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Review Article

Current Concept Review: State of Acute Lateral Ankle Injury Classification Systems

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A R T I C L E I N F O

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A B S T R A C T

Acute lateral ankle sprain (ALAS) is one of the most frequent musculoskeletal injuries, with a great impact on health and socioeconomic factors. There are few consensuses on this subject and multiple therapeutic options that are difficult to compare due to the lack of a universally adopted classification system. The objective of this study is to is to report the actual knowledge on how ALAS are classified and reported and not to make any therapeutic recommendation. A comprehensive literature review of the literature was carried out through a search in the MEDLINE, Cochrane Library and Google Scholar databases, with identification of articles that describe ways to classify lateral ankle sprains or with relevant content for their classification. Twenty-five different classification systems were identified. The majority of articles referring to ALAS use an unspecific classification. Most classification systems divide sprains into 3 degrees. The most used parameters are the anatomy of the injury, clinical parameters, functional loss and the presence of instability. No articles were found to verify the validity of the systems used, namely regarding their association with therapeutic proposals or prognostic predictions. Based on the available evidence, recommendations cannot be made regarding the most appropriate classification system. The considerable heterogeneity of the existing literature makes it difficult to compare studies and to optimize the treatment and follow-up of these injuries. Future research in this area is necessary to define a practical and rigorous system that can be used universally.

Ankle sprain is probably the most frequent musculoskeletal injury and is estimated to account for 15% to 25% of all injuries. Ankle sprain patients make up about 5% of all admissions to emergency services (1).

The vast majority are sprains of the lateral ligament complex (about 85%). They are usually benign injuries and resolve without sequelae, and even the most serious injuries can evolve favorably with an appropriate therapeutic approach (2).

Although they are usually considered trivial injuries, they represent an important problem for public health. School, academic and work absenteeism rate of up to 25% has been reported in the 7 days following the initial injury (3).

Even with high incidence and socioeconomic impact, the follow-up of these patients remains a challenge since it is difficult to definitively establish the severity of the injury at the time of the initial trauma.

Although there is many information available in the literature about acute lateral ankle sprains (ALAS), the existing data is unclear and the results are ambiguous, making it difficult to compare and extrapolate to clinical practice, which makes the existing severity classification tools inconsistent.

Thus, this work consists of a comprehensive review of the literature whose main objective is to identify and describe the existing formal classification systems for ALAS and to summarize any analyses of the reliability and validity of each system

Materials and Methods

A comprehensive search strategy was conducted to find published studies in various electronic databases including the MEDLINE, Google Scholar and Cochrane Library databases. This was followed by hand searching of reference lists of the selected studies (Fig. 1). The search was re-conducted prior to study completion date.

Searches using the following Boolean operators were carried out:

"Ankle sprain" AND ("classification system" OR "grading system" OR "classification" OR "scoring" OR "grading" OR "staging" OR "score" OR "stage" OR "clinical assessment" OR "assessment" OR "evaluation").

