Case Reports


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Keywords: Platelet-Rich Plasma Injection, Groin Pain, soccer, adductor-related groin pain

https://doi.org/10.26603/001c.120209

Introduction

Adductor-related groin pain involves an injury to the common aponeurosis connecting the rectus abdominus and adductor longus to the pubis. It commonly occurs in sports that require cutting and pivoting and can result in significant loss of playing time. Platelet-Rich Plasma (PRP) is often indicated for treatment of musculoskeletal disorders and may represent an alternative treatment for patients with adductor-related groin pain. The purpose of this case report is to describe the non-surgical management of adductor-related groin pain in a competitive soccer player with a with an ultrasound (US)-guided PRP injection and physical therapy management.

Case Description

A 17-year-old male competitive soccer player with right-sided adductor-related groin pain was treated with an US-guided PRP and a multi-phased physical therapy regimen based on tissue healing and individual patient/criteria progression. The patient completed 12 physical therapy sessions over six weeks post PRP injection.

Outcomes

At the end of treatment, clinically meaningful improvements were observed in pain intensity, passive range of motion, strength (handheld dynamometry, Biodex), functional tests, psychosocial (OSPRO-YF) and patient-reported outcomes (HAGOS, LEFS). The subject returned to sport at six weeks post injection without limitation and at three months follow up, the subject reported that he had returned to 95% of his previous level of play.

Discussion

This case report may offer support for PRP as an alternative treatment in the management of adductor-related groin pain. Incorporation of PRP as an adjunct to physical therapy led to improvements on all outcomes that surpassed the clinical significance change criteria.

Level of evidence

5
INTRODUCTION

Groin pain is responsible for 8 to 18% of injuries in competitive soccer, with an incidence of 0.8 to 1.3 groin-related injuries per 1,000 hours of athletic exposure.1–3 Adductor-related groin pain is most prevalent in sports requiring pivoting, cutting, kicking, and change of direction.4 The patho-anatomy involves weakening of or chronic tensile overload at the common attachment of the distal rectus abdominus and proximal adductor longus tendon.5–8 Symptoms are typically unilateral and exacerbated by sudden sport specific movements.5,9–11 Pain is often localized to the medial groin and may radiate to the perineum, adductors, distal rectus insertion, inguinal ligament, and/or testicular area.5,6

Treatment options include both nonoperative and operative interventions. Depending on the timing of competitive play (whether preseason or in season), initial treatment focuses on rest, anti-inflammatory medication, and/or physical therapy.5,6,8,12 However, nonoperative management has been poorly defined, with outcomes following non-surgical management inconsistently reported.4,12 Furthermore, results after use of corticosteroid injections are inconclusive and have been shown to only provide temporary relief that eventually leading to a surgical intervention.12,13 Surgical intervention has been shown to be more effective than nonsurgical options, however, surgical intervention has risks and access to surgeons that treat adductor-related groin pain may be limited.14 Additionally, surgical intervention may lead to a substantial amount of time loss from competitive play or be season ending.4,12

Platelet-Rich plasma (PRP) has been advocated for use in augmenting the healing progression in chronic injuries and acceleration of acute tissue repair by releasing biologically active elements to help in revascularization and regeneration of connective tissue.15 Further, there is evidence to support the use of PRP in tendinopathic pathologies.8,16–20 Consequently, PRP may represent a novel modification to the rehabilitation of individuals with adductor-related groin pain with the potential of avoiding surgery, improving outcomes while decreasing time loss from sport. This case describes the non-surgical management of adductor-related groin pain in a competitive soccer player with an US-guided PRP injection and accelerated physical therapy management.

CASE DESCRIPTION

A 17-year-old competitive soccer player presented to a sports medicine clinic with right-sided chronic groin pain of six months in duration. The injury occurred as he planted with his left leg and struck the ball with his right leg. He noted immediate sharp, stabbing pain along his pubic bone. He reported that his shot was rushed by the defender and as he planted with his left leg and he “over kicked” with his right leg. He initially rested from athletic activities, but symptoms returned upon resumption of sprinting and soccer-specific activities.

During the initial examination, he reported 0/10 pain level at rest, and 9/10 pain level with activity. His examination revealed localized tenderness and pain in the inguinal canal along the right adductor longus origin and lateral to the umbilicus and distally to the pubis consistent with the insertion site of rectus abdominis. Resisted adductor and partial sit-up tests were provocative for pain and symptom exacerbation. Pain decreased with rest, modification of soccer specific activities, and ice. His goal was to decrease pain associated with soccer related activities and to return fully to his previous competitive level activity.

