



The Effect of a Postural Enhancing Device on Sub-Acromial and Coracohumeral Distances during Shoulder Abduction: A Bi-Plane Fluoroscopy Imaging Study

Abstract:

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Soft tissue impingement has been identified as a cause of painful shoulder disability. Impingement has been described in several different anatomic locations and can be affected by gleno-humeral positioning. Sub-acromial and sub-coracoid impingement has been described as possible sources of pain and dysfunction in overhead athletes or as a result of repetitive motion stress and postural dysfunction. A postural enhancing device (PED) may alter glenohumeral positioning subsequently having an effect on impingement patterns. The purpose of this study was to determine the effect of a PED on the sub-acromial and coracohumeral space in healthy subjects during shoulder abduction.

Methods

Five males, who had full shoulder range of motion and strength and no prior surgery in their tested shoulders, participated in this study. After informed consent, the participant obtained a shoulder CT and performed shoulder abduction with and without a PED (Posture Shirt, Aligned Inc, Santa Ana, CA) while being filmed in a dynamic biplane fluoroscopy system. 3D models of each shoulder were generated and the minimum sub-acromial and coracohumeral distances were measured (accuracy<1mm) at 0, 45, 90, 135 and 180° of shoulder abduction with and without a PED. These distances were contrasted with a 2-way repeated measures ANOVA and Bonferroni post-hoc tests ($p=0.05$).

Results

Coracohumeral distance was influenced by the PED ($F_{1,4}=8.1$, $p=0.047$) but not by the position of shoulder abduction ($F_{4,16}=2.1$, $p=0.132$). Coracohumeral distance was on average 13% greater with the PED (PED, 10.0 ± 0.7 mm; No PED, 8.9 ± 0.8 mm). Sub-acromial distance was influenced by the PED ($F_{1,4}=10.1$, $p=0.034$) and by the position of shoulder abduction ($F_{4,16}=16.8$, $p<0.001$). Sub-acromial distance was on average 29% greater with the PED (PED, 3.7 ± 1.2 mm; No PED, 2.9 ± 1.1 mm). Compared to the arm at the side, the sub-acromial space was smaller at 90, 135 and 180° of abduction during both PED conditions (all $p<.05$).

Discussion

The PED modified gleno-humeral positioning and on average increased the sub-acromial and coracohumeral distances. If these distances can be addressed conservatively with a PED then perhaps training or rehabilitating with this device may reduce the risk of superior and anterior-superior shoulder impingement and pain.