Knee Arthroplasty: Limits and Other Problems

Total Knee Replacement Following High Tibial Osteotomy and Unicompartmental Knee

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It is obvious that prior surgery may complicate subsequent total knee replacement. Although the indications for high tibial osteotomy (HTO) and unicompartmental knee differ to some extent, there is considerable overlap. While it is known that prior unicompartmental knee replacement may complicate the final result, it is unclear how this occurs. This report attempts to address these issues in a single surgeon series.

Materials and Methods

All total knee replacements carried out by the senior author following HTO or unicompartmental knees have been reviewed. They were rated clinically using the Hospital for Special Surgery (HSS) score, and radiographic examination involved 3-foot standing radiographs to assess the final alignment of the knee.

All knee replacements were carried out where possible with a semi-constrained knee, usually the Tricon series (Smith & Nephew Richards, Memphis, Tenn). The femoral component was inserted at 7° of valgus to the anatomical axis of the femur in the tibial component and 90° to the anatomical axis of the tibia. Unless significant bone grafting was carried out, immediate full weight bearing was allowed. The follow-up was 2 to 15 years.

There were 158 HTO conversions, 92 of whom were male and 66 female. Age range was 31 to 88 years (mean: 64). Previous operations included HTO in 100%, patellectomy in 3, tibial tubercle anteromedialization in 3, femoral osteotomy 1, tibial re-osteotomy for excessive valgus in 2, skin grafts in 1, and previous sepsis in 1.

Concomitant operations were bone grafting, usually to the lateral tibial plateau in 10 (6.3%), 1 tibial tubercle osteotomy for access, and 2 quadriceps snips. One hundred fifty-six knees were semi-constrained and 2 were posterior stabilized knees. Intraoperative complications included 3 tibial crack fractures during stem insertion and 2 stuck stems; 1 could be extracted, allowing the use of a stemless tibial component, and 1 could not be removed and was bone grafted, but subsequently loosened and was revised with a smaller stem. One patient had partial pull-off with the patellar tendon re-attached with a screw and soft tissue washer, and 1 patient developed a drop foot that subsequently recovered. Three patients were subsequently diagnosed as reflex sympathetic dystrophy. In retrospect, it is not known if this existed prior to surgery. One patient died shortly postoperatively and 5 at less than 2 years, leaving 152 for review.

Postoperative complications in the HTO conversion group included removal of an exostosis for a gracilis snap in 1, and patellar subluxation requiring soft tissue repair in 2. Patellar avascular necrosis occurred in 3 cases at 6 months, 3 and 4 years postoperatively. One required a partial patellectomy. There was skin breakdown in the case with the skin graft. A muscle flap was turned, but the knee became infected and dislocated, requiring a fusion. There were 10 revisions at less than 6 years, including 3 for pain. Two were subsequently diagnosed as having reflex sympathetic dystrophy. Two knees were in excessive valgus. The stuck stem case was revised, as was 1 case of end-of-stem pain. One patient fractured the tibial base plate, 1 had

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patellar avascular necrosis with a loose femoral component, and 1 had medial tibial sinking. Another 11 cases required revision at later than 6 years including 4 for tibial polyethylene wear, 3 for patellar wear, and 4 for tibial sinking. This left 131 patients for final review.

There were 38 unicompartmental knee conversions: 13 men and 25 women with an age range of 56 to 88 years (mean: 72). Follow up was 2 to 11 years. Previous operations included a unicompartmental knee in 100%. Two had become septic and had been converted to Girdlestones. Two had a tibial osteotomy, 1 a tibial plateau fracture, 1 a patellectomy, 1 a MacIntosh hemiarthroplasty, and 1 was septic and treated with an immediate exchange. Thirty-seven implants were medial compartmental unis and 1 a lateral compartment. Concomitant procedures included 10 (26.3%) femoral bone grafts and 13 (34.2%) tibial grafts. One patient required a tibial tubercle osteotomy for access. The majority of knees were semi-constrained, mainly the Tricon series of which 1 required a revision femoral component to make up for posterior femoral bone loss. Two posterior stabilized knees were used. One patient had no medial collateral ligament and considerable bone loss, and was treated with a hinge.

Early complications included 1 drop foot which recovered, and 1 patellar tendon avulsion treated with a screw and soft tissue washer. Late complications included 1 patellar subluxation treated with a tibial tunnel transfer and 1 stress fracture of the femoral neck in the hinge patient.

Five patients died at less than 2 years and were excluded from further study. Seven patients required revision at 6 years or less, including 1 for patellar dislocation and medial collateral laxity, 1 for end of stem pain; 1 patella became avascular. A patellectomy was carried out, but the knee was subsequently revised to a posterior stabilized knee. Two patients developed infection, 1 at 1 year post-surgery. Both were fused. One grafted tibial plateau collapsed at 5 years and was revised. One patient became very unstable and was revised to a hinge at 6 months. One case developed late infection at greater than 6 years, and was successfully revised. This left 26 for review.

RESULTS

In the HTO conversion group, of the remaining 131 available for review, the HSS rating was 77.1% excellent, 12.9% good, 9.2% fair, and 0.8% poor. If revisions at less than 6 years are counted as occurring as a result of the difficulties experienced with the index operation, then the results are 70.6% excellent, 11.9% good, 8.4% fair, and 9.1% poor. Ten of the overall group (6.3%) were in excessive valgus, i.e., greater than 9°. None were in excessive varus. The overall complication rate including revisions at less than 6 years was 11.2%.

In the uni-conversion group, of the remaining 26, 57.7% scored excellent, 34.6% good, and 7.7% poor. If the revisions at less than 6 years are included, 45.4% scored excellent, 27.3% good, and 27.3% poor. One patient was in excessive valgus and 1 in excessive varus. The overall complication rate including revisions at less than 6 years was 27.3%.

DISCUSSION

The overall results in the HTO group of 82.5% good or excellent (acceptable) and 17.5% unacceptable with a complication rate of 11.2% are not particularly good. Staheli et al.4 in a series of 35 HTO conversions, were able to achieve an 89% acceptable result, but they had a significant complication rate of 22.9%, including a 10% revision rate and another 12.8% in excessive varus.

The overall results in the uniconversion group of 72.7% acceptable with a complication rate of 27.3% are not particularly sterling either. Barrett and Scott,5 in the revisions of 29 unis, had a 66% acceptable rate with a 13.8% incidence of revision. Lai and Rand6 reported 81% acceptable results, and Padgett et al7 reported on 19 uni conversions, an 84% acceptable result with 2 revisions. Jackson et al,8 in converting 20 HTOs, had a 30% complication rate. In their conversion of 23 unis, they used thick tibial components in 30%, and had a 4.3% incidence of revisions. They did not give overall acceptable/unacceptable results.

These results are poor in comparison to three large series of total knee arthroplasties reported by the senior author9,10 with an average acceptable result of 95%. The inferior results achieved with HTO and uni-compartmental knee conversions show that neither can always be regarded as truly "conservative" procedures. This is perhaps an unfair comparison, as the results should, in fact, be compared to those achieved in total knee revisions. Nevertheless, these conversions may be extremely challenging and the results unpredictable.

REFERENCES