FACULTY OF MEDICINE AND HEALTH SCIENCES

* DEPARTMENT OF ORTHOPAEDIC SURGERY AND TRAUMATOLOGY

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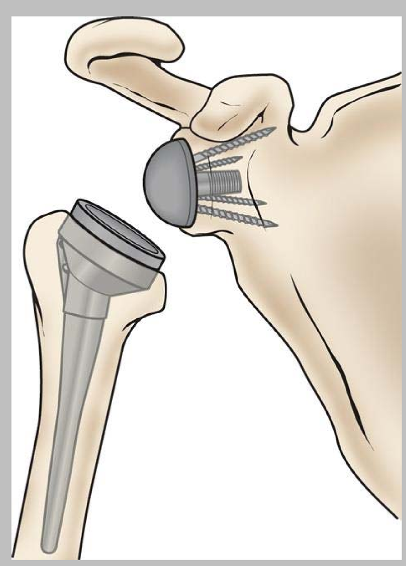
ROBOTIC BIOMECHANICAL EVALUATION OF REVERSE SHOULDER IMPLANTS

Shoulder pain

?

Cuff arthropathy, Arthrosis

(Reverse total shoulder arthroplasty)
rTSA



- 30 brands
- Reverse polarity

Same functional outcome

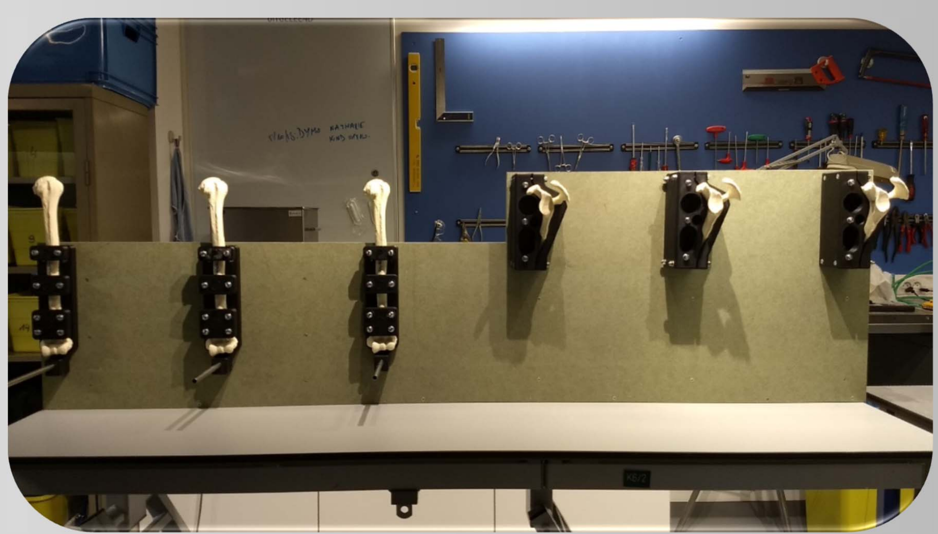
Restricted ROM
(Range of motion)

