

HAMID REZA JARRAH

PHD STUDENT | PROGRAM 1
ARC TRAINING CENTRE FOR JOINT BIOMECHANICS

PhD duration: October 2022 to October 2025

My interests: Computational models and artificial Intelligence to reach more accurate results in applied biomedical fields. I've gained valuable experience simulating advanced materials such as shape memory polymers, and 3D, 4D printing materials. I am so keen to extend my knowledge in producing medical prosthesis based on computational studies.



MEng (Iran University of Science and Technology)

Principal Supervisor: A/Prof. Saulo Martelli

PROJECT OVERVIEW

Project Title: Investigation the effects of surgical variables on loosening in Reverse Shoulder Arthroplasty (RSA)

THE PROBLEM

There are different problems and complications for the revision of this surgery, such as shoulder instability, infection, humeral problems such as glenoid loosening, unscrewing and fracture and, lastly, glenoid loosening. Instability, and component loosening are a consequence of post-operative joint biomechanics. These complications directly attribute to implant design and bone resorption. Regarding loosening, the reason for this postoperative complication is still unknown, but some surgeons believe that bone resorption due to stress shielding could be a factor.

Why do the causes of revision for Reverse Shoulder Arthroplasty (RSA) require more research?

In Australia, over 80% of total shoulder arthroplasty procedures performed in 2019 were RSA. A study of 4124 shoulders with RSA reported a complication rate of 16.1%. Revision in this surgery is both expensive and stressful for patients. Moreover, the statistics has shown that complications rate of the revision arthroplasty (65%) was much higher than that of the primary arthroplasty (15%). A comprehensive study in this field for decreasing the rate of revision would be very helpful for surgeons and patients.

How can my research help?

By aiding this research, we will investigate the effects of various surgical variables to eliminate prosthesis loosening in this surgery to reach the best performance for the implementation of prosthesis.

HYPOTHESIS

That bone resorption due to stress shielding is the main contributing factor in glenoid loosening. We believe that finding the best location for glenoid baseplate and determining other geometrical parameters would eliminate loosening phenomena.

PROJECT AIMS

1. Finding the best location for the glenoid baseplate
2. Investigation of loosening and micromotion under external forces and muscle forces
3. Determining the screw trajectory and its length
4. Investigation the effects of different prosthesis on loosening and micromotion



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