

# Return to Play Following Injection of Micronized Amniotic Membrane Derived from the Umbilical Cord for Hamstring Tears in College Football Players

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## Background

Muscle injuries account for one-third of all injuries that result in loss of playing time, with the hamstring being the most commonly injured muscle in major sports.<sup>1, 2</sup> While rehabilitation programs serve as the foundation of treating acute hamstring injuries, injections of corticosteroid and platelet rich plasma have been increasingly used to expediate recovery and return to play. Nevertheless, complications, such as fibrosis, degeneration, and muscle contracture have been reported, and the clinical benefit is unclear due to conflicting evidence,<sup>3-9</sup> suggesting the need for novel treatments that aid in regenerative healing by minimizing both inflammation and scarring.

Cryopreserved Amniotic Membrane (AM) has been increasingly used in orthopedics and sports medicine due to their anti-inflammatory, anti-scarring, and pro-regenerative properties.<sup>10-13</sup> Given its widespread clinical benefit in orthopedics, we evaluated whether injection of micronized AM can aid in the functional recovery and return to play of college football players with hamstring injuries.

## Methods

A single-center, retrospective chart review was performed on consecutive college football players who sustained hamstring tears and were subsequently managed with single injection of sterile, micronized AM derived from placenta and umbilical cord (Clarix® Flo; BioTissue, Miami, FL).

Exclusion criteria included less than 6 months of follow-up and a history of recurrent/previous injury within the last year. Diagnosis was based on history, clinical and ultrasound exam, and magnetic resonance imaging.

All patients were initially treated with athletic training directed treatment modalities, physical therapy, activity modification, and nonsteroidal anti-inflammatory medications for 7 days. Patients also received injection of 50 or 100 mg AM within 5 days of injury, which was reconstituted in 2cc of 1% lidocaine without epinephrine and injected under ultrasound-guidance at the site of injury. All patients followed the same rehabilitation protocol and sport return progression post-injection.

## Results

Six male athletes with hamstring tears met the eligibility criteria and were included for analysis. The patients played football in the following positions: wide receiver (n=2), offensive line (n=1), linebacker (n=1), running back (n=1), and defensive line (n=1).

Athletes returned to play  $33.3 \pm 17.8$  days (range: 20-69) post-injury, with five of six (83.3%) athletes returning to play within 4 weeks. The four athletes with partial tears (grade 2) returned to play at an average of  $25.8 \pm 3.9$  days (range: 20-28) post-injury. One athlete with a partial to full thickness tear returned to play at 28 days, and one athlete with a complete tear (grade 3) returned to play 69 days post-injury. No complications or re-injuries occurred during the follow-up period of 6 months.

**Table 1. Demographics and Treatment Outcomes**

Case	Age (years)	Position	BMI (kg/m <sup>2</sup> )	Grade	Dose (mg)	RTP (Days)
1	20	WR	23	2	50	28
2	21	OL	25	2	100	27
3	20	DL	36	2	50	28
4	20	RB	30	2	50	20
5	21	LB	30	3	50	69
6	18	WR	23	2±3	50	28

## Conclusions

Injection of micronized AM is a safe treatment that may enable quick return to play without reinjury in football players sustaining hamstring tears.

## References

- Shankar PR, Fields SK, Collins CL, Dick RW and Comstock RD. Epidemiology of High School and Collegiate Football Injuries in the United States, 2005-2006. *The American journal of sports medicine.* 2007; 35: 1295-303.
- Feeley BT, Kennelly S, Barnes RP, et al. Epidemiology of National Football League Training Camp Injuries from 1998 to 2007. *The American journal of sports medicine.* 2008; 36: 1597-603.
- Matev I. Isolated contracture of the long head of biceps femoris muscle. *International orthopaedics.* 1991; 15: 167-8.
- Moraes VY, Lenza M, Tamaoki MJ, Faloppa F and Belloti JC. Platelet-rich therapies for musculoskeletal soft tissue injuries. *The Cochrane database of systematic reviews.* 2013: Cd010071.
- Sheth U, Simunovic N, Klein G, et al. Efficacy of Autologous Platelet-Rich Plasma Use for Orthopaedic Indications: A Meta-Analysis. *JBJS.* 2012; 94: 298-307.
- Seow D, Shimozono Y, Tengku Yusof TNB, Yasui Y, Massey A and Kennedy JG. Platelet-Rich Plasma Injection for the Treatment of Hamstring Injuries: A Systematic Review and Meta-analysis With Best-Worst Case Analysis. *The American journal of sports medicine.* 2021; 49: 529-37.
- Reurink G, Goudswaard GJ, Moen MH, et al. Rationale, secondary outcome scores and 1-year follow-up of a randomised trial of platelet-rich plasma injections in acute hamstring muscle injury: the Dutch Hamstring Injection Therapy study. *British journal of sports medicine.* 2015; 49: 1206-12.
- Gultekin S and Cross T. The Franklin-Naismith Lesion: A Severe Variant of Hip Pointer. *Orthopaedic journal of sports medicine.* 2019; 7: 2325967118820507.
- Connell DA, Jhamb A and James T. Side strain: a tear of internal oblique musculature. *AJR American journal of roentgenology.* 2003; 181: 1511-7.
- Tseng SC. HC-HA/PTX3 Purified From Amniotic Membrane as Novel Regenerative Matrix: Insight Into Relationship Between Inflammation and Regeneration. *Investigative ophthalmology & visual science.* 2016; 57: ORSFH1-8.
- Tseng SC, Espana EM, Kawakita T, et al. How does amniotic membrane work? *The ocular surface.* 2004; 2: 177-87.
- Ackley JF, Kolosky M, Gurin D, Hampton R, Masin R and Krahe D. Cryopreserved amniotic membrane and umbilical cord particulate matrix for partial rotator cuff tears: A case series. *Medicine.* 2019; 98: e16569.
- Duru N, Williams GK and Jones D. A comparative, controlled, retrospective study of patient reported outcomes after meniscectomy with adjunctive use of platelet-rich plasma or amniotic membrane/Umbilical cord particulate. 106th Annual Meeting of the Clinical Orthopaedic Society. Austin, TX2018.
- Connell DA, Schneider-Kolsky ME, Hoving JL, et al. Longitudinal study comparing sonographic and MRI assessments of acute and healing hamstring injuries. *AJR American journal of roentgenology.* 2004; 183: 975-84.