Human Placental Allograft: Does it Decrease Postoperative Pain in Tendon Repair and Debridement?

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Introduction

Lower extremity tendon repair and debridement can be associated with post-operative risks. In particular, pain levels may increase postoperatively due to the development of tissue adhesions and fibrosis. This can contribute to extended postoperative rehabilitation and ultimately may result in poor patient outcomes.[1]

Recently, attention has been turned to the use of biologic adjuncts such as human placental allografts to provide additional support to tendon repairs as they have been found to demonstrate anti-inflammatory, anti-microbial, anti-adhesive, and anti-fibrotic properties. These properties have been well-described in the ophthalmology literature, demonstrating a reduction in postoperative inflammation, pain, and adhesion formation.[2]

Use of these allografts has since expanded into other surgical fields including maxillofacial, gynecologic, and now orthopaedic surgery.[3,4] By capitalizing on these properties to minimize the postoperative adverse events of adhesions, fibrosis, and inflammation, the use of placental allograft may contribute to decreased postoperative pain and improved surgical outcomes. However, there is limited data on both short- and long-term patient outcomes to support the regular use of these adjuncts in orthopaedic foot and ankle surgery.

The purpose of this study was to compare postoperative pain scores in patients undergoing achilles or peroneal tendon repair or debridement with adjunctive human placental allograft compared to patients who underwent repair or debridement without allograft.

Methods

All patients who underwent achilles tendon repair, peroneal tendon repair, or peroneal tendon debridement performed by one fellowship trained orthopaedic foot and ankle surgeon at a single institution from January 1, 2022 to February 10, 2023 were included in the study. Patient demographic data including age and sex was collected. Surgical data including CPT code, procedure type (achilles tendon repair, peroneal tendon repair, or peroneal tendon debridement) was collected. Pain scores were obtained at preoperative and two week postoperative clinic visits from nursing assessment notes. These were numerical pain scales based on a 0-10 point scale. Data on preoperative and postoperative pain scores are presented as means.

SAS statistical software was used to perform t-score analyses in order to compare mean pain scores at two weeks postop between patients undergoing repair or debridement with graft versus without graft. Patients were then further stratified by type of tendon repair or debridement (achilles or peroneal) and those who had allograft were compared to those who did not using the same mean and t-score analysis.

Results

A total of 44 patients underwent either achilles tendon repair, peroneal tendon repair, or peroneal tendon debridement between January 1, 2022 and February 10, 2023. Of these patients, 19 had their repair or debridement augmented with allograft, while 25 did not.

Of the patients who underwent allograft, 13 (68.42%) were male, while 6 (31.58%) were female. Of those without allograft, 11 (44%) were male, while 14 (56%) were female. The average age in both groups was 42.16 years old. The mean preop pain score in the allograft patients was 3.31. The mean preop score in the patients without allograft was 4.24. The mean pain score at 2 weeks postop was 2.37 in the allograft patients, compared to 3.00 in the patients without allograft ($p = 0.63$).

Of the 44 total patients, 17 (38.64%) underwent achilles tendon repair. Of these patients, 9 (52.94%) were augmented with allograft, while 8 (47.06%) were not. Of the 9 patients who underwent allograft, 7 (77.78%) were male and 2 (22.22%) were female. Of the 8 patients who did not receive allograft, 6 (75%) were male and 2 (25%) were female. The mean age in the allograft group was 41.56, compared to 43.75 in the group

without allograft. The mean preoperative pain score in the allograft group was 2.44, compared to 3.50 in the group without allograft. Postoperatively at 2 weeks, the allograft group had a statistically significant decrease in pain score to 0.88 compared to 3.13 in the group without allograft ($p < 0.05$).

Of the 44 total patients, 27 (61.36%) underwent peroneal tendon repair or debridement. Of these patients, 10 (37.04%) were augmented with allograft, while 17 (62.96%) were not. Of the 10 patients who underwent allograft, 6 (60%) were male and 4 (40%) were female. Of the 17 patients who did not receive allograft, 5 (29.41%) were male and 12 (70.59%) were female. The mean age in the allograft group was 42.70, compared to 41.41 in the group without allograft. The mean preoperative pain score in the allograft group was 4.10, compared to 4.59 in the group without allograft. At 2 weeks postop, these pain scores decreased to 3.70 in the allograft group and 2.94 in the group without allograft ($p = 0.6$).

Discussion

While there are several surgical techniques described for tendon repair and debridement, data on the use of human placental allograft in orthopedic foot and ankle surgery is lacking. Steginsky et al in 2016 reported that over 25% of these patients have postoperative complications such as pain, while persistent swelling can be seen in almost 20%.[5] Preventing these postoperative complications—perhaps with the use of human placental allograft—allows patients to recover faster and with improved outcomes.

