

Determining the effect of submuscular versus prepectoral implant position on shoulder girdle dynamics: A biomechanical cadaver study

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Introduction

- Prepectoral breast reconstruction has been associated with decreased post-operative pain, expedited recovery, and better function than submuscular implant placement with acellular dermal matrix (ADM) sling.
- No mechanical analyses exist to confirm impact of pocket location on shoulder girdle dynamics.

Methods

- Post-mortem human subject mounted to Vicon 3D motion tracking system¹
- Tracking nodes implanted on sternum, clavicles, scapulae, humeri
- Shoulder range of motion tested using counterweight apparatus
- ROM testing repeated after placement of 300 cc silicone gel implants (right partially submuscular with ADM sling, left prepectoral with ADM sling) (Figure 1)

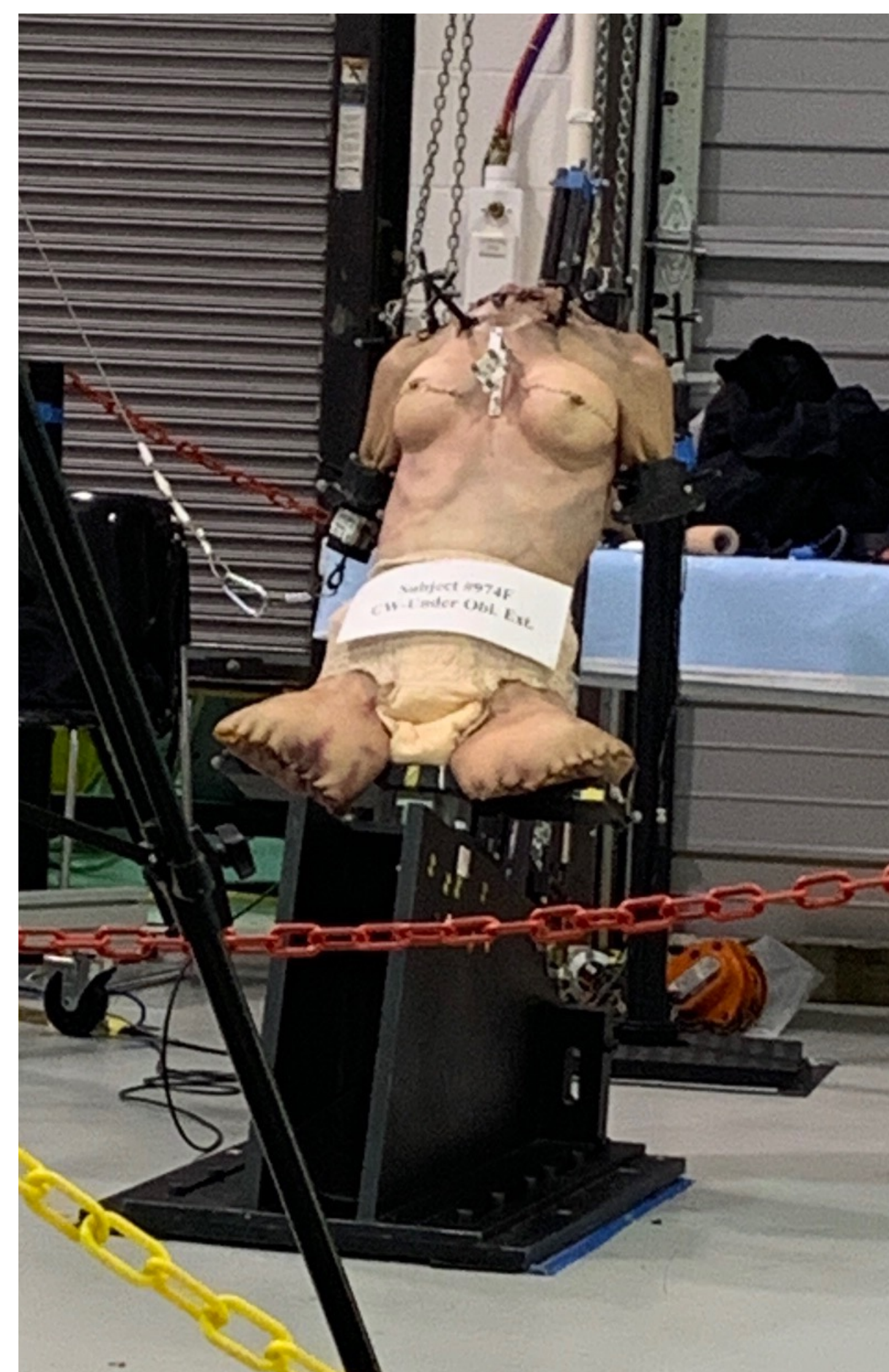


Figure 1- Human subject with Vicon 3D motion tracking system and 300 cc silicone implants in place.

Results

- During extension/flexion, *submuscular* placement associated with increased:
 - Scapular, humeral, clavicular, and sternal displacement
 - Scapular and humeral rotation
- Prepectoral associated with increased average *humeral displacement* in extension, abduction, oblique flexion/extension

Discussion

Submuscular placement was associated with a compensatory increase in scapular and clavicular displacement and rotation, whereas prepectoral placement was associated with increased humeral displacement, both of which could have functional impacts in activities of daily living. Further replication of this protocol with other body types and implant sizes is needed to determine broader applicability to implant-based reconstruction.

1) Berthelson PR, Jayathirtha MK, Zhu J, et al. Characterization of PMHS shoulder biomechanics under sub-injurious loading. *International Research Council on Biomechanics of Injury Conference 2021*.

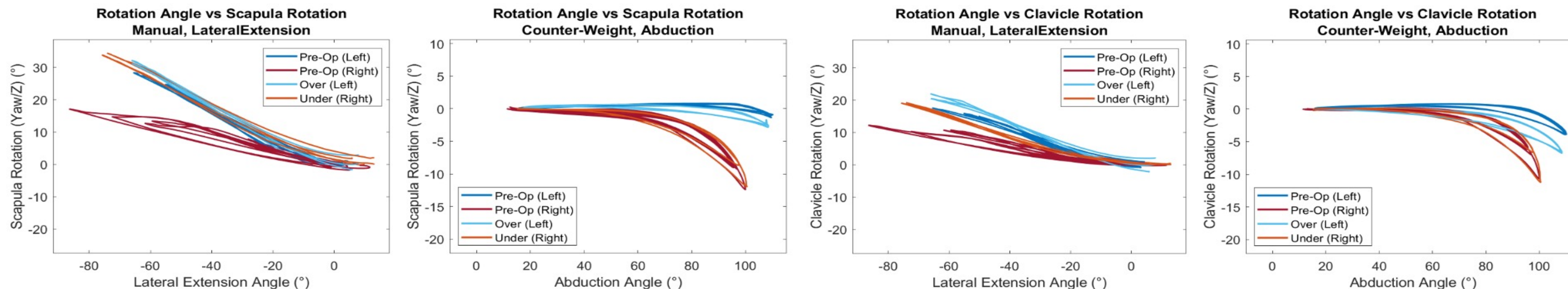


Figure 2- Representative examples of 3D motion tracking average values for scapula and clavicle rotation with shoulder extension and abduction before and after prepectoral (left) versus submuscular (right) implant placement.