

3D MODELLING OF THE TRAPEZIOMETACARPAL JOINT. APPLICATION TO THE EVALUATION OF FIRST CARPO- METACARPAL JOINT ARTHRITIS TREATMENT

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Introduction

The objectives of the study were 1) to quantify the 3D motion of the trapeziometacarpal joint on normal subjects and 2) to evaluate the effect of different type of treatment of the first carpo-metacarpal joint arthritis.

Materials and Methods

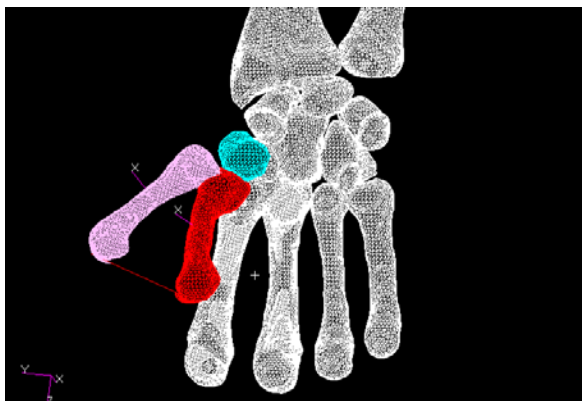
Specific MRI protocol has been developed to perform acquisitions on 5 normal subjects (3 males and 2 females mean age of 31±9 years old) in five positions: neutral, adduction, abduction, flexion, extension. Total duration time was about 20 minutes. Specific CT scan protocol were performed on 5 patients (mean age of 62±7 years old) before and after treatment (trapeziectomy or arthroplasty...). Total duration time was about 20 seconds.

Segmentation of the bones were performed using Simpleware software and geometrical modeling with Patran (MSC.Software). Helical axes were calculated for flexion-extension and abduction-adduction positions.

Interoperator variation segmentation has been quantified by superimposing both models and the distance between the points.

Results

3D models of flexion-extension for a normal and pathological subject are shown in Figure 1.



(a)



(b)

Figure 1: Extension-flexion movement for a normal subject (a) and a patient with implant (b).

Variation of the distance between both models was about 0.5mm ±1.3. Ranges of values for normal subject were found to be for the angle of rotation 41°-70° for flexion-extension and 45°-62° for adduction - abduction respectively. Results obtained for the pathological cases demonstrated lower range of values 22°-43° for flexion-extension and 16°-43° for adduction - abduction respectively. One should note that higher values for treatment was obtained with the patient with implant.

Discussion

According to our knowledge, this is the first study providing in vivo range of motion of the TMJ using MRI. The methodology and reference data we developed are of interest for clinical objective evaluation of treatment of the TMJ (Chevalier et al. 2012).

References

Chevalier *et al*, Rev Rhum, 79:110-115, 2012.