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Research Article

Sonographic Evaluation of Acute Musculotendinous Injuries Among Professional Football Players in the Iraqi Premier League: A Retrospective Study

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Abstract

Background: Acute musculotendinous injuries represent a substantial clinical and economic burden in professional football, leading to significant time loss and performance impairment. ***Objective***: To comprehensively evaluate the anatomical distribution and grading of acute musculotendinous injuries among professional Iraqi League players using ultrasound and to analyze associations between injury patterns, playing positions, and sonographic findings. ***Methods***: A cross-sectional study was conducted at the Private Radiology Clinic in Baghdad between January 2022 and January 2025. It initially included 92 professional male football players who complained of acute onset of muscle pain during an official match or training session and sustained acute musculotendinous injuries and underwent ultrasound examination within 72 hours of injury. ***Results***: The most common site of injury is the hamstring muscle (47.8%); Grade 2 injuries were the most prevalent. There was a perfect agreement between the two radiologists, and this agreement was statistically significant (kappa=0.846, p=0.001). Older players, the striker position, and injuries during matches rather than during training emerged as key factors increasing the possibility of more severe injuries. The highest prevalence of hamstring muscle injuries was seen significantly among strikers and winger players (66.7%, p=0.001), while all goalkeepers suffered from adductor muscle injuries (100%). ***Conclusions***: The study validates musculoskeletal ultrasonography as a rapid, cost-effective, and reliable technique for diagnosing and categorizing muscle injuries in a competitive sports environment. It further backs the use of pitch-side ultrasound to quickly and accurately detect injuries, which can help with important decisions about returning to play.

Keywords: Acute injury, Football players; Musculotendinous; Ultrasound.

تقييم التصوير بالموجات فوق الصوتية لإصابات العضلات الحادة بين لاعبي كرة القدم المحترفين في الدوري العراقي: دراسة استعادية

الخلاصة

الخلفية: تمثل الإصابات الحادة في العضلات عبئا سريريا واقتصاديا كبيرا في كرة القدم الاحترافية، مما يؤدي إلى فقدان وقت كبير وضعف في الأداء. **الهدف**: تقييم شامل للتوزيع التشريحي وتصنيف الإصابات العضلية الحادة بين لاعبي الدوري العراقي المحترفين باستخدام الموجات فوق الصوتية وتحليل الروابط بين أنماط الإصابات، وضعيات اللعب، ونتائج فحص الموجات فوق الصوتية. **الطرائق**: أجريت دراسة مقطعية في العيادة الخاصة للأشعة في بغداد بين يناير 2022 ويناير 2025. شملت في البداية 92 لاعب كرة قدم محترف اشتكوا من ألم عضلي حاد خلال مباراة رسمية أو حصة تدريبية وتعرضوا لإصابات عضلية حادة وخضعوا لفحص بالموجات فوق الصوتية خلال 72 ساعة من الإصابة. **النتائج**: أكثر مواقع الإصابة شيوعا هي عضلة أوتار الركبة (47.8٪); كانت الإصابات من الدرجة الثانية هي الأكثر انتشارا. كان هناك اتفاق تام بين أخصائيي الأشعة، وكان هذا الاتفاق ذا دلالة إحصائية (كابا=0.846، p=0.001). ظهرت عوامل خطورة تزيد من احتمال حدوث إصابات أكثر خطورة لدى اللاعبين الأكبر سنا، ومركز المهاجم، والإصابات أثناء المباريات بدلا من التدريب. تم تسجيل أعلى معدل لإصابات عضلة الركبة بشكل ملحوظ بين المهاجمين ولاعبي الأجنحة (66.7٪، p=0.001)، بينما عانى جميع حراس المرمى من إصابات عضلية تقارب (100٪). **الاستنتاجات**: تؤكد الدراسة أن التصوير بالموجات فوق الصوتية العضلية الهيكلية هو تقنية سريعة وفعالة من حيث التكلفة وموثوقة لتشخيص وتصنيف إصابات العضلات في بيئة رياضية تنافسية. كما يدعم استخدام الموجات فوق الصوتية على جانب الملعب لاكتشاف الإصابات بسرعة ودقة، مما يمكن أن يساعد في اتخاذ قرارات مهمة بشأن العودة إلى اللعب.

