IJSPT
INTERNATIONAL JOURNAL OF SPORTS PHYSICAL THERAPY

Zeppieri G, Smith MS, Roach RP. Nonsurgical Management of Adductor-related groin pain with Ultrasound-Guided Platelet-Rich Plasma Injection and Physical Therapy in a Competitive Soccer Player: A Case Report. *IJSPT*. 2024;19(7):898-909.
doi:10.26603/001c.120209

Case Reports

Nonsurgical Management of Adductor-related groin pain with Ultrasound-Guided Platelet-Rich Plasma Injection and Physical Therapy in a Competitive Soccer Player: A Case Report

Giorgio Zeppieri[1,2a], Micheal S Smith, Ryan P. Roach[3]

[1] Rehabilitation, University of Florida, [2] Team Physical Therapist, University of Florida, [3] Department of Orthopaedic Surgery and Sports Medicine , University of Florida

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

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

International Journal of Sports Physical Therapy

Vol. 19, Issue 7, 2024

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

a Corresponding Author:
Giorgio Zeppieri Jr., PT, SCS
Department of Rehabilitation, University of Florida, Team Physical Therapist, University of Florida Health
3450 Hull Rd, Gainesville, FL 32607 (USA)
E-mail: zeppig@shands.ufl.edu

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.[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 to the insertion site of rectus abdominis. Resisted adductor and partial sit-up tests were provocative e 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 lift 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 groin and hip 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 presentably 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 OSPRO 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 OSPRO-YF was used to screen for pain-related psychosocial distress

with higher scores indicating higher levels of psychosocial distress.[27,28] The OSPRO has been shown good concurrent validity with pain intensity and functional disability across anatomical regions.[28]

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 psoas 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 uninvolved 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).[29] All isokinetic measurements (ICC = .82-.95) were performed at 60 deg/sec and recorded for peak torque (ft/lbs).[30]

Hip abductor 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.[31,32] The contralateral hip was positioned in 40° of flexion with 90° flexion at the knee.[31,32] One examiner stabilized the pelvis with hands placed at the lumbar and anterior iliac while a second examiner positioned the dynamometer force pad proximal to the lateral femoral condyle.[31,32] The subject performed a maximal muscle contraction against the dynamometer force pad for five seconds to record a result.

Hip adductor 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 malleoulus.[31] 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.[31] One examiner stabilized the contralateral leg. The second examiner positioned the dynamometer proximal to the patella.[31] 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 uninvolved hip was tested first, followed by the involved hip. The MDC for hip flexion is 8.2° (ICC = 0.97), hip abduction is 7.3° (ICC = .94), hip external rotation is 7.1° (ICC = .98) and hip internal rotation is 7.8° (ICC= .98).[33-35]

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.[33] 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.[33] The moving arm of the goniometer was aligned along the midline of the testing femur.[33] The second examiner passively abducted the hip.

Hip external and internal rotation was measured prone. The test leg was placed in 0 degrees of hip extension and abduction with the knee flexed to 90 degrees.[34,36-38] Examiner one stabilized the pelvis by placing their hands over the ischium, while passively moving the lower leg until first resistance was detected.[34,36-38] The second examiner aligned a bubble inclinometer proximal to the medial malleolus in line with the shaft of the tibia.[34,36-38]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.[39]

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 strength testing using a hand-held dynamometer. Table 1 summarizes these findings. The patient had positive findings during the FABER test for reproduction of groin pain, but negative findings for sacroiliac, lumbar, or posterior hip pain. FADIR test was positive for reproduction of groin pain.

