



ORIGINAL ARTICLE

C.R.I.E.S Protocol for Acute Ankle Sprains: A Prospective Study

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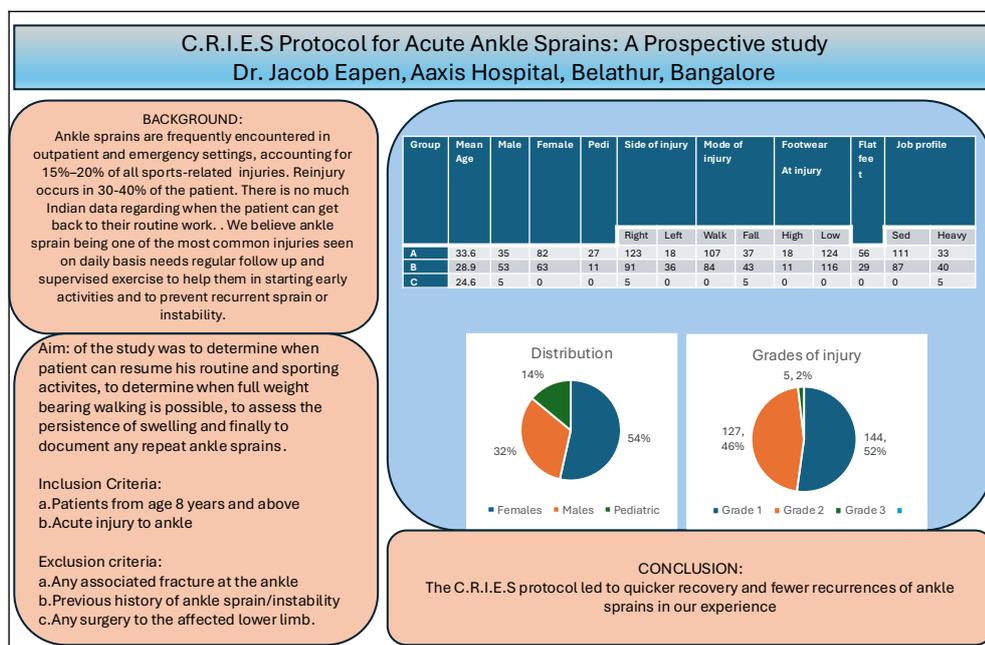
Abstract

Ankle sprains are prevalent injuries, constituting 15%-20% of all sports-related injuries and often leading to significant loss of workdays and delayed return to athletic activities. This prospective study evaluates the efficacy of the C.R.I.E.S protocol in managing acute ankle sprains. The protocol includes clinical examination, radiographic evaluation, limited immobilization, exercises, early weight-bearing, and strength training. A total of 276 patients, aged 8 to 67 years, were assessed from May 2022 to March 2025, with a follow-up period ranging from 5 to 34 months. The study categorized injuries into three grades: Grade 1 (127 patients), Grade 2 (144 patients), and Grade 3 (5 patients). Results indicated that Grade 1 injuries had an average recovery time of 3 weeks and 5 days, Grade 2 injuries had an average recovery time of 6.2 weeks, and Grade 3 injuries were managed conservatively with a mean recovery time of 13.6 weeks. The study highlights the importance of early mobilization and muscle strengthening in the recovery process, with no recurrent sprains observed during the follow-up period. The findings suggest that the C.R.I.E.S protocol is effective in managing acute ankle sprains and facilitating a timely return to routine and sporting activities.

Keywords: Lateral ankle sprain, Functional outcome, Return to sports, C.R.I.E.S

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Graphical Abstract



Introduction

Ankle sprains are frequently encountered in outpatient and emergency settings, accounting for 15%–20% of all sports-related injuries [1]. They can result in considerable loss of workdays or delayed return to athletic activities. Ankle sprains are classified as mild, moderate, or severe. This grading assists in determining the appropriate management for lateral ligament injuries. Ankle injuries usually lead to persistent pain, swelling, instability and recurrence. Reinjury occurs in 30–40% of the patient.

Grade 1 injuries present with minor swelling and tenderness without functional instability. Grade 2 (moderate) injuries involve partial ligament tears, accompanied by moderate pain, swelling, some instability, and loss of function. Grade 3 denotes a complete ligament tear, significant functional impairment, and marked instability [3].