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INTRODUCTION

Regular physical activity has many positive effects on health. Muscular contractions during physical activity alter the structure of the circulatory network [1]. New research shows that hemodynamic and mechanical stimuli mediate the process of angiogenesis. Consequently, the vascular bed is stimulated to develop due to an increase in shear stresses, which occurs when blood flow through the vessels is increased during physical effort. The vascular endothelium is stimulated to expand blood vessels through the involvement of nitric oxide [2,3]. Despite these advantages, sports must be played in a regulated setting and according to a set schedule to avoid the specific kinds of injuries that are associated with them. Myofascial, myotendinous, and muscular injuries can occur as a result of physical activities that put an undue strain on the fascial and musculotendinous tissues [4]. For professional athletes, musculotendinous injuries make up as much as one-third of all sports-related injuries. Playing sports like football, which involve regular running and stretching, puts athletes at a higher risk of musculoskeletal injury [5]. They are a leading cause of morbidity and performance limitation in elite football, as well as other sports of similar activities, accounting for approximately 30–40% of all time-loss injuries during competitive seasons [6]. Hamstring injuries, in particular, have consistently been identified as the most common musculotendinous injury across professional leagues worldwide, with significant recurrence rates and prolonged recovery periods [7]. Sports medicine doctors primarily want to get their patients back on the pitch as soon as possible, but they also have to think about how to keep the injury from getting worse or occurring again. Crucially, a prognosis needs to be based on the most recent findings in clinical and imaging data. Muscle injuries in sports require imaging not only to diagnose the injury but also to assess its severity and direct therapy. This, in turn, influences the prognosis. It becomes extremely important when the injury's seriousness or diagnosis is unclear, when the patient's rehabilitation takes longer than expected, or when interventional or surgical therapy is being considered [8]. Despite musculoskeletal ultrasound's lack of ionizing radiation, its portability, its ability to reveal the surrounding anatomy, including muscle structure—which is often difficult to see on MR images owing to edema—and its immediate pitch-side application, magnetic resonance imaging (MRI) is still the gold standard for evaluating soft tissue injuries [9]. Ultrasound can track injury healing, which helps determine when it's safe to return to play and for rehab. While statistics on musculotendinous injuries in North American, European, and Australian leagues have been published in great detail, very little is known regarding their prevalence among Middle Eastern players [10]. The Iraqi Premier League presents a unique environment where players encounter intense competition, extreme heat, and unreliable training facilities, all of which can lead to remarkably elevated injury rates. To adapt prevention and management strategies to specific local contexts, it is essential to have an evidence-based comprehension of these patterns. Therefore, this study aimed to describe the anatomical distribution and grading of acute musculotendinous injuries among professional Iraqi League players using ultrasound and to analyze associations between injury patterns, playing positions, and sonographic findings.

METHODS

Study design and setting

A cross-sectional study was conducted at the Private Radiology Clinic in Baghdad between January 2022 and January 2025.

Study population

The study initially included 98 professional male football players competing in the Iraqi Stars League and Premier Division, aged between 18 and 35 years, who complained of acute onset of muscle pain during an official match or training session and sustained acute musculotendinous injuries, underwent ultrasound examination within 72 hours of injury by two well-trained radiologists with over 10 years of experience, and had complete clinical and imaging records and were considered for inclusion. Each scan was independently reviewed, and consensus was reached in cases of disagreement. Patients with chronic or recurrent injuries (> 6 months) (two players excluded), who underwent prior surgical repair of the affected muscle (four players excluded), and who had concomitant bone or ligament injuries requiring priority intervention were excluded from this study. The final study cohort included 92 players.