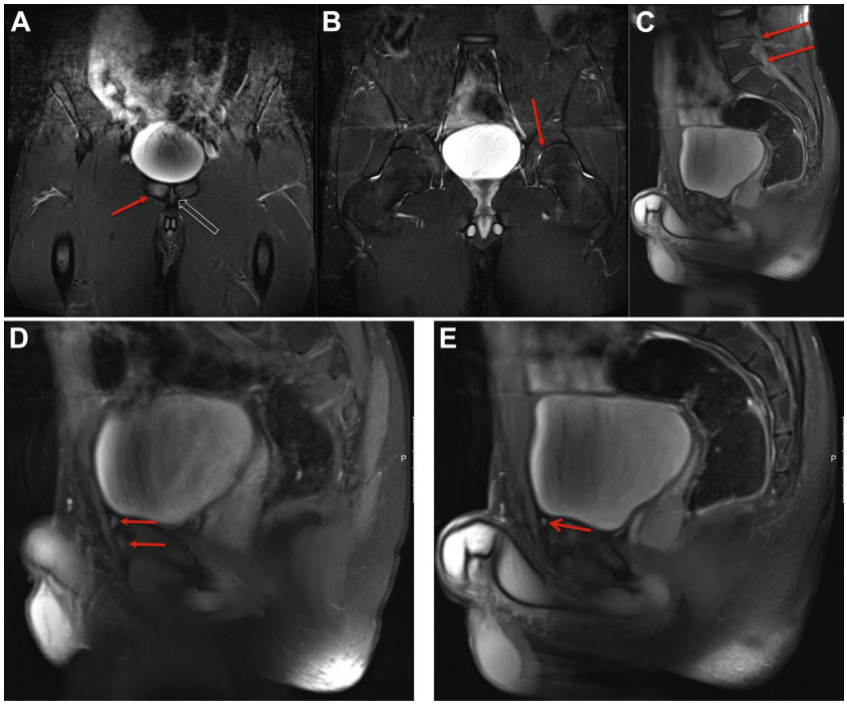

Figure 1. Pre-operative coronal short tau inversion recovery (STIR) magnetic resonance image reveals in (A) marrow edema within the right parasymphyseal pubis (solid arrow) and a central fluid cleft along the articular disc of the pubic symphysis (open arrow), and in (B) a left anterosuperior acetabulum labral tear. Sagittal proton density fat-suppressed sequence images demonstrate disc protrusions at L4/5 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.[12,40,41] 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 3 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 –

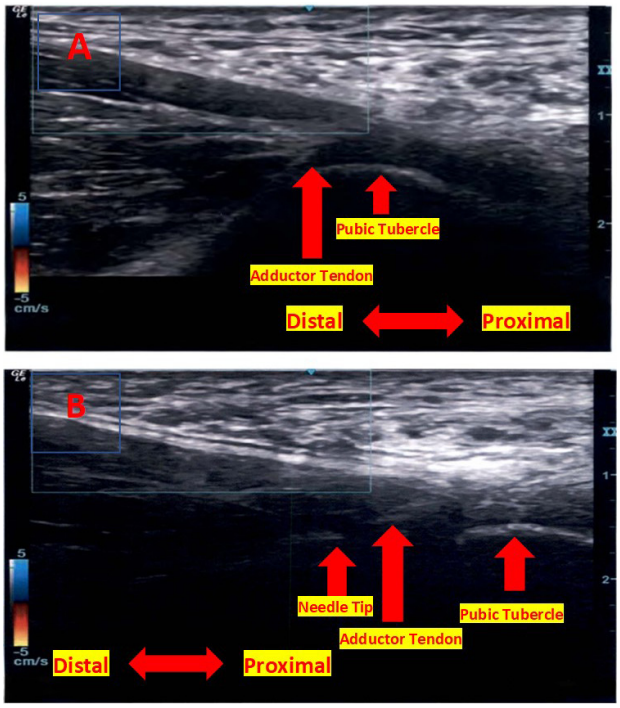

Figure 2. Ultrasound-guided platelet-rich plasma (PRP) (A) Thickened and disrupted adductor tendon attachment to pubic tubercle (B) Initial trajectory of needle tip and injection of PRP.

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 = 11.3). 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 133.38 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 uninvolved (left side peak torque = 131.0 ft/lbs) and 23.7% stronger involved hamstrings (right side peak torque = 91.0 ft/lbs) compared to the uninvolved side (left side peak torque = 73.5 ft/lbs). Limb sym-