The vast majority of ankle sprains are managed conservatively, often leading to good or excellent outcomes [4]. Biological healing is typically divided into three phases: (a) inflammatory phase (up to 10 days), (b) proliferative phase (4–8 weeks), and (c) maturation phase (up to one year). Standard treatment includes immobilization, rest, bracing, bandaging, taping, non-steroidal anti-inflammatory drugs (NSAIDs), balance training, and strengthening exercises [5]. We believe ankle sprain being one of the most common injuries seen on daily basis needs regular follow up and supervised exercise to help them in starting early activities and to prevent recurrent sprain or instability.

In this study we desired on following a standard protocol for all the patients with grade 1 and 2 ankle sprain with regular follow up. All the patients were closely reviewed at each visit by the author. The clinical findings were documented, and

exercise were personally re-in forced to the patient at each visit.

Mechanism

Ankle sprains usually occur due to forefoot adduction and hindfoot inversion combined with external tibial rotation when the joint is in plantar flexion [6]. The lateral ligament complex comprises the anterior talofibular ligament (ATFL), calcaneofibular ligament (CFL), and posterior talofibular ligament. Depending on the force applied and its direction, one or more ligaments may be injured, with the ATFL being most affected due to its relative weakness [6].

Materials and Methods

Inclusion Criteria:

- a. Patients from age 8 years and above
- b. Acute injury to ankle

Exclusion criteria:

- a. Any associated fracture at the ankle
- b. Previous history of ankle sprain/instability
- c. Any surgery to the affected lower limb.

We evaluated 347 patients who came to our emergency room with history of ankle twisting injury from May 2022 to March 2025. Seventy-one patients were excluded from the study as they had associated lateral malleoli, medial malleoli or posterior malleoli fracture or a combination of these three fractures. Only 276 patients with no radiographic features of fractures were included in the study. The age of the patients ranged from 8 years to 67 years. The minimum follow up was 5 months and maximum follow up is 34 months.

All patients received the C.R.I.E.S protocol, which consists of the following components:

1. Clinical examination by a single consultant
2. Radiographic evaluation
3. Immobilization for limited period
4. Exercises and Early weight bearing
5. Strength training.

Aim of the study was to determine when patient can resume his routine and sporting activities, to determine when full weight bearing walking is possible, to assess the persistence of swelling and finally to document any repeat ankle sprains.

All patients underwent thorough clinical examination by the author which included OTTAWA ankle rules, palpation of Medial collateral ligament, Lateral collateral ligament and whole foot. Visual Analogue score, swelling, tenderness, ankle movements, anterior drawer test and talar tilt test were documented. We also documented the mode of injury whether its twisting injury while walking, sporting activities or fall from height. Age group, Sex, side of injury, footwear worn at the time of injury, presence of flat feet, preinjury activity levels, type of work. Patients underwent radiographic evaluation next. Those with even hairline fractures were excluded from the study. Based on the clinical examination the patients were assigned three groups A, B, C based on whether the ankle sprain is grade 1,2 or 3 respectively.

Demographics

In our study which included 276 patients with ankle sprain. The demographics is as shown in Table 1.

Table 1. Demographics

Group	Mean Age	Male	Female	Pediatric	Side of injury		Mode of injury		Footwear At injury		Flatt	Job profile	
					Right	Left	Walk	Fall	High	Low		Sever	Heavy
A	33.6	35	82	27	123	18	107	37	18	124	56	111	33
B	28.9	53	63	11	91	36	84	43	11	116	29	87	40
C	24.6	5	0	0	5	0	0	5	0	0	0	0	5

Results

A total of 127 patients had grade 1, 144 had grade 2, and 5 had grade 3 ankle sprains. All underwent thorough clinical exams. Grade 1 and 2 patients received anti-inflammatories, ice every eight hours, limb elevation, and used an ankle brace while walking. They were allowed full weight-bearing with limited walking for two weeks and advised to use an ankle binder for 2–4 weeks. Heat therapy was avoided. Dorsiflexion, plantar flexion, quadriceps, VMO, and calf strengthening exercises (25 reps daily for 6 weeks) began on day one as tolerated.