Imaging protocol

Following the initial assessment, which commenced with a clinical history and pertinent physical examination, all sonographic examinations were performed using a high-frequency linear transducer (7–12 MHz) on the HD11 Philips ultrasound system. Both longitudinal and transverse planes were obtained, with the patient positioned to optimize exposure for the injured muscle group. The initial radiologist scans the afflicted region longitudinally and transversely after determining the best transducer settings. The symptomatic area usually pinpoints the specific location of the muscle lesion in most cases of muscle injuries, but we still need to be sure of the anatomy we're looking at and the precise location. Once the muscle and any lesions have been examined at rest, the next step is to perform a dynamic assessment during active contraction of the muscle and passive stretching induced by external movement to determine the extent of the abnormality and the surrounding tissues. This step makes it easier to tell if the anomaly is solid or cystic, if there is a change in muscle function, and if damaged fibers are moving (which helps distinguish between different grades of tears). Because muscular hernias often don't show up until the patient is standing, further maneuvers may be necessary to treat these conditions. The contralateral limb was always examined for comparison to differentiate pathology from normal anatomical variations. The same examination procedure mentioned above was repeated by the 2nd radiologist. In situations where the grading difference between the two radiologists might affect patient management or treatment plan, we would recommend MRI as the gold standard, particularly in younger patients and high-risk individuals. For small discrepancies that are not expected to affect management (similar grades within the same treatment group), it is recommended to combine clinical evaluation (symptoms, functional status, physical exam) with imaging findings instead of routinely ordering an MRI.

Grading of injury severity

They were graded according to the modified Peetrons classification, which is originally an ultrasound ordinal grading system and used to categorize the severity of muscle injuries based on imaging findings. It provides a simple grading system, which has been widely adopted and modified for use with MRI. Injuries were graded according to the following [11]. Grade 1, focal hypoechogenicity without fiber disruption (Figure 1); grade 2, partial fiber disruption with hematoma formation (Figure 2); and grade 3, complete rupture with tendon retraction (Figure 3). For each case, additional findings such as perimuscular fluid, fascial involvement, and neovascularization were documented.

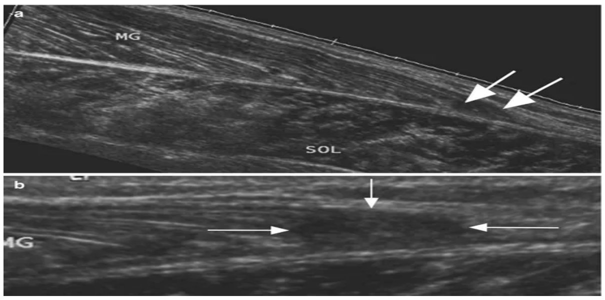

Figure 1: Longitudinal ultrasound image shows grade 1 muscle strain with mild hypoechoic interstitial edema and preserved fibrillar pattern.

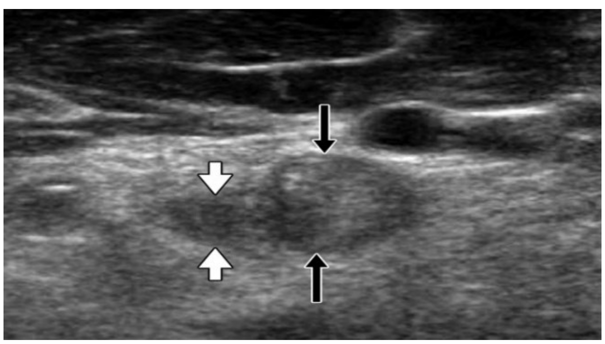

Figure 2: Grade 2 muscle injury with partial fiber disruption and focal intramuscular hematoma.

