Audit

Initial management of closed fracture-dislocations of the ankle

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Background: Immediate management of closed fracture-dislocations of the ankle requires urgent reduction and immobilisation of the ankle prior to definitive surgery.

Methods: The management of 23 patients attending the accident and emergency department of a district general hospital with this type of injury were reviewed retrospectively.

Results: Paramedic reduction was attempted in 1 of the 22 patients brought by ambulance. Triage categorisation was inappropriate in 14 patients. Unnecessary pre-reduction radiographs were obtained in 8 patients. Reduction was initially inadequate in 2 patients, and no post-reduction splintage was applied in a further 2 patients. Recording of skin and neurovascular status was inadequate in the majority of the patient's notes.

Conclusions: The necessary urgent reduction and splintage is being delayed in some cases because of inadequate injury recognition, inappropriate triage categorisation and unnecessary radiographs.

Key words: Ankle injuries – Complications – Radiographs – Fracture-complications – Dislocation-complications

Closed fracture-dislocations of the ankle represent a significant traumatic insult both to the bone and the surrounding soft tissues. Immediate management should be directed towards protection of these soft tissues by anatomical reduction and immobilisation of the ankle, prior to definitive bony stabilisation.^{1–3} Preservation of a healthy soft tissue envelope is a priority. The purpose of this study was to review the initial management of ankle fracture-dislocations in the accident and emergency department over a 12-month period, with respect to the urgency of ankle reduction and immobilisation prior to definitive surgery.

Patients and Methods

We retrospectively reviewed the initial management of all patients presenting with a fracture dislocation of the ankle to the accident and emergency department of Kingston Hospital over a 1-year period ending in July 2000. Notes made by the paramedic team, if involved, triage nurses and attending doctors were reviewed in conjunction with all ankle radiographs taken. These injuries were identified by documentation of gross clinical deformity and/or talar shift of greater than 50% on the radiograph. Details recorded included: (i) any

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Table 1 Patient data

Sex	No.	Mean age (years)	Age range (years)
Male	10	31	14–44
Female	13	56	15–77
Total	23		

AO fracture grade	Number
A3	1
B1	2
B2	5
B3	3
C1	3
C2	9

attempts by paramedic staff to reduce the dislocation prior to arrival at the accident and emergency department; (ii) the allocation of triage category by the relevant nurse; (iii) the grade of the attending doctor; (iv) records of the soft tissue condition and neurovascular status of the foot and ankle; (v) requests for and timing of pre-reduction radiographs; (vi) attempts and timing of ankle reduction; and (vii) adequacy of post-reduction splintage.

Results

Patient data

A total of 23 patients with ankle fracture-dislocations presented within the time period; their details and AO grading⁴ of the injuries are shown in Table 1. Types A, B and C represent infrasyndesmotic, trans-syndesmotic and suprasyndesmotic fibula fractures, respectively, with subdivisions describing the posterior and medial injuries.

Figure 1 Time to attendance by doctor according to triage category.

Table 2 Triage category

Triage category	Number of patients
Red (see immediately)	1
Orange (see within 10 min)	8
Yellow (see within 1 h)	6
Green (see within 3 h)	1
Not recorded	7

Paramedic reduction

Twenty-two patients were brought to hospital by the emergency services. An attempt at ankle reduction by the paramedics was performed in one patient; however, this proved inadequate on a subsequent radiograph.

Triage category

The allocation of triage category for each patient is shown in Table 2. One patient (4%) was triaged as green (see within 3 h), despite the triage nurse noting 'obvious deformity to right ankle'. The triage category was correlated to how long the patient had to wait to see a doctor (Fig. 1). Fifteen patients were seen within 30 min despite their triage category. The patient triaged as green waited over 30 min to be seen. Of the 6 patients whose triage categories were not recorded, only 3 were seen within 15 min and 2 waited 30–60 min. The time a doctor initially attended the patient was not recorded in 4 cases; therefore, these are not included in the figure.

Figure 2 Time from being seen by a doctor to time of manipulation.

Figure 3 Antero-posterior radiograph demonstrating fracture dislocation of ankle.

Figure 4 Lateral radiograph demonstrating fracture dislocation of ankle.

Grade of attending doctor

Sixteen (70%) of the 23 patients were seen by senior house officers (SHOs), 5 (22%) by registrars and 2 (9%) by consultants.

Pre-reduction radiograph

Eight (35%) patients had pre-reduction radiographs, clearly demonstrating ankle dislocation with soft tissue deformity (Figs 3–5). Five (62.5%) of these requests for radiographs were made by SHOs, the remainder by more senior staff.

