

Integrating New Ideas within the Methodology of Muscle Injury in Football

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ABSTRACT

Muscle injuries are the most common injuries occurring during sports activity. The highest incidents of muscle injury occur in the thigh. Practitioners and physiotherapists have to be proactive in the near future managing the situation and becoming the leaders in identifying risk factors and planning the best treatment while considering the new technologies are coming. There are new trends emerging, which provide more information and understanding the mechanisms, which produce and cause injuries. These extend beyond the classification of intrinsic or extrinsic factors currently found in medical literature. While the intrinsic and extrinsic factors remain relevant there are

more ways to look at the prevention, assessment and treatment of injury. Surgical treatments have been positioned as the gold standard in professional football when focus on severe muscle ruptures, but there is some evidence pointing to the use of biological therapies and these ways need to be further investigated.

Key words: Muscle injuries; Risk factors; Biological therapies; Surgery

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INTRODUCTION

Muscle injuries are the most common injuries that occur during sports activity, with the highest incidents of muscle injury being in the thigh. An elite male football team with 25 players can expect an average of 18 muscle injuries per season. Of these, 7 will affect the hamstrings and 3, the quadriceps^[1]. The use of MRI or ultrasonography enables a classification of a radiological grade or severity of the injury^[2].

Football combines maximum sprints and accelerations /decelerations combined with jumping and tackling which involves frequent contact between players. Given the intensity and contact nature of the sport, it is not surprising that up to 30% of all injuries in football are injuries involving these muscle groups and resulting in impairment and time lost in training and competition. It represents almost one third of all time losses^[3]; and more than a quarter of all training absences and unavailability for competitions. Matches also suggest a higher rate of injury when compared to training. Injuries have negative consequences not just for the player affected but also the team, with coaches sometimes left without their best players, results of the team not going their way and with some economic consequences. Because the impact of an injury can be so critical, it is important for practitioners to not only take a reactive approach when working

with muscles injuries. They should be proactive, be able to identify the possible risks and plan accordingly, implementing optimal injury treatment to minimise the number of relapses. Being proactive will reduce the number of injuries and could speed up the recovery phase when injuries occur and minimise the risk of re-injury. The magnitude of the problem highlights the necessity of a better understanding of these injuries and its prevention and adaptation has become an emerging challenge for football clubs. The objective of this article is to integrate new methods in conventional approaches when managing and treating muscle injuries. This precedes new approaches to risk factors and new methods on injury treatment.

WHAT ARE THE RISK FACTORS ASSOCIATED WITH MUSCLE INJURY AND RE-INJURY?

It is important to identify the factors associated with an increased risk of injury. Factors such as strength deficit, muscular imbalances between the hamstring and quadriceps muscles, reduced flexibility^[4], poor warm-up before training and competition, intense training periods, recovery times, recovery methods, mechanical and anthropometric aspects, footwear characteristics, playing surface and competition against much higher level opponents are considered some of the risk factors for injury occurrence^[5].

Other factors to take into account are the age and the previous history of injuries, since soccer players with a previous injury in the hamstring have a 7 times greater risk of suffer recurrent injuries as from other muscle groups in the lower extremities than players with no history of injuries^[6]. Previous injury is not only a risk for recurrence of the same injury but also can increase the likelihood of different but related injuries at other anatomical sites^[7]. There are also some emerging risk factors that might provide valuable information with regard to the mechanisms that produce and cause an injury.

Age also an important risk factor for the injury, nowadays is starting being considered with a new understanding. Players under 22 had a significantly lower incidence than players between the ages of 22 and 30^[8]. Age and development is also key at youth level since the process of growth and maturation of the individual is not totally parallel to his chronological age^[9,10]. There are subjects who have an accelerated maturation process and show developments which are advanced at their age and which is called early maturity. There are subjects who show slower development with respect to their age and who are called late or immature mature and others who have a development according to their age^[11]. Premature maturity, from the sporting point of view, has advantages such as the ease to be integrated into sports programs and the achievement of early sports results. Late maturity has advantages by allowing a progression according to age, the absence of pressure to achieve results and possibly the absence of sports saturation. Late maturers with potential might end up being overlooked when competing with other players who share their chronological age but have biologically developed at a faster rate^[12].

NEW OUTLOOK ON METHODOLOGY OF DEALING WITH MUSCLE INJURIES

When talking about risk factors have to be taken into account the external load that each player could assume. Because of the high intensity and workloads that footballers are subjected to during training and matches, they will experience some risk of injury. This can be necessary for training adaptations to occur. Using GPS data allows us to figure out which is the correct age regardless cronological or biological^[13].

The use of the GPS data has increased in football as a means of physical parameters, that allows practitioners to predict muscle injury risk.

The use of GPS data provides information regarding external loads (distances covered, number of accelerations and decelerations and tracking changes in working load or training state). This information can help medical teams identify stages within the season where players are at increased risk for injury (e.g. when faced with excessive increases in workloads) or when players are not maintaining their usual level of performance (as indicated by decreases in distances covered, number of high-intensity actions that are not as a result of tactical changes)^[14,15].

