Bioprotection of Tendon Repair: Adjunctive Use of Botulinum Toxin A in Achilles Tendon Repair in the Rat

Reference:

Scientific Literature Review

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PODIATRIC RELEVANCE:
In podiatric Surgery, tendon repair procedures are focused on increasing the strength of the repair site to prevent re-rupture or gapping of the tendon. Surgeons are always looking for the best options for suturing, injections and bio-scaffolding available to achieve the best surgical results. Botox injections have become increasingly popular in all aspects of medicine and surgery. This study showed that if Botox is injected into the gastrocnemius muscle bellies there will be a decrease in the active force production which will be below the force that’s required to rupture a repaired Achilles tendon. This temporary decrease in force may result in better patient outcomes.

METHODS:
At one month of age, 79 rats had their left hind Achilles tendon transected and repaired. Both the medial and lateral gastrocnemius muscle bellies were injected with either saline (control) or Botox (treatment). The rats were evaluated at week 1, 2, 3, 4, 8, 12 or 24 after the surgery by exposing the tendon to record the continuity of the tendon and scar tissue. The muscle force was then evaluated by disarticulating and pinning the calcaneus to create a linear relationship between the gastrocnemius and the force transducer. The sciatic nerve was exposed and stimulated to produce the maximal twitch and tetanus. The length of time that the Botox vs. Saline affected the muscle was evaluated with the right hind leg of each rat as a control.

RESULTS:
At week 1, the Botox group had 1 partial rupture and no total ruptures while the saline group had 2 partial ruptures and 2 total ruptures. After the first week, it was not possible to visually assess the degree of tendon rupture, because of scar tissue and adhesions. By week 3 the Botox tendons were smooth while the saline group had exposed suture which is suggestive of high tensions. The twitch and tetanus forces were both decreased by approximately 75% in the Botox group and the saline group experienced a 10% decrease. Baseline forces were reached by 24 weeks. From weeks 1-2 significantly more tendon strength was required to rupture the Botox group as compared to the saline group, but from weeks 4-24 there was no significant difference in tendon strength between the two groups.

COMMENTS:
Overall, the authors surmised that the Botox treated tendons could not create the force that was required to rupture the tendon. This would be a beneficial treatment to protect tendon repair sites from muscle contractions that would potentially rupture the site. If this is translated to podiatric patients, this could be used in combination with a Tendo-Achilles Lengthening or as it own procedure to decrease plantar pressures. This proves to be an interesting alternative to protecting tendon repairs.