OUTCOME MEASURES

PATIENT REPORTED OUTCOMES

To assess hip and groin symptoms, activity limitations, participation restrictions in daily living and sport, and quality of life, the Copenhagen Hip and Groin Outcome Score was used. The HAGOS has been validated in young to middle aged, physically active individuals with hip and groin pain.21 The HAGOS consists of 6 subscales, 7-item symptom assessment scale, 5-item limitation in activity and daily living scale, 8-item limitation in sport participation scale, 2-item participation in physical activity scale, and 5-item quality of life scale. Each subscale is scored on 5-point Likert scale. Scores in each subscale are summed and divided between maximum score achievable in each subscale and then multiplied by 100. Higher score indicates decreased hip and groin dysfunction. The ICC for the individual HAGOS subscales is between 0.82 to 0.92.21 MCIDs for the HAGOS subscales are symptom assessment (>10), restrictions in activities of daily living (>11.2), pain (>9.8), physical activity (>16.9), quality of life (>12.7), restriction sport participation (>13.1).22–24

The Lower Extremity Functional Scale was used to assess the patient’s lower extremity orthopedic function. The LEFS consists of 20 items, scored from 0 (extremely difficult or unable to do) to 4 (no difficulty). The score is summed and higher scores indicate increased lower extremity function, while lower scores indicate decreased lower extremity function. The ICC for the LEFS is 0.94 in individuals with lower extremity, musculoskeletal dysfunction.25 MCIDs for the LEFS is 9 points.25

The Patient Specific Functional Scale was utilized to assess the patient’s overall function by identifying three patient specific important activities presently limited by their groin pain. The patient was then asked to score each activity from 0 (unable to perform the activity) to 10 (fully able to perform the activity with restriction) based on their preinjury level. The PSFS is a valid and reliable instrument (ICCs = 0.71-0.85) with a MCID of 1.2 points.26

PSYCHOSOCIAL PRESENTATION

The OSPORT Yellow Flag Assessment Tool is a 17-item questionnaire that includes items from pain susceptibility (negative coping and fear-avoidance) and confrontation (positive coping and self-efficacy) domains.27 The OSPORT-YF was used to screen for pain-related psychosocial distress
with higher scores indicating higher levels of psychosocial distress. The OS PRO has been shown good concurrent validity with pain intensity and functional disability across anatomical regions.

**IMPAIRMENT BASED OUTCOMES**

Strength was assessed through maximum voluntary isometric contractions using a handheld dynamometer (MicroFet 2, Hoggan Scientific LLC, Salt Lake City, UT, USA) for gluteus medius, adductor longus, and psaas and isokinetic testing (Biodex Medical System 2.0, Shirley, NY, USA) for quadriceps and hamstring. All dynamometer measurements were recorded in Newtons and included three trial for each measurement, with best of three recorded. The procedure for all testing positions, was to test the uninjured hip first, followed by the involved hip. The minimal detectable change for hip abduction is 35.5 N (ICC = .85), hip adduction is 30.8 N (ICC = .94), and hip flexion is 80.1 N (ICC = .76). All isokinetic measurements (ICC = .82- .95) were performed at 60 deg/sec and recorded for peak torque (ft/lbs).

Hip adductor strength was measured in lateral decubitus. The hip to be tested was placed on top and placed in slight extension with the knee fully extended, parallel to the table. The contralateral hip was positioned in 40° of flexion with 90° flexion at the knee. One examiner stabilized the pelvis with hands placed at the iliac and anterior iliac while a second examiner positioned the dynamometer force pad proximal to the lateral femoral condyle. The subject performed a maximal muscle contraction against the dynamometer force pad for five seconds to record a result.

Hip abductor strength was measured supine. The hip to be tested was placed in a neutral position. The contralateral leg was flexed with the patient’s foot fixed on the table. One examiner stabilized the pelvis with their hands along anterior iliac spines, the second examiner positioned the dynamometer force pad superior to the medial malleolus. The patient performed a maximal muscle contraction against the dynamometer force pad for five seconds to record a result.