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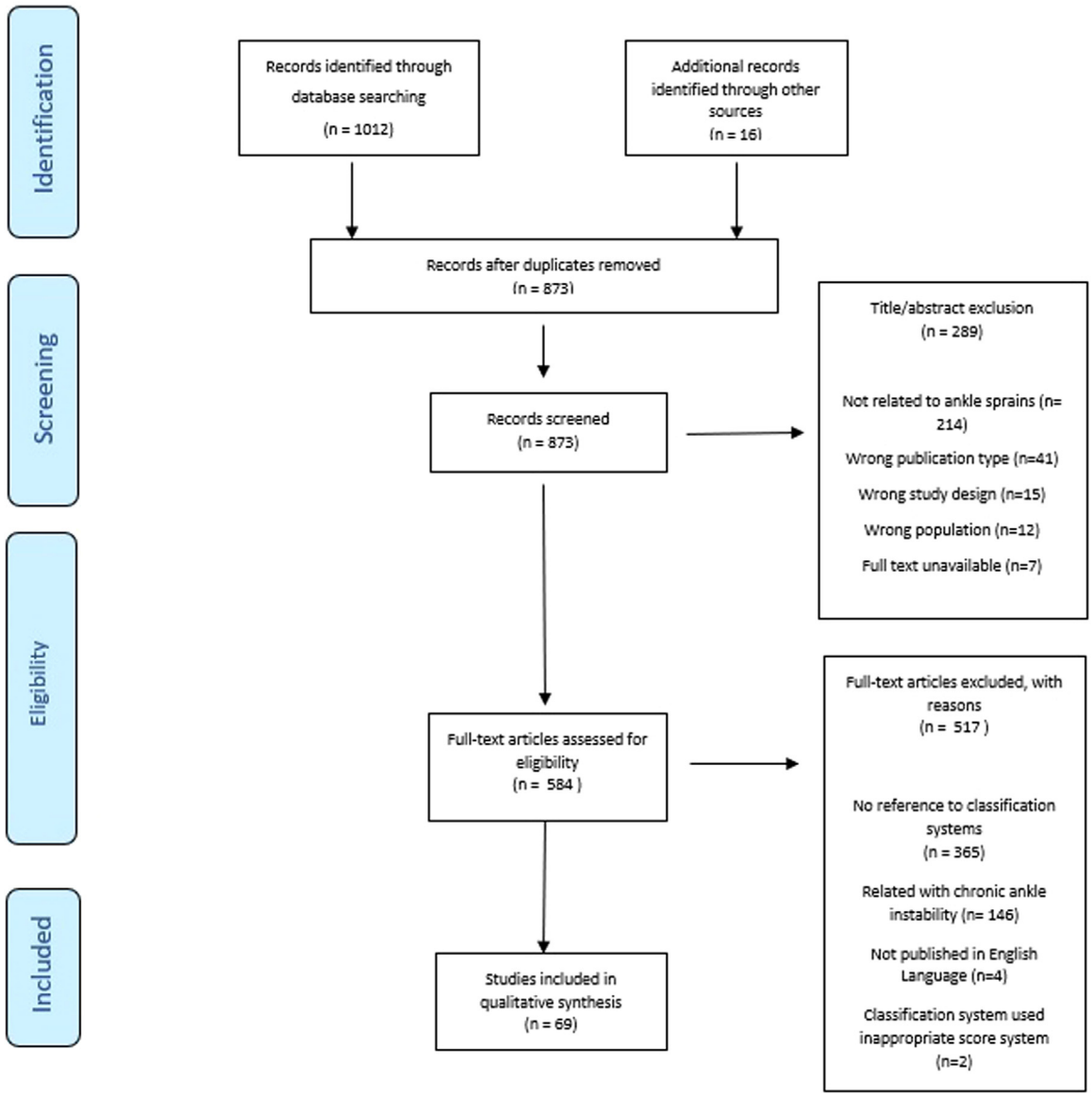

Fig. 1. Research flowchart.

We included systematic reviews, randomized controlled trials and observational studies (such as cohort studies) when they described details of ways in which to classify ALAS.

We excluded articles not related to humans, not published in English, Spanish or French, case reports, theoretical and empirical studies (letters to the editor, reports or conference abstracts) and articles related to other types of injuries than ALAS. No chronological limits were used. If a study was excluded, reasons were recorded.

The articles identified from this search were included for full-text review if they clearly indicated in the title or abstract that a classification or grading system related to acute lateral ankle sprain was used.

The quality of the methods used in each study was assessed against the Consensus-based standards for the selection of health status Measurement Instruments (COSMIN) guidelines.

Full texts of potential articles meeting the inclusion criteria were reviewed by 2 independent investigators to obtain the final collection of included studies.

Results

A total of 1012 articles were obtained and 873 were screened for eligibility. After the titles and abstracts were screened, a total of 584 records were assessed by full-text review and 69 were considered eligible and studied in detail for inclusion in the final review.

Of the articles included, 20 of them referred to the use of a classification system, but did not say which one, did not define it or did not even refer to the parameters used (4–23).

In the analysis of the remaining articles, 21 different classification systems were initially identified. Of these 21 systems, 2 were not included: one (Bernett) because the article that originally described it was in German, and the article that mentioned it did not gather sufficiently detailed information about the classification; another (AISS) was not considered for inappropriate content since, according to the authors, it was based on the questionnaire by Olerud and Molander, which applies a scale originally described to assess ankles after fracture;

In the analysis of bibliographic references of the selected articles, we also identified 16 articles of interest for inclusion in the final review. From these 16 articles (24-38), in addition to more detailed information on the classifications already considered, we found a description of 6 more classifications, making a total of 26 classifications (described in detail in appendix 1).