A 2017 retrospective single center study looked at using Stravix placental tissue as an adjunct surgical wrap in the repair of ruptured tendons in five patients with an average age of 31.[6] Their cohort of consisted of 2 patients with ruptured peroneus brevis tendons, 2 patients with ruptured achilles tendons, and 1 patient with a rupture posterior tibial tendon. Their study looked at postoperative pain scores at 1 week, postoperative adverse events through 2 years, and if there was a reduction in pain from preop. They found that 40% of patients reported no pain at 1 week postop. There were no postoperative adverse events such as dehiscence, infection, fluid collection, or drainage. All 5 patients reported a reduction in pain from preop.

Our study demonstrates similar findings of reduction in pain from preop and a decreased postoperative pain score at 2 weeks in patients with allograft compared to those without. While the combined analysis from this study is not yet statistically significant given the sample size, it does demonstrate a trend. Patients with allograft had lower postoperative pain scores compared to those without. Additionally, when stratified by type of tendon repaired, the patients who underwent achilles tendon repair with allograft demonstrated a statistically significant lower postoperative pain score compared to those without allograft.

Surgical Technique

The same surgical technique was used to implement the human placental allograft in both achilles and peroneal repair or debridement in order to minimize scar tissue and

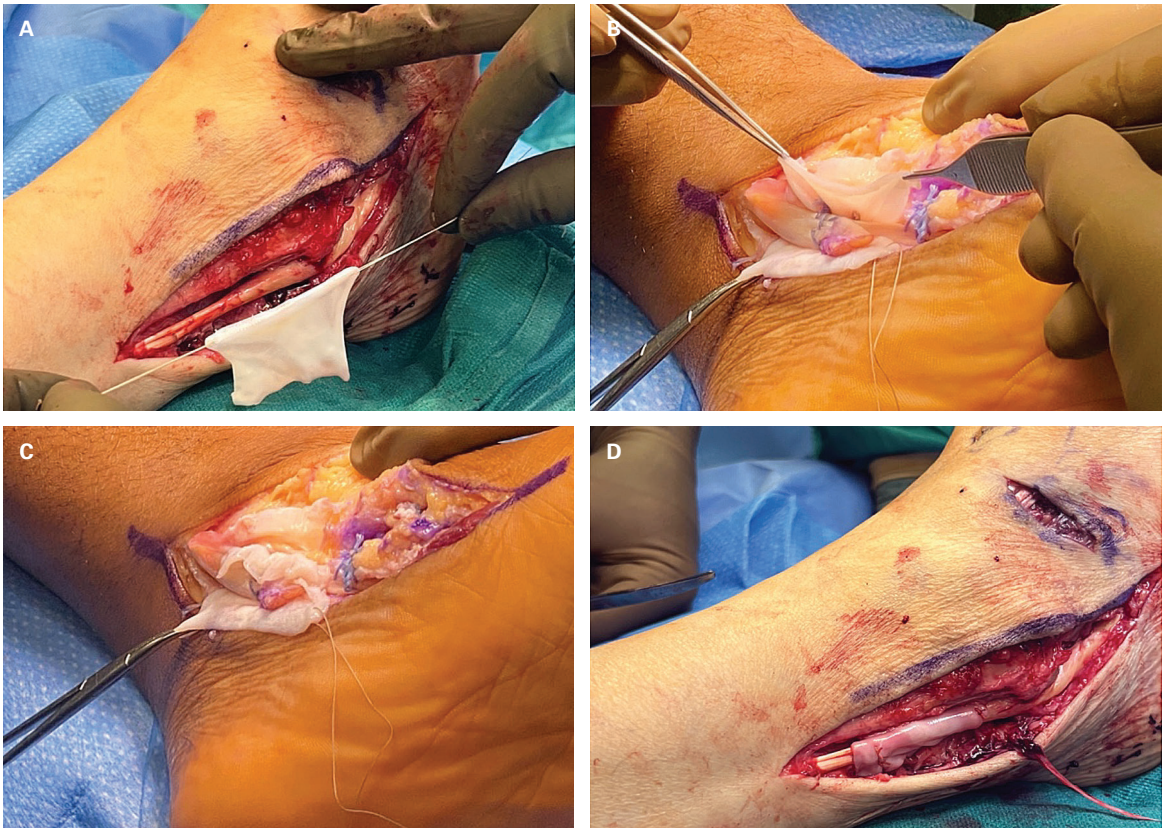

Figure 1. Surgical technique for allograft use in peroneal tendon repair. **(A)** Allograft prepared with 3-0 vicryl suture on two corners; **(B)** Passing allograft beneath peroneal tendon; **(C)** Suturing allograft in place to tendon; **(D)** Completed peroneal tendon repair with allograft wrapped circumferentially

