

## A Prospective Randomised Controlled Trial Comparing Clinical, Biomechanical, and Functional Outcomes of Anterior Cruciate Ligament Reconstruction Using Anatomical Single-Bundle Versus Anatomical Double-Bundle Technique

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### Summary:

This prospective randomised controlled study demonstrated improvements in both SBACL and DBACL groups undergoing either anatomical SBACL or DBACL reconstruction. However, there is no significance difference between the two groups after 4 years of follow-up.

### Abstract:

#### INTRODUCTION

Controversies still exist regarding the ultimate outcomes of anatomical double bundle ACL (DBACL) reconstruction. This prospective randomised controlled study aims to evaluate the clinical, biomechanical, and functional outcomes of a group of patients underwent anatomical SBACL or DBACL reconstruction, with particular attention to the effect on knee rotational stability.

#### METHODOLOGY

Between July 2007 and December 2010, male aged 17-40, with unilateral isolated ACL injury were recruited and randomised into anatomical SBACL versus anatomical DBACL reconstruction groups. Clinical assessments (ROM, Lachman test, Anterior Drawer and Pivot Shift tests), functional outcomes (Isokinetic muscle strength, Single-leg hop test, Lysholm & International Knee Documentation Committee (IKDC) score & Biomechanical stability (anterior-posterior) by KT-1000 arthrometer were assessed. Assessments of static knee rotational stability using knee rotational meter, as well as dynamic knee rotational stability using optical motion analysis (frVicon 624, Vicon Motion Systems Ltd, Oxford, United Kingdom). All subjects recruited at 2010 were assessed before and after the operations at baseline, 6 months, 1 year, and final follow-up.

Independent t-tests were used for comparisons between the Anatomical SBACL and DBACL groups, with paired samples t-tests used for pre-op and post-op comparisons,  $p < 0.05$  was taken as statistical significance.

#### RESULTS

103 male patients with unilateral ACL injury were recruited during the period, with 55 and 48 underwent SBACL and DBACL reconstructions, respectively, using hamstring tendon. With an average follow up of 48 months, there were no significant differences between groups in ROM, Lachman, Anterior drawer, and Pivot Shift tests. There were significant improvements in Lysholm and IKDC score, KT-1000, and rotational stability after the operation but no differences found between the two at similar time points. 12 patients in the SBACL group and another 12 in the DBACL group received both pre- and post-operative assessments of the rotational stability of the knee using Knee Rotational meter. There was significant improvement in rotational stability in both groups, but no significance was found between groups. 29 SBACL vs 27 DBACL received motion analysis on AP and rotational stability before and after the operations, and there was significant improvement in both groups after operations, but with no statistical

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significance differences demonstrated between the two.

Most patients regained full range of extension 3 months post-operation except one in the single-bundle group and three patients in the double-bundle group due to graft re-rupture.

### DISCUSSION & CONCLUSION

This is the first prospective randomised controlled study comparing anatomical SBACL versus DBACL, including comprehensive assessment of all the key outcome parameters of ACL reconstructions (clinical, biomechanical, and functional), under strict inclusion and exclusion criteria. The different means of assessment of static and dynamic rotational stability aimed to answer the question of whether adding one more bundle can help to reduce the rotational instability of the knee joint, which had shown to be negative in this study.

In conclusion, both anatomical SBACL and DBACL group demonstrated superior results when compares to pre-operative condition. However, we were unable to show any significance difference between the two groups with an average of 4 years follow-up.