EFFECT OF FLEXUM AND RECURVATUM DISTAL FEMORAL OSTEOTOMIES ON THE DEFORMITIES OF THE FEMORO-TIBIAL JOINT

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INTRODUCTION

Etiology of gonarthrosis does not originate from a single-plane deviation. It is rather the consequence of a truly find its source only in deviation on the frontal plan, but in a three-dimensional deviation leading to non-physiological joint attitude and long-term overloading. Thus, rotational disorders would be at the origin of unilateral gonarthrosis [1]. Surgical treatments by high tibial osteotomy (HTO) seem to allow obtaining satisfactory results [2]. On the other hand, results from low femoral osteotomies (LFO) are more mixed and experimental studies are poor. The aim of this study was to perform for the first time in-vitro measurements related to the variations of constraints in the femoro-tibial joint after flexum and recurvatum osteotomies (6, 12 and 18°).

METHODS

Six left fresh-frozen human lower limbs were obtained from the ULB donation program. None of these specimens showed any sign of disorders related to the musculoskeletal system. Each specimen was thawed during 24 hours before its preparation. The latter included: - dissection of the muscles of the thigh, - attachment of muscular tendons of fishing wires for loading (200 N for the quadriceps and 100 N for the totality of the flexor muscles). The specimens were set on a customized jig to stabilize the pelvic and femoral bones (Figure 1). Six strain gages (SG, FCA-1-17, ø 4.5 mm, 120 Ω, TML) were encapsulated in an epoxy resin (LX 112) solution to created six measurements element (ME), and inserted into tunnels drilled into the cancellous bone of the tibial proximal epiphysis, just below the tibial plateau. These six tunnels were located at various locations approximately 10 mm below the knee joint line. Tunnel orientation was parallel to the tibial cartilaginous surface. Tunnel diameter size was slightly smaller than the ME diameter to ensure tight fitting and a maximal contact between ME and cancellous bone. A custom-made data input device including six signal-amplification modules was developed to collect the output from the 6 SGs. A 6 DOF-electrogoniometer [3] measured tibio-femoral kinematics, and allowed to normalize constraint results according to the range of motion. The relationships between femoro-tibial constraints and knee flexion-extension motion were further analyzed. For each specimen, three repetitions of two cycles of flexion-extension movement were performed. Flexion was applied manually, but extension was obtained by the quadricipital loading.

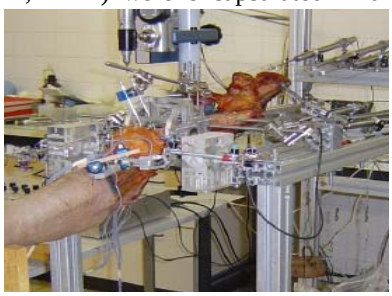

Figure 1: Experimental setup

RESULTS AND DISCUSSION

Results showed a significant constraint reduction (*Wilcoxon test* $p<0.05$) during flexum corrections at the level of the antero-medial (Figure 2) and antero-lateral gages. Recurvatum corrections did not show the same evolution for the posterior gages.

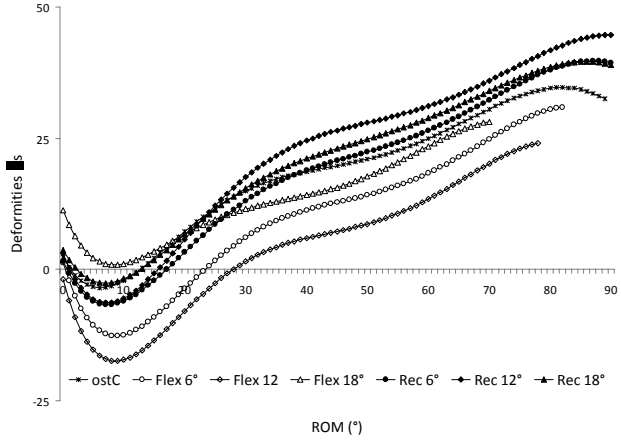

Figure 2: Variation of bone deformity for antero-medial strain gage during different conditions of bone correction.

CONCLUSIONS

The results of this study seem to indicate that flexum osteotomies flexum lead to significant constraint decreasing at the level of the anterior part of the articular surface of the tibial plateau. The other osteotomy correction performed in this study did not show any significant joint constraint alteration between and before surgery.

REFERENCES

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