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Interpretation of Normal Foot and Ankle Radiographs by Accident & Emergency and Orthopaedic Clinicians

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Abstract

The purpose of this study was to assess the ability of clinicians dealing with foot and ankle trauma to interpret plain radiographs of the foot and ankle in standard views.

A survey of 47 clinicians was conducted between November and December 2010. House officers, senior house officers (SHOs) and specialist registrars (SpRs) from the Emergency and Orthopaedic departments were recruited. Participants were supervised identifying 12 standard bones/landmarks on four images of normal foot and ankle radiographs.

A significant difference was found between Emergency and Orthopaedics clinicians (p=0.01), in favour of the Orthopaedic group. Emergency SHOs correctly identified only seventy per cent of the structures assessed in this study.

Orthopaedic trainees scored higher. Failure to recognize these bony landmarks may give rise to problems regarding the identification of fractures and dislocations. There is a deficiency in the knowledge and application of radiographic anatomy across Emergency clinicians, particularly evident in SHOs.

Keywords: Normal foot radiograph; Normal ankle radiograph; Orthopaedic clinicians

Introduction

Trauma to the foot and ankle accounts for a large number of Accident & Emergency (A&E) attendances each year, with lateral ankle sprains accounting for five per cent of these. Plain radiographs form an integral part of the diagnosis and management of these patients, as they are often the first-line investigation. A paper by Roche et al. [1] highlighted the deficiencies in surface anatomy knowledge of the foot and ankle amongst A&E and orthopaedic trainees. If similar deficiencies existed in identification of structures on 'normal' radiographs then at best communication amongst clinicians could be confusing or at worst, abnormalities may be missed. The aim of this study was to assess the ability of clinicians dealing with foot and ankle trauma to interpret plain radiographs of the foot and ankle in standard views.

Materials and Methods

Good quality plain radiographs showing an Antero-Posterior (AP) and lateral view of the ankle and AP and oblique views of the foot were obtained from the radiology department. These were confirmed to be normal without any significant abnormality by a Consultant musculoskeletal radiologist.

Participants were recruited from the Accident & Emergency (A&E) and Trauma and Orthopaedic departments at a University Teaching Hospital in the UK. Foundation Year 2 (F2), Core Surgical and Specialty Trainees Years 1 and 2 (CST1, CST2, ST1 and ST2) and higher surgical trainees (ST3 and above and Specialist Registrar (SpR) were approached. Additionally, Orthopaedic Foundation Year 1 (F1) doctors were included to establish a baseline level of knowledge of doctors fresh from medical school.

Each participant was shown the four views described above and asked to identify certain bones/landmarks on each by means of a pointer. For each one correctly identified they were awarded one point (total score range 0-12). The landmarks that they were asked to identify in each radiograph are listed in (Table 1).

Results were analysed in Excel® (Microsoft Corporation, Redmond, WA, USA). The unpaired (student's) T test was used for significance calculations.

Radiograph	Landmark
AP Foot	Navicular
	Medial cuneiform
	Base of 5th metatarsal
Oblique Foot	Navicular
	Cuboid
	Talus
AP Ankle	Lateral malleolus
	Medial malleolus
	Talus

Lateral ankle	Talus
	Calcaneus
	Navicular

Table 1: Landmarks identified on each radiograph

11	2	3	1	3	1
12	0	4	2	3	9
Total	11	8	10	7	11

Table 2: Scores obtained by grade and specialty

Results

Nineteen A&E and twenty-eight Orthopaedic clinicians were asked to participate in the study. For the purpose of the results, F2, CST and ST1 and 2 doctors were grouped as SHOs and ST3+ and SpRs were grouped as Registrars. Of the nineteen A&E clinicians surveyed, eleven were SHOs and eight were Registrars. Seven SHOs were surveyed from the Orthopaedic department, along with eleven Registrars and ten F1 doctors.

