

SEPARATION OF TENDON ENDS AFTER SUTURE OF ACHILLES TENDON

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Ten patients treated for an acute rupture of the achilles tendon were studied. During the operation a marker was attached to each tendon end. The postoperative separation of the markers was studied by repeated X-ray examinations. Despite immobilization a small initial separation was found during the first 4 days, followed by a period of no separation. After about 20 days a second separation started. No re-ruptures occurred. Both in the rabbit and in man a small initial separation of sutured tendon ends seemed to indicate an adequate tendon suture and therefore also a good tendon healing.

Key words: achilles tendon; immobilization; suture technic; tendon suture

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In experimental studies of ruptured achilles tendon in rabbits we found that after tendon suturing, there was a biphasic separation of the tendon ends that was independent of immobilization (Nyström & Holmlund 1983). The initial separation occurred during the first 3–5 days. No further separation took place until after about 21 days, when a second separation started. Only the first phase of separation could be influenced by immobilization. A small early separation was accompanied by a good tendon healing.

The present study was directed to investigate whether the pattern of separation of the tendon ends in man was similar to that in rabbits.

MATERIAL AND METHODS

Eight men and two women, 26–44 years old and otherwise healthy, participated in the study. All ruptures occurred during sports: badminton (7), football (2), and volley ball (1). Several surgeons were involved and each chose the method for suturing the tendon he preferred. In all patients a medial skin incision was made in order to avoid damaging the sural nerve. Tendon suture was performed according to Bunnell, steel

wire was used in three cases and Ethibond®, a braided polyester, in seven cases. In two patients the suture region was covered by the plantaris fascia.

During the operation, a 3–0 steel wire was attached to each tendon end at a distance of about 15 mm from the site of the rupture.

After the operation the ankle was immobilized for 3 weeks in a position of slight plantar flexion with a below knee plaster. Thereafter a new plaster was applied with the ankle at 90° angle to foot for another 3 weeks. With the aid of a standardized X-ray technique, a lateral projection with a fixed film-focus distance of 100 cm, the position of the markers was measured directly on the film. The X-ray examinations were performed immediately following the operation, on the 4th and 10th postoperative day, twice on the 21st postoperative day (before and after changing the plaster), between 40 and 50 days, and between 100 and 150 days postoperatively.

RESULTS

Figure 1 shows a biphasic separation of the sutured tendon ends. An initial separation was apparent during the first days after the operation. This was followed by a period during which no or

a very small separation took place. Between the 10th and the 40th day a further separation occurred. After the 40th day no additional separation occurred. The initial separation was small, mean 3 mm (range 2–4 mm). On the average the total separation was 11 mm (range 10–12 mm). The change of plaster on the 21st day did not result in further separation of the markers.

The use of different suture techniques and suture materials did not seem to influence the pattern of separation of the tendon ends. No re-ruptures occurred in our patients.

DISCUSSION

The results indicate a postoperative separation of the tendon ends after suturing a ruptured achilles tendon despite immobilization.

The biphasic separation of the tendon ends after suturing a ruptured achilles tendon in man was similar to that found in rabbits. The initial separation was small, which according to our experience in the rabbit, indicated that the continuity between the tendon ends was preserved. A small initial separation seems to guarantee a good tendon healing in the rabbit (Sjöström & Nyström 1983). The same seems to be valid in man. The initial separation might be explained by

tonus of the muscles and by an edematous softening of the tendon ends which permits some slackening of the sutures.

The second separation started more than 10 days after the operation (more than 11–21 days following rupture). After a tendon rupture, the attached muscle fibres are damaged but regenerate rapidly. About 21 days after tenotomy the regenerated muscle fibres can contract on nerve stimulation (Studitsky 1974). The lack of separation between the 4th and 20th day may thus be explained by a paralysis of the attached muscles. When these muscles regain function, the second separation takes place.

In man the second separation of the sutured tendon ends took place despite immobilization. In experimental studies in the rabbit (Sjöström & Nyström 1983) it was shown that this second separation started after about 21 days both when the leg was immobilized during this period and when immobilization for only 7 days was used. During the nonseparation phase, 7–21 days after the tendon rupture, immobilization thus was not needed. Whether the same rule is also valid in man remains to be investigated.

REFERENCES

- Nyström, B. & Holmlund, D. (1983) Separation of tendon ends when different suture materials and different suture techniques are used. An experimental study in rabbits. *Scand. J. Plast. Reconstr. Surg.*, in press.
- Sjöström, M. & Nyström, B. (1983) Achilles tendon injury. Effects of alternative therapeutical approaches on rabbit soleus fine structure and tendon elongation. *Virchows Arch A.*, in press.
- Studitsky, a. n. (1974) The neural factor in the development of transplanted muscles. In: *Exploratory concepts in muscular dystrophy. II. Control mechanism in development and function of muscle and their relationship to muscular dystrophy and related neuromuscular diseases* (Ed. Milhorat). Excerpta Medica, Amsterdam.

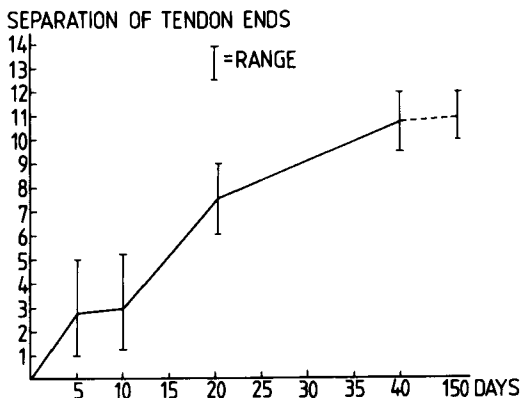


Figure 1. Postoperative separation of the tendon ends following surgical repair of ruptured achilles tendon.