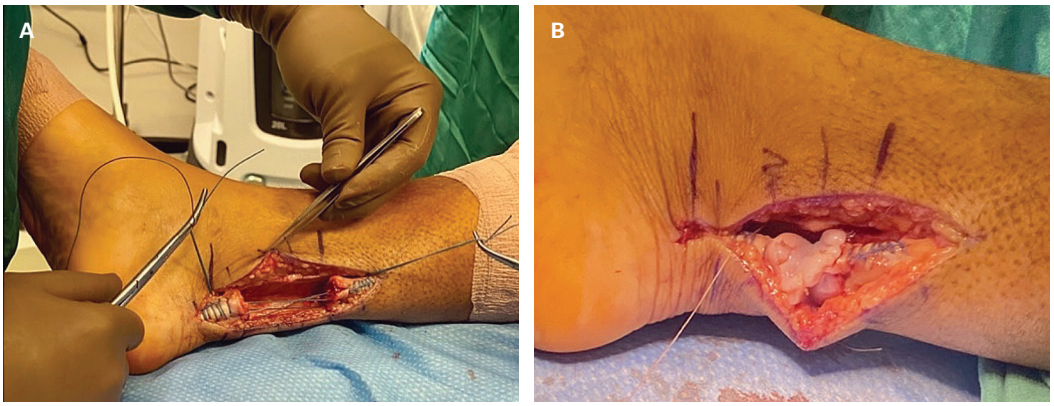

Figure 2. Use of allograft in achilles tendon repair. **(A)** Achilles tendon repair before allograft; **(B)** Achilles repair with allograft wrapped circumferentially around tendon.

Table 1. Complete Data

Characteristic	Graft (n = 19)	No Graft (n = 25)
Tendon		
Achilles	9 (47.37%)	8 (32%)
Peroneal	10 (52.63%)	17 (68%)
Sex		
Male	13 (68.42%)	11 (44%)
Female	6 (31.58%)	14 (56%)
Age (mean)	42.16	42.16
Pain score (mean)		
Preop	3.31	4.24
Postop (2 weeks) p = 0.63	2.37	3.00

Table 2. Stratified Data

	Achilles (n = 17)		Peroneal (n = 27)	
Characteristic	Graft (n = 9)	No Graft (n = 8)	Graft (n = 10)	No Graft (n = 17)
Sex				
Male	7 (77.78%)	6 (75%)	6 (60%)	5 (29.41%)
Female	2 (22.22%)	2 (25%)	4 (40%)	12 (70.59%)
Age (mean)	41.56	43.75	42.70	41.41
Pain score (mean)				
Preop	2.44	3.50	4.10	4.59
Postop (2 weeks)*	0.88	3.13	3.70	2.94
	*p = 0.01		*p = 0.60	

inflammation postoperatively. First, one 3-0 vicryl suture was passed through a proximal corner of the allograft. Then a second 3-0 vicryl suture was passed through a distal corner on the same side of the allograft as the previous suture.This technique allowed for improved control of the graft and the application of gentle tension to make wrapping the desired tendon easier. The allograft was then wrapped circumferentially around the tendon at the site of repair, passing it underneath the tendon while holding onto the proximal and distal vicryl sutures. These sutures were then passed back through the opposite corner to wrap the allograft around the tendon. These were tied sequentially. A third 3-0 vicryl suture was used to anchor the allograft to the tendon to keep it in place. In peroneal debridement or repair, the allograft was wrapped around the more diseased tendon (not both) at the site of maximal adhesion in order to prevent further adhesions with the other peroneal tendon.

Conclusion

Lower extremity tendon repair and debridement can be associated with increased postoperative pain due to the development of tissue adhesions, fibrosis or inflammation. While several surgical subspecialties have adopted the use of human placental allograft for their anti-inflammatory, anti-microbial, anti-adhesive, and anti-fibrotic properties, there is limited data to support the regular use of these in orthopedic foot and ankle surgery.

Data on 44 patients from one orthopedic foot and ankle surgeon at a single institution demonstrate a trend in decreased postoperative pain at two weeks in patients undergoing tendon repair or debridement with adjunctive allograft compared to those without allograft. Future studies are necessary to demonstrate statistical significance in a larger cohort of patients with longer follow up.

References

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