Hip flexor strength was measured sitting. Both the testing hip and the contralateral hip were positioned in 90 degrees of flexion. One examiner stabilized the contralateral leg. The second examiner positioned the dynamometer proximal to the patella. The patient performed a maximal muscle contraction against the dynamometer force pad for five seconds to record a result.

Passive range of motion for hip flexion and abduction was measured with a 2 -arm goniometer, while passive hip internal and external rotation was measured with a bubble goniometer. All ROM measurements were recorded utilizing a two-tester method and for all testing positions, the uninjured hip was tested first, followed by the involved hip. The MDC for hip flexion is 8.2° (ICC = 0.97), hip abduction is 7.5° (ICC = .94), hip external rotation is 7.1° (ICC = .98) and hip internal rotation is 7.8° (ICC = .98).

Hip flexion ROM was measured supine with both legs extended on the table. The first examiner passively flexed the hip and knee of the testing leg to end ROM. The second examiner aligned a goniometer with the midline trunk and lateral femoral condyle. This method has a reported excellent interclass correlation coefficient (ICC) of 0.97, .35, .36

Hip abduction ROM was measured supine. The contralateral hip was positioned in slight abduction and the pelvis was stabilized by the first examiner. The second examiner placed the center of the goniometer on the testing hip anterior superior iliac spine (ASIS) and positioned the stationary arm of the goniometer towards the contralateral ASIS. The moving arm of the goniometer was aligned along the midline of the testing femur. The second examiner passively abducted the hip.

Hip external and internal rotation was measured prone. The leg test was placed in 0 degrees of hip extension and abduction with the knee flexed to 90 degrees. Examiner one stabilized the pelvis by placing their hands over the ischium, while passively moving the lower leg until first resistance was detected. The second examiner aligned a bubble inclinometer proximal to the medial malleolus in line with the shaft of the tibia. Performance based measures to assess power were measured through series hop testing (single leg, triple, and cross over hop). Measurements were recorded as limb symmetry index (LSI) and included three practice attempts prior to testing. The average of the three trials were calculated and LSI was recorded as the ratio of distance hopped on the injured side as a percentage of the distance hopped on the non-injured side. Reliability index for limb symmetry is (ICC = .92) for the single leg hop, (ICC = .88) for the triple hip, and (ICC = .84) for the cross over hop.

**EXAMINATION**

The subject was screened for associated intra and extra articular hip pathology, as well as lumbar pathology prior to determining adductor-related groin pain as the cause of symptoms. There was no tenderness along the lumbar spine with full, pain free lumbar range of motion. There was intact light touch sensation along dermatomal patterns with normal low extremity reflexes. Straight leg raise and slump test were negative bilaterally. Hip flexion, abduction, and internal rotation (FADIR) as well hip flexion, adduction, and internal rotation (FABER) were assessed to rule out femoroacetabular impingement (FAI) pathology. Both tests reproduced his groin pain, however symptoms were mild. Resisted partial sit-up and leg adduction tests did reproduce symptoms.

Passive range of motion (PROM) of hip was limited to 115 degrees of flexion with 5/10 pain with associated muscle guarding, 30 degrees of abduction with 4/10 pain with associated muscle guarding, 31 degrees of internal rotation with 5/10 pain, and 30 degrees of external rotation with 2/10 pain. The patient presented with pain and weakness during stress testing using a hand-held dynamometer.
Figure 1. Pre-operative coronal short tau inversion recovery (STIR) magnetic resonance image reveals in (A) marrow edema within the right parasymphyseal pubis (solid arrow) and a central fluid cleft along the articular disc of the pubic symphysis (open arrow), and in (B) a left anterosuperior acetabulum labral tear. Sagittal proton density fat-suppressed sequence images demonstrate disc protrusions at L4/S and L5/S1 (C) and increased signal along the insertion of the left rectus abdominis (D) when compared to the right (E).