Understanding Impact of
- Design ≠ brands
- Glenosphere size

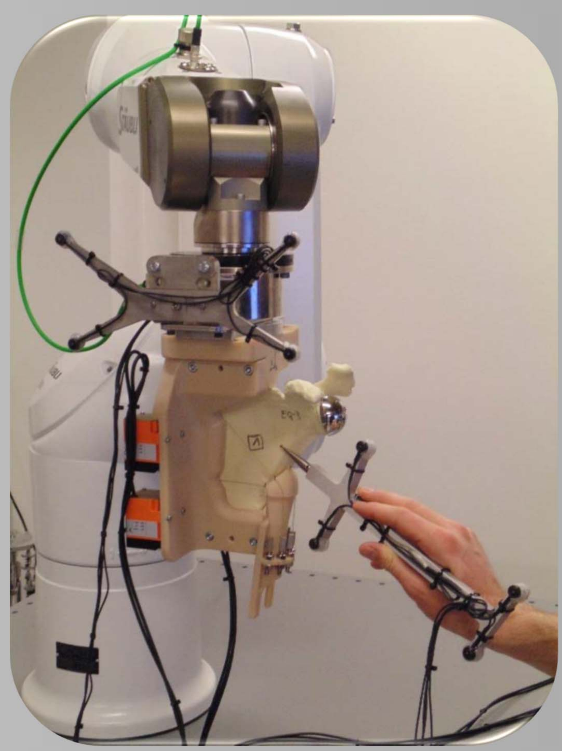
on ROM

Improve Surgery: Case selection

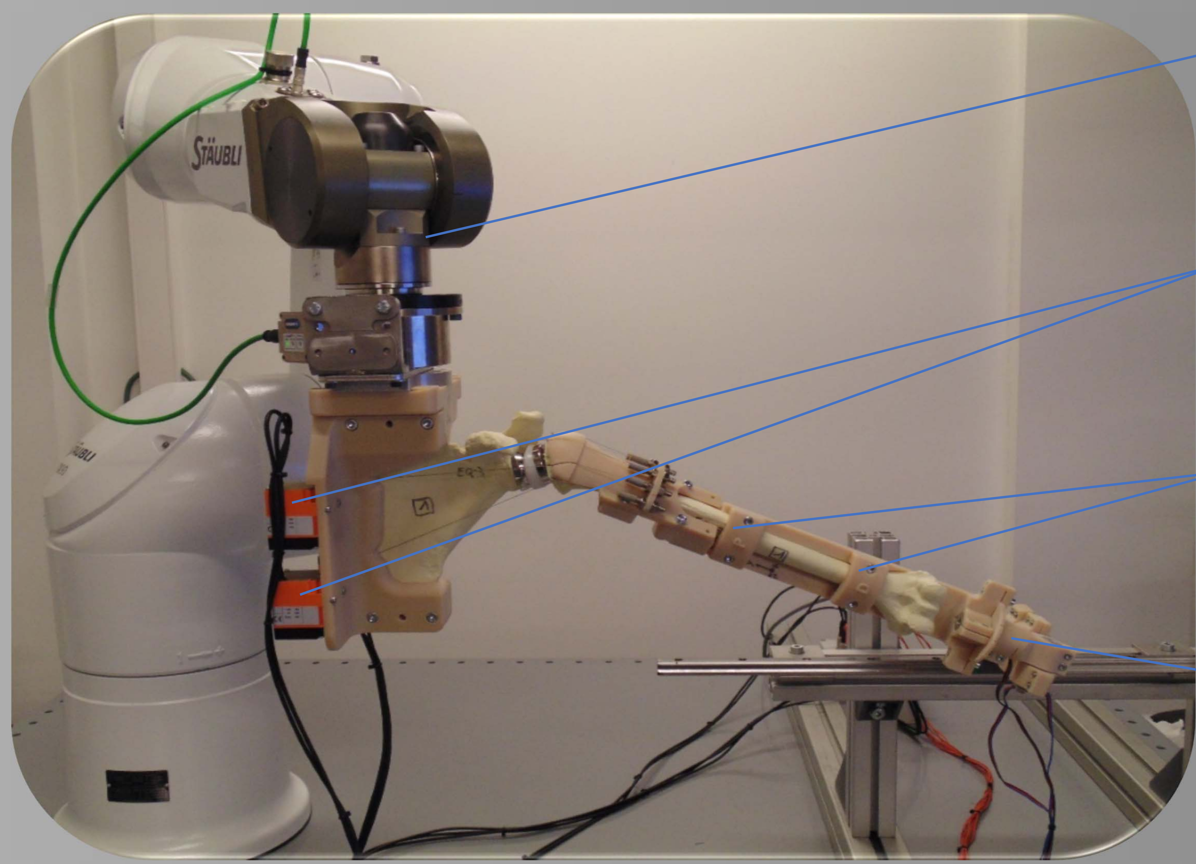
Methods: Robotic biomechanical evaluation of 6 frequently implanted prosthesis in the most common configuration



