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Using Primary Implants for Revision Total Knee Arthroplasty Thanks to Navigated Intra-Operative Analysis

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Abstract

Using navigated analysis of bone and ligamentous status during revision total knee arthroplasty allows using frequently primary implants instead of revision ones.

1 Introduction

Total knee arthroplasty (TKA) is considered a highly successful procedure. Survival rates of more than 90% after 10 years are generally reported (Baumbach 2016), but revision may still occur for various reasons (Bozic 2010). Computer assistance has been suggested to improve the accuracy of implantation of a primary TKA (Jenny 2005), but also for revision TKA (Massin 2008). Revision implants with long stem extensions are routinely implanted in revision TKA cases, but they involve more bone loss than primary, smaller implants. The present study was designed to evaluate the possibility of implanting routinely primary implants instead of revision implants thanks to a better intra-operative understanding of bone and soft-tissue condition after a navigated intra-operative analysis.

The hypothesis of this study will be that the survival rate of primary TKAs implanted for revision cases will not be negatively impacted in comparison to revision implants.

2 Material and methods

A monocentric retrospective study was conducted at our university, tertiary care referral center. All patients undergoing a TKA exchange change for any reason between January 2013 and December 2017 were included. The exclusion criterion was the absence of radiographs with a known magnification ratio. All patients were operated on by two senior surgeons experienced with revision TKA. A navigated analysis of bone and soft-tissue conditions was performed prior to implant removal and with the revision trial implants (OrthoPilot ®, Aesculap, Tuttlingen, FRG). The target for reimplantation was the same for all patients: neutral mechanical alignment, orthogonal position of both implants in anteroposterior and lateral planes, restoration of the joint line within 2 mm of the native one, medial and lateral gaps in flexion and in extension less than 5 mm. All these parameters were controlled by the navigation system. Attention was paid to correct bone loss by bone allografting and/or metal augments without increasing bone defects by additional resection. Again, these parameters were controlled by the navigation system. The smallest implant was chosen, which allowed primary fixation of both implants and graft/augment.

Information about follow-up was collected from the individual patient files. All patients were recalled for clinical and radiological examination. The survival curve was plotted and compared to the existing literature for revision implants.

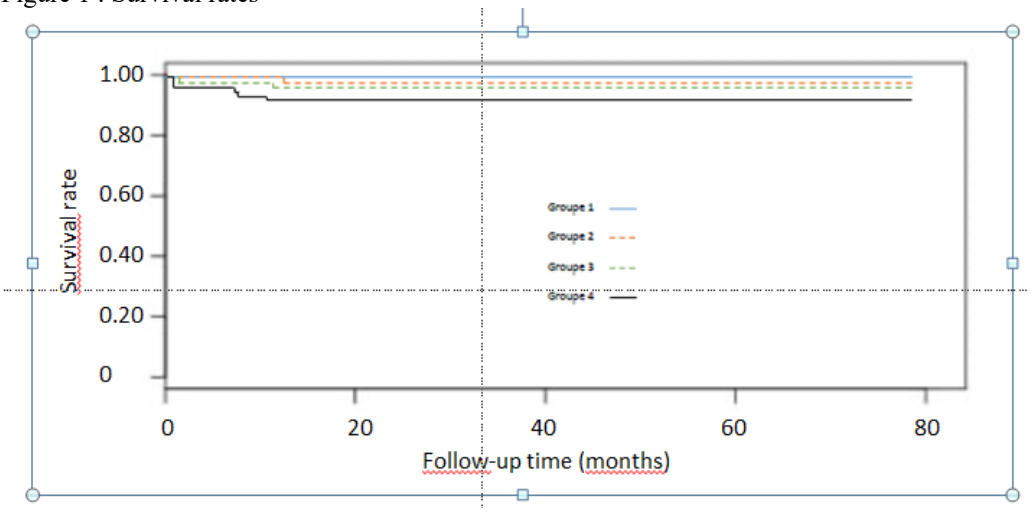
3 Results

165 patients were eligible. Of these 165 patients, 7 were excluded: 1 died the day after surgery, 4 had no available X-rays, 2 could not be followed up. 158 patients were included: 96 women and 62 men, with a mean age at surgery of 71 ± 10 years. The mean body mass index was 31.6 ± 6.72 kg/m². Reasons for revision were infection (65%), aseptic loosening (13%), implant malposition (10%), and instability (6%).

11 cases were reimplanted with a smaller implant than the implant removed (Group A). 37 cases were reimplanted with the same size of implant than the implant removed (Group B). 31 cases were reimplanted with a longer implant than the implant removed for only one tibial or femoral component (Group C), and 79 cases were reimplanted with a longer implant than the implant removed for both components (Group D). There was no significant difference between all groups for demographic data: age, gender, body mass index, ASA score. Bone defects were significantly larger in group D than in all other groups.

The survival rate of the group A was 100% at 5 years. The survival rate of the group B was 96% at 5 years. The survival rate of the group C was 94% at 5 years. The survival rate of the group D was 92% at 5 years. The differences were not statistically significant (figure 1).

Figure 1 : Survival rates



Patients of the group A had a limited improvement in the clinical outcome. There was no difference between all groups when considering complications or repeat surgery.

4 Discussion

Cases of revision TKA are increasing (Bozic 2015) but may fail more frequently than primary TKAs (Sachdeva 2019). Especially, infection rate of revision TKA is superior to that after primary TKA (Watts 2015). Repeat revision may consequently be necessary in some patients, leading to significant bone loss when revision implants with stem extension are used.

Reimplantation of a TKA smaller or with the same size than the removed implant was possible in 30% of the cases, without a negative impact on the survival rate after 5 years. Both tibial and femoral extension stems were necessary only in 48% of the cases. Navigation offers the possibility to decrease significantly the size of the implants during TKA revision. This might allow preserving bone stock for a possible repeat revision, especially in cases of infected TKA where the failure rate is significantly higher.

5 References

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6 Disclosure

Jean-Yves JENNY receives royalties from AESCULAP, is a paid consultant for FH Orthopedics and Globus Medical, is member of the board of the CAOS-International Society and of the International Society for Technology in Arthroplasty. Geoffrey GINOT has nothing to disclose.