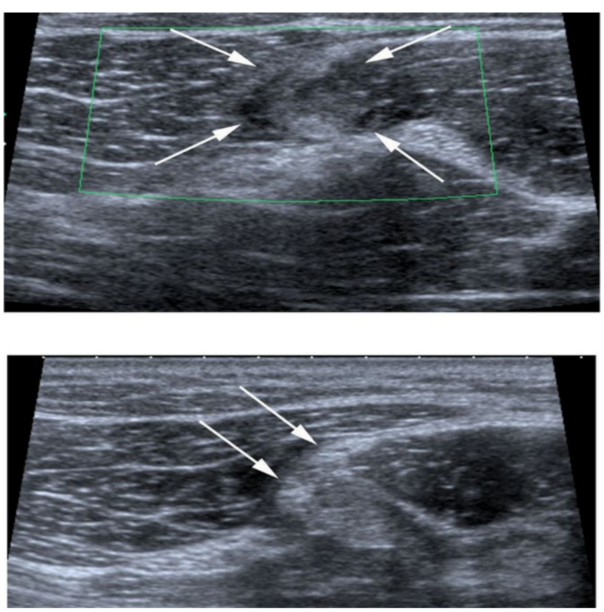

Figure 3: Longitudinal ultrasound image showing grade 3 muscle rupture with complete fiber discontinuity and intervening hematoma.

Ethical considerations

The Declaration of Helsinki lays forth the ground rules for how this study should be carried out ethically. Approval from the Ibn Sina University of Medical and Pharmaceutical Sciences Ethics Committee was obtained. After all patients were informed about the objectives and procedures of the study, we acquired written informed consent from them. Data security was guaranteed by utilizing identifying codes and storing data in a password-protected environment.

Statistical analysis

Data analysis was performed using SPSS version 28.0 (IBM Corp., Armonk, NY). Descriptive statistics included frequencies, percentages, means, and standard deviations as appropriate. Chi-square tests examined associations between independent categorical variables, with $p < 0.05$ considered statistically significant. We used binary logistic regression analysis to find the variables that were linked to severe injuries. Player position, age, injury site, and context were the four independent variables included in this model. Cohen's Kappa Coefficient (k) measured inter-rater agreement for qualitative (categorical) items.

RESULTS

The final sample comprised 92 football players. Patients' characteristics are presented in Table 1.

Table 1: Patients' Characteristics (n= 92)

Variable	n(%)
Age groups (year)	
< 25	15(16.3)
≥ 25	77(83.7)
Player position	
Defender	31(33.7)
Midfielder	28(30.4)
Winger	15(16.3)
Striker	12(13.0)
Goalkeeper	6(6.5)
Context of injury	
Match	62(67.4)
Training	30(32.6)
Site of injury	
Hamstring	44(47.8)
Quadriceps	20(21.7)
Calf	19(20.7)
Adductor	9(9.8)

The majority of injured players (83.7%, n= 77) were aged ≥ 25 years (27.48 ± 3.4 and ranged from 19 to 35 years); 33.7% of them were defenders, 67.4% were injured during matches, and the most common site of injury was the hamstring muscle (47.8%). Table 2 showed the level of agreement between the two radiologists regarding the grade of injury. Radiologist 1 and radiologist 2 showed the same grade of injury in 84 patients, while there was disagreement between them in eight patients. These results indicated that there was a perfect agreement between the two radiologists, and this agreement was statistically significant (kappa= 0.846, p=0.001).

As shown in Figure 4, hypoechogenicity was found in the majority of injured players (n= 78, 92.9%), hematoma and fiber were detected in 59.5%, fluid in 40.5%, fascia in 9.5%, and retraction in 7.1%.

Table 2: Agreement in grade of injury between the two radiologists

Grade (Radiologist 1)	Grade (Radiologist 2)			Total (n=92)	Kappa value	*p*-value
	1	2	3			
1	34	3	0	37	0.846	0.001
2	2	44	2	48		
3	0	1	6	7		
Total	36	48	8	92		

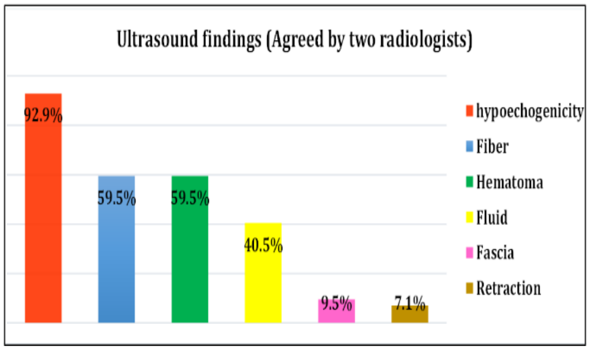

Figure 4: Ultrasound findings that agreed by two radiologists.

