Technical variations in the Latarjet procedure impact glenohumeral joint stability: A simulation study

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Abstract

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1. Introduction

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Shoulder instability injuries occur with excessive force that translates the humeral head out of the shoulder joint socket (Thangarajah and Lambert, 2016). Shoulder instability injuries are a concerning problem affecting young athletes in overhead collision sports (e.g. Australian football; rugby) (Bohu et al., 2015, p. @Orchard2013). Effective clinical care is vital to avoid recurrent injuries, as well as reduced shoulder function and joint degradation (Thangarajah and Lambert, 2016). Surgery is commonly used to address pathology, restore function, and correct stability (Kavaja et al., 2012). The Latarjet procedure is a non-anatomic, open shoulder reconstruction surgery involving a bone block via transfer of the coracoid process to the anterior glenoid (i.e. coracoid bone graft) with the attached conjoint tendon (Latarjet, 1954). The Latarjet procedure is commonly used in cases with significant glenoid bone loss, large humerus compression fractures, or glenoid and humeral bone defects (Millett et al., 2005) — and is effective in combatting recurrent anterior instability injury (Bonacci et al., 2018, p. @Bessiere2014). Latarjet procedures are emerging as the preferred option for shoulder stabilisation, especially in contact sport settings (Millett et al., 2005, p. @Bonazza2017).

2. Methods

- Use distance to dislocation as our primary metric then we can compare how the presence of a bone defect affects the distance relative to the intact glenoid (i.e. as a %)

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- We can then apply this same approach to testing how completing the Latarjet procedure changes the distance, still probably keeping this in the same relative scale to the intact model (i.e. does it get back to 100%, or how close to intact does the Latarjet get to).
- We can then look at the data across Latarjet variations (i.e. displacement in the vertical and horizontal directions, graft size) in isolation and see what impact this has. From a practical perspective, this might tell us where the optimal positioning is to maximise distance to dislocation; whether larger grafts equate to better outcomes; whether a smaller graft can be used with optimum placement; whether you need bigger grafts if you stray away from optimum placement etc. Examining the results from the individual variations in the context of one another, given they are on the same proportional scale, should theoretically help answer these questions.
- It's also possible that the above mentioned aspects may vary with different bone defect sizes or types (e.g. Hill-Sachs included?)

```
##      speed           dist
##  Min.   : 4.0   Min.   :  2.00
##  1st Qu.:12.0   1st Qu.: 26.00
##  Median :15.0   Median : 36.00
##  Mean   :15.4   Mean   : 42.98
##  3rd Qu.:19.0   3rd Qu.: 56.00
##  Max.   :25.0   Max.   :120.00
```

3. Bibliography styles

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References

Bessière, C., Trojani, C., Carles, M., Mehta, S.S., Boileau, P., 2014. The Open Latarjet Procedure Is More Reliable in Terms of Shoulder Stability Than Arthroscopic Bankart Repair. Clinical Orthopaedics and Related Research 472, 2345–2351. doi:10.1007/s11999-014-3550-9

Bohu, Y., Klouche, S., Lefevre, N., Peyrin, J.-C., Dusfour, B., Hager, J.-P., Ribaut, A., Herman, S., 2015. The epidemiology of 1345 shoulder dislocations and subluxations in French Rugby Union players: a five-season prospective study from 2008 to 2013. British Journal of Sports Medicine 49, 1535–1540. doi:10.1136/bjsports-2014-093718

Bonacci, J., Manson, B., Bowe, S.J., Gill, S., Seward, H., Hoy, G., Page, R., 2018. Operative shoulder instability injury management in Australian Football League players: A case series. Journal of Science and Medicine in Sport 21, 760–764. doi:10.1016/j.jsams.2017.11.011

Bonazza, N.A., Liu, G., Leslie, D.L., Dhawan, A., 2017. Trends in Surgical Management of Shoulder Instability. Orthopaedic Journal of Sports Medicine 5, 232596711771247. doi:10.1177/2325967117712476

Kavaja, L., Pajarinen, J., Sinisaari, I., Savolainen, V., Björkenheim, J.-M., Haapamäki, V., Paavola, M., 2012. Arthrosis of glenohumeral joint after arthroscopic Bankart repair: a long-term follow-up of 13 years. Journal of Shoulder and Elbow Surgery 21, 350–355. doi:10.1016/j.jse.2011.04.023

Latarjet, M., 1954. A propos du traitement des luxations récidivante de l'épaule. Lyon Chir 49, 994–1003.

Millett, P.J., Clavert, P., Warner, J.J.P., 2005. Open Operative Treatment for Anterior Shoulder Instability. The Journal of Bone & Joint Surgery 87, 419–432. doi:10.2106/JBJS.D.01921

Orchard, J.W., Seward, H., Orchard, J.J., 2013. Results of 2 Decades of Injury Surveillance and Public Release of Data in the Australian Football League. The American Journal of Sports Medicine 41, 734–741. doi:10.1177/0363546513476270

Thangarajah, T., Lambert, S., 2016. Management of the unstable shoulder. British Journal of Sports Medicine 50, 440–447. doi:10.1136/bjsports-2015-h2537rep