Table 1. Patient reported outcome measures

Patient Reported Outcomes	Initial	Discharge	Change
Hagos-Total	48.7%	94%	45.3* (MDC ≥ 5.2)
Hagos-Symptoms	64.3%	96.4%	32.1* (MCID ≥ 10.2)
Hagos - Pain	87.5%	100%	12.5* (MCID ≥ 9.8)
Hagos – Daily Activity	100%	100%	0 (MCID ≥ 11.2)
Hagos- Functional Sport	85%	100%	15*(MCID ≥ 13.1)
Hagos- Participation	0%	87.5%	87.5* (MCID ≥ 16.9)
Hagos -Quality of Life	15%	80%	65* (MCID ≥ 12.7)
OSPROYF-FABQ-W	5.494	1.757	3.737* (MCID ≥ 7)
OSPROYF-FABQ-PA	20.456^	5.5053	14.9507*(MCID ≥ 4)
OSPROYF-TSK-11	18.587	14.442	4.145(MCID ≥ 10)
OSPROYF-PCS	1.665	1.423	.242(MCID ≥ 1.8)
OSPROYF-STAI	23.789	23.682	.169(MCID ≥ 10)
OSPROYF-STAXI	11.209	11.014	.195(MCID = NE$^{\beta}$)
OSPROYF-PHQ-9	.95	0.158	.792(MCID ≥ 3)
OSPROYF-PASS-20	7.528	6.371	1.157(MCID = NE$^{\beta}$)
OSPROYF-PSEQ	40.432	55.904	-15.472*(MCID ≥ 10)
OSPROYF-SER	114.311	120	-5.689(MCID = NE$^{\beta}$)
OSPROYF-CPAQ	71.349	78.415	-7.066(MCID = NE$^{\beta}$)
Lower Extremity Functional Scale	87.5	98.8	11.3*(MCID ≥ 9)
Patient Specific Functional Scale (1) (Kick a Soccer Ball)	5	10	5*
Patient Specific Functional Scale (2) (Pivot while Running)	0	10	10*

*Met MCID/MDC, ^Positive for Psychological Yellow Flag, $^{\beta}$Not 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 Kniesiopobia-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

ROM	Pre-Involved Right	Pre-Uninvolved Left	Post-Involved Right	Post-Uninvolved Left	Involved Change	Uninvolved Change
Hip Flexion	115 deg	125 deg	125 deg	125 deg	10 deg*	0 deg
Hip Internal Rotation	31 deg	30 deg	30 deg	30 deg	-1 deg	0 deg
Hip External Rotation	30 deg	40 deg	35 deg	39 deg	5 deg*	-1 deg
Hip Abduction	30 deg	50 deg	45 deg	50 deg	15 deg*	0 deg
Strength						
Gluteus Medius	20.3 kg (199.08 N)	24.4 kg (239.28 N)	33.9 kg (332.46 N)	31.2 kg (316.75 N)	13.6 kg* (133.38 N)	6.8 kg (66.69 N)
Adductor	13 kg (127.49 N)	20.3 kg (199.08 N)	21.2 kg (207.9 N)	22.3 kg (218.69 N)	8.2 kg* (80.41 N)	2 kg (19.61 N)
Iliospoas	42 kg (411.88 N)	47.5 kg (465.82 N)	50.2 kg (492.29 N)	48.8 kg (478.56 N)	8.2 kg* (80.41 N)	1.4kg (13.73 N)

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

metry index of the quadriceps was 96.64% and for hamstring was 118.95%.

Table 3. Performance based measures

Performance Tests	Involved Side (Right)	Uninvolved Side (Left)	Outcomes
Strength Based (Isokinetic) Test at Discharge	**Peak Torque 60 deg/ sec**	**Peak Torque 60 deg/ sec**	
Quadriceps	131.0 ft/lbs	126.6 ft/lbs	3.4 % deficit Involved < Uninvolved
Hamstring	73.5 ft/lbs	91.0 ft/lbs	23.7% stronger Involved > Uninvolved
Jump Based Performance Tests at Discharge	**Distance**	**Distance**	
Single Leg Hop	190 cm	180 cm	106%Ω Involved > Uninvolved
Triple Hop	571.34 cm	583 cm	98%Ω Involved < Uninvolved
Cross Over Hop	525.2 cm	520 cm	101%Ω Involved > Uninvolved

deg/sec=degree per second, ft/lbs.= foot-pounds, cm= centimeters, Ω=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 corticosteriod.[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.

CORRESPONDING AUTHOR

Giorgio Zeppieri Jr., PT, SCS
Department of Rehabilitation, University of Florida, Team

Physical Therapist, University of Florida Health
3450 Hull Rd, Gainesville, FL 32607 (USA)
E-mail: zeppig@shands.ufl.edu

Submitted: February 26, 2024 CDT, Accepted: June 05, 2024 CDT

SUBJECT CONSENT

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

REFERENCES

1. Candela V, De Carli A, Longo UM, et al. Hip and groin pain in soccer players. *Joints*. 2021;7:182-187.

2. Mosler AB, Weir A, Eirale C, et al. Epidemiology of time loss groin injuries in a men's professional football league: A 2-year prospective study of 17 clubs and 606 players. *Br J Sports Med*. 2018;52:292-297. doi:10.1136/bjsports-2016-097277