CLINICAL IMPRESSION

Due to the intimate association between FAI, acetabular labral tears, and adductor-related groin pain, a magnetic resonance imaging (MRI) was ordered. There was no evidence on MRI of an acetabular labral tear or cartilage defect. There was stripping of the common adductor/rectus abdominis aponeurosis from the anterior pubic body, right greater than left with mild articular cortical irregularity at the pubic symphysis (Figure 1). There were no findings to suggest iliopsoas or trochanteric bursitis. The surrounding muscles and tendinous attachments were normal. There was no soft tissue mass or muscular atrophy and the visualized intraperitoneal structures and somatic soft tissues of the pelvic sidewalls were also deemed normal. Based on the MRI findings, patient’s subjective complaints and mechanism of injury, and clinical objective findings, adductor-related groin pain was diagnosed. Given the timing of the injury (start of the high school season), commitment to overseas competitive academy post high school season (two months), and reluctance of the athlete to undergo surgical intervention due to anxiety of missing entire of high school season plus delay of overseas professional career, the athlete opted for an Ultrasound (US) guided PRP injection.

TREATMENT

Treatment consisted of an US-guided PRP Injection to the right adductor (MSS) followed by a multi-phased physical therapy program based on tissue healing and individual patient progression twice a week for six weeks.

ULTRASOUND-GUIDED PLATELET-RICH PLASMA INJECTION

The Arthrex Angel System (Naples, FL) was utilized to deliver platelet-rich plasma. The max centrifuge spin was 4000 RPMs with a starting volume of 60 ml of the patient’s own blood and a hematocrit setting of 4%. There was an average fold yield increase of a 5.76 platelet (PLT), 1.69 white blood cell (WBC), and .67 neutrophil (NE) obtained in PRP preparation relative to whole blood. Cellular concentrate included a PLT concentration of 1032.94 k/µL, WBC concentration of 8.55 k/µL, and a NE concentration of 1.81 k/µL. The adductor was identified with ultrasound, and a doppler was used to evaluate for any adjacent neurovascular structures. The injection site was cleansed with chlorhexidine, and sterile gel was applied. 5 ml of 1% lidocaine and 1 mL (40 mg/mL) of Depo Medrol were delivered through the 22-gauge ½ inch needle into the adductor tendon. Subsequently, 5 ml of PRP was delivered through a 20-gauge needle. (Figure 2A &B) Risks, including infection, bleeding, nerve damage, and pain at the injection site were thoroughly discussed with the patient.

PHYSICAL THERAPY INTERVENTION

Rehabilitation consisted of five phases: immediate post-injection (Phase 1 - 1-7 days), controlled motion (Phase 2 -
8-14 days), advanced strengthening (Phase 3-15-21 days), multi-planar strengthening (Phase 4 – 22-28 days) and return to sport (Phase 5-28-35 days). During the rehabilitation process, the patient attended scheduled orthopedic medical appointments for routine updates regarding the injection site and rehabilitation progressions. The details of the phased rehabilitation program are provided in Appendix 1.

Phase 1 consisted of managing post-op pain and swelling, minimizing post-injection muscle attenuation, limiting activities that increase intra-abdominal pressure, and implementing range of motion exercises. Phase 1 exercises included core/pelvic strengthening exercises in quadruped and side-lying and initiation of a walking/bike riding program.

Phase 2 involved gradually improving the patient’s lower extremity strength and neuromuscular control. The goals for this phase were to progress isotonic exercises, improve lower extremity neuromuscular control, begin a jogging program, and gradually return to light functional activities.

Phase 3 focused on increasing overall strength in the sagittal and frontal plane and implementing power production. The goals for this phase were to progress to aggressive and advanced lower extremity and core sagittal plane strengthening, initiate a plyometric and agility program, progress lower extremity balance on multiple uneven surfaces, initiate therapeutic exercises integrating neurocognitive reactive therapy and progress sprinting.

Phase 4 goals were to initiate lower extremity and core strengthening in the transverse plane, progress lower extremity weight training, progress agility, sprinting and plyometric activities, start a jump/landing program, and progress therapeutic exercises with neurocognitive reactive therapy and initiate non-contact practice sport-specific drills.

Phase 5 was the progression of jump/landing program, participation in sports practice, progression of cutting drills, and progression to full sports participation. Full return to sport occurred at six weeks after the injection.

OUTCOMES

Table 1 summarizes patient-reported and clinical outcomes at initial examination and discharge. The patient demonstrated improved hip and groin self-reported function, strength, range of motion, performance.

PATIENT REPORTED OUTCOMES

All patient reported and psychosocial based outcomes are listed in Table 1. The patient met MCID’s for the HAGOS subscales, as well as the LEFS (MCID = 11.5). The subject achieved their initial patient specific functional goals (kick a soccer ball and pivot while running and compete competitively in soccer and soccer workouts) without pain and limitation set at the initial evaluation. The subject received accolades for offensive player of the year following the completion of the season. He reported no limitation following physical therapy intervention.