Time to manipulation

All patients had their dislocations reduced under midazolam sedation. Timings recorded for administration of the sedation were used to calculate the time from arrival to manipulation. Figure 2 shows these times for all patients, divided into those with or without pre-reduction radiographs. Post-reduction radiographs demonstrated inadequate reduction in 2 patients. These ankles were adequately reduced at a second manipulation.

Figure 5 Clinical photograph of the deformity associated with a fracture dislocation of the ankle.

Recording of ankle skin status and presence of pulse

Comment on the integrity and condition of the skin was recorded in the notes of 5 (22%) patients. Assessment of the dorsalis pedis pulse had been noted in 18 (78%) cases prior to reduction and in only one of these patients (4%) following manipulation. None of the patients had the neurological status of their feet recorded.

Post-reduction splintage

Two patients had no splintage applied after successful reduction. The remaining patients had a plaster of Paris backslab applied.

Discussion

In the period covered by this audit, of the 85,500 patients presenting to the accident and emergency department, 2258 had ankle injuries. Whilst the severity of open injuries is usually apparent, closed ankle fracture-dislocations require equally urgent management. Although we have used the AO classification to describe the injuries of the study population, this radiographic grading does not describe the extent of the soft tissue injury and, therefore, would not influence immediate management. Failure to act promptly will result in excessive tissue swelling, which may result in delayed surgery, poor wound healing and prolonged time to bone union.^{1,5} Provision of urgent treatment requires recognition of the injury, an understanding of the need for prompt action, and referral to a clinician competent in the necessary reduction.

Reduction of these injuries can be easily achieved under sedation in the accident and emergency department. The main principle is to restore the alignment of the foot to the long axis of the leg, and 'undo' the deformity. In most fracture dislocation configurations, this usually consists of using one hand to cup the heel and bring it gently forward, while the other hand controls lateral movements at the lower leg. Charnley describes holding the heel and allowing the leg and foot to fall into external rotation, which will automatically correct the valgus deformity.⁶ Once the position resembles the normal posture of the foot and leg, it can be maintained by holding the leg elevated by the toes for application of a splint. The reduction is not a definitive treatment, but is meant to relieve the tension on the skin and soft tissues. The pedal pulses should be checked and noted.

Paramedic reduction of a dislocation was only attempted in one patient. This may reflect the training and willingness of paramedics to perform such a procedure, rather than recognition of the type of injury. The Joint Royal Colleges Ambulance Liaison Committee Pre-hospital Guidelines⁷ provide a structure and protocols from which paramedics

work. It states the importance of assessing the vascular status of an injured limb, and re-aligning long-bone fractures anatomically. Whilst the simple manoeuvre for reduction of an ankle dislocation, outlined above, could easily be taught to paramedics, they are advised not to reduce dislocated joints in the absence of adequate analgesia or sedation. With the introduction of limited analgesic administration by paramedics, ankle reduction is a skill that would be of potential benefit in situations of vascular compromise or long transfer times.

The purpose of triage is to assess and sort patients on arrival to ensure that they are managed with appropriate urgency. The Manchester triage system, used in our department, is a computerised system which places patients with 'deformity' and 'swelling' into the green (see within 3 h) category, and patients with 'gross deformity' into the yellow (see within 1 h) category. If a patient is recognised as potentially having "vascular compromise" or 'critical skin' they are placed in the orange (see within 10 min) category. The triage nurses should be trained to recognise the importance of such injuries and interpret the current triage system appropriately. Even if the injury is enclosed within paramedic splints, an adequate view must be obtained for accurate assessment. In our study, 15 patients were seen within 30 min, and all patients were seen within an hour, regardless of their triage category. This could imply that doctors were being made aware of the presence of such patients in the department. Although triage nurses could be trained to reduce these injuries competently, reductions in the accident and emergency department should be performed under monitored sedation, which is usually administered by a doctor. Therefore, once such an injury is recognised, the role of the triage nurse should be to alert a doctor promptly.

Pre-reduction radiographs were obtained in 8 of the 23 patients. Although the numbers are small, it would appear that this led to an unnecessary delay in the treatment of these 8 patients. Radiographs of a dislocated ankle will not contribute to planning of subsequent definitive reduction and fixation. It is reasonable to attempt to reduce all deformed ankles into an anatomical position and splint appropriately, prior to obtaining a radiograph.⁸

The recording of skin integrity and presence of a pulse pre- and post-manipulation is important, as these are factors that may influence timing of operation. Once a backslab has been applied, thus obscuring the limb, previous recording of skin and pulses is vital.

Conclusions

The need for urgent reduction and splintage of closed ankle fracture-dislocations has previously been emphasised.

Factors contributing to a delay in appropriate management include failure to identify the need for prompt reduction, inappropriate triage categorisation and unnecessary pre-reduction radiographs.

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