plaster from groin to toes is applied.

The benefit from osteotomy in the knee region that is due to correction of distorted weight-bearing and thus to correction of excess lo-

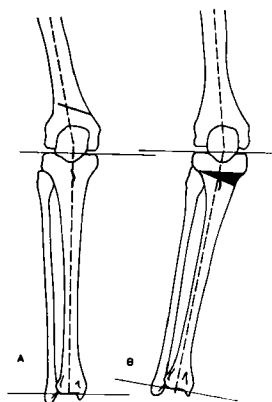


Figure 1. Level of osteotomy when the deformity is situated above the knee (A) and below the knee (B).



Figure 2. X-ray of a wedge osteotomy of the proximal tibia.

Figure 3. Schematic drawing of supracondylar femoral osteotomy of the telescoping type.

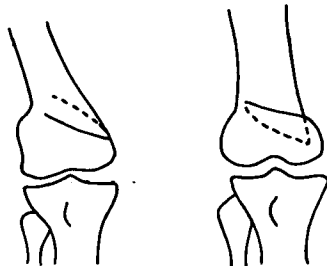


Figure 4. X-rays of a supracondylar femoral osteotomy of the telescoping type.

calized compression and of instability, needs no further explanation. It has further been suggested that pain relief is due to relief of intra-medullary venous pressure (Wardle 1964), improvement in the nutrition of the articular cartilage (Smillie 1962) and alteration of the vascular network (Trueta 1962). The comments regarding vascular improvement are similar to those made about proximal femoral osteotomy for degenerative arthritis of the hip, and similarly one finds reports of steadily improving knee cartilage space and reversal of roentgenological signs of subchondral changes (Jackson & Waugh 1961, Wardle 1962, 1964). Whichever explanations are ultimately accepted, the operation seems of great value when done with the proper indications and surgical technique.

CONCLUSION

Valgus and varus deformity in the knee joint with degenerative changes chiefly localized to the "concave side of the joint" are suitable for corrective osteotomy.

Range of motion in the knee joint preoperatively should be at least 60–70°.

The hip joint should be evaluated preoperatively.

The osteotomy should not be combined with synovectomy or other knee joint surgery.

The osteotomy should be placed near the joint. Mobility training should be initiated as soon as possible.

SUMMARY

Twenty-eight cases of osteotomy in the knee joint region for degenerative arthritis and rheumatoid arthritis have been followed up, observation time 1–10 years. Results are evaluated particularly with reference to causes of postoperative complications and unsatisfactory results. Choice of indications is evaluated and surgical technique discussed.

RESUME

Vingt-huit cas d'ostéotomie dans la région de l'articulation du genou dans des cas d'arthrite dégénérative et d'arthrite rhumatoïde ont été réexaminés. La période d'observation s'est étendue sur 1 à 10 ans. Les résultats sont jugés en se référant aux causes des complications post-opératoires et aux mauvais résultats. Il est porté une appréciation sur le choix des indications et il est discuté de la technique chirurgicale.

ZUSAMMENFASSUNG

Achtundzwanzig Fälle von Osteotomi in der Kniegelenksregion bei degenerativer und rheumatoider Arthritis wurden nachuntersucht. Die Beobachtungszeit war 1–10 Jahre. Die Ergebnisse sind unter besonderer Berücksichtigung der Ursachen für postoperative Komplikationen und nichtzufriedenstellende Resultate bewertet. Die Indikationsstellung wird besprochen und die chirurgische Technik wird diskutiert.

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