

BIOMECHANICAL COMPARISON OF RECONSTRUCTIVE TECHNIQUES FOR SCAPHOLUNATE DISSOCIATION

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Introduction

Numerous reconstruction techniques have been introduced for the treatment of chronic scapholunate dissociation. The most widely used method is three-ligament tenodesis (3LT) [1], but there are many results that dorsal ligament reconstruction alone does not provide sufficient stability. To compensate for 3LT, the Mark-Henry technique (MHT) [2], which additionally performs volar ligament reconstruction, has been introduced, but it was too complicated. Recently, the SwiveLock technique (SWT) using autologous tendons and synthetic tapes has been introduced, but long-term clinical results are lacking [3]. We performed a biomechanical comparison of three different reconstructive techniques for scapholunate dissociation in a controlled laboratory cadaveric model (Fig. 1).

METHODS

Eleven fresh-frozen upper extremity cadaveric specimens were prepared. A wrist simulator with a linear guide rail system and the motion capture system were used. The scapholunate distance, scaphoid rotation, and lunate rotation were measured with continuous flexion-extension and ulnar deviation–radial deviation movements. Results were compared in five conditions: (1) ligaments intact, (2) scapholunate dissociation, (3) SWT, (4) 3LT, and (5) MHT.

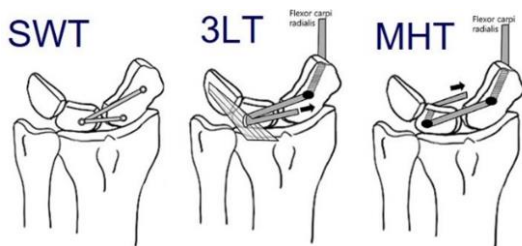


Figure 1: Three different reconstructive techniques for scapholunate dissociation.

RESULTS

Scapholunate dissociation resulted in a typical pattern of scapholunate instability. The scapholunate distance was restored similarly to the intact state after SWT and MHT, but over-tightening was observed after SWT. This means that SWT is over-tightened on the dorsal side and there is a risk of a hinge effect on the volar side. The lunate extension was restored similarly to the intact state after all reconstructions. However, the scaphoid flexion was restored only after SWT (Fig. 2). The SwiveLock technique is most effective in improving distraction intensity and rotational strength for the treatment of scapholunate dissociation.

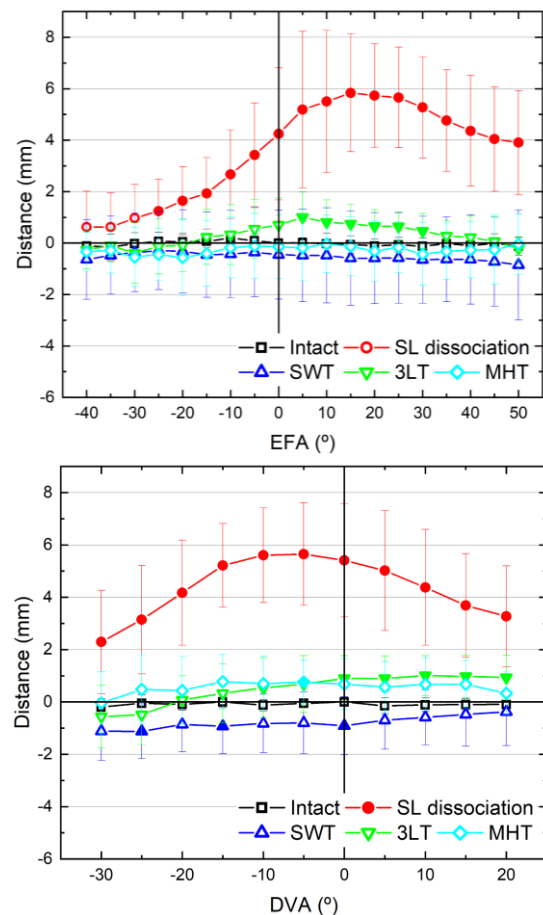


Figure 2: The scapholunate distance after SWT and MHT was not different from that of the intact wrists, but 3LT had wider scapholunate distance than the intact wrists.

Discussion

The SWT was most effective in improving distraction intensity and rotational strength. Given the complexity of the technique in 3LT and MHT, SWT may be a more efficient technique in terms of operating time and intraoperative damage to the volar side structures. However, the over-tightening effect occurs in the scapholunate distance, so it is considered that additional studies are necessary on the clinical effect.

References

1. Garcia-Elias M et al, J Hand Surg Am. 31(1):125-134, 2006.
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3. Mullikin I et al, Orthop Clin North Am. 51(1):77-86, 2020.