In most classifications, it was not possible to identify the original articles that described them for the first time. In these cases, we

included only the information contained in the articles that use or referred each classification.

Two different articles referred to 2 different classifications by the same author (Clanton). As each of them presents detailed data on the classification, we decided to integrate both differentiating by the year of publication – Clanton 1999 (39) - and - Clanton 2007 (33), respectively.

Fig. 2 shows the number of publications that mentioned each classification system. It should be noted once again that 20 of the selected articles indiscriminately used an unspecified classification system, without mentioning which one and without providing sufficient data for its characterization.

Excluding these articles that used a non-specific classification, the Balduini system was the one mentioned more times. Most systems are referred to in just 1 or 2 articles.

Discussion

Overview

It is difficult to accurately define the severity of a sprain and classify it based on the patient's first assessment. This problem is even more evident when we realize the wide range of existing classifications.

The results of a questionnaire to orthopedic doctors to assess their habits in the diagnosis, classification and treatment of these injuries, showed that 90.8% of orthopedists guide their treatment based on the application of a classification system, but that only 59% were secure when classifying a sprain (40).

Among studies are included different classification systems, different degrees of severity, different follow-up times and different endpoints. Therefore, this results in the existence of multiple different classification systems, each with its own characteristics.

Number of Categories

Most systems use 3 degrees to classify lesions with increasing severity from 1 to 3 (n = 21). Two authors choose to make an extra subdivision of these 3 degrees: Malliaropoulos adds a subdivision of grade III patients into 2 groups based on radiological findings (38) and Bordet divides grade into 3 subgroups according to the number of associated injuries (37).

As can be seen in appendix 1, although all of these systems use 3-degree divisions, a different combination of several parameters is used, which makes each classification unique.

Four articles opt for a division into 4 degrees, also with increasing severity. Castaing system is the only which includes a grade 0 to define stretches without rupture (41); Trevino divides grades III and IV into 3 groups, in grade III according to the ligament involved in addition to the anterior tibial fibular ligament and in grade IV according to the type of bone lesion associated (28).

Only one author (Clanton 2007) divides lateral sprains into 2 types, according to the presence (type 1) or absence of instability (type 2), the latter being further divided into 2 groups according to age and level of sporting activity (33).

Parameters of the Classification Systems

Classification systems can be seen as a logical process of grouping complex data into groups, using repeated characteristics for this purpose, which is verified by the overlapping of the parameters used (see Table).

The anatomy of the ligament injury (differentiation between stretch, partial tear or complete ligament tear) is the parameter most included in the classification systems (n = 18), respecting a classic tradition in Medicine that applies this division in a generic way in all ligaments the human body (proposed by the American Medical Association Medical Nomenclature). However, this division is done indiscriminately in

