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British athletics muscle injury classification: a reliability study for a new grading system

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AIM: To implement and validate the newly proposed British athletics muscle injury classification in the assessment of hamstring injuries in track and field athletes and to analyse the nature and frequency of the discrepancies.

MATERIALS AND METHODS: This was a retrospective study analysing hamstring injuries in elite British athletes using the proposed classification system. Classification of 65 hamstring injuries in 45 high-level athletes by two radiologists at two time points 4 months apart to determine interrater variability, intrarater variability, and feasibility of the classification system was undertaken.

RESULTS: Interrater Kappa values of 0.80 (95% confidence interval [CI]: 0.67–0.92; $p<0.0001$) for Round 1 and 0.88 (95% CI: 0.76–1.00; $p<0.0001$) for Round 2 of the review were observed. Percentages of agreement were 85% for Round 1 and 91% for Round 2. The intrarater Kappa value for the two reviewers were 0.76 (95% CI: 0.63–0.88; $p<0.0001$) and 0.65 (95% CI: 0.53–0.76; $p<0.0001$) and the average was 0.71 suggesting substantial overall agreement. The percentages of agreement were 82% and 72%, respectively.

CONCLUSIONS: This classification system is straightforward to use and produces both reproducible and consistent results based on interrater and intrarater Kappa values with at least substantial agreement in all groups. Further work is ongoing to investigate whether individual grades within this classification system provide prognostic information and could guide clinical management.

Introduction

Muscle injuries are common in sport resulting in a significant amount of time lost from training and competition.[1,2] A recent study showed 48.2% of all injuries sustained during track and field competition were attributed to muscle injuries with the hamstring group being most commonly affected.[1] They represent a significant proportion of injuries in professional football,[2] resulting in an average of 90 days missed per club per season.[3] Muscle injuries are also common in a variety of other sports including rugby union,[4,5] Australian rules football,[6] basketball,[7] and various Olympic disciplines.[8] Accurate grading of muscle injuries is important for both

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clinicians and athletes, and the ultimate goal of an injury classification system would be to guide clinical management and provide prognostic information to predict recovery and time off from competition.

The most widely used muscle grading systems[9,10] are relatively simplistic, comprising three grades of muscle injury based on imaging findings. Grade 1 represents a strain, grade 2 represents a partial-thickness tear, and grade 3 a full-thickness tear.[11–13] A number of published studies have attempted to provide prognostic information on muscle injury based on magnetic resonance imaging (MRI) injury criteria including: the length of muscle tear[9,14] MRI "negative" injuries,[9,10,15] distance from the origin of injury,[16] cross-sectional area (CSA) of oedema,[17,19] and tendon involvement.[16,19,20] Furthermore, a grade 0 muscle injury has also been proposed[21,22] to amend the current grading system. This describes a clinically apparent muscle injury without imaging evidence of abnormality and suggests a subtle muscle injury, which at present is undetectable with current techniques.[23,24] Such an injury has been associated with quicker return to sport.[9,10,15]

These classification systems, however, do not consider the MRI parameters that have demonstrated some prognostic relevance or consider the nature of the tissue injured, potentially resulting in a number of different injuries (with different treatment and rehabilitation regimens) being categorised into a single group. Such a situation is far from ideal, particularly in elite sport, which requires greater diagnostic accuracy thereby allowing important decisions regarding treatment, rehabilitation, and return to training/play to be made.

A new British athletics muscle injury grading has been proposed[25] based on current evidence to assist in the classification and potential clinical management and prognostication of injuries. It has been developed primarily for hamstring injuries in track and field athletes.

The British Athletics Muscle Injury Classification is new classification, which proposes five grades of muscle injury ranging from Grade 0 through to Grade 4, based on specific MRI features (Table 1). Grades 1–4 are further subdivided into groups (a, b or c) based on the site and extent of the injury. The injury is classified as a number and letter as determined by the injury characteristics.

The suffix "a" denotes a myofascial injury at the muscle–fascia interface at the peripheral aspect of the muscle. A "b" injury is predominantly within the muscle belly or the muscle–tendon junction (MTJ), but with no intratendinous involvement. A "c" denotes extension of an injury into the tendon, which has been demonstrated to be associated with a poorer prognosis.[15,17] Our group has

Table 1
British athletics grading system for hamstring injury based on MRI findings.

Grade	Description	MRI (ideally 24–48 hours)
0n	Referred pain	MRI normal
0a	Focal area of muscle pain usually following exercise	MRI normal
0b	Generalised muscle pain following unaccustomed exercise	Patchy high signal change throughout one or more muscles
1a	Small myofascial tear	High signal change evident at the fascial border with <10% extension into muscle belly CC distance of <5 cm
1b	Small muscular/MTJ tear	High signal change of <10% CSA of muscle usually at the MTJ High signal change of CC length <5 cm (may note fibre disruption of <1 cm)
2a	Moderate myofascial tear	High signal change evident at fascial border with extension into the muscle High signal change CSA of between 10% and 50% at maximal site High signal change of CC length >5 and <15 cm Architectural fibre disruption usually noted over <5 cm
2b	Moderate muscular/MTJ tear	High signal change evident usually at the MTJ High signal change CSA of between 10% and 50% at maximal site High signal change of CC length >5 and <15 cm Architectural fibre disruption usually noted over <5 cm
2c	Moderate-sized intratendinous tear	High signal change extends into the tendon with longitudinal length of tendon involvement <5 cm CSA of tendon involvement <50% of tendon CSA No discontinuity within the tendon
3a	Extensive myofascial tear	High signal change evident at fascial border with extension into the muscle High signal change CSA of >50% at maximal site High signal change of CC length of >15 cm Architectural fibre disruption usually noted over >5 cm
3b	Extensive muscular/MTJ tear	High signal change CSA of >50% at maximal site High signal change of CC length of >15 cm Architectural fibre disruption usually noted over >5 cm
3c	Extensive intratendinous tear	High signal change extends into the tendon Longitudinal length of tendon involvement >5 cm CSA of tendon involvement >50% of tendon CSA There may be loss of tendon tension although no discontinuity is evident
4	Full-thickness tear of muscle	Complete discontinuity of the muscle with retraction
4c	Full-thickness tear of tendon	Complete discontinuity of the tendon with retraction

MTJ, muscle-tendon junction; MRI, magnetic resonance imaging; CC, cranio-caudal; CSA, cross-sectional area.