Five patients exhibiting probable ankle instability were immobilised with a slab for two weeks. Individuals presenting with significant swelling and instability were referred for MRI scans of the ankle to confirm injury grade. Of 18 patients who underwent MRI, five were diagnosed with a grade 3 tear of the lateral collateral ligament and a grade 2 tear of the deltoid ligament, categorising them as Group 3. Six patients had associated fractures and were consequently excluded from the study. Seven patients were assigned to Group B (Grade 2 ankle sprain).

Group A: All patients were followed up at 7 days, 4 weeks, 2 months, 6 months and one year. Patients were checked for VAS score, ankle movements, gait pattern, ankle instability. The time to resume sporting activities and work loss days were also calculated.

Of the 127 patients with grade 1 injury the average recovery time was 3wk 5 days. The mean VAS score was 4.3 on the day of presentation and 0 at the end of 2.5 weeks. All patients were fully weight bearing from day 1. Fifty-six patients complained of swelling persisting for more than 5 weeks, but they did not have restriction any activity. 61 patients were working from home as they had the option for 2.3 weeks and 39 patients continued going for work. There was no ankle instability or recurrent sprain noted in Group A patients at the end of follow up. 45 patients who were regular in sports/weight training were able to resume their activities by third week. They could gradually get back to their pre-injury levels by 7th week. No patient complained of altered gait at the end of 6.5 weeks.

Group B: 144 patients with grade 2 injury recovery time was 6.2 weeks. Pain free movements and ability to do weight

bear walking to do daily chores were considered as good recovery. On presentation the VAS score was 6.7, 3 at 3 weeks and mean of 1.9 at 5.6 weeks. 49 patients took work from home for 3.1 weeks, 27 patients resumed traveling to office from the first day, 48 patients took complete rest at home for 4.5 days and then resumed daily office work. The mean follow up was 11.6 months. They could resume sporting activities by 8.2 weeks. There was continued pain for 12 patients; 8 patients underwent MRI scan was taken and it showed Grade 2 LCL sprain and grade 1 MCL sprain with mild ankle synovitis. 39 patients complained of gait abnormality for up to 8.8 weeks. 23 patients admitted that exercises protocol was not followed as advised. 16 patients had gait problems despite doing exercise due to swelling. There was no restriction of activities for 90 patients by 7.2 weeks.

At the end of follow up there were 12 patients with mild gait abnormality due

to calf muscle wasting. There is no incidence of recurrence of sprain.

Group C: This group had 5 patients with grade 3 ankle sprain. All patients underwent MRI scan after detecting ankle instability on clinical examination. Patients were advised for surgery for ligament reconstruction. All 5 patients were daily wage workers and not willing for surgery. They were managed conservatively in below knee cast and strict non weight bearing for 4 weeks. They were also advised on exercises for the Quadriceps, VMO and static calf muscle strengthening. At the end of 4 weeks the cast was removed and the protocol for Grade 1 and 2 injuries were followed. All patients complained of stiffness at ankle till 3 weeks. VAS score was 8.2 on arrival, 4.5 at the end of 4 weeks and 2.7 at 13.6 weeks. 4 patients complained of swelling for 6 months. 3 patients were followed up for 14 months. During this period none of them had another sprain episode (Table 2 and Figure 1).

Table 2. VAS score at the time of injury and final follow up in each group

Group	VAS (initial)	VAS (final)
A	4.3	0 (2.5wk)
B	6.7	1.9(5.6wk)
C	8.2	2.7(13.6wk)

