Pentamidine Decreases Adhesion Formation after Flexor Tendon Repair

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Introduction

- Adhesion formation is a frequent complication after repair of flexor tendon injuries, leading to impaired tendon gliding and adversely impacts digit functions.
- A combination of factors is thought to contribute to adhesion formation, including tissue damage, inflammation, suture, and immobilization.[1,2]
- While improvements in repair and care techniques have led to reduced adhesions, many pharmacological agents have also been described. In particular, anti-inflammatory drugs such as indomethacin and ibuprofen have been demonstrated to decrease flexor tendon adhesions.[3]
- Pentamidine is a FDA-approved drug for antimicrobial purposes. It has also been demonstrated to have anti-inflammatory properties and data from our lab has shown that it can inhibit fibrosis in rabbit models of hypertrophic scar. Herein, using a previously described turkey model for flexor tendon repair,[4] we investigated the effect of local pentamidine application during surgery in reducing preitendinous adhesion formation.

Methods

The study was approved by our Institutional Animal Care and Use Committee 12 adult Bourbon Red turkeys were randomly assigned into either control (surgery only) or pentamidine (surgery with treatment) groups. The other non-operated third digit served as baseline.

- The middle digit on either the right or left foot of each turkey was randomly chosen to be surgically repaired.
- A Z-shaped incision was made at the level of the proximal interphalangeal joint.
- The flexor digitorum profundus (FDP) tendon was exposed and sharply transected 1cm distal to the proximal vinculum. Tendon was repaired with the modified Pennington technique.
- Fifty mg of pentamidine was then applied to the repair site and skin was closed.
- The digits were wrapped in cotton and immobilized in a flexion position with a hard cast. Turkeys were allowed to roam free in a large cage fed ad libitum until euthanasia at 6th week postoperatively.
- Tendon adhesion was evaluated and scored using a previously described system[5] by 3 individuals blinded to the treatment groups. Work of flexion (WOF) at the PIP joint was assessed with a combined tensile transducer and a motion analysis system **(Figure 1)**. Tendon breaking strength was tested with a servo-hydraulic machine.

Results

- Gap (> 2 mm) between the repaired tendons was found in the 4 (1 control, 3 drug-treated) out of the first batch of 6 turkeys during dissection after they were tested for work of flexion.
- A change of WOF setup was done and 1mm gaps were found in 2 (drug treated) out of the later 6 turkeys.
- Under a constant 5N force applied to the FDP tendon, PIP joint flexion was produced for an average of 27.09 degrees (range, 16.60-37.36) on the non-operated third digit, 2.27 degrees (range, 1.22-3.33) for the non-treated digits, and 10.94 degrees (range, 9.98-12.31) (p = 0.001) for the treated digits **(Figure 3)**.
- Average adhesion score in the non-treated group was 5.8 (range, 3-8) and 2 (range, 1-3) (p = 0.0013) in the treated group. Average breaking strength was 32.46 N (24.67-37.54) in time 0, 46.81 (31.46-55.62) in non-treated, and 25.24 N (11.59-43.69) in treated tendons (p = 0.09).

Figure 1. PIP flexion test setup

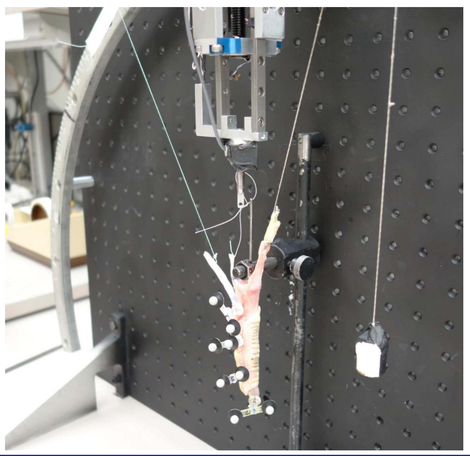


Figure 2. Digit dissection

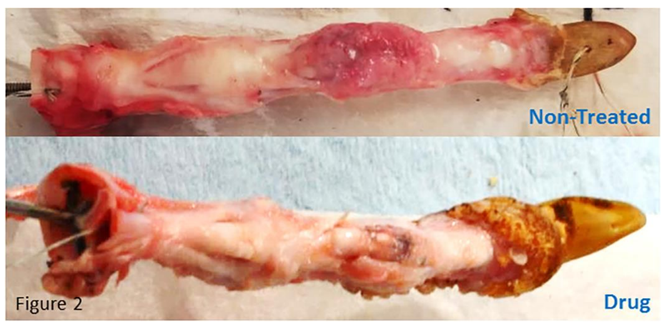
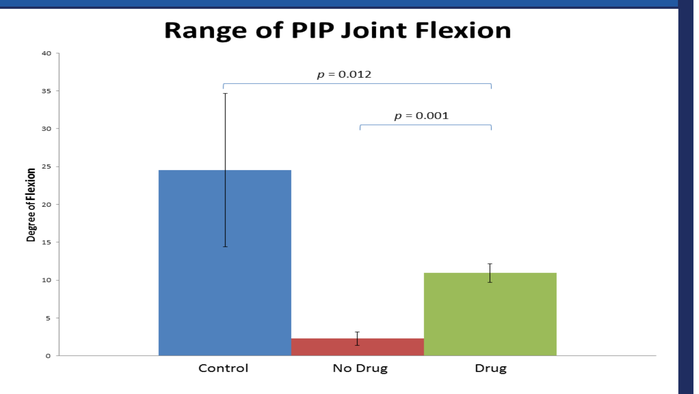


Figure 3. PIP joint motion



Discussion and Conclusion

Pentamidine treatment resulted in:

- Reduced adhesion formation
- Higher degree of flexion
- Lower adhesion scores
- Reduced strength of repaired tendon (Not statistically significant, possibly due to anti-inflammatory property of drug)
- Pilot data shows potential promising results in reducing adhesion formation after tendon repair.

Future larger studies with longer time points are required to better understand the effect of pentamidine on flexor tendon healing.

References

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