The 'ABC' of examining foot radiographs

EYIYEMI O PEARSE, BENJAMIN KLASS, STEPHEN P BENDALL

Department of Trauma and Orthopaedics, Princess Royal Hospital, Haywards Heath, West Sussex, UK

ABSTRACT

INTRODUCTION We report a simple systematic method of assessing foot radiographs that improves diagnostic accuracy and can reduce the incidence of inappropriate management of serious forefoot and midfoot injuries, particularly the Lisfranc-type injury.

STUDY GROUP AND METHODS Five recently appointed senior house officers (SHOs), with no casualty or Orthopaedic experience prior to their appointment, were shown a set of 10 foot radiographs and told the history and examination findings recorded in the casualty notes of each patient within 6 weeks of taking up their posts. They were informed that the radiographs might or might not demonstrate an abnormality. They were asked to make a diagnosis and decide on a management plan. The test was repeated after they were taught the 'ABC' method of evaluating foot radiographs.

RESULTS Diagnostic accuracy improved after SHOs were taught a systematic method of assessing foot radiographs. The proportion of correct diagnoses increased from 0.64 to 0.78 and the probability of recognising Lisfranc injuries increased from 0 to 0.6.

CONCLUSIONS The use of this simple method of assessing foot radiographs can reduce the incidence of inappropriate management of serious foot injuries by casualty SHOs, in particular the Lisfranc type injury.

KEYWORDS

Lisfranc – Fracture-dislocation – Radiographs – Casualty

CORRESPONDENCE TO

Mr EO Pearse, 28 Elm Grove Road, Barnes, London SW13 0BT, UK
M: +44 (0)7780 860507; E: YemiPearse@aol.com

Patients present to casualty with a spectrum of forefoot and midfoot injuries. Diagnosis is often left to junior medical staff or triage nurses. History and clinical examination are

insufficient to make the diagnosis because patients with trivial injuries may present with the same history and physical signs as patients with serious injuries. Consequently, much

Antero-posterior
(AP)

Medial-oblique
(MO)

Figure 1 Anteroposterior (AP) and medial-oblique (MO) projections of the foot.

emphasis is placed on radiographs. However, foot radiographs are difficult to interpret because of unfamiliarity with normal anatomy and because bones overlap in all projections of conventional radiographs.

Failure to appreciate the severity of an injury may result in inappropriate management and considerable morbidity.¹ We have developed a simple systematic method of assessing foot radiographs that improves diagnostic accuracy and can reduce the incidence of inappropriate management of serious forefoot and midfoot injuries.

Study Group and Methods

The 'ABC' method of examining foot radiographs

Bones overlap in all projections because the foot has transverse and longitudinal arches (Fig. 1). The medial two rays are best assessed on the anteroposterior (AP) projection and the lateral three rays are best assessed on the medial-oblique (MO) projection.

Alignment

As shown in Figure 2, evaluation of the tarsometatarsal joints (TMTJs) can be simplified by observing the alignment of the metatarsal bones with their corresponding tarsal bones:² the medial and lateral margins of the metatarsals align with the margins of the corresponding tarsal bones. Although there is normal variation,⁴ the most constant normal relationship is the alignment of the medial margin of the second TMTJ.⁴

Bones

Fractures are most easily identified as a discontinuity in the cortex. Trace the outline of each bone (Fig. 3). As previously, the medial two rays are best assessed on the AP projection and the lateral three rays are best assessed on the MO projection. Accessory bones are recognised by: (i) site; (ii) shape (rounded versus irregular); and (iii) smooth versus sharp borders.

Congruity

Forefoot joints are assessed on both AP and MO projections. The medial two tarsometatarsal joints are assessed on the AP projection (Fig. 4A), and the lateral three tarsometatarsal joints and the midtarsal joints are assessed on the MO projection (Fig. 4B).

Validation

Five recently appointed SHOs, with no casualty or orthopaedic experience prior to their appointment, were shown a set of 10 foot radiographs and told the history and examination findings recorded in the casualty notes of each

patient within 6 weeks of taking up their posts. They were informed that the radiographs might or might not demonstrate an abnormality. They were asked to make a diagnosis and decide on a management plan. The test was repeated after they were taught the 'ABC' method of evaluating foot radiographs.

Results

Diagnostic accuracy improved after SHOs were taught the systematic method of assessing foot radiographs: the proportion of correct diagnoses increased from 0.64 to 0.78 ($P = 0.099$, chi square test). The probability of recognising Lisfranc injuries increased from 0 to 0.6.

Conclusions

We recommend the use of this simple method of assessing foot radiographs which can reduce the incidence of inappropriate management of serious foot injuries by casualty SHOs in particular the Lisfranc-type injury.

References

1. Richter M, Wippermann B, Krettek C, Schratz HE, Hufner T, Therman H. Fractures and fracture dislocations of the midfoot: occurrence and long-term results. *Foot Ankle Int* 2001; **22**: 392–8.
2. Norfray JF, Geline RA, Steinberg RI, Galinski AW, Gilula LA. Subtleties of Lisfranc fracture-dislocations. *AJR Am J Roentgenol* 1981; **137**: 1151–6.
3. Delfaut EM, Rosenberg ZS, Demondion X. Malalignment at the Lisfranc joint: MR features in asymptomatic patients and cadaveric specimens. *Skeletal Radiol* 2002; **31**: 499–504.
4. Foster SC, Foster RR. Lisfranc's tarsometatarsal fracture-dislocation. *Radiology* 1976; **120**: 79–83.