Internal load, which relates to physiological and psychological state, has to be collected as well. There are questionnaires that are appearing nowadays to collect objectively the inner status of the players such as amount of sleep, stress levels, anxiety, level of confidence to return to play after an injury. This kind of information is beneficial to reduce the risk of injuries when could be linked with external load data coming from GPS.

Players genetic profiles, can from the beginning help identify players which are predisposed to injury. For example, players with polymorphisms IGF2 and CCL2 (specifically its allelic form GG) may be more vulnerable to serious injuries^[16]. In the future, genetic tests may be used to identify people at risk of injury and to focus on risk prevention programs A multidisciplinary approach must be done from different disciplines biological, medical, physical, nutritional, and psychological) to cope with this actual situation, and the practitioner has to be the leader of this management.

TREATMENT OF MUSCLE INJURIES AND NEW LINES OF RESEARCH IN THIS FIELD

Can biological treatments be the new tools for the treatment of injuries and even for the prevention of these? The objectives of treatment and rehabilitation are: first, to restore range of motion without pain; and, second, reach a level of performance that allows the third phase, a functional rehabilitation program. To get going restoring movement without pain is accomplished through rest, compression bandage if necessary and physiotherapy. The main initial objectives are to initiate ROM and isometric exercises. Massage is contraindicated in this period. There are a variety of other treatments commonly used in the early stages of the injury, such as non-steroidal anti-inflammatory drugs (NSAIDs) and corticosteroid injections, however, they are a current source of controversy, since NSAIDs in the acute phase are controversial due to the association with the suboptimal regeneration of myofibrils and by increasing the deposits of scar tissue. Regarding corticosteroid injections, they are contraindicated in the acute phase although they may provide some short-term benefits in reducing pain, however, they can make the player more susceptible to a new long-term injury.

Currently, new treatment methods based on biological engineering are being applied, such as the use of platelet-rich blood plasma (PRP)^[17]. This therapy represents an interesting biological technique to increase tissue repair by inducing chemotactic, proliferative and anabolic cellular responses^[18].

PRP injections have been studied for different applications, including as an adjuvant treatment for muscle injuries. Pilot clinical studies indicate that PRP therapies can improve muscle repair after distention or contusion. However, there is still no convincing data to show that this improves the recovery of sports time.

Cell therapies provide promising therapeutic possibilities to im-

prove the repair and/or regeneration of damaged tissues. Ota *et al.* (2011)^[19] showed that the injured mice injected with MDSC (stem cells derived from the muscle) after a lesion had increased levels of vascular endothelial growth factor (VEGF) during the first week and a greater regeneration and muscular strength. during the second week. In addition, researchers have observed decreased fibrosis and improved angiogenesis. The availability of an easily accessible and reproducible cellular source can greatly facilitate the development of new cell-based therapies for applications of regenerative medicine in the musculoskeletal system. Clinical studies are needed to further characterize the effect of stem cell therapy on muscles with acute injuries. The results of these treatments seem promising, but more and more randomized studies are needed to elucidate and determine their efficacy for use in clinical practice, and to build protocols based on solid scientific evidence.

Nowadays the early phases of recovery process include biological treatments that allows the physiotherapist to start as soon as possible mobilizing the player in order to keep the neuromuscular skills at the highest level. The immunomodulatory and antalgic effect of these biological therapies are essential to promote this sort of approaches.

Ideally when managing muscle injuries the goal is to try and minimize invasive and surgical treatments. However, there are some instances when faced with serious injury the surgical treatment have to consider this type of intervention. Currently, the indications for surgery in muscle injuries have increased looking for an optimal effect without relapses and achieving a high level performance. Some of them have been validated in several guidelines^[20]. These indications include the athlete with a complete (GIII) rupture of a muscle with a few or no agonist muscles (i.e. hamstring, adductor), a tear (GII) if more than half of the muscle is torn, or a large intramuscular hematoma(s). Furthermore, surgical treatment should be considered if an athlete complains of permanent extension pain (duration, > 2 months) (i.e. rectus femoris) in a previously injured muscle. In a such case, formation of scar adhesions restricting the movement of the injured muscle have to be suspected and surgical debridement of adhesions should be considered.

Thus far we have addressed some issues pertaining purely to muscle injury. But, often muscle injuries have some tendinous disruption. Thus, it is important for proper diagnosis of the injury to be made before determining the best treatment plan. To do this, the tendon area involved in the muscle injury has to be taken into account to assess the nature of the lesion, as well as in the surgical planning.

CONCLUSIONS

Currently there is much controversy as to what risk factors can really affect the player's sporting activity, just as new categorizations of these factors are being proposed, leaving behind classification based on intrinsic or extrinsic factors as we find in medical literature. It has been proposed that a proactive process is required to manage injuries and that new adjustable scores can be given to other risk factors which vary based on a case by case basis. The approach needs to be more personalized and individualized medicine.

Regarding treatment, more and more articles are being published on the use of cellular therapies, although its reception is being moderate, it is a new way to overcome the controversies that involve treatments with NSAIDs or injections of corticosteroids in muscle injuries, especially in professionals that needs to come back to compete very quickly. It can also provide an alternative to surgical treatments in severe muscle injuries especially in athletes who can not afford to reduce their neuromuscular skills.

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