

Original Article

Radiography in Acute Lower Extremities Blunt Trauma: Proposed Guidelines for General Practitioners

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ABSTRACT

Objective: To evaluate the routine use of radiological investigations in acute blunt trauma to the lower extremities and propose applicable guidelines for general practitioners.

Design: All patients aged five years and above with unilateral lower extremity blunt trauma attending the orthopedic casualty department were examined and categorized according to their ability to walk. They were then sent for radiological investigations (plain X-ray) for evidence of fractures. The information gathered was recorded in a table designed for this purpose.

Setting: The orthopedic casualty department of a general hospital.

Patients: A total of 73 patients attending the orthopedic casualty department were included in this study.

Results: X-ray of the lower extremity in this cohort

was positive for fracture only in about 22% (n = 16). Of these only five patients were able to walk on the affected limb.

Conclusion: Most patients with lower extremities blunt trauma who had routine X-ray did not have fractures, particularly if they were able to bear weight on the affected part. Obtaining an adequate medical history and performing an appropriate physical examination are the main tools to establish the diagnosis. The knowledge of the anatomy and the function of the affected lower extremity and the mechanism of the injury are of great help in the diagnosis. Proper follow-up will ensure good care. Based on the results of the study we recommend some guidelines. These guidelines will help in, optimal management, reducing radiation risk, minimizing cost and saving time.

KEYWORDS: blunt trauma, lower extremity, radiation

INTRODUCTION

Blunt trauma to the lower extremities, especially the ankle region, is a common presentation to both orthopedic and general practice clinics. Radiological imaging is justified to assess fractures. However we had a feeling that many radiological investigations were not necessary. We designed this study to prospectively study the validity of doing X-ray examination in patients presenting with blunt trauma to the lower extremity.

PATIENTS AND METHODS

A prospective study was conducted in the orthopedic casualty department in one of the general hospitals (Farwania hospital, Kuwait). This hospital covers a catchments area with a population of 586,751 and serves 16 primary health clinics. The study group was taken randomly at different time periods. It consisted of seventy-three patients. There were 49 males (67.1%) and 24 females (32.9%). The inclusion criteria for the patients were:

- Five years of age and above (for reliable medical history and physical examination)
- Having unilateral blunt trauma of the lower extremities (for better comparison with the

other unaffected extremity)

- Having closed blunt trauma of the lower extremities
- Having no evidence of local infection
- Having no neuromuscular disease or mental retardation
- Not pregnant

Detailed medical history was taken about the site and mechanism of injury. All patients had a physical examination evaluating mainly the ability to walk. The patient is considered to be able to walk if he or she is able to bear weight on the affected part of the lower extremity. In injuries to the forefoot and toes, if the patient is walking on his heel, he or she is considered to be unable to walk. The presence of deformity and swelling at the site of injury were also assessed. All patients were then sent for a plain X-ray (2 views) of the affected extremity irrespective of the outcome of the physical examination. The X-rays are then evaluated for the presence of fractures. A data collection table was designed to include: patient's name, age and sex, site and mechanism of injury, physical examination findings (swelling, deformity and ability of walking) and X-ray result. The

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Table 1
Comparison of the characteristics of the study group

| Variables | n (% of Total) |
|----------------|----------------|
| Gender | |
| Male | 49 (67.1) |
| Female | 24 (32.9) |
| Site | |
| Foot and ankle | 54 (74) |
| Others | 19 (26) |
| Deformity | |
| No | 69 (94.5) |
| Yes | 4 (5.5) |
| Swelling | |
| No | 26 (35.6) |
| Yes | 47 (64.4) |

statistical computer software SPSS version 10.05 was used for statistical analysis. A P-value of 0.05 was taken as significant; Fisher's Exact Test was used.

RESULTS

The study group were seventy-three patients ($n = 73$), consisting of 49 (67.1%) males and 24 (32.9%) females. The patients were between five and 59 years old with an average of 20.2 years. Fifty four patients (74%) had foot and ankle trauma and 19 (26%) sustained other traumas (leg, knee and thigh). The mechanism of trauma varied. Twisting trauma was seen in 30 patients (41.1%), 11 patients (15.1%) had a fall, 24 patients (32.9%) had direct trauma and eight patients (11%) had sports injury. Plain X-rays showed that out of the study group only 16 patients (22%) had fractures.

Physical examination showed that 57 patients (78%) were able to walk on the affected extremity (Fig. 1). Out of them only five patients (8.8%) had fractures. There is a significant statistical difference in the presence of fractures between patients who were able to walk on the affected extremity and those who were not ($P = 0.002$). Four patients had deformity (5.5%) and all of them had fractures. There was a significant statistical difference in the presence of fractures between the group of patients who had deformity and those who had not ($P = 0.002$). Swelling was present in 47 patients (64.4%), 29.8% of which had fractures. There is a significant statistical difference in the presence of fractures between patients who presented swelling and those who did not ($P = 0.029$). All patients who could walk on the affected extremities despite having fracture (five patients) had fifth metatarsal bone fractures. The plain lower extremity X-ray costs five to seven Kuwaiti Dinars (K.D.) (16.1 to 22.6 U.S. Dollars)^[1]. If 78% of X-rays can be spared, 390.5 to 546.7 K.D. can be saved for every 100 X-rays done.