3. Werner J, Hagglund M, Walden M, Elkstrand J. UEFA injury study: A prospective study of hip and groin injuries in professional football over seven consecutive seasons. *Br J Sports Med*. 2009;43(13):1036-1040. doi:10.1136/bjsm.2009.066944

4. Caudil P, Nyland J, Smith C, Yerasimides J, Lach J. Sports hernias: A systematic literature review. *Br J Sports Med*. 2008;42:954-964. doi:10.1136/bjsm.2008.047373

5. Elattar O, Choi H, MD, Dills VD, Busconi B. Groin injuries (athletic pubalgia) and return to play. *Sports Health*. 2016;8(4):313-323. doi:10.1177/1941738116653711

6. Drager J, Rasio J, Newhouse A. Athletic pubalgia (Sports Hernia): Presentation and treatment. *Arthroscopy*. 2020;36(12):2952-2953. doi:10.1016/j.arthro.2020.09.022

7. Meyers WC, Yoo E, Devon ON, et al. Understanding "sports hernia"(athletic pubalgia): The anatomic and pathophysiologic basis for abdominal and groin pain in athletes. *Oper Tech Sports Med*. 2012;20:33-45. doi:10.1053/j.otsm.2012.03.005

8. Scholten PM, Massimi S, Dahmen N, Diamond J, Wyss J. Successful treatment of athletic pubalgia in a lacrosse player with ultrasound-guided needle tenotomy and platelet-rich plasma injection: A case report. *PM & R*. 2015;7:79-83. doi:10.1016/j.pmrj.2014.08.943

9. LeBlanc KE, LeBlanc KA. Groin pain in athletes. *Hernia*. 2003;7:68-71. doi:10.1007/s10029-002-0105-x

10. Meyers WC, Foley DP, Garrett WE, Lohnes JH, Mandlebaum BR. Management of severe lower abdominal or inguinal pain in high-performance athletes. PAIN (Performing Athletes with Abdominal or Inguinal Neuromuscular Pain Study Group). *Am J Sports Med*. 2000;28:2-8. doi:10.1177/03635465000280011501

11. Steele P, Annear P, Grove JR. Surgery for posterior wall inguinal deficiency in athletes. *J Sci Med Sport*. 2004;7:415-421. doi:10.1016/S1440-2440(04)80257-3

12. Larson CM. Sports hernia/athletic pubalgia: Evaluation and treatment. *Sports health*. 2014;6(2):139-144. doi:10.1177/1941738114523557

13. Paajanen H, Brinck T, Hermunen H, Airo I. Laparoscopic surgery for chronic groin pain in athletes is more effective than nonoperative treatment: A randomized clinical trial with magnetic resonance imaging of 60 patients with sportsman's hernia (athletic pubalgia). *Surgery*. 2011;150(1):99-107. doi:10.1016/j.surg.2011.02.016

14. Kraeutler MJ, Mei-Dan O, Belk JW, Larson CM, Talishinskiy T, Scillia AJ. A systematic review shows high variation in terminology, surgical techniques, preoperative diagnostic measures, and geographic differences in the treatment of athletic pubalgia/sports hernia/core muscle injury/inguinal disruption. *Arthroscopy*. 2021;37(7):2377-2390. doi:10.1016/j.arthro.2021.03.049

15. Everts P, Onishi K, Jayaram P, Lana JF, Mautner K. Platelet-Rich plasma: New performance understandings and therapeutic considerations. *Int J Mol Sci*. 2020;21(20):7794. doi:10.3390/ijms21207794

16. James JSLJ, Ali AK, Pocock PC, et al. Ultrasound guided dry needling and autologous blood injection for patellar tendinosis. *Br J Sports Med*. 2007;41:518-521. doi:10.1136/bjsm.2006.034686

17. Kon E, Filardo G, Delcogliano M, et al. Platelet-rich plasma: New clinical application: A pilot study for treatment of jumper's knee. *Injury*. 2009;40:598-603. doi:10.1016/j.injury.2008.11.026

18. Sanchez M, Anitua E, Azofra J, Andıa I, Padilla S, Mujika I. Comparison of surgically repaired Achilles tendon tears using platelet rich fibrin matrices. *Am J Sports Med*. 2007;35:245-251. doi:10.1177/0363546506294078

