

Computarized surgical planing and personalized patient instrumentation for total knee arthroplasty

WU H, BERCOVY M

Clinique Paris 5, University Paris, France

wuhaorthop@yahoo.com.cn

Personalised instrumentations are supposed to ameliorate the technique of TKA by increasing precision, decreasing the number of instruments and reducing invasiveness.

This is a prospective matched pair study comparing the classical instrumentation (CI) with a personalised instrumentation (PI).

We present a new technique for TKA implantation consisting in a dedicated positioning and cutting guide manufactured for each patient, based on his virtual models of distal femur and proximal tibia.

The purpose of the present study is to compare the accuracy, advantages and disadvantages of this technique with the conventional instrumentation.

Material: MRI scans of the patient's ankle, knee and hip are processed to determine mechanical axis, plan bony resections, implant components size and proper positioning and to manufacture custom positioning guides that will work with standard implants without any intra or extra-medullary guides.

Method

This study compares 30 patients operated with this technique with 30 patients operated with conventional instruments.

Our hypothesis was that 3D alignment using the dedicated technique would be at least as accurate as that obtained with the standard instrumentation within 2 degrees.

The following parameters were measured: KSS, Oxford, Womac scores, HKS, HKA axes, tibial mechanical and slope angles, femoral component rotation (on CT), duration, bleeding, pain and flexion angle.

The implant was a PCL sacrificing, MOBILE BEARING high FLEXION knee.

Both groups are identical for age, gender, BMI, etiology, comorbidities, drainage, and post operative protocols for pain, rehabilitation, and thromboembolic prophylaxis.

Results: The KSS, Oxford and Womac scores were identical in both groups at the same follow up.

The active flexion was 128° at 3 months in both groups;

There were no angular differences superior to 2° between both groups except for femoral rotation, which was more precise with the personalized technique ($p < 0.01$)

2 patients in the dedicated group had a different femoral component size than the planned one, (one size inferior) but no patient necessitated a modification of the planned axes.

The dedicated technique had significant lower duration (10 mn) [$p < 0.05$] and lower bleeding (559cc +/- 305cc versus 651cc +/- 303) [$p < 0.05$]

Discussion & Conclusion: The dedicated instrumentation technique is less invasive than the conventional technique. It has a similar precision for mechanical axis but is more precise for femoral component rotation. It can be used on all patients whatever the severity of the arthritic deformation.

It has a lower surgical duration and significantly less bleeding and is reproducible in less expert hands and for teaching. There were no specific complications with this technique. However,

this technique does not allow flexion extension gap and ligament balance which needs to be done with a dedicated instruments.

Cost and Logistics: As the size is determined one month before surgery and the probability of modification is only of one size, the quantity of instruments sets to be delivered and sterilised is 4 times less.