Advances in Quadriceps Muscle Strain Injury Recovery Time in Soccer Players

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Soccer Injury Prevention Strategies

We welcome a new regular contributor the Professional Soccer Athletic Trainers Society (PSATS) to Performance Conditioning Soccer. Each submission will provide coaches, parents and athletes with the latest strategies in prevention injury and maintaining a healthy soccer lifestyle. The mission of the Professional Soccer Athletic Trainers Society (PSATS) is to serve as an educational resource for the Major League Soccer athletic trainers. PSATS serves its members by providing for the continuing education of the athletic trainer as it relates to the profession thereby improving the athletic trainers understanding of sports medicine as it relates to soccer. PSATS strives to improve the education of its members so that they may better serve Major League Soccer, their organizations, and the professional soccer players under their care. PSATS also serves as an educational resource for those outside of the professional soccer community to better educate them on the role of the athletic trainer within the sports medicine team. Thank you PSATS! -ed

Case study:

Autologous Fat Grafting as an Autologous Regenerative Matrix in an Acute Rectus Femoris Strain in a Professional Soccer Player

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INTRODUCTION

Autologous Fat Graft (AFG) as an Autologous Regenerative Matrix (ARM) [Ref Albano] and Platelet Rich Plasma (PRP) [Ref Mishra, Finoff] have been described for chronic musculoskeletal (MSK) conditions. Albano and Alexander briefly described the rationale for use of AFG in a chronic patellar tendon tear.

For high level athletes, a prolonged or even normal recovery time is undesirable and may result in missing an important game. In our experience, PRP has been used successfully to decrease recovery time with acute muscular strains and sprains. What other acute strain PRP articles?
However, when a professional soccer player presented with a grade II rectus femoris strain 6 days prior to a playoff game, AFG as an ARM was considered to enhance the recovery.

**CASE REPORT**

A 30 year-old male professional soccer player (who will be referred to as SP) experienced sudden onset right proximal anterior thigh pain while sprinting during a game. He was immediately withdrawn and evaluated. There was weakness and diminished Range of Motion (ROM) with hip flexion and knee extension, but no palpable defect in the quadriceps musculature. SP was diagnosed clinically with a grade II-III quadriceps muscle strain. The usual RICE treatments were instituted immediately. NSAID use was stopped until a treatment was decided.

MR imaging confirmed a grade II rectus femoris muscle strain in the proximal musculature lateral to the central tendon slip. Signal enhancement, signifying edema and hemorrhage, was seen in and around the proximal musculotendinous junction of the right rectus femoris.

MSK Ultrasound (US) the following day revealed extensive edema and a muscle fiber disruption just lateral to the central slip of the proximal rectus femoris tendon and extending much of the depth of the muscle belly.

The next round of the playoffs was 8 days from the injury and 6 days from evaluation by the author (JA). The most rapid resolution of this injury was desired by all involved. Conservative treatment alone would not enable SP to participate in the next game in this brief time interval. The training staff, physicians, and athlete decided to pursue a regenerative medicine option as this has been shown to decrease the amount of recovery time. AFG with PRP was the chosen treatment.

Sixty mL of whole blood was processed to obtain 10cc of PRP using a Harvest Technologies Smart PReP system. Five cc of autologous fat was obtained from the right flank using standard lipoaspiration procedures and mixed with 3cc of PRP. Using direct ultrasound-guidance, the Autologous Regenerative Matrix consisting of the fat graft mixture was injected into the site of muscle injury, which was noted to be lateral to the central tendon slip. The remaining 7cc of PRP was placed into and around the strain. NSAID use was avoided. Tylenol and ice for 10-15 minutes were allowed for pain relief as needed.

The day after the procedure (2 days after the injury), SP began a rehabilitation program consisting of passive stretching, core stabilization and eccentric exercises in a pool twice daily. After four days, pool workouts were increased to four times daily and gradually progressive field exercises were incorporated. On the morning of the sixth day, SP reported minimal pain, good ROM, and was able to sprint in practice. SP and his athletic trainer decided that he would attempt to play in the next playoff game scheduled that night. SP played 83 minutes and denied any thigh pain during or after the game. During the off-season, SP continued an at home rehab program and has not had any residual pain, weakness, or re-injury in the 8 months following the injury. A 5 month follow-up MRI showed near complete resolution of the muscle injury.

**DISCUSSION**

Acute muscle injuries are extremely common among recreational and elite athletes. Soccer players are especially prone to this injury. Lower extremity muscle strains constitute one-third of all injuries in professional European soccer players [Ekstrand-Pedim]. Current initial conservative treatment consists of RICE, a short course of NSAIDs,[JAAOS, optimising] (which may impair muscle healing) [almekinders]), a short period of immobilization (2 to 6 days), then progressive rehabilitation including trunk stabilization, stretching and eccentric strengthening [optimising].

PRP has been used to treat acute muscle injuries [Hamilton papers and Hammond] and AFG with PRP may accelerate muscle repair in animals [JBJS]. Laboratory studies show that adipose-derived mesenchymal stem cells (ADSCs) from the AFG have myogenic potential [Meligy, Di Rocco, Collins]. The use of AFG as part of an ARM may be a useful regenerative therapy option for chronic and acute MSK injuries. However, the use of AFG in combination with PRP as an ARM for these injuries in humans has not been described in the literature.

The average time taken for athletes with muscle strains to return to play is variable and ranges from weeks to months. SP suffered from a grade II rectus femoris strain and returned to play 6 days after treatment with AFG as an ARM. In one report, professional soccer players with a grade II hamstring muscle strain returned to play on average 22 days after the injury [Ekstrand Ham]. It has been found that earlier return to play is associated with recurrent injuries [JAAOS]. Especially in elite athletes, the risks of early return to play must be communicated and cautioned effectively. It is unknown whether injuries treated with AFG or PRP have the same re-injury rate. However, at the time of article submission, SP was 11 months out from his injury and has not had a recurrence. Current status is no recurrence to the affected area. The tendency for repaired muscle strains to re-injure during the early recovery period may be due to the biomechanical differences between the native skeletal muscle and the newly formed collagen. The young collagen in these early phases of recovery has less elasticity than the native tissue but has yet to develop the tensile strength necessary to fully withstand the contractile forces. The ADSCs may allow the more elastic skeletal muscle to regenerate during the early phases of healing, potentially lessening its risk to re-injury. Further, repairing the damaged muscle with regenerated muscle instead of fibrous tissue may allow for better long term function and strength due to the maintained contractility [Matziolis]. Additional research is needed to further answer these questions.

**Conclusion**

There is in vitro and animal evidence that the use of AFG to treat muscle injuries may expedite recovery and improve
function. [JBJS, Meligy, Di Rocco, Collins] Our patient experienced an extraordinary recovery from his acute muscle injury. However, further research is warranted to elucidate its efficacy, safety, and indications for use.

REFERENCES