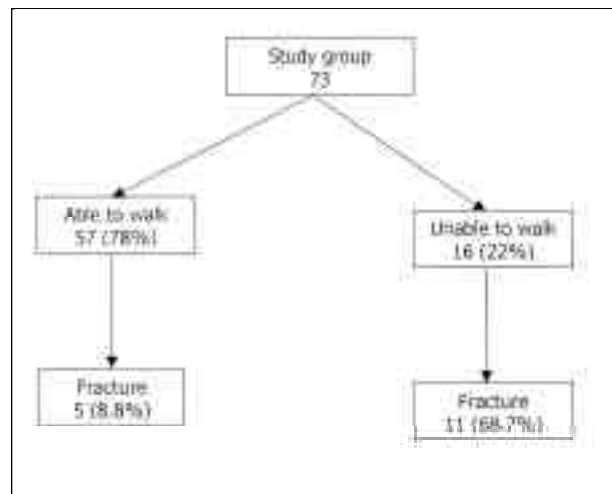


Fig 1: The relationship between the presence of fracture and ability to walk.

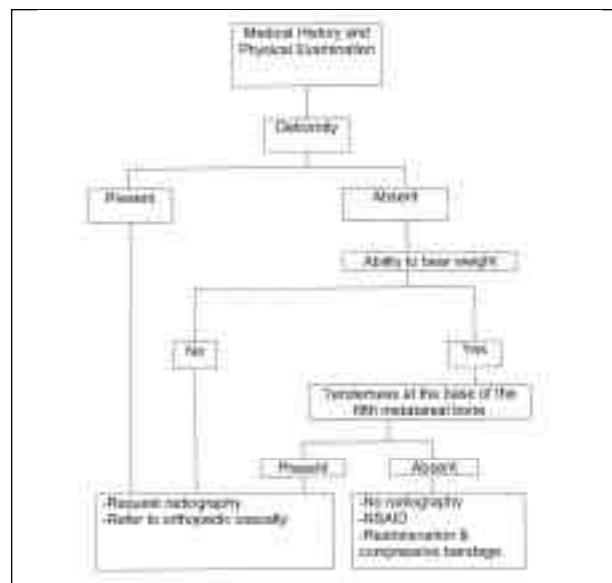


Fig 2: Proposed guidelines for acute lower extremities blunt trauma management

DISCUSSION

Radiological investigations are extensively used as diagnostic aids, but there is no safe radiation dose^[1]. Evidence is accumulating that small doses of radiation can cause both mutations and neoplasm. No one knows just how much radiation is tolerable^[2]. Some spontaneous genetic mutation and some malignant diseases are attributable to background radiation. Man-made radiation now accounts for 15% of the total radiation burden. Ninety seven percent of man-made radiation is due to diagnostic medical exposure^[1]. There is an excess of cancers following diagnostic levels of irradiation to the fetus and female breast. The total collective cancer deaths from medical X-ray could be responsible for between 200 and 500 of the 160,000 cancer deaths each year in the United Kingdom^[3].

In our study we found that only 22% of the X-rays were positive for fractures, the cost of

unnecessary X-rays is 390.5 to 546.7 K.D. for every 100 X-rays done. In 1981, Scavone *et al* studied the use of lumbar spine X-rays in trauma to the lumbosacral spine^[4]. It revealed that 33.3% of patients with major trauma had no radiological abnormality, 21.7% had an incidental or questionable findings and 45% had diagnostic findings. Whereas in minor trauma, 40.1% had no radiological abnormality, 45.7% had an incidental or questionable findings and only 14.2% had diagnostic findings. This supports the hypothesis that 78% of radiological examinations can be avoided by obtaining a good medical history and careful physical examination, concentrating on two of the most important criteria, namely walking ability and presence of deformity. This will reduce cost, save time and eliminate excess radiological risk^[5-10].

In Kuwait, the majority of general practice clinics do not have a radiology department or X-ray machines. Patients, in need of radiological examination or orthopedic intervention have to be referred to the regional hospital. These problems can be eliminated if all physicians in the primary care clinics have set guidelines. As mentioned earlier, only five patients out of 57 who could walk on their traumatized lower extremities had fractures at the base of the fifth metatarsal bone. This type of fracture is the commonest fracture in foot and ankle trauma^[11-15]. Hence we recommend lower threshold for X-ray in patient with pain and tenderness over the base of the fifth metatarsal bone^[16]. Although swelling was found to be statistically a significant sign, eliciting its presence depends on the judgement of individual physicians. Deformity of the affected part of the lower limb is an important sign. If present, it is advisable to refer the patient for X-ray to rule out presence of fracture. In this study, all patients with deformity have fractures and majority of those with no deformity have no fractures.

Patients with potential sensory and/or cognitive problems like diabetes mellitus or neuromuscular deficits can have complex clinical picture with quite unreliable physical examinations. This is also true for patients below five years of age with unreliable history.

A proper guideline can be of great help in improving managing the lower extremities blunt trauma and reduce cost and risk of radiology. An audit of ankle injuries in an accident and emergency department was done by Packer G.J. *et al*^[17], which concluded that using a protocol can, at

little expense, improve the treatment of ankle injuries and reduces the cost of radiology in an accident and emergency department. The number of patients undergoing radiography was reduced from 80% to 70%.

CONCLUSION

In this study, we have shown that patients who can bear weight on the affected part after blunt trauma are less likely to have fractures. We therefore recommend that patients who can bear weight and have no deformity should be observed without immediate X-rays performed.

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