ISSN: 3033-358X

Case Report

Journal of Orthopedics and Physiotherapy

Hamstring Injury Rehabilitation in the Female Athlete. A Clinical Case

Lamens T and Kersschot J*

Family Medicine, No Primary Affiliation, Antwerp, Belgium

***Corresponding author**
Kersschot J, Family Medicine, No Primary Affiliation, Antwerp, Belgium.

Received: August 24, 2023; **Accepted:** September 05, 2023; **Published:** September 08, 2023

ABSTRACT
Hamstring injury is a common sports injury in the female athlete. Both rehabilitation and preventive measures are crucial but not standardized yet. In this article we present a female athlete with a fresh hamstring injury which was treated with both physiotherapeutic treatment as well as with regional sugar water injections into the muscular lesion. The goal of this paper is to share this experience with other physical therapists and sports doctors. This case is also an invitation to the medical community to design randomized trials to confirm our clinical experience with this dual management.

Keywords: Hamstring Injury, Muscle Tear, Hockey, Orthobiologics, Physiotherapy, Sports Injury, PRP, Glucopuncture, Rehabilitation, Prolotherapy, Female Athlete

Introduction

Muscle injuries are some of the most common injuries in sports. Especially hamstring injuries are very common among, for example, football players, tennis players and hockey players [1]. Such lesions can be very detrimental for athletic performance [2]. As hamstring injuries are associated with a lengthy recovery period and a high rate of reinjury, it would be interesting to have new and safe treatment modalities to speed up recovery from such an injury [3]. Most of these hamstring injuries occur during high-speed movements or in sports requiring sudden directional changes [4]. Unfortunately, such muscle injuries have a high recurrence rate and can result in long term loss of ability to participate in training or competition [5]. To exclude lesions which require immediate surgery, early ultrasound or MRI are required. As hamstring injuries are common in female athletes and associated with a lengthy recovery period and a high rate of reinjury, it would be interesting to have safe treatment modalities to speed up recovery [6]. In this article, we want to share a clinical case of a combination of physical therapy with regional intramuscular injections of sugar water 5% into the muscle lesion [7]. It is presented as a dual treatment, meaning that both should be combined for maximal outcome. It is hypothesized that this novel dual treatment can speed up recovery dramatically. Unfortunately, no controlled clinical trials have been designed to confirm the efficacy of this dual treatment.

Hamstring Injury in the Female Athlete

Currently, the majority of existing literature investigating hamstring injury rehabilitation has been conducted using male participants. However, female athletes display intrinsic hormonal, anatomical and biomechanical differences compared to male athletes. Female athletes display anatomical differences such as increased anterior pelvic tilting, increased pelvic width-to-femoral length ratio, gluteus maximus weakness, and increased degree of femoral anteversion. These features can predispose females to hamstring injuries. Maneuvers designed to strengthen gluteal and abdominal musculature can overcome these risk factors. Female athletes typically also show increased joint laxity, a greater range of motion of hip flexion and internal rotation compared to male athletes.

Treatment of Hamstring Injury

Proximal hamstring injuries can present as chronic tendinosis, acute muscle strain, partial tendinous avulsions, or complete 3-tendon rupture. Nonoperative management for chronic insertional tendinosis and low-grade tears includes activity modification, anti-inflammatories, and physical therapy [8]. Oral anti-inflammatories are less popular because of suppression of inflammation, which may slow down tissue repair. Oral anti-inflammatories also have potential side effects [9,10]. Platelet-rich plasma (PRP) injections, dry needling, and shock wave therapy are newer therapies that also may provide benefit [11]. PRP is even better than steroids [12]. Injections with corticosteroid injections are becoming less popular because of potential side (local and systemic) effects [13-19]. Instead of using steroids, sports doctors are using more and more regional injections with sugar water 5% (S5W) such as dextrose 5% in water (D5W) or glucose 5% in water (G5W) because of easy application and excellent safety profile [20]. Surgical indications include complete proximal avulsions, partial avulsions in young athletes and partial avulsion injuries that have failed nonoperative management. Surgical interventions entail open primary repair,

Citation: Lamens T, Kersschot J. Hamstring Injury Rehabilitation in the Female Athlete. A Clinical Case. J Ortho Physio. 2023. 1(1): 1-4.
DOI: doi.org/10.61440/JOP.2023.v1.03

endoscopic primary repair, or tendon reconstruction. In this article, the focus is on treatment of fresh uncomplicated muscle tears by a team of two practioners: a physical therapist and a sports doctor. It is hypothesized that combining both treatment modalities leads to optimal outcome.

