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ORIGINAL ARTICLE

Intraoperative fractures and ligament tears during total knee arthroplasty. A 1795 posterostabilized TKA continuous series

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KEYWORDS
Total knee arthroplasty;
Intraoperative complications;
Periprosthetic fracture;
Ligament injuries

Summary
Introduction. — Intraoperative fractures are a reported complication during the course of primary total knee replacement. Major ligament disruptions can also occur. Clinical data are lacking to tell how much these incidents affect implantation quality and outcome.
Hypothesis. — A thorough knowledge of these occasional incidents helps proper decision making when confronted to such situations at surgery.
Materials and methods. — This report is based on a series of primary, posterostabilized total knee arthroplasties (posterostabilized, mobile bearing TKA with a third median condyle from Tornier Laboratory). We studied all possible mechanical complications that developed during the course of arthroplasty and analyzed their cause. We compared the functional results of patients presenting these complications to those of the total series and to data from the literature. The entire operative reports for the 1795 TKA performed during this study were available and evaluated. A clinical and radiological review was performed for 1624 patients at an average follow-up time of 36.8 ± 34 (2—193) months.
Results. — At this last follow-up, the average International Knee Society (IKS) score was 91.2 (19—100) and the function score was 77.76 (0—100). One hundred and thirty-two patients were deceased (unrelated to TKA) at this last follow-up evaluation. A total of 69 mechanical complications were accounted for at the time of surgery (3.8%): 40 definite fractures or fissures around the knee (2.2%), 29 tendon or ligament disruptions or attenuations (1.6%). The risk of tibial cracks was statistically more significant, with the smaller sizes tibial trays (size 1) ($p = 0.019$) or when an anterior tibial tuberosity elevation had been performed ($p = 0.02$). Survival curve analysis (at an average seven and a half-years postoperative follow-up) showed that all prosthetic components were still present in 93.3% of cases in the series of patients with these peroperative complications, and in 93.8% of cases in the series of patients without

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these intraoperative complications; this survival rate amounted to 91.9% of cases at an average 16-years postoperative follow-up.
Conclusion. — This large, homogeneous series of primary, posterostabilized TKA took on 3.8% of intraoperative bone or ligament complications. All these complications could be prevented by a rigorous surgical technique. The improvement of ancillary materials, the saws, and good knowledge of such complications by the surgeon are essential.
Level of evidence: Level IV. Therapeutic Study.

Introduction

Total knee arthroplasty (TKA) is now a reliable and reproducible procedure, thanks mostly to improvements of ancillary materials supplied by the manufacturers. Analysis of the procedure's success is very subjective, and many scales allow its evaluation. Failure of TKA is always difficult to define.

Changing one piece or all prosthetic components clearly represents surgical failure from varied causes. Two large categories may thus be identified: infections, on the one hand [1], and mechanical failures, on the other hand.

In the latter category, failure may be attributed to the surgeon (implant malpositioning or technical error may lead to femorotibial instability, for example) [2] or to the implants themselves (polyethylene wear [3,4], implant rupture, metallosis). However, other complications are difficult to impute to a particular cause: aseptic loosening may be due to poor cimentation (by the surgeon), helped by the release of polyethylene particles (from the implant), or by some major activity and excess weight (patient).

These failures may be evaluated objectively by calculating implant survival curves.

Complications ensuing during surgery may also modify the postoperative outcome and affect the functional prognosis of TKA. The procedure itself may also be seen as a failure by the patient.

Intraoperative complications are due to surgical technique and may be manifold: periprosthetic, intraoperative fracture [5], intraoperative tendon or ligament weakness [6—8], nerve [9—11] or vascular [12] complications.

In a series of primary, posterostabilized TKA (gliding, posterostabilized TKA with a third median condyle from Tornier Laboratory, St-Ismier, France), we studied all fractures and ligament tears occurring during surgery and analyzed their cause. We compared the functional results of patients who had these complications to those of patients without such complications and to data from the literature. Defective implant positioning in the frontal plane was not studied in that series and the frequency of anterior femoral notching.

Materials and methods

Since November 1987, all patients operated by or under the responsibility of one of the authors (PN), in our university hospital service, for TKA were followed up clinically and radiologically. Thanks to a register created prospectively since 1995 and retrospectively for the earlier period, they were systematically reviewed at two months, six months, and one year, then every two years after surgery. The intraoperative and follow-up clinical and radiological data were noted in a logbook and fed into a database. The surgery report was included, and the occurrence of different intraoperative complications was also noted.

The clinical examination and interview data were recorded via questionnaire according to the International Knee Society (IKS) criteria, allowing score calculation during each follow-up visit. Radiographic evaluation comprised AP and lateral pictures of the operated knee in monopodal stance as well as patellofemoral incidence at 45° flexion, during each follow-up visit. Pangonometry completed the findings during each follow-up visit, at two months and one year postoperatively, then every two years.

During the period 1987 to 2007, 1795 primary TKAs were performed in 968 right knees and 827 left knees.

The average age during the intervention was 71 ± 8 (20—95) years. The gender ratio was 0.38, in favour of women.

The operated knees had not undergone any previous surgical procedure in three quarter of cases (Table 1).

The main indication for TKA was medial femorotibial arthrosis (Table 2).

Before 1996, a medial approach was the rule for TKA. After that period, the choice of approach was dictated by initial deformation in the frontal plane: the medial approach in cases of genu varum, and the lateral approach in cases of genu valgum (Table 3). When anterior tibial tuberosity (ATT) elevation was necessary, the usual fixation technique employed was fixation by two cortical screws 4.5 mm in diameter.

Since 1987, the prostheses implanted are supplied by the same manufacturer (Tornier Laboratory). The prosthetic design of this tricompartmental, posterostabilized TKA always includes a third median condyle.

The patellas were resurfaced in most cases (eight non-resurfaced patellas = 0.4%). All implants were cimented except for 127 femoral implants covered by hydroxyapatite (7%) without cement during the period of a prospective study which will be reported shortly.

Table 1 Previous surgeries on operated knees.

Previous interventions	Number	%
None	1376	77
1	311	17
More than 1	108	6