Logistic regression analysis identified significant predictors of severe injury (Grade II or III) (Table 3). Three factors were found to be important independent risk factors for severe injury. Older age (players aged > 25 years are 9.22 times more likely to complain of severe injury than younger players (OR= 9.22 with 95% CI: 6.2 to 22.1)), strikers are 6.39 times more likely to complain of severe injury than other positions (OR= 6.39 with 95% CI: 1.64–25.3), and players injured during matches are 22.14 times more likely to complain of severe injury than those injured during training (OR= 22.14 with 95% CI: 11.08 to 44.23).

Table 3: Independent predictors of severe injury by logistic regression

Predictor variable of severe injury (48 players in Grade II and 7 players in Grade III)	OR	95% CI	*p*-Value
Older player (age ≥ 25 years)	9.22	6.2–22.1	0.001
Striker position	6.39	1.64-25.3	0.008
Injury during matches	22.14	11.08-44.23	0.001

As shown in Table 4, the highest prevalence of hamstring muscle injuries was seen significantly among strikers and winger players (66.7%, p= 0.001), while all goalkeepers suffered from adductor muscle injuries (100%), which demonstrated a significant association between site of injury and player position. No statistically significant associations were detected between the site of injury and both age and context of injury (p> 0.05).

Table 4: Association between injury site and certain parameters

Player Position	Site of injury				*p*-value
	Hamstring (n=44)	Quadriceps (n=20)	Calf (n=19)	Adductor (n=9)	
Age (year)					
< 25	8(53.3)	4(26.7)	0(0)	3(20)	0.115
≥ 25	36(46.8)	16(20.8)	19(24.7)	6(7.8)	
Player position					
Defender	12(38.7)	8(25.8)	11(35.5)	0(0)	0.001
Midfielder	14(50)	6(21.4)	5(17.9)	3(10.7)	
Winger	10(66.7)	2(13.3)	3(20)	0(0)	
Striker	8(66.7)	4(33.3)	0(0)	0(0)	
Goalkeeper	0(0)	0(0)	0(0)	6(100)	
Context of injury					
Match	34(54.8)	12(19.4)	13(21)	3(4.8)	0.065
Training	10(33.3)	8(26.7)	6(20)	6 (20)	

Values are expressed as frequency and percentage.