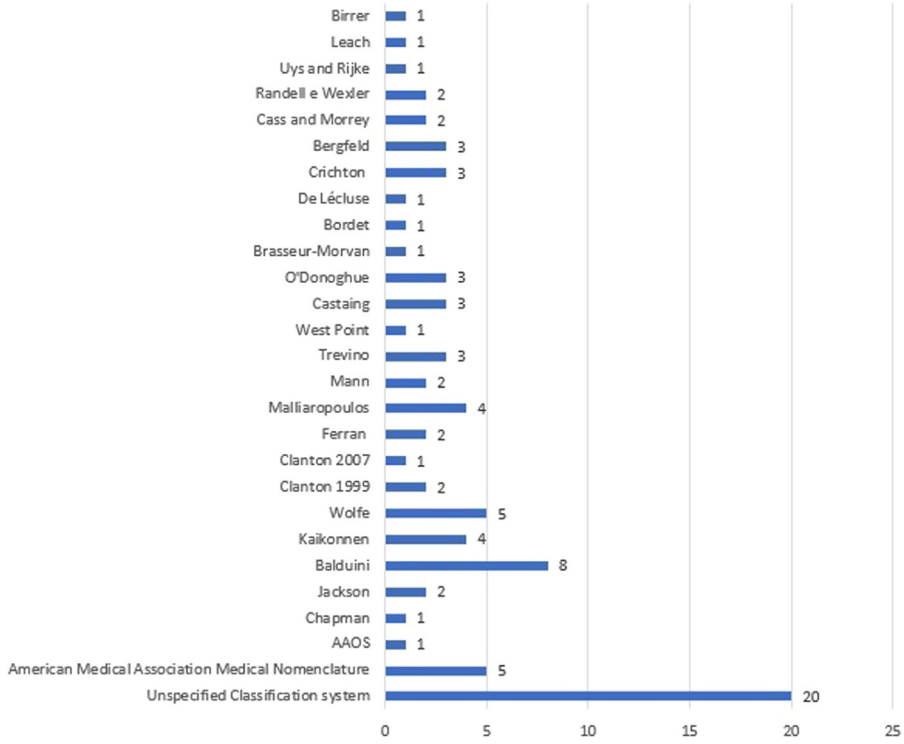

Fig. 2. Number of articles that used each classification system.

many of these classifications, not detailing which specific ligament of the lateral aspect of the ankle refers to, and according to Broström's work, 15% to 25% of severe sprains involve multiple ligaments (42).

Twelve of the 26 classifications include multiligamentar involvement and specify which ligament is affected (anterior tibial fibular ligament; calcaneofibular ligament; posterior tibial fibular ligament).

Clinical parameters are also included in most systems (n = 15). However, these parameters are not always used and grouped in a similar way between classifications. Most generally assess pain, edema, hematoma / bruising in mild, moderate and severe, but there are some who report more concrete data regarding these signs and symptoms.

Functional loss was also used in most classifications (n = 16), with some authors separately referring to the ability to support a load and carry out walking (n = 9) and some even the ability to jump over the injured limb (n = 3)

Acute mechanical instability of the ankle is another parameter that is often included (n = 15), as it seems to be more associated with more severe injuries (43). In most articles, it is evaluated clinically through the presence of asymmetrical joint laxity, with the anterior drawer test and varus stress being used preferentially. Some centers continue to use stress radiographs for this purpose, despite its low sensitivity and high interobserver variation (44).

The presence of associated injuries (e.g., osteochondral lesions, peroneal tendons) is included in 4 classifications, although there are some studies in the literature that report the lack of correlation between their presence and the lesion prognosis. For the diagnosis of this type of injury, 2 studies used ultrasound alone, 1 only radiography and 1 by both exams.

Only one classification included the overall status of the patient (distinguishing youth from the elderly and athletes from non-athletes) to differentiate subgroups of patients with different treatment needs.

Using a Classification System to Guide Treatment

Several authors recommend that the treatment of lateral ankle sprains should be done according to a classification system.

Balduini recommends conservative treatment for grade I and II of his classification, and mentions a lack of consensus in the treatment of grade III, although he prefers functional treatment and early mobilization, reserving surgical treatment for patients with chronic instability (25).

Puffer states that grades I and II of the West Point classification should be treated conservatively and that grades III also present better results with conservative treatment, reserving surgical treatment for high performance athletes (27).

Only one study (Clanton 2007) presents a classification created with the main aim of guiding the treatment of patients, including treatment proposals specifically in their classification. Clanton suggests patients in need of surgical treatment are those with unstable lesions, confirmed by stress radiographs in young patients (type II, group IIB) (33).

Using a Classification System to Predict Outcome

At least 4 studies used the proposed classification system to predict the prognosis of the injury and estimate the period of consequent physical inactivity. According to Balduini, it is difficult and imprudent to place time limits on the recovery rate and on specific aspects of the rehabilitation program, since different athletes can evolve differently regardless of having similar injuries (25).

Jackson's classification, based on a prospective study of 105 athletes, states that mild sprains (Grade I) correspond to an average downtime of 8 days, moderate sprains (grade II) to 15 days and severe sprains (Grade III) to 19 days (5,45).

According to Puffer, grade I injuries from the West Point Ankle Grading System, will correspond to a period of absence of physical activity between 7 to 14 days, grade II between 2 and 6 weeks, and grade III may result in a period between 4 to 26 weeks until the return to competitive sport (27).

Malliaroupoullos finds a contradictory relationship between the different degrees of the system he proposes and the prognosis related to the recurrence rate. In their system, athletes with a grade II injury have a significantly higher rate of recurrence (29%) than grade I (14%), but also those who have suffered a grade IIIA injury (5.6%) (46).

