

Revision after osteotomy for gonarthrosis

A 10-19-year follow-up of 314 cases

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During a 10-year period, 314 tibial osteotomies were performed for medial gonarthrosis. At follow-up after 10-19 years, 62 knees had been revised by arthroplasty (52 cases) or reosteotomy (10 cases). The revision rate was 54/170 in undercorrected knees and 8/144 in knees with normalization or overcorrection of the hip-knee-ankle angle. Our results confirm that tibial osteotomy for gonarthrosis requires proper indications and precise surgery. Perhaps, given another 10 years, our osteotomies will have outlived contemporary arthroplasties.

Early results of tibial osteotomy for medial gonarthrosis are generally favorable (Tjörnstrand et al. 1981a, Insall et al. 1984), but there is some disagreement concerning the importance of overcorrection of the knee. Does the knee alignment achieved after healing of the osteotomy for medial gonarthrosis influence the rate of revision operations? We now report the revision by reosteotomy or arthroplasty after tibial osteotomy in relation to the postoperative alignment after healing.

Patients and methods

From 1969 through 1978, 314 proximal tibial wedge osteotomies were performed for medial gonarthrosis at our hospital. There were 131 osteotomies in males and 183 in females. The follow-up after healing of the osteotomy at least 1 year postoperatively included the hip-knee-ankle angle (HKA; Lindstrand et al. 1982, Waugh 1986), and the arthrosis was staged according to Ahlbäck (1968). HKA was determined on a whole lower limb frontal radiograph as the lateral angle between the lines from the tibial eminence to the center of the femoral head and the talus, respectively. An angle of less than 180° denotes a valgus alignment.

The long-term follow-up in 1987 and 1988 was conducted by examination, telephone interview, or by a review of the patients' charts. Observation time was determined either up to the date of the review, the death of the patient, or the date of revision to a knee arthroplasty or a reosteotomy. The mean observation time until revision was 6 years and for nonrevised osteotomies 14 years.

Osteotomy revision curves were generated by the method of Kaplan and Meier (1958) at monthly intervals, also used by Lewallen et al. (1984) in a 10-year follow-up of knee arthroplasty. Revision and correction angle was analyzed in a univariate analysis using the chi-square test and the generalized Wilcoxon test. Wald's test was used for multivariate analysis of the relative risk of revision.

Results

Totally, 144 out of 314 osteotomies were aligned in normocorrection or overcorrection of the HKA. Revision had been performed in 62 knees: in 52 with an endoprosthesis and in 10 by reosteotomy. The revision rate was 54/170 in undercorrected knees and 8/144 in knees with normalization or overcorrection of the HKA ($P < 0.001$; Table 1). The risk of revision was not related to age at surgery or sex, but was increased at an HKA exceeding 180° (Figure 1) and Stages III ($P < 0.05$), IV, and V arthrosis ($P < 0.01$; Table 2).

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Table 1. Number of revisions related to the postoperative hip-knee-ankle angle (HKA) in 314 knees treated with high tibial osteotomy for medial gonarthrosis

HKA (degrees)	Revised	Total
-180	8	144
181-185	7	86
186-	47	84

$P < 0.001$ (chi-square test and generalized Wilcoxon test).

Table 2. Multivariate analysis of the relative risk of revision in 314 knees after high tibial osteotomy for medial arthrosis

Risk factors	Relative risk	P^1
Year for surgery	1.2	NS
Age at surgery	1.0	NS
Sex	1.2	NS
HKA angle (degrees)		
-180	1.0	(reference)
181-185	1.5	NS
186-	12.0	($P < 0.001$)
Stage I	1.0	(reference)
Stage II	1.1	NS
Stage III	4.2	($P < 0.05$)
Stage IV	6.2	($P < 0.01$)
Stage V	8.6	($P < 0.01$)

¹ Wald's test.

Discussion

In 63 knees with a 1-3-year follow-up, Bauer et al. (1969) reported good results after tibial osteotomy for arthrosis in the majority of those with normalization of the femorotibial angle, but poor results in those with an abnormal angle. Coventry (1979) found that recurrence of varus was in part at least the cause of recurring pain that could be minimized by a slight overcorrection of the osteotomy.

Tjörnstrand et al. (1981b) found better results at a 7-year follow-up in knees with a corrected/overcorrected HKA. In a 10-year follow-up, Hernigou et al. (1987) reported the best results in knees where the HKA angle was corrected to 3°-5° in valgus.

Insall et al. (1984) found that knees that had been inadequately corrected initially had the earliest recurrence of pain, but that the influence of correction on the result was not as important as they had previously believed. Sundarm et al. (1986) found no correlation between correction of the deformity with physiologic valgus and results after dome osteotomy, with an average follow-up of 5 years; correction was recorded as the femorotibial angle, and 5°-9°

Revision rate (per cent) of tibial osteotomies

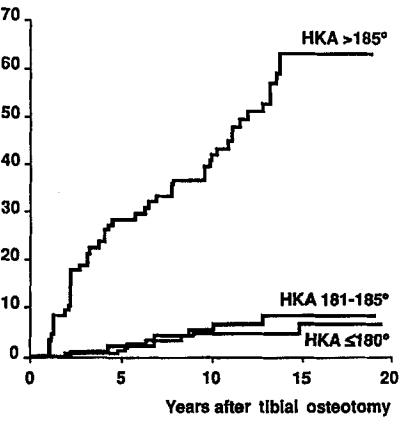


Figure 1. Cumulative revision rates for 314 knee osteotomies.

was deemed a good correction. A consistent correspondence between HKA and femorotibial angle was reported by Jokio et al. (1984). In a 10-year follow-up, Holden et al. (1988) found a slight, but not significant, correlation between the alignment achieved and the clinical result in younger patients.

Because the HKA in our series was recorded late, after the osteotomy had healed, recurrence in varus from initially good correction might have occurred; Insall et al. (1984) found recurrence of varus after 9 years in initially corrected knees, and Prodromos et al. (1985) reported recurrence of varus deformity in patients with high adduction moment during walking, with an average observation time of 3 years. However, Mymerts (1980) and Hernigou et al. (1987) found that recurrence of varus deformity and progress of medial gonarthrosis after healing of the osteotomy occurred only when the osteotomy was undercorrected.

In our series advanced stage of arthrosis had a great influence on the revision rate, which accords with Hagstedt (1974).

No substantial change of our treatment program for gonarthrosis has occurred during the period 1969 through 1978 except that only knees with early stages of gonarthrosis (Stages I-III) were subjected to tibial osteotomy after Hagstedt's (1974) follow-up of the early material. Of tibial osteotomies performed from 1969 through 1971, three out of 24 normocorrected and overcorrected knees and 24 out of 57 undercorrected knees had Stage IV or V advanced arthrosis at the follow-up. Year of surgery was not found to be a significant risk factor.

With few exceptions, all the revised knees in our series were undercorrected after healing of the osteotomy, which tallies with Hernigou et al. (1987), who had 17 revisions to knee arthroplasty out of 93 osteotomies with 16 revised knees undercorrected. Mathews et al. (1988) also found that the single most important factor that related to continued satisfactory function after osteotomy for gonarthrosis was the surgical accuracy and appropriate correction of the angular deformity.

Our long-term follow-up confirms that tibial osteotomy for medial gonarthrosis requires proper indications and precise surgery. Under such conditions the results are on a par with the best of those reported for arthroplasty (Bauer et al. 1987). Perhaps given another 10 years, the osteotomies will outlive the arthroplasties.

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