Human amniotic membrane as adjunct to nerve and tendon repair in the lower extremity

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Statement of Purpose

Post-operative scar tissue and adhesion development is inherent to foot and ankle surgery. This complication is particularly problematic following the release of nerve entrapments and fibrous tendon repairs. The development of adhesions following these procedures is common and the resulting complications significant with recurrent pain, limited motion and/or neuroma resulting. The ability to limit scar and adhesion formation following these challenging procedures would have significant positive impact on patient satisfaction and post-operative outcomes.

Literature Review

The development of post-operative scar tissue and adhesions is inherent to foot and ankle surgery. Two areas in which this complication is particularly challenging are in the release of nerve entrapments and fibrous tendon repairs. The goal of nerve release surgery, such as tarsal tunnel release, is to decompress the affected nerve. Post-operative scar formation re-establishes that unwanted incarvation leading to impingement of vascularity and limitation of nerve gliding thus precipitating the return of symptoms1. Due to the commonality of this issue in tarsal tunnel release, the use of barrier techniques have been advocated to insulate the posterior tibial nerve from recurrent compression4. A number of materials have been considered for such a role, including medical grade silicone, polyurethane, polyethylene, and collagen. The advantages of these materials include the ability to prevent adhesions and reduce scar formation, which has been shown to potentially improve outcomes following nerve release and tendon repair. However, the use of these materials has been limited due to the challenges associated with their incorporation into clinical practice. A recent study by Liu et al. investigated the use of cryopreserved amniotic membrane as an adjunct to nerve and tendon repair in the lower extremity, highlighting its potential benefits in improving surgical outcomes11.

Case 1

A 65 year old African American male presented with 1 year history of neuropathic pain to right lower extremity. Driven to the area. The patient had no previous medical history benign and non-contributory. MRI analysis revealed a high grade intrasubstance tear of the peroneus brevis tendon, without complete tendon tear or tendinous retraction as well as a low grade intrasubstance tear of the peroneus longus tendon. The patient healed uneventfully and is currently 5 months post-op. She has finished physical therapy and is currently painfree without signs/symptoms of adhesions.

Case 2

The patient was a 59 year old African American female who presented with complaint of pain to the outside of the right ankle x 1 month duration. Patient described pain as constant and dull in nature with no history of trauma. Denied any history of trauma. Previous treatments included both low dye tapping, anti-inflammatory medications and immobilization in fracture boot with no significant improvement in symptoms. Past medical history significant for obesity and PVD, otherwise non-contributory. Upon physical examination, pain was noted to palpation of peroneal tendon course from posterior to lateral malleolus as well as at insert into 5th metatarsal base. Pain was also noted with maximal inversion. Minimal muscle testing revealed pain with eversion through strength was maintained. Pedal and ankle joint range of motion was noted to be full. Increase in medial longitudinal arch height noted. Physical examination was otherwise unremarkable.

Radiographic evaluation was positive for findings consistent with high arch foot type but otherwise unremarkable. MRI analysis revealed a high grade intrasubstance tear of the peroneus brevis tendon, without complete tendon tear or tendinous retraction as well as a low grade intrasubstance tear of the peroneus longus tendon (Figure 2a,b). The superficial peroneal retinaculum was repaired and tendons noted to move freely without subluxation. Deep, subcutaneous and skin closures were performed in routine fashion. A post-operative splint was applied.

Pathology report of excised peroneal brevis tendon was significant for fibrilloglomerous tendinous tissue with mild degeneration. Post-operative course consisted of 2 weeks non-weight bearing in posterior splint. Patient was then allowed appropriate weight bearing in fracture boot for 4 weeks. The patient was then allowed weight bearing in boot or brace at 6 weeks post-op. Physical therapy was started at 6 weeks post-op.

Patient healed uneventfully and is currently 5 months post-op. She has finished physical therapy and is currently painfree without signs/symptoms of adhesions.

Analysis and Discussion

Human amniotic membrane has been proven to have anti-inflammatory, anti-scar, and anti-angiogenic affects with support in the ophthalmic literature11,12. Existing research in animal models has shown significant decrease in scar and adhesion formation in both nerve and tendon repair in comparison to control13–15. To date, there have been no published studies on the effectiveness of HAM augmentation on nerve or tendon repair in a human model. The results of this case study provide support for this potential benefit.

Figure 2a,b. MRI analysis revealing a high grade intrasubstance tear of the peroneus brevis tendon, without complete tendon tear or tendinous retraction as well as a low grade intrasubstance tear of the peroneus longus tendon.

Figure 3. Peroneus brevis tendon ensheathed in human amniotic membrane following repair.

Figure 4a,b. Wrapping of the posterior tibial nerve with cryopreserved human amniotic membrane.

References