19. Everts PA, Devilee RJJ, Brown Mahoney C, et al. Exogenous application of platelet-leukocyte gel during open subacromial decompression contributes to improved patient outcome. *Eur Surg Res*. 2008;40:203-210. doi:10.1159/000110862

20. Randelli PS, Arrigoni P, Cabitza P, Volpi P, Maffulli N. Autologous platelet rich plasma for arthroscopic rotator cuff repair. A pilot study. *Disabil Rehabil*. 2008;30(20–22):1584-1589. doi:10.1080/09638280801906081

21. Thorborg K, Hölmich P, Christensen R, Petersen J, Roos EM. The Copenhagen Hip and Groin Outcome Score (HAGOS): development and validation according to the COSMIN checklist. *Br J Sports Med*. 2011;45(6):478-491. doi:10.1136/bjsm.2010.080937

22. Thorborg K, Kraemer O, Madsen AD, Hölmich P. Patient-reported outcomes within the first year after hip arthroscopy and rehabilitation for femoroacetabular impingement and/or labral injury: the difference between getting better and getting back to normal. *Am J Sports Med*. 2018;46(11):2607-2614. doi:10.1177/0363546518786971

23. Kemp JL, Collins NJ, Roos EM, Crossley KM. Psychometric properties of patient-reported outcome measures for hip arthroscopic surgery. *Am J Sports Med*. 2013;41(9):2065-2073. doi:10.1177/0363546513494173

24. Thomeé R, Jónasson P, Thorborg K, et al. Cross-cultural adaptation to Swedish and validation of the Copenhagen Hip and Groin Outcome Score (HAGOS) for pain, symptoms and physical function in patients with hip and groin disability due to femoro-acetabular impingement. *Knee Surg Sports Traumatol Arthrosc*. 2014;22(4):835-842. doi:10.1007/s00167-013-2721-7

25. Mehta SP, Fulton A, Quach C, Thistle M, Toledo C, Evans NA. Measurement properties of the Lower Extremity Functional Scale: A systematic review. *J Orthop Sports Phys Ther*. 2016;46(3):200-216. doi:10.2519/jospt.2016.6165

26. Hefford C, Abbott JH, Arnold R, Baxter GD. The patient-specific functional scale: validity, reliability, and responsiveness in patients with upper extremity musculoskeletal problems. *J Orthop Sports Phys Ther*. 2012;42(2):56-65. doi:10.2519/jospt.2012.3953

27. Zeppieri G Jr, George SZ, Bialosky J, Lentz TA. Patient-centered outcomes: Domain importance predicts health care use following physical therapy. *P M & R*. 2022;14(9):1044-1055. doi:10.1002/pmrj.12680

28. Lentz TA, Beneciuk JM, Bialosky JE, et al. Development of a yellow flag assessment tool for orthopaedic physical therapists: Results from the optimal screening for prediction of referral and outcome (OSPRO) cohort. *J Orthop Sports Phys Ther*. 2016;46(5):327-343. doi:10.2519/jospt.2016.6487

29. Thorborg K, Hölmich P. Hip- and knee-strength assessments using a hand-held dynamometer with external belt-fixation are inter-tester reliable. *Knee Surg Sports Traumatol Arthrosc*. 2013;21(3):550-555. doi:10.1007/s00167-012-2115-2

30. Feiring DC, Ellenbecker TS, Derscheid GL. Test-retest reliability of the biodex isokinetic dynamometer. *J Orthop Sports Phys Ther*. 1990;11(7):298-300. doi:10.2519/jospt.1990.11.7.298

31. Thorborg K, Petersen J, Magnusson SP, Hölmich P. Clinical assessment of hip strength using a hand-held dynamometer is reliable. *Scand J Med Sci Sports*. 2010;20(3):493-501. doi:10.1111/j.1600-0838.2009.00958.x

32. Krause DA, Neuger MD, Lambert KA, Johnson AE, DeVinny HA, Hollman JH. Effects of examiner strength on reliability of hip-strength testing using a handheld dynamometer. *J Sport Rehabil*. 2014;23(1):56-64. doi:10.1123/JSR.2012-0070

33. Pua YH, Wrigley TV, Cowan SM, Bennell KL. Intrarater test-retest reliability of hip range of motion and hip muscle strength measurements in persons with hip osteoarthritis. *Arch Phys Med Rehabil*. 2008;89(6):1146-1154. doi:10.1016/j.apmr.2007.10.028