Table 1: Dual Approach of Hamstring Injury

1. Physiotherapy
2. Orthobiologic Injections

1. Physiotherapy

In clinical practice, a wide variety of treatment strategies are commonly applied [21]. Typical techniques at the physiotherapy department are eccentric exercises [22-24]. It is a good idea to introduce high-intensity eccentric loading into rehabilitation at an early phase. Other approaches include deep tissue massage, microcurrent application and dry needling [28-28]. Microcurrent application is a non-invasive and safe electrotherapy applied through a series of sub-sensory electrical currents (less than 1 mA), which are of a similar magnitude to the currents generated endogenously by the human body. Microcurrent application seems to have a favorable effect on tissue repair [29].

Table 2: Physiotherapy for Hamstring Injury

Eccentric Exercises
Deep Tissue Massage
Microcurrent Application

2. Orthobiologic Injections

Various orthobiologics have been investigated for tissue healing of tendons, articular cartilage, and joint capsule (Table 3). Their application in sports injuries still requires more clinical studies. The goal of orthobiologic injections is to improve regeneration of musculoskeletal tissues by injecting biomaterials [30,31]. Orthobiologic injections are not only applied into joints, but injections are also given into tissues with intrinsic repair ability such as cartilage, tendons, ligaments and muscle. Some of these injectates are derived from organic material such as bone marrow or blood [32]. Typical orthobiologics are sugar water 5% (S5W), hyaluronic acid (HA), platelet-rich plasma (PRP), bone morphogenetic protein-2 (BMP-2), bone marrow aspirate (BMA), bone marrow aspirate concentrate (BMAC) and mesenchymal stem cells (MSCs). Orthoregeneration can be used by orthopedic surgeons and sports doctors as an alternative for cortisone and in some cases as an alternative for surgery [33,34].

Table 3: Examples of Orthobiologic Injectates

Sugar Water 5% (S5W)
Hyaluronic Acid (HA)
Platelet-rich Plasma (PRP)
Bone morphogenetic protein-2 (BMP-2)
Bone marrow aspirate (BMA)
Mesenchymal Stem Cells (MSCs)

Remark

It is worth noting that *hypertonic* sugar water injections such as glucose 15% or dextrose 15%, as applied in prolotherapy, are avoided for muscular injuries because these hyperosmolar injectates can cause local cell death and tissue damage. Such hyperosmolar injections, however, can be very effective in thickening and strengthening weak ligaments and bands.

Clinical Case

A professional hockey player (33) had a painful hamstring injury on April 20, 2023. Ultrasound (April 21) demonstrated a very large tear in the left hamstring of 10 cm (4 inches). Her doctor said she should refrain from all sports activities for the next six weeks. The physical therapist of the hockey team immediately started with a combination of exercises and microcurrent treatment. The exercises were mainly based on eccentric variations of glutes bridges, as well as gliding techniques in an eccentric phase. Adding the microcurrent applications allowed her to follow the physical therapy program without pain or discomfort. Her physical therapist also sent her to a doctor who is specialized in glucopuncture (GP). Although there are no controlled trials yet to confirm this, both doctor and physiotherapist realize that the combination of physical therapy and glucopuncture can speed up tissue repair effectively. The first GP session was on April 24. On clinical examination, there were several longitudinal areas which were hard and sore on palpation. She received multiple intramuscular (IM) injections (needle 0.4 x 40 / 27 G) of 5 mL in those muscle tears. After this first GP session, she felt much better. She received a second GP treatment on April 28. An ultrasound on the same day showed a lesion of only 2,35 cm (0.94 inch). The radiologist was quite surprised about the result. At the third GP session (May 2), clinical examination revealed that both soreness and hardness of the three areas were much better. During this period, she continued her treatments with the physical therapist, which included isometric exercises and microcurrent applications [35]. Combining those different treatment options allowed her to quickly return to the field to optimize her running capacities. The patient insisted on playing as soon as possible because there was an important qualification match coming up. She received the same GP treatment two more times (May 2 and May 5) and she was able to play the qualification match (May 7) without any restrictions or relapse. An ultrasound investigation on May 11 showed no more muscular lesions. Follow up on August 8 did not reveal any recurrence of the hamstring injury.

Prevention of Hamstring Injury

Existing literature on hamstring injury prevention shows that both Nordic hamstring exercises and balance exercises may reduce the risk of sustaining hamstring injuries [36]. Reducing injury may be achieved through exercise-based programs, but their specific components and their practical applicability remain unclear. The most common risk factor is a previously sustained injury, particularly early after return-to-sport [37]. Several strategies exist to prevent hamstring injury and address known risk factors [38,39]. Eccentric strengthening reduces injury incidence and improves hamstring strength, and limb asymmetry, while stretching-based interventions can be implemented to improve flexibility.

Conclusion

Hamstring injury is a common sports injury which requires an individualized treatment to speed up recovery. In this article a female athlete with a fresh hamstring injury was treated with a new dual approach. Both physiotherapeutic treatment as well as

sugar water 5% injections into the muscular lesion were applied with a very positive outcome. The goal of this paper is to invite the medical sports community to design randomized trials to confirm our clinical experience with this novel dual management.

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