Validation of Classification Systems

We conducted a literature search to determine whether any of the identified classification systems or severity measures used in the literature has been tested for predictive validity or reliability and no studies were identified. None of the articles selected for this review included analyzes to demonstrate the reproducibility or predictive value of the proposed classification system

Although some suggest therapeutic plans associated with classification, no article has directly assessed the impact of these treatments.

Therefore, it was not possible to make a critical assessment of the systems using the COSMIN checklist. Likewise, construction validity and content validity were not evaluated in any of the articles.

Characteristics for a Reference Classification System

The lack of objectivity and uniformity that surrounds the classification of lateral ankle sprains, often leads us to question why an issue that should be obvious, linear and descriptive, is surrounded by so much imprecision. Doubts are easily raised as to the practical implications of using inadequate classification systems and how much this may imply in making treatment decisions for these patients.

In the author's opinion, a good classification system must meet 3 potential applications: predict the prognosis and guide treatment (clinical applications) and allow more precise comparison between studies (scientific investigation). A universally accepted classification must be objective, reproducible, with high interobserver agreement, simple to use, must have clinical application without the need to use elaborate techniques (so that it can be used in multiple situations), must be based on factors with prognostic impact and should be oriented towards treatment, facilitating its use in an emergency context.

Without such a system, comparative studies have an unacceptable potential for selection bias.

This may explain, to some extent, why management of ALAS remains a challenge and a reason for divergences between physicians. The extensive literature is disconcerting, and it is likely that many doctors will simply continue to use the system with which they are familiar.

In conclusion, we found that none of these systems have been vigorously tested for prognostic impact, none is used as a reference for deciding on treatment of patients, and none is used as a standard / reference when comparative clinical trials are wanted.

Thus, no recommendation on the best classification currently available can be made based on the available literature.

To the knowledge of the authors, this article is the only extensive review dedicated exclusively to this topic, thus giving an overview of the classification systems used in the present. The limitations of this review are related to the difficulty in assessing the quality of the selected articles, since we include many important but classical articles published prior to randomized controlled trials on this matter.

We do not exclude the hypothesis that there are other classifications here not mentioned in other bibliographic sources not consulted.

Table
Parameters of the classification system

Classification Systems	Anatomy	Symptoms (Pain, Edema,...)	Functional Loss	Ability to Walk	Ability to Jump	Range of Movement	Instability	Multiligamentar Involvement	Global Status	Associated Injuries	Radiographs	Ultrassounds	MRI	Treatment Proposoal	Related to Prognosis	Total
American Medical Association Nomenclature (26,34,47-49)	x															1
O'Donoghue (38,40,50)	X	X	X				X				X					5
Castaing (38,40,45,51)	X							X			X					3
Jackson (34,44)		X	X	X	x										x	5
Chapman (43)		X	X				X									3
Cass e Morrey (52,53)	x						x									2
Bergfeld (54–56)	x	x	x			x	x	x								6
Balduini (29,35,37,57–61)		X	X			x	X							x	x	6
AAOS (62)		X	X			x										3
Kaikonnen (26,31,39,63)	X	X	X	X			X									5
Trevino e Davis (25,26,38)	x						X	X		X	X					5
Crichton (64–66)	x						x									2
ACFAS (Wolfe) (67–71)	X	X	X	X			X									5
Randell e Wexler (72,73)	x	x	x	x										x		5
Clanton 1999 (26,33)	x							X								2
Birrer (74)		x	x			x	x									4
West Point Ankle Grading System (32)	X	X	X	X			X	X						X	x	8
Brasseur e Morvan (38)	x							X		X		X				4
Uys e Rijke (75)	x							x			x		x			4
Mann (34,35)		X	X	X												3
Bordet (38)	x							X		X		X				4
De L'Ecluse (38)	X	X	X	X		x	X	X		X	X	X				10
Malliaroupolos (20,38,46,76)	X	X	X	X	X	X	X	X			X				x	10
Leach (77)	x		x				x	x							x	5
Ferran (based in Chornley) (27,78)	X	X	X	X	x	X	X	X								8
Clanton 2007 (34)							X		x		X			X		4
Total	19	15	16	9	3	7	16	12	1	4	7	3	1	4	5	

Our work highlights the need for future research in this area and the lack of clear and universally accepted guidelines for the use of classification systems for lateral ankle sprains.

Supplementary Materials

Supplementary material associated with this article can be found in the online version at https://doi.org/10.1053/j.jfas.2022.08.005.

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