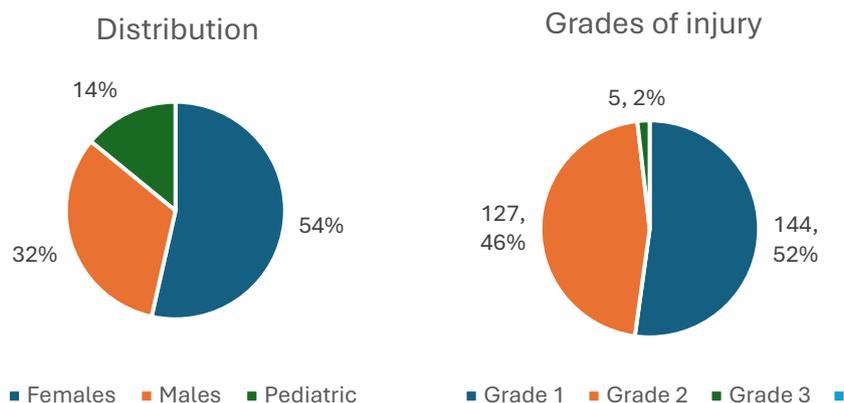


Figure 1. Gender Distribution and Number of patients in each group

Discussion

Post-ankle sprain concerns often include determining appropriate timelines for returning to work, resuming sporting activities, and understanding potential long-term consequences. This study aimed to address these questions in a hospital setting that serves patients from various socio-economic backgrounds and to assess the functional outcomes of the C.R.I.E.S protocol. Most components of this protocol aligned with existing treatment approaches, with particular emphasis on quadriceps, vastus medialis oblique (VMO), and calf muscle strengthening, as well as early mobilization. Patients were encouraged to maintain adherence through regular follow-up visits.

In this study we followed up 276 patients with a minimum follow up of 8 months. We assigned three groups based on the grades of sprain. Our objective was to develop a standard protocol in lines of conservative management which would help the patients resume their routine activities and sports at the earliest.

Studies have shown that exercise-based interventions reduce the rate of re-injury [7-11]. But no study has shown any association between reinjury and increasing the training period. In our study we noticed

there was no re injury during the period of follow up except for 2 patients which was diagnosed as grade 1 sprain. Both the patients were again followed up for a year, and ankle was found to be stable. Lazarou et al. [12] reported significant reduction in pain in patients who followed exercise protocol versus patients who did not have regular follow ups. In our study Grade 1 patients reported zero visual analogue score at the end of 2.5 weeks and Grade 2 patients reported VAS score of 1.9 by 5.6 weeks.

Hultman et al. [13] reported reduction in reinjury and lower pain in patients who had minimum 4 visits by 6th month. Van Reijen et al¹⁴ compared exercise-based protocol delivered via phone versus printed booklet. A small reduction in re injury was noted in booklet group which was not statistically significant. Pourkazemi et al¹⁵ noted prevalence of recurrent ankle sprains was 22% in patients who were not regular with exercises.

The duration required to return to activity is influenced by several factors, such as the pre-injury activity level and rehabilitation process. Studies showed average time to return to sports after lateral ankle sprain is 16-25 days [16]. But many athletes experience reinjury or long-term

pain. The recurrent ankle sprain in athletes ranged from 12-47% [17,18]. Lateral ankle sprains can result in proprioceptive disturbances originating from the central nervous system beyond spinal reflexes, which may cause functional instability^{19,20}. In this study, among 127 patients with grade I injuries, 45 individuals engaged in recreational sports were able to resume activities by the third week. Our study strictly restricted patient from sports for first 2 weeks even those who were pain free.

Recurrent ankle sprain leads to chronic ankle instability. Chronic ankle instability is an important predictor of post traumatic osteoarthritis.

In our study 54% (145) were females, 32% (88) males and 14% (38) paediatric. All the paediatric ankle sprains happened while playing. 27 children had grade 1 sprain and 11 had grade 2 sprain. All children resumed sports by 11+/- 2 days. Only one child reported twisting injury 4 weeks from the initial injury. The mean weight of the paediatric group was 41.3 kg.

Conclusion

In our cohort we found that C.R.I.E.S protocol in acute ankle sprain led to faster recovery in terms of reduction of pain, full weight bearing and return to sports. There was also very less recurrence noted in our study. We advise supervised exercises and regular follow up in all acute ankle sprains which reduces recurrence and thus future arthritic changes.

Strength and limitation

We tracked 276 patients for at least 6 months, documenting findings and teaching exercises at each visit. One consultant performed all clinical exams. Frequent follow-ups were likely due to our

hospital being the only orthopaedic facility for a population of 55,000–60,000. The C.R.I.E.S protocol led to quicker recovery and fewer recurrences of ankle sprains in our experience. No statistical analysis was conducted. All grade 3 ankle sprains were treated conservatively, so we cannot assess the benefits of surgical intervention.

Statements and Declarations

Conflicts of interest

The authors declare that they do not have conflict of interest.

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