DISCUSSION

Up to one-third of all injuries sustained by professional athletes are musculotendinous in nature [12]. There is currently no standardization in the way muscle injuries are described, diagnosed, or graded, even though they occur often in elite athletes, and the main goal is to reduce the number of days that athletes miss from competing [13]. Ultrasonography offers a rapid, cost-effective, and portable alternative to diagnose soft tissue injuries [14]. While most sports medicine research has concentrated on leagues in North America, Europe, and Australia, this study fills a notable geographical void by providing the first thorough sonographic assessment of acute musculotendinous injuries in the professional Iraqi Stars League and Premier Division. Our data demonstrated that Grade 2 injuries were the most prevalent, and the most common injury site was the hamstring muscle. These results are consistent with global trends documented by several studies, as the hamstring muscle group emerged as the most frequently injured, particularly among high-speed position players such as wingers and strikers [15,16]. Such injuries might happen due to several reasons, as the hamstrings cross two joints: the hip and the knee. This complexity makes them vulnerable, as they have to coordinate movement and absorb forces from both joints simultaneously [17]. Also, in its role in sprinting (during the late swing phase, just before the foot hits the ground), the hamstrings work eccentrically at maximum length to decelerate the rapidly extending lower leg. This is the moment of peak tension and highest injury risk [18]. These findings highlight the importance of sprint-related biomechanics in injury pathophysiology. Several studies agreed that grade 2 injuries were the most prevalent [19,20]. The predominance of partial fiber disruptions may be explained by athletes' tendency to continue playing despite mild initial symptoms, leading to progression of injury severity [21]. The agreement of musculoskeletal ultrasound in our cohort was high, particularly for grades 1 and 3 injuries, corroborating prior work by Ueda *et al*. [22] and Guermazi *et al*. [8], who demonstrated strong agreement between ultrasound and MRI grading. Ultrasound's portability and cost-efficiency make it especially suitable for immediate pitch-side assessment in resource-limited environments. This study found that older players, the striker position, and injuries during matches rather than during training emerged as key factors increasing the possibility of more severe injuries. The Mandorino *et al*. study agreed that the incidence of severe injuries increases in older players [23]. A study by Vassis *et al*. also reported that injuries during matches rather than during training increase the possibility of more severe injuries [24]. The setting of a competitive match is fundamentally distinct from a regulated training session, resulting in greater impact. Also, the striker's job requires the most explosive and powerful movements on the field, which directly raises the risk and severity of injuries. This study found that strikers and wingers have a significantly higher prevalence of hamstring muscle injuries compared to other players. This conclusion is logical, as the biomechanical profile of strikers and wingers is distinct and challenging due to the combination of high-volume, high-velocity sprinting and frequent, strong kicking. Because of this, they are at a higher risk of hamstring injuries than any other group because of the extreme repetitive eccentric loading, which they experience [25]. Many of the injured players in our study were defenders or midfielders, with 31 and 28 cases, respectively. Defenders' frequent high-intensity accelerations, decelerations, tackling movements, and directional changes may lead to lower limb musculotendinous injuries. The muscles of midfielders are subjected to a high cumulative mechanical demand because of the constant running loads, sprints, and switching between attacks and defenses that they are usually involved in [26]. We can understand why these two positions have such high injury rates by looking at how physically and neurologically demanding they are during games and practices, as well as how important they are to the game. The results back up previous studies that showed how many different types of muscle injuries professional football players experience, with midfielders and defenders making the most hits. The results show that midfielders and defenders need strength training and load management programs specific to their positions. It is possible that the continual high-speed sprinting and emergency maneuvers required for defense contribute to the higher injury rate (such as hamstring strains) experienced by defenders rather than midfielders.

Novelty and contribution

This offers the initial thorough sonographic evaluation of acute musculotendinous injury among Iraqi League professional footballers in contrast to most existing literatures that mostly uses MRI or data from European and Australian leagues. Moreover, it provides evidence-based data that can directly influence return-to-play decisions by identifying players at increased risk for serious injuries soon after trauma.

Consequences of the study

In contrast to most studies that employ MRI as the gold standard, this study presents a primary perspective on the diagnostic power and practical applicability of ultrasound in a professional football environment. Specifically, the outcomes declared the effectiveness of ultrasound in providing immediate assessments on the field. In addition, the study found that individuals in this group were more likely to sustain significant injuries (Grade II or III) if they were older ($\geq$ 25 years), played the position of striker, and were injured in a more intense match. The findings highlighted the need for future research into the frequency and severity of muscle injuries sustained due to strength training regime.

Study Limitations

This study has several critical limitations. Firstly, the fact that we conducted this study in a single private radiology clinic in Baghdad may limit the applicability of our findings to all players in the Iraqi Premier League. Second, the retrospective nature of the study makes it subject to inconsistencies in how data was recorded. Third, the detail and accuracy of injury diagnoses and exposure data (training/match minutes) may vary between different medical staff, clubs, or seasons. Absence of MRI confirmation in all cases may lead to variability in classification. A "Grade 1 strain" at one club might be classified differently at another, affecting the prevalence data. Fourth, the results may not be generalizable to female athletes, youth players, or amateur leagues, where physiological profiles and playing conditions differ significantly. Fifth, lack of important information such as data on the intensity, volume, and type of training. These limitations mean that our findings should be interpreted as generating real-world evidence suggesting benefits of an integrated radiological approach rather than proving independent superiority of ultrasonography.