Setup implant placement



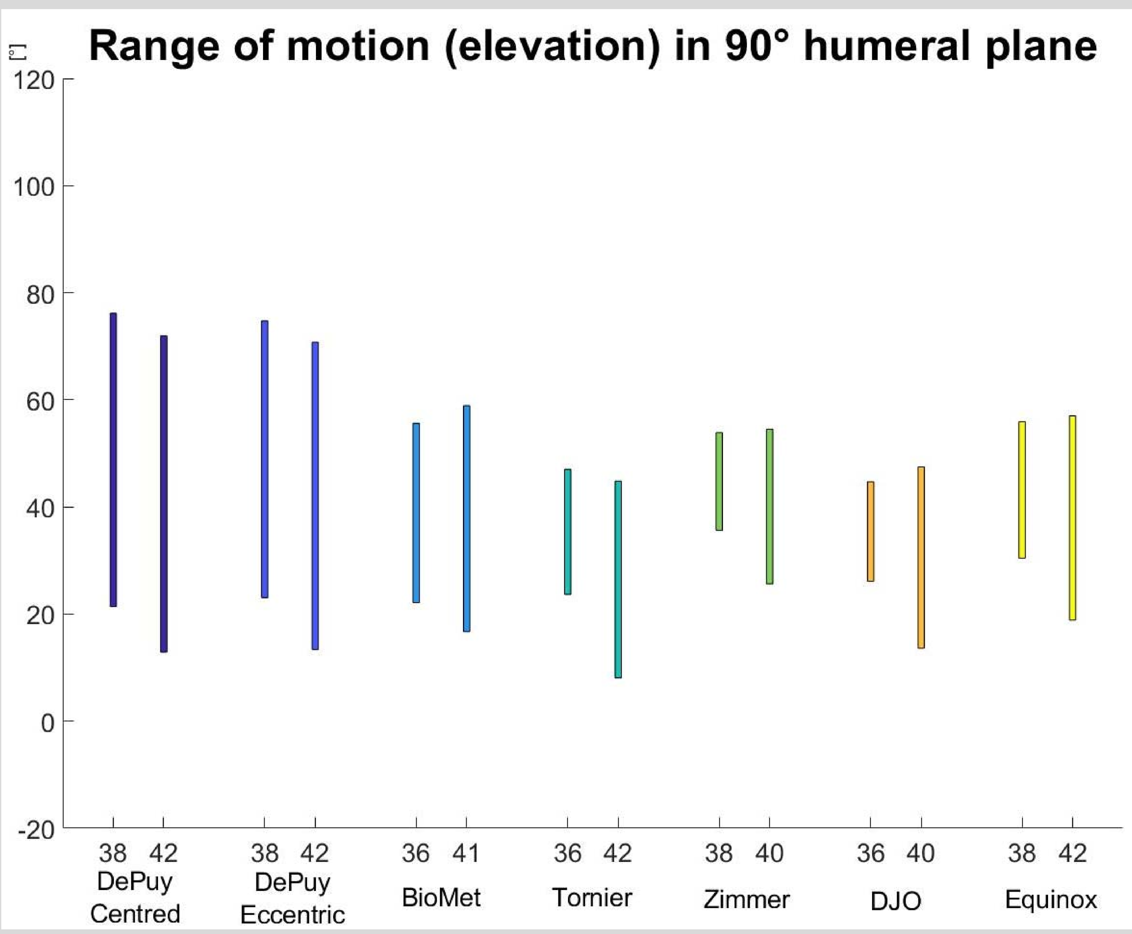
Scapula registration

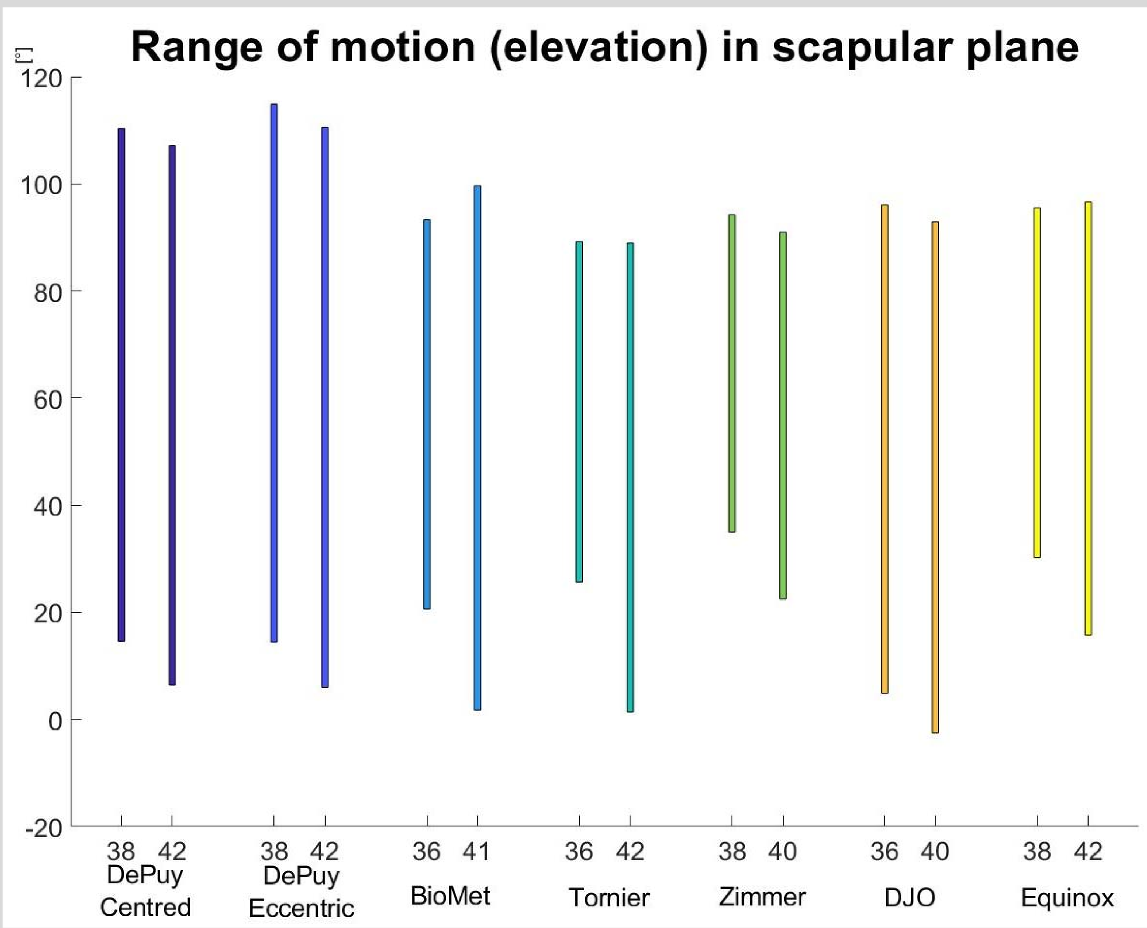


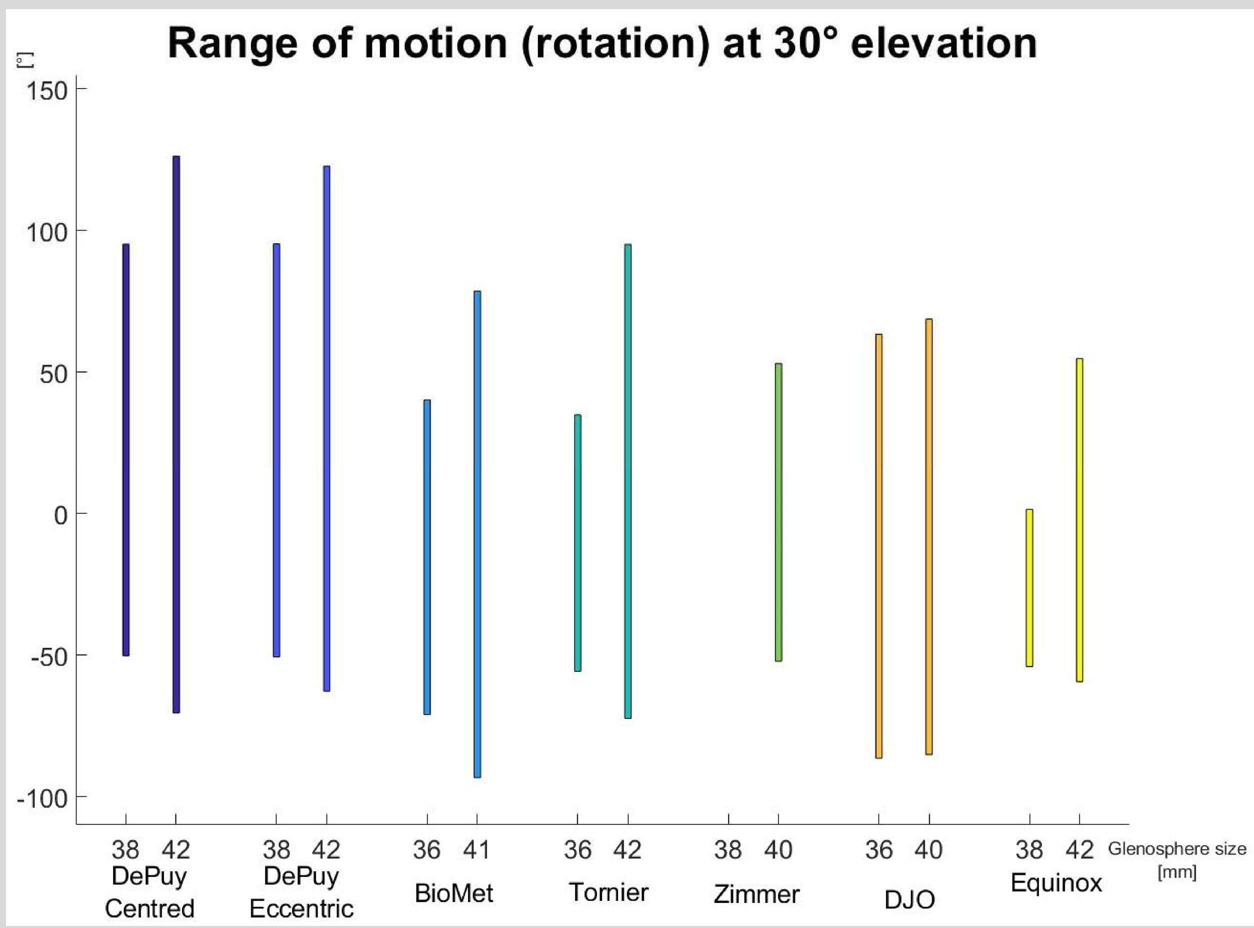
Robotic testing

- 6-DOF robot for active control of the humeroscapular joint
- Cuff muscles simulated by tensioned draw wire encoders
- Repetitive Sawbone® clamping with 3D printed guides
- Spherical joint with rotary encoders

Results:







Discussion:

A **wide variation in the ROM** is discovered between the six most frequent implanted prosthesis. A **larger glenosphere** results in a **better ROM** in all different brands. These significant differences in ROM can be clinically important as it can result in impingement and restricted functionality of the humeroscapular joint. This implies that each clinical case should be matched with the best implant by comparison of the biomechanical properties of the different implant systems. This **pilot study** showed a **large variation in biomechanical parameters** after implantation. This variation could be used to select the **most optimal implant design** for **every patient** based on numerical simulations.

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