High Tibial Osteotomy
A Retrospective Analysis of 30 Cases

Kim J. Chillag, MD*
Paul J. Nicholls, MD‡

ABSTRACT: In this review of 28 patients who had 30 high tibial valgus osteotomies done, with an average followup of 51 months, 43% were judged as satisfactory and 57% were judged as poor, according to the criteria of Harris and Kostiuk.1 Surgical-technical error was the most common finding associated with the poor results. The next most common finding was inadequate correction.

Introduction
Since Jackson first reported the use of high tibial osteotomy for gonarthritis in 1958, several authors including Coventry, Slocum, Keene and Maquet have demonstrated their results.1-14 This article reviews the experience with high tibial osteotomy in a teaching institution.

Materials and Methods
The records of 38 patients (40 knees) who underwent proximal tibial valgus osteotomy at the Veterans Administration Medical Center, Lexington, Kentucky, from 1974 to 1980 were reviewed. Of these, 28 patients (30 knees) with greater than one year followup returned for interview, examination and completion of a rating scale.

All patients were men, with an average age of 54.5 years at the time of surgery. The average followup was 51 months, with a range of 13 to 97. The diagnosis was osteoarthritis in all cases, two of which were posttraumatic. Previous operations had been performed in 13 cases, medial meniscectomy accounting for ten of these.

The patients selected for high tibial osteotomy were those with complaints primarily of medial compartment pain and radiographic evidence of osteoarthritis predominantly in the medial compartment. Later in the series, preoperative arthroscopy was used to exclude those patients with significant patellofemoral or lateral compartment osteoarthritis.

The preoperative alignment was recorded in terms of the femorotibial angle.5 Weightbearing radiographs were used, as stressed by Coventry,2 Harris,1 and others. The average femorotibial angle was 181° and the range was 174° to 190°. All patients underwent valgus closing wedge osteotomies. Preoperatively, all except one patient came to full extension. That one patient lacked 5°. All patients flexed past 90° in the preoperative period.

Results
Our evaluation of end results is based on the patients' subjective evaluation using the criteria of Harris and Kostiuk.1 A good result indicated freedom from pain and substantial increase in walking tolerance; a fair result indicated substantial relief from pain and increased walking tolerance; and a poor result meant no improvement in symptoms.

There were three (10%) good results, ten (33%) fair results and 17 (57%) poor results. The preoperative and postoperative femorotibial angles are listed in Table 1.

In the group rated good, there were no technical errors and all varus deformities were adequately corrected. Three patients in the fair group did not have full correction (postoperative femorotibial angles 180° - 182°). There were ten technical errors in the group rated poor (Table 2).

There were 11 complications in eight patients (Table 3). All patients suffering complications were rated in the poor category. The three patients with overcorrection had associated varus/valgus instability.

<table>
<thead>
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<th>TABLE 1</th>
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<td>PREOPERATIVE AND POSTOPERATIVE FEMOROTIBIAL ANGLES</td>
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<tr>
<td>Result</td>
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<tr>
<td>Good</td>
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<tr>
<td>Fair</td>
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<td>Poor</td>
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TABLE 2
TECHNICAL ERRORS ASSOCIATED WITH POOR RESULTS

| Overcorrection | 3 |
| Undercorrection | 5 |
| Osteotomy into Joint | 2 |

One osteotomy approached the joint and reared in subsequent collapse.

<table>
<thead>
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<th>TABLE 3</th>
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<tr>
<td>COMPLICATIONS</td>
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<tr>
<td>Peroneal Nerve Injury</td>
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<tr>
<td>Deep Infection</td>
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<tr>
<td>Superficial Infection</td>
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<td>Thromboembolitis</td>
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<tr>
<td>Overcorrection (Instability)</td>
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<td>Osteotomy into Joint</td>
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*Orthopedic resident and Assistant professor of orthopaedic surgery, University of Kentucky Medical Center, Lexington; and Chief, Orthopaedic Surgery Service, VA Medical Center, Lexington. Reprint requests: Paul J. Nicholls, MD, Veterans Administration Medical Center, Lexington, Kentucky 40511.
One patient had significant loss of knee extension, with a 40° loss. He was listed in the poor result group. Three patients lacked flexion beyond 90°, two with poor outcome and one with fair result.

Discussion

Proximal tibial osteotomy has become an accepted technique for the treatment of unicondylar gonarthrosis. Numerous studies have confirmed the value of this procedure.1-8,12-15 Our results, however, have been unsatisfactory in over 50% of cases.

Coventry stressed careful patient selection as a prerequisite for satisfactory results.2,3 In an effort to improve patient selection, many patients in the latter part of the series underwent diagnostic arthroscopy. Because of the small patient population and frequency of technical failure, we cannot comment statistically on the efficacy of preoperative arthroscopy; however, our results seem to support those of Keene and Dyreby in that arthroscopy did not have predictive value.11 Eighteen patients had preoperative bone scan with postoperative bone scan after at least 12 months (range: 14 to 55 months). Although our population is small we did not find bone scan of value. Many patients with bilateral disease on scan had satisfactory results. Generally, there was little change in the preoperative and postoperative scans. Only one patient had significantly decreased uptake in the medial compartment postoperatively; this was associated with a good initial result that deteriorated to poor after two years.

Coventry3 and Kettlekamp5 found a greater percentage of good results with correction of the femorotibial angle to 5° of genu valgum or more. In the poor group there were 13 technical errors, undercorrection being the most common. Interestingly, three patients with undercorrection (femorotibial angle of 180° to 182°) had fair results.

Complications (Table 3) included one permanent and one temporary peroneal nerve palsy. In three patients varus-valgus instability was present following overcorrection. No concomitant ligamentous surgery was performed. One patient had early collapse of the tibial plateau following osteotomy placed too proximally, and in one case the proximal osteotomy entered the joint.

There were two cases in the poor result group where adequate correction was achieved and no complications were encountered. Both patients had preoperative bone scans showing some increased activity in the lateral as well as medial compartments.

In a similar Veterans Administration Hospital population, Engel and Lippert16 found that their initial results (55% good) were also poorer than those series reported in the literature. Both their series and ours dealt with a patient population that is more compensation and disability oriented than the general patient population, which may contribute to the poor results. We found, as did Engel and Lippert, that technical error was the main factor contributing to poor results. They developed a detailed protocol including the use of an alignment jig to improve their results.16,17 Mynert also developed an alignment jig to increase the precision of wedge removal.18,19

Harding20 reported only a 46% good or fairly good result in a series of tibial osteotomies in varus knees. Correction of the femorotibial angle was achieved only in 39% of the 124 knees in his overall series. Given the difference in rating scales, our results are parallel.

In a comparison study, Karpman and Volz10 reported poor results in 12 of 23 patients who underwent osteotomy, and they also had a high rate of undercorrection and complications.

Conclusion

We have determined at our institution that high tibial osteotomy is a very technical demanding operation, associated with unsatisfactory results 57% of the time. In our hands, adequate correction of the deformity was frequently not achieved. For those surgeons performing this operation infrequently, we would stress adequate correction of the deformity, perhaps using an alignment jig.

References