PSYCHOSOCIAL OUTCOME

The OSPRO-YF questionnaire indicated a positive yellow flag for fear of physical activity at the initial evaluation. Following physical therapy, the patient was negative for fear of physical activity and had met MCID for fear of physical activity (MCID = 14.95). There were no other negative coping or pain susceptibility indicators identified during the initial examination.

IMPAIRMENT BASED OUTCOMES

All impairment-based outcomes are listed in Table 2. Passive range of motion was measured in flexion, abduction, external and internal rotation. The patient met MDC for hip flexion (8.2°) with a change of 10°, hip abduction (7.3°) with a change of 15°, hip external rotation (7.1°) with a change of 5°, but not internal rotation (7.8°) with a loss of one degree.

The patient demonstrated improvements strength of the hip flexors, abductors, and adductors compared to baseline. The patient met MDC for hip flexion (80.1 N), hip adduction (30.8 N), and hip abduction (35.5 N) with a change of 80.41 N in flexion, 80.41N in adduction, and 135.38 N in abduction. Isokinetic testing conducted at discharge revealed a 3.4% quadriceps deficit involved (right side peak torque = 126.6 ft/lbs) compared to uninjured (left side peak torque = 151.0 ft/lbs) and 23.7% stronger involved hamstrings (right side peak torque = 91.0 ft/lbs) compared to the uninjured side (left side peak torque = 73.5 ft/lbs). Limb sym-
Table 1. Patient reported outcome measures

<table>
<thead>
<tr>
<th>Patient Reported Outcomes</th>
<th>Initial</th>
<th>Discharge</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hagos-Total</td>
<td>48.7%</td>
<td>94%</td>
<td>45.3% (MDC ≥ 5.2)</td>
</tr>
<tr>
<td>Hagos-Symptoms</td>
<td>64.3%</td>
<td>96.4%</td>
<td>32.1% (MCID ≥ 10.2)</td>
</tr>
<tr>
<td>Hagos - Pain</td>
<td>87.5%</td>
<td>100%</td>
<td>12.5% (MCID ≥ 9.8)</td>
</tr>
<tr>
<td>Hagos - Daily Activity</td>
<td>100%</td>
<td>100%</td>
<td>0 (MCID ≥ 11.2)</td>
</tr>
<tr>
<td>Hagos- Functional Sport</td>
<td>85%</td>
<td>100%</td>
<td>15% (MCID ≥ 13.1)</td>
</tr>
<tr>
<td>Hagos- Participation</td>
<td>0%</td>
<td>87.5%</td>
<td>87.5% (MCID ≥ 16.9)</td>
</tr>
<tr>
<td>Hagos - Quality of Life</td>
<td>15%</td>
<td>80%</td>
<td>65% (MCID ≥ 12.7)</td>
</tr>
<tr>
<td>OSPROYF-FABQ-W</td>
<td>5.494</td>
<td>1.757</td>
<td>3.737% (MCID ≥ 7)</td>
</tr>
<tr>
<td>OSPROYF-FABQ-PA</td>
<td>20.456*</td>
<td>5.5053</td>
<td>14.950% (MCID ≥ 4)</td>
</tr>
<tr>
<td>OSPROYF-TSK-11</td>
<td>18.587</td>
<td>14.442</td>
<td>4.145% (MCID ≥ 10)</td>
</tr>
<tr>
<td>OSPROYF-PCS</td>
<td>1.665</td>
<td>1.423</td>
<td>-0.242% (MCID ≥ 1.8)</td>
</tr>
<tr>
<td>OSPROYF-STAI</td>
<td>23.789</td>
<td>23.682</td>
<td>-0.169% (MCID ≥ 10)</td>
</tr>
<tr>
<td>OSPROYF-PSEQ</td>
<td>11.209</td>
<td>11.014</td>
<td>-0.195% (MCID = NE)</td>
</tr>
<tr>
<td>OSPROYF-SER</td>
<td>114.311</td>
<td>120</td>
<td>-5.689% (MCID = NE)</td>
</tr>
<tr>
<td>OSPROYF-CPAQ</td>
<td>71.349</td>
<td>78.415</td>
<td>-7.066% (MCID = NE)</td>
</tr>
<tr>
<td>Lower Extremity Functional</td>
<td>87.5%</td>
<td>98.8%</td>
<td>11.3% (MCID ≥ 9)</td>
</tr>
<tr>
<td>Pain Specific Functional</td>
<td>5</td>
<td>10</td>
<td>5%</td>
</tr>
<tr>
<td>Scale (1) (Kick a Soccer Ball)</td>
<td>0</td>
<td>10</td>
<td>10%</td>
</tr>
<tr>
<td>Pain Specific Functional</td>
<td>0</td>
<td>10</td>
<td>0%</td>
</tr>
<tr>
<td>Scale (2) (Pivot while Running)</td>
<td>0</td>
<td>10</td>
<td>10%</td>
</tr>
</tbody>
</table>