The mean scores per grade and specialty are shown in (Figure 1). The mean number of correctly identified structures for A&E clinicians was 9.6 (out of 12), whereas that for the Orthopaedic group was 10.6. If F1s are excluded from the Orthopaedic group, the mean score rises to 11.4 giving a significant difference between the two groups (p=0.01). The mean score for SHOs in the A&E department and Orthopaedic SHOs was 8.4 and 11 respectively (p=0.03). There was no statistical difference between the mean scores of the Registrars (p=0.29). The range of scores obtained across the participants was 2-12.
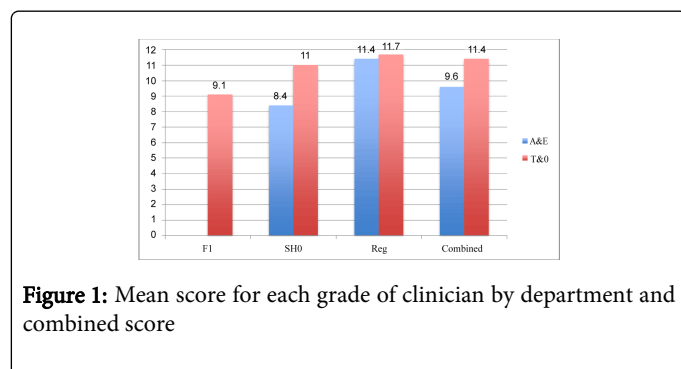

Figure 1: Mean score for each grade of clinician by department and combined score

Twenty-one per cent of A&E physicians scored maximum points with the lowest score by a registrar being ten. The best mark an A&E SHO obtained was eleven. One A&E SHO scored two out of twelve. In the Orthopaedic group, fifty per cent of doctors surveyed obtained top marks (nine Registrars, three SHOs and two F1s). The lowest scoring Orthopaedic physician scored 6 (2 F1s). The scores achieved by each grade of physician in each specialty are shown in (Table 2).

Score	A&E		T&O		
	SHO	Reg	F1	SHO	Reg
2	1	0	0	0	0
6	0	0	2	0	0
7	1	0	2	0	0
8	2	0	0	1	0
9	3	0	0	0	0
10	2	1	3	0	1

Discussion

The radiographic anatomy of the A&E and Orthopaedic physicians surveyed was found to be poor but improved once registrar training is reached. Doctors in A&E scored lower than Orthopaedic trainees. Senior House Officers in A&E correctly identified only seventy per cent of the foot and ankle structures assessed in this study. Overall, Orthopaedic trainees scored higher and this was, perhaps, to be expected. Failure to recognize these bony landmarks on standard radiographic views has the potential to give rise to problems regarding communication and the identification of fractures and dislocations. This may result in foot and ankle radiographs being frequently misread [2]. In clinical practice interpretation of these images may be difficult because of the variety of possible injuries and their sometimes-inconspicuous appearances [3].

Roche et al. [1] concluded after assessing 109 clinicians across both specialties palpate six anatomical landmarks that Orthopaedic and Emergency clinicians were becoming over-reliant on expensive imaging of the foot and ankle, thus overlooking the fundamentals of physical examination. Undergraduate teaching was also thought to be inadequate.

Our study has revealed some interesting results; however it is not without its limitations. One such limitation is the relatively small sample sizes used, in particular within the Emergency clinician group. Having more size-matched and larger numbers in each group would doubtless have improved the reliability of the results and provided them with greater credibility. This is an area which can be improved if the study were to be taken further. Another potential area for improvement is complimenting knowledge of radiographic anatomy with clinical significance by asking the clinicians to palpate the relevant surface anatomical landmarks on a human model as well as simply identifying them on a radiograph. This would add a clinical aspect to the study.

We have found that the basic interpretation of foot and ankle radiographs is flawed. One of the methods that could be adopted to address this issue in the postgraduate arena is to hold an educational teaching session [4] as part of regular departmental teaching programs. This may help to increase familiarity to landmarks in the foot and ankle. This study could then be further improved by testing both sets of clinicians before and after the said teaching session has taken place.

Conclusions

A complete radiographic series is one of the most important aspects for correct interpretation of the traumatized foot and ankle [5]. However, without prior knowledge of normal radiographic anatomy fractures may well be missed. Therefore, it is the author's opinion that there is a deficiency in the knowledge and application of radiographic anatomy across both A&E and Orthopaedic trainees. This could potentially be addressed with extra teaching sessions aimed at junior trainees involved in interpreting these films.

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