

SSOT 2014 Paper Submission

Kinematic of the Shoulder Joints in Professional Tennis Players

A. Lädermann¹, S. Chagué², F.C Kolo³, C. Charbonnier²

¹Division of Orthopaedics and Trauma Surgery, La Tour Hospital, Meyrin, Switzerland

²Medical Research Department, Artanim Foundation, Geneva, Switzerland

³Rive Droite Radiology Center, Geneva, Switzerland

Introduction

Shoulder pain and injury are common in tennis players. The precise causes for these pains remain unclear, but it is believed it could result from different factors (e.g., impingements (Gilles Walch's and Christopher Jobes's theories), anterior dynamic (Frank Jobes' theory) and posterosuperior static glenohumeral instability (Stephen Burkhart's theory) scapular orientation, etc.). Impingement at critical tennis positions and glenohumeral instability have rarely been dynamically evaluated in-vivo. The purpose of this study was thus to evaluate the different types of impingement and stability during tennis movements.

Methods

Type and frequency of impingement as well as percentage of subluxation were evaluated in ten intermediate or ex-professional tennis players through a novel dedicated patient-specific measurement technique based on optical motion capture and Magnetic Resonance Imaging (MRI).

Results

All volunteers, nine male and one female, had a clinically functional rotator cuff. No tennis players had 180° range of motion in internal-external rotation. MR images revealed eleven rotator cuff lesions in five subjects (three interstitial of the supraspinatus, three PASTA of the supraspinatus, three PASTA of the infraspinatus and two articular of the subscapularis) and six labral lesions in five subjects (two inferior, two posterior and two posterosuperior). Lateral subacromial, anterior subacromial, internal anterosuperior, and internal posterosuperior impingements were observed in four, three, two and seven subjects, respectively. No instability could be demonstrated in this population.

Conclusion

Tennis players presented frequent radiographic signs of structural lesions that could be mainly related to posterior impingements due to repetitive abnormal contacts (Gilles Walch's and Christopher Jobes' theories). This is the first study demonstrating that a dynamic and precise motion analysis of the entire kinematic chain of the shoulder is possible through a non-invasive method of investigation. This premier kinematic observation offers novel insights into the analysis of shoulder impingement and instability that could, with future studies, be generalized to other shoulder pathologies and sports. This original method may open new horizons leading to improvement in impingement comprehension.