ROLE OF PERIOSTEUM AND BONE MARROW IN LENGTHENING: A QUANTITATIVE STUDY IN RABBITS USING DXA

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INTRODUCTION: This study values quantitatively the bone formation due to peristeum and/or bone marrow-endosteum in distraction osteogenesis.

MATERIALS AND METHODS: Surgical procedure. One femur of 18 NZW 2.4-3.0 kg rabbits was fitted with a custom-made external fixator.

CONCLUSION: A synergistic effect (spatial and qualitative) may result from the combination of periosteum and bone marrow in bone healing.

Table I. Measurements on the whole specimens (W) and in the 3 central regions (C) in the 4 groups: % increase in area, BMC and BMD for the op. femur / non-op. femur (mean ± 1 SD).

Table II. Effects (α = 0.05) on the bone formation, bone turnover and interaction P/BM (PB) on the area, BMC & BMD of the whole specimens (W) and of the 3 central regions of interest, around the distraction gap (C).

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IN VIVO DETERMINATION OF INTERNAL/EXTERNAL ROTATION OF THE FEMUR RELATIVE TO THE TIBIA

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INTRODUCTION: The exact pattern of axial tibiofemoral rotation after TKA is unclear. The objective of this study was to assess in vivo axial tibiofemoral rotation after posterior cruciate retaining (PCR) and posterior cruciate substituting (FS) total knee arthroplasty (TKA).

METHODS: Thirty-two subjects (19 PS, 13 PCR) were studied under fluoroscopic surveillance performing weightbearing deep knee bends to maximum flexion. Three-dimensional solid CAD models of the femoral and tibial components were fit onto the 2-D silhouette images using a model fitting technique [1]. Femoralisotal contact points for the medial and lateral condyles were determined for the four flexion angles. A line was then created from the medial condyle contact point to the lateral condyle contact point. The angle between this line and the midline of the tibia in the coronal plane was measured and denoted as the screwhome angle. A positive angle was denoted as normal screwhome rotation (tibia internally rotates with flexion) and a negative angle was denoted as reverse screwhome rotation.

RESULTS: Previous studies have shown that the normal knee exhibits 10 to 16 degrees of screwhome rotation during flexion [1]. The average amount of screwhome rotation for subjects in this study was 9.74 and 0.55 degrees for the PS and PCR-implanted knees, respectively. All 19 subjects having a PS-implanted knee and 9 of 13 subjects having a PCR-implanted knee exhibited a normal screwhome pattern from 0 to 90 degrees of knee flexion. Four of the subjects having a PCR-implanted knee demonstrated a reverse screwhome pattern. Rotational patterns in both groups were erratic, with 10 of 16 subjects with a PS TKA (62.5 percent) and 10 of 13 with a PCR TKA (76.9 percent) demonstrating a reverse screwhome pattern at one of the three evaluated flexion ranges, most commonly at 60-90 degrees.

Figure 1. PS TKA at 0, 30, 60 and 90 degrees.

Figure 2. Average screwhome values for PCR TKA.

Figure 3. Average screwhome values for PS TKA.

CONCLUSION: This analysis demonstrates reverse screwhome rotation can occur, most commonly after PCR TKA. This may be related, in part, to abnormal anterior femoral translation during flexion that has been observed in previous in vivo kinematic studies. Reverse screwhome rotation is potentially detrimental, enhancing the risk of patellofemoral instability, and premature polyethylene wear.