学 位 論 文 の 要 旨

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学 位 論 文 名　Comparison of Elastic Versus Rigid Suture Material for Peripheral Sutures in Tendon Repair

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論 文 内 容 の 要 旨

INTRODUCTION

Postoperative range of motion (ROM) exercises performed after tendon repair prevent adhesion, increase fusion of cells, and improve gliding of the tendon. However, if a gap forms at the sutured site, fusion and functional recovery are hindered. A primary factor for tendon suture material is its high tensile strength, which is considered necessary for the sutured site. Generally, a combination of core sutures and peripheral sutures is applied for tendon repair. Regarding, the core suture method, our group previously reported that the side-locking loop technique provides high rigidity; and for the core suture material, a braided polyblend polyethylene thread was reported to have very high tensile strength and reduced elongation. Thus, for secure tendon repair, while core suture materials have been previously investigated, the optimum material for peripheral sutures remains unclear. In this study, we investigated whether the use of a braided polyblend polyethylene thread would be optimal for both core and peripheral sutures in tendon repair.

MATERIALS AND METHODS

Sixty-four transected bovine gastrocnemius tendons were repaired by 2-strand side-locking loop technique using No.2 braided polyblend polyethylene thread for the core suture. Then, 8-strand peripheral cross-stitches were added using either 2-0 rigid sutures (braided polyblend polyethylene) or USP 2-0-sized elastic sutures (Nylon). The holding area of each peripheral suture was set at either 3×1mm (shallow holding) or 6×2mm (deep holding). Therefore, 4 groups were compared (the shallow-rigid, deep-rigid, shallow-elastic, and

deep-elastic groups). The gap formation (n=32), ultimate tensile strength and suture migration state (n=32) were measured after 500 cyclic loading (from 10 to 200N). Statistical analysis was performed by the Scheffe's post-hoc test, P values of less than 0.05 were defined as significant.

RESULTS AND DISCUSSION

The shallow-rigid group had inferior outcomes compared to the other groups, in which the gap size was 7.55±4.04mm and the ultimate tensile strengths was 419.27±43.34N. However, the deep-rigid group had smallest gap (3.23±1.47mm) and highest ultimate strength (577.12±82.68N). All samples of the rigid peripheral suture material had failure prior to core suture rupture. The other hand, the two elastic groups showed no significant differences, irrespective of the size of the holding area; the gap size and the ultimate strength of shallow group was respectively 4.76±0.93mm and 492.55±51.55N, and that of deep group was 5.45±1.76mm and 549.21±98.26N. Suture migration did not occur in the two elastic groups until the ultimate strength was reached and the core suture ruptured. In other word, when both core and peripheral sutures are rigid thread, the load is borne by the peripheral suture relative to its holding depth. But the use of Nylon thread with high elasticity reduced the load on the peripheral sutures. The human tendons requiring repair can be very thin. Therefore, a nylon thread may be more applicable for peripheral sutures in human tendons, as the holding area of each peripheral suture has less effect on the outcome than when a braided polyblend polyethylene thread is used.

CONCLUSION

Depending on the suturing method, rigid suture material may not be appropriate for peripheral sutures, when accompanying rigid core suture material. If peripheral sutures can be made with accurate deep holding, rigid suture material will provide favorable outcome. However, in other cases, elastic suture material is considered best for supporting a rigid core suture, as elasticity is another important factor for peripheral sutures.