*Met MCID/MDC, *Positive for Psychological Yellow Flag, Piot Established, MCID = Minimal Clinically Important Difference, MDC = Minimal Detectable Change, HAGOS= The Copenhagen Hip and Groin Outcome Score, OSPRO-YF=Optimal Screening for Prediction of Referral and Outcome Yellow Flag Questionnaire, FABQ-W= Fear Avoidance Belief Questionnaire-Work Scale, FABQ-PA= Fear Avoidance Belief Questionnaire-Physical Activity Scale,TSK-11= Tampa Scale for Kinesiophobia-11, PCS= Pain Catastrophizing Scale, STAI=State Trait Anxiety Inventory, STAXI=State Trait Anger Expression Inventory, PHQ-9= Patient Health Questionnaire-9, PASS 20= Pain Anxiety Symptom Scale, PSEQ= Pain Self Efficacy Questionnaire, SER= Self Efficacy for Rehabilitation, CPAQ= Chronic Pain Acceptance Questionnaire

Table 2. Impairment-based clinical measures

<table>
<thead>
<tr>
<th>ROM</th>
<th>Pre-Involved Right</th>
<th>Pre-Uninvolved Left</th>
<th>Post-Involved Right</th>
<th>Post-Uninvolved Left</th>
<th>Involved Change</th>
<th>Uninvolved Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip Flexion</td>
<td>115 deg</td>
<td>125 deg</td>
<td>125 deg</td>
<td>10 deg*</td>
<td>0 deg</td>
<td></td>
</tr>
<tr>
<td>Hip Internal Rotation</td>
<td>31 deg</td>
<td>30 deg</td>
<td>30 deg</td>
<td>-1 deg</td>
<td>0 deg</td>
<td></td>
</tr>
<tr>
<td>Hip External Rotation</td>
<td>30 deg</td>
<td>40 deg</td>
<td>35 deg</td>
<td>5 deg*</td>
<td>-1 deg</td>
<td></td>
</tr>
<tr>
<td>Hip Abduction</td>
<td>30 deg</td>
<td>50 deg</td>
<td>45 deg</td>
<td>15 deg*</td>
<td>0 deg</td>
<td></td>
</tr>
<tr>
<td>Strength</td>
<td>20.3 kg (199.08 N)</td>
<td>24.4 kg (239.28 N)</td>
<td>33.9 kg (332.46 N)</td>
<td>31.2 kg (316.75 N)</td>
<td>13.6 kg* (133.38 N)</td>
<td>6.8 kg (66.69 N)</td>
</tr>
<tr>
<td>Gluteus Medius</td>
<td>13 kg (127.49 N)</td>
<td>20.3 kg (199.08 N)</td>
<td>21.2 kg (207.9 N)</td>
<td>22.3 kg (218.69 N)</td>
<td>8.2 kg* (80.41 N)</td>
<td>2 kg (19.61 N)</td>
</tr>
<tr>
<td>Adductor</td>
<td>42 kg (411.88 N)</td>
<td>47.5 kg (465.82 N)</td>
<td>50.2 kg (492.29 N)</td>
<td>48.8 kg (478.56 N)</td>
<td>8.2 kg* (80.41 N)</td>
<td>1.4 kg (13.73 N)</td>
</tr>
</tbody>
</table>

*Met MDC, MDC = Minimal Detectable Change, ROM= Range of Motion, deg=degrees, Kg=kilograms, N=Newton

The symmetry index of the quadriceps was 96.64% and for hamstring was 118.95%.
Table 3. Performance based measures