Conclusions

Professional football players in Iraqi leagues with acute musculotendinous injuries, to our knowledge, were not evaluated sonographically before, as this first retrospective study has done. The results reveal important trends and risk factors unique to this group. With high levels of agreement amongst radiologists, the study confirms musculoskeletal ultrasonography as a fast, affordable, and dependable method for identifying and classifying muscle injuries in a competitive sports context. This study provides more support for the use of pitch-side ultrasound for the rapid and accurate detection of injuries, which can aid in crucial choices regarding the player's return to play. By using ultrasound, not only were injuries' precise locations and degrees of severity determined, but relationships between injury patterns, playing positions, and sonographic findings were also established. These results support the idea that ultrasonography could be a beneficial technique for assessing and monitoring musculotendinous injuries in professional football players.

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Conflict of interests

The authors declared no conflict of interest.

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Data sharing statement

Supplementary data can be shared with the corresponding author upon reasonable request.

REFERENCES

1. Liu C, Wu X, Vulugundam G, Gokulnath P, Li G, Xiao J. Exercise promotes tissue regeneration: mechanisms involved and therapeutic scope. *Sports Med Open*. 2023;9(1):27. doi: 10.1186/s40798-023-00573-9.
2. Green DJ, Hopman MT, Padilla J, Laughlin MH, Thijssen DH. Vascular adaptation to exercise in humans: Role of hemodynamic stimuli. *Physiol Rev*. 2017;97(2):495-528. doi: 10.1186/s40798-023-00573-9.
3. Albahadili M, Ismael SM, Al-Samarraee MF. Is it possible to manage appendicular mass without surgery? *Al-Rafidain J Med Sci*. 2025;9(2):46-50. doi: 10.54133/ajms.v9i2.2322.
4. Paton BM, Read P, Van Dyk N, Wilson MG, Pollock N, Giakoumis M, et al. London International Consensus and Delphi study on hamstring injuries part 3: rehabilitation, running and return to sport. *Br J Sport Med*. 2023;57(5):278-291. doi: 10.1136/bjsports-2021-105384.
5. SantAnna JPC, Pedrinelli A, Hernandez AJ, Fernandes TL. Muscle injury: Pathophysiology, diagnosis, and treatment. *Rev Bras Ortop (Sao Paulo)*. 2022;57(1):1-13. doi: 10.1055/s-0041-1731417.
6. Zeng Y, Ji W, Shi Y, Liu W, Ji W. Sports injuries in elite football players: classification, prevention, and treatment strategies update. *Front Sports Act Living*. 2025;7:1643789. doi: 10.3389/fspor.2025.1643789.
7. Breed R, Opar D, Maniar N, Pizzari T. Epidemiology of hamstring strain injuries in Elite Male Australian football players: An analysis of 773 injuries over 7 seasons. *JOSPT Open*. 2024;2(4):289-296. doi: 10.2519/josptopen.2024.0359.
8. Guermazi A, Roemer FW, Robinson P, Tol JL, Regatte RR, Crema MD. Imaging of muscle injuries in sports medicine: Sports imaging series. *Radiology*. 2017;282(3):646-663. doi: 10.1148/radiol.2017160267.
9. Zhang M, Xie K. Advances in musculoskeletal ultrasound for assistive diagnosis in pain clinics. *Pain Ther*. 2025;14(3):791-801. doi: 10.1007/s40122-025-00721-x.
10. Buabbas M, Pearson S, Albannai A, Merza E. Musculoskeletal injuries among professional football players in Kuwait: A protocol for a cross-sectional survey. *Asian J Sport Med*. 2025;16(16):e164887. doi: 10.5812/asjsm-162457.
11. Heiss R, Tol JL, Pogarell T, Roemer FW, Reurink G, Renoux J, et al. Imaging of muscle injuries in soccer. *Skeletal Radiol*. 2025;54(4):655-667. doi: 10.1007/s00256-023-04514-1.
12. Isern-Kebschull J, Mechó S, Pruna R, Kassarjian A, Valle X, Yanguas X, et al. Sports-related lower limb muscle injuries: pattern recognition approach and MRI review. *Insights Imag*. 2020;11(1):108. doi: 10.1186/s13244-020-00912-4.
13. Valle X, Alentorn-Geli E, Tol JL, Hamilton B, Garrett Jr WE, Pruna R, et al. Muscle injuries in sports: a new evidence-informed and expert consensus-based classification with clinical application. *Sport Med*. 2017;47(7):1241-1253. doi: 10.1007/s40279-016-0647-1.
14. Hirahata Y, Yasui Y, Sasahara J, Inui T, Nakagawa T, Kawano H, et al. Role of ultrasonography and MRI in acute hamstring strains: Diagnostic and prognostic insights. *Diagnostics (Basel)*. 2025;15(9). doi: 10.3390/diagnostics15091053.
15. Onaka GM, Gaspar JJ, Graças D, Barbosa FSS, Martinez PF, Oliveira-Junior SA. Sports injuries in soccer according to tactical position: a retrospective survey. *Physiother Movement*. 2017;30(suppl 1):249-257. doi: 10.1590/1980-5918.030.S01.AO24.
16. Oleksy Ł, Mika A, Pacana J, Markowska O, Stolarczyk A, Kielnar R. Why is hamstring strain injury so common in sport despite numerous prevention methods? Are there any missing pieces to this puzzle? *Front Physiol*. 2021;12:586624. doi: 10.3389/fphys.2021.586624.
17. Afonso J, Rocha-Rodrigues S, Clemente FM, Aquino M, Nikolaidis PT, Sarmento H, et al. The hamstrings: Anatomic and physiologic variations and their potential relationships with injury risk. *Front Physiol*. 2021;12:694604. doi: 10.3389/fphys.2021.694604.
18. Andrews MH, Shield AJ, Lichtwark GA, Pincheira PA. Hamstring injury mechanisms and eccentric training-induced muscle adaptations: Current insights and future directions. *Sports Med*. 2025;55(10):2429-2443. doi: 10.1007/s40279-025-02291-6.
19. Fernandes A, Cunha P, Silva J, Duarte C, Estaca A, Bettencourt M, et al. Iliopsoas grade 2 myotendinous junction injury in an elite football player: Return to play process. *Orthopaedic SPOT*. 2024;1(1):38-43. doi: 10.82189/spot.8.
20. Bourogiannis G, Hatzimanouil D, Semanltianou E, Georgiadis I, Sykaras E. Reintegration program for professional football players after grade 2 hamstring injuries. *Montenegr J Sports Sci Med*. 2023;12(1). doi: 10.26773/mjssm.230305.
21. Stožer A, Vodopivc P, Križančić Bombek L. Pathophysiology of exercise-induced muscle damage and its structural, functional, metabolic, and clinical consequences. *Physiol Res*. 2020;69(4):565-598. doi: 10.33549/physiolres.934371.

