Influence of marker movement errors on measuring 3 dimensional scapular position and orientation

**Abstract:**

**Introduction:** Scapulothoracic muscles weakness or fatigue can result in abnormal scapular positioning and compromising scapulo-humeral rhythm and shoulder dysfunction. The scapula moves in a 3-Dimensional fashion so the use of 2-Dimensional Techniques cannot fully capture scapular motion. One of approaches to positioning markers of kinematic systems is to mount each marker directly on the skin generally over a bony anatomical landmarks. However skin movement and motion of underlying bony structures are not necessarily identical and substantial errors may be introduced in the description of bone movement when using skin-mounted markers. Objective: evaluation of influence of marker movement errors on 3-Dimensional scapular position and orientation

**Materials & Methods:** 10 Healthy subjects with a mean age 30.50 participated in the study. They were tested in three sessions. A 3-dimensional electromechanical digitizer was used to measure scapular position and orientation measures were obtained while arm placed at the side of the body and elevated 45° 90° 120° and full range of motion in the scapular plane. At each test positions six bony landmarks were palpated and skin markers were mounted on them. This procedure repeated in the second test session in third session. Removal of markers was not performed through obtaining entire range of motion after mounting the markers.

**Findings:** The intraclass correlation coefficients (ICC) for scapular variables were higher (0.92-0.84) when markers were replaced and re-mounted on bony landmarks with increasing the angle of elevation.

**Conclusion:** our findings suggested significant markers movement error on measuring the upward rotation and posterior tilt angle of scapula.

**Keywords:** Marker error, 3-dimensional scapular kinematics, electromechanical digitizer

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