

REBAR Technique for Complete Radial Meniscal Tears: A Biomechanical Study

David Figueroa, Maria Figueroa, Rafael Calvo Mena, Marilaura Nuñez, Rafael Calvo¹, Alex Vaisman

¹Org

INTRODUCTION:

Biomechanical studies have shown that complete radial tears of the meniscus are functionally equivalent to a total meniscectomy in the involved compartment. In recent years, different techniques have been described for the repair of radial tears. The REBAR technique (derived from English: reinforcing bars) consists of 2 vertical and 2 horizontal sutures. The stability of the repair depends on the meniscal tissue as the technique implemented and the suture material used. The most used material is high-strength sutures, however, to date, there are no studies comparing different materials in this specific type of repair.

The objective of this study is to compare biomechanical stability in complete radial meniscal tears repaired with the REBAR technique using different types of suture materials. We hypothesized that one manufacturer's high-strength suture product is stronger for radial meniscal tears than another manufacturer's non-absorbable monofilament suture using the REBAR technique.

METHODS:

A biomechanical study with 12 porcine menisci was designed and an experimental model was established. The specimens were randomly divided into 2 groups of 6 menisci each. The first group was repaired with high-strength suture (group 1) and the second group with non-absorbable monofilament suture (group 2). Each repaired meniscus was subjected to cyclic loads between 5N and 30N for 500 cycles at one cycle per second, then loaded to failure at 5mm/min using a universal testing machine. The parameters evaluated were maximum deformation, maximum load-to-failure, and cause of failure in each case. Univariate analysis and T-Student statistical test were performed, with an alpha level of 0.05.

RESULTS:

All samples were successfully evaluated. All menisci repaired with high-strength suture failed due to meniscus tear, while 83.3% of menisci sutured with non-resorbable monofilament suture failed due to suture tear. Group 1 had a higher maximum load-to-failure than Group 2, with a mean of 223.0 N [SD ± 32.98] versus 112.0 N [SD ± 22.42], respectively ($p = 0.001$). On the other hand, the maximum deformation was greater in Group 1 with a mean of 17.79mm [SD ± 4.9] ($p = 0.02$).

DISCUSSION AND CONCLUSION:

The REBAR technique offers an optimal way for stabilizing the meniscus by using two reinforcement sutures that run with the circumferential fibers to help restore the natural hoop stress of the meniscus.

The repair of partial radial meniscal tears could decrease the pressure on the involved compartment and may have a protective effect on the cartilage, but currently, there is no established "Gold standard" technique for radial tears, and other configurations as all-inside techniques could have similar biomechanics as the REBAR technique.

In a biomechanical study, meniscal repair with high-strength suture using the REBAR technique had the highest mechanical strength in complete radial meniscal injuries.