22. Ueda Y, Tanaka H, Takeuchi Y, Tachibana T, Inui H, Nobuhara K, et al. Agreement in rotator cuff muscles measurement between ultrasonography and magnetic resonance imaging. *Asia-Pac J Sports Med, Arthroscop Rehabil Technol*. 2022;28:13-20. doi: 10.1016/j.asmart.2022.03.005.
23. Mandorino M, Figueiredo AJ, Gjaka M, Tessitore A. Injury incidence and risk factors in youth soccer players: a systematic literature review. Part I: epidemiological analysis. *Biol Sport*. 2023;40(1):3-25. doi: 10.5114/biolsport.2023.109961.
24. Vassis K, Misiris I, Plakias S, Siouras A, Spanos S, Giamouridis E, et al. Injury pattern according to player position in male amateur football players in Greece: A retrospective study. *J Clin Med*. 2025;14(17):6320. doi: 10.3390/jcm14176320.
25. Bramah C, Mendiguchia J, Dos'Santos T, Morin JB. Exploring the role of sprint biomechanics in hamstring strain injuries: A current opinion on existing concepts and evidence. *Sports Med*. 2024;54(4):783-793. doi: 10.1007/s40279-023-01925-x.
26. Moreno-Azze A, Roldán P, Pradas de la Fuente F, Falcón-Miguel D, Gómez-Carmona CD. Differences in accelerations and decelerations across intensities in professional soccer players by playing position and match-training day. *Appl Sci*. 2025;15(16):8936. doi: 10.3390/app15168936.