<table>
<thead>
<tr>
<th>Performance Tests</th>
<th>Involved Side (Right)</th>
<th>Uninvolved Side (Left)</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strength Based (Isokinetic) Test at Discharge</td>
<td>Peak Torque 60 deg/sec</td>
<td>Peak Torque 60 deg/sec</td>
<td></td>
</tr>
<tr>
<td>Quadriiceps</td>
<td>131.0 ft/lbs</td>
<td>126.6 ft/lbs</td>
<td>3.4 % deficit Involved &lt; Uninvolved</td>
</tr>
<tr>
<td>Hamstring</td>
<td>73.5 ft/lbs</td>
<td>91.0 ft/lbs</td>
<td>23.7% stronger Involved &gt; Uninvolved</td>
</tr>
<tr>
<td>Jump Based Performance Tests at Discharge</td>
<td>Distance</td>
<td>Distance</td>
<td></td>
</tr>
<tr>
<td>Single Leg Hop</td>
<td>190 cm</td>
<td>180 cm</td>
<td>106%(^\circ) Involved &gt; Uninvolved</td>
</tr>
<tr>
<td>Triple Hop</td>
<td>571.34 cm</td>
<td>583 cm</td>
<td>98%(^\circ) Involved &lt; Uninvolved</td>
</tr>
<tr>
<td>Cross Over Hop</td>
<td>525.2 cm</td>
<td>520 cm</td>
<td>101%(^\circ) Involved &gt; Uninvolved</td>
</tr>
</tbody>
</table>

deg/sec=degree per second, ft/lbs= foot-pounds, cm= centimeters, \(\Omega\)=Limb Symmetry Index

STRENGTH AND PERFORMANCE-BASED OUTCOMES AT DISCHARGE

The patient demonstrated an LSI index of 106% for the single leg hop, a LSI of 98% for the triple hop, and a LSI of 101% for the cross over hop (involved > uninvolved). (Table 3)

DISCUSSION

This case report describes the successful treatment of adductor-related groin pain in a competitive youth soccer player with US-guided PRP injection and multi-phased physical therapy. Meaningful improvements in clinical and patient-reported outcomes were noted. These outcomes included improvements in patient-reported outcomes, negative coping indicators such as fear, impairment-based outcomes, and performance-based outcomes. Utilizing US-guided PRP along with appropriate physical therapy may allow athletes to return to sport and complete their season without significant time loss.

Scholten et al., described the utilization of US-guided PRP for the successful treatment of distal rectus abdominis tendinopathy in a lacrosse player, however that patient had a concomitant hip labral tear that was treated with surgery prior to the PRP injection for adductor-related groin pain.\(^8\) This case describes the utilization of PRP as a first line intervention followed by a phased intervention physical therapy approach for adductor-related groin pain alone. PRP may allow a window for expedited healing and symptoms improvement allowing for accelerated rehabilitation compared to physical therapy alone or with the administration of a corticosteroid.\(^{42-45}\) In fact, its reported that physical therapy alone or in conjunction with a corticosteroid injection may take eight weeks before return to sport in acute groin injuries, and up to six months for chronic strains.\(^{46,47}\) Additionally, research indicating the short- and long-term results of corticosteroid injections in the treatment of groin pain have not been well demonstrated.\(^{12,48}\) The results in of gains in psychosocial outcomes, range of motion, and strength could be due to diminished pain allowing earlier progression of rehabilitation. PRP may be a promising adjunct to physical therapy, allowing accelerated rehabilitation and return to sport.

While the outcomes of this case report demonstrated value of PRP as a treatment adjunct, definitive conclusions cannot be made due to limitations inherent to case reports. Furthermore, it cannot be said definitively that PRP injection was the deciding factor in the successful rehabilitation of this athlete in this case, as physical therapy intervention alone and/or tissue healing time may elicit similar outcomes. Future studies will be necessary to elucidate causation.

CONCLUSION

US-guided PRP in conjunction with a phased physical therapy program was effective in treating a competitive soccer player with adductor-related groin pain affording resolution of symptoms, improved strength, minimal time loss from competitive play, and successful return to previous level of play. US guided PRP warrants further clinical consideration as an alternative intervention in athletes with adductor-related groin pain.

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SUBJECT CONSENT

The subject was informed prior to treatment that data concerning the case would be submitted for publication.
REFERENCES


SUPPLEMENTARY MATERIALS

Appendix 1