34. Ellenbecker TS, Ellenbecker GA, Roetert EP, et al. Descriptive profile of hip rotation range of motion in elite tennis players and professional baseball players. *Am J Sports Med*. 207(35):1371-1376. doi:10.1177/0363546507300260

35. Prather H, Harris-Hayes M, Hunt DM, et al. Reliability and agreement of hip range of motion and provocative. *PM R*. 2010;2(10):888-895. doi:10.1016/j.pmrj.2010.05.005

36. Bates K, Zeppieri G, Young C, et al. Preseason lower extremity range of motion, flexibility, and strength in relation to in-season injuries in NCAA division I gymnasts. *Phys Sportsmed*. 2024;52(2):200-206. doi:10.1080/00913847.2023.2215775

37. Ore V, Nasic S, Riad J. Lower extremity range of motion and alignment: A reliability and concurrent validity study of goniometric and three-dimensional motion analysis measurement. *Heliyon*. 2020;6:e04713. doi:10.1016/j.heliyon.2020.e04713

38. Zeppieri GJ, Lentz TA, Moser MW. Changes in hip range of motion and strength in collegiate baseball pitchers over the course of a competative season: A pilot study. *Int J Sports Phys Ther*. 2015;10(4):505-513.

39. Reid A, Birmingham TB, Stratford PW, Alcock GK, Giffin JR. Hop testing provides a reliable and valid outcome measure during rehabilitation after anterior cruciate ligament reconstruction. *Phys Ther*. 2007;87(3):337-349. doi:10.2522/ptj.20060143

40. Hammoud S, Bedi A, Magennis E, Meyers WC, Kelly BT. High incidence of athleticpubalgia symptoms in professional athletes with symptomatic femoroacetabular impingement. *Arthroscopy*. 2012;28:1388-1395. doi:10.1016/j.arthro.2012.02.024

41. Larson CM, Pierce BR, Giveans MR. Treatment of athletes with symptomatic intra-articular hip pathology and athletic pubalgia/sports hernia: A case series. *Arthroscopy*. 2011;27:768-775. doi:10.1016/j.arthro.2011.01.018

42. Cecerska-Hery´c E, Goszka M, Serwin N, et al. Applications of the regenerative capacity of platelets in modern medicine. *Cytokine Growth Factor Rev*. 2022;64:84-94. doi:10.1016/j.cytogfr.2021.11.003

43. Le ADK, Enweze L, DeBaun MR, Dragoo JL. Platelet-rich plasma. *Clin Sports Med*. 2019;38(10):17-44.

44. Reurink G, Goudswaard GJ, Moen MH, et al. Platelet-Rich plasma injections in acute muscle injury. *New Engl J Med*. 2014;370(26):2546-2547. doi:10.1056/NEJMc1402340

45. Xu Z, He Z, Shu L, Li X, Ma M, Ye C. Intra-Articular platelet-rich plasma combined with hyaluronic acid injection for knee osteoarthritis is superior to platelet-rich plasma or hyaluronic acid alone in inhibiting inflammation and improving pain and function. *Arthroscopy*. 2021;37(3):903-915. doi:10.1016/j.arthro.2020.10.013

46. Morelli V, Weaver V. Groin injuries and groin pain in athletes: Part 1. *Prim Care*. 2005;32(1):163-183. doi:10.1016/j.pop.2004.11.011

47. Holmich P, Uhrskou P, Ulnits L, et al. Effectiveness of active physical training as treatment for long-standing adductor-related groin pain in athletes: Randomised trial. *Lancet*. 1999;353(9151):439-443. doi:10.1016/S0140-6736(98)03340-6

48. Campbell KJ, Boykin RE, Wijdicks CA, Giphart EJ, LaPrade RF, Philippon MJ. Treatment of a hip capsular injury in a professional soccer player with plateletrich plasma and bone marrow aspirate concentrate therapy. *Knee Surg Sports Traumatol Arthrosc*. 2013;21:1684-1688. doi:10.1007/s00167-012-2232-y

SUPPLEMENTARY MATERIALS

Appendix 1

Download: https://ijspt.scholasticahq.com/article/120209-nonsurgical-management-of-adductor-related-groin-pain-with-ultrasound-guided-platelet-rich-plasma-injection-and-physical-therapy-in-a-competitive-socc/attachment/232834.docx