

Delayed presentation or delayed diagnosis? A retrospective study of prospectively collected data of 482 foot and ankle injuries

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KEY WORDS

Delayed presentation
Delayed diagnosis
Indirect delayed presentations
Foot and ankle injuries
Failure to suspect
Failure to diagnose

ABSTRACT

Background: Delayed presentation of injury cases is common in developing countries like India. It is prudent to study reasons for delayed presentations to focus preventive measures towards responsible factors. Since foot and ankle orthopaedics is in its infancy in India, it was deemed to be worthwhile to study reasons for delayed presentations of foot and ankle injuries.

Methods: Retrospective analysis of prospectively collected data from 482 foot and ankle injuries treated at our three foot and ankle centres over past three years was undertaken. Delayed presentation was defined as cases presenting to us at or after 3 weeks of injury, but with complete records. Reasons for delayed presentations were analysed.

Results: There were ninety eight such cases who fulfilled the delayed presentation criteria and within this group there were twenty different varieties of foot and ankle injuries. Of these twenty six cases were never treated by qualified orthopaedic surgeons and were labelled as direct delayed presentations, and the remaining 72 cases who were treated by qualified orthopaedic surgeons, but could not be diagnosed and presented late, were labelled as indirect delayed presentations. Failure to suspect injury (5 cases) or failure to diagnose injury (67 cases) were reasons for indirect delayed presentations. Failure to diagnose injury on part of clinicians was either due to failure of clinical and radiological analysis (analytical failure – 15 cases) or due to failure to investigate case with further radiological investigations (investigative failure – 10 cases). Forty-two cases had combined failures.

Conclusions: In developing countries like India, patients did neglect their foot and ankle injuries and presented late. In fact, by way of delayed diagnosis, clinicians were more responsible for indirect delayed presentations of foot and ankle injuries. This is contrary to the common belief that in developing countries like India, only patients would be solely responsible for delayed presentations after injury. Because delayed diagnosis by clinicians seemed more alarming than delayed presentation by patients, focus of prevention of foot and ankle injuries in developing countries should shift more towards educating clinicians than patients.

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Introduction

Early diagnosis and prompt management of any injury would result into a better outcome [1]. For early diagnosis, it is mandatory that injury cases present in time [1]. Delayed presentation of injury cases would lead to delay in the diagnosis and compromise in the management leading to poor outcome [1–3]. In the past, studies have been performed to find out the reasons and solutions for missed injuries indirectly leading to delayed presentations [3–7]. Such studies were conducted at trauma centres of developed countries with focus on multiply injured cases [8]. On the other hand true delayed presentation of injuries is a common feature in developing countries unlike developed countries [9] and is not widely studied.

Foot and ankle orthopaedics is in its infancy in developing countries. Consequently countries such as India featured with delayed presentations of foot and ankle injuries [9]. Provided that the factors causing delayed presentations in developing countries are identified, implementing preventative strategies would be easy. To the best of our knowledge, till date; no study has focused on finding out the reasons for delayed presentations of foot and ankle injuries in India or in any other developing countries.

We decided to study types, reasons and underlying responsible factors for delayed presentations of foot and ankle injuries in India.

Materials and methods

This retrospective study was based on prospectively collected data of all foot and ankle injuries cases who presented to our centres between years 2014 to 2016. Three centres located in three different cities participated in this study. Inclusion criteria were all foot and

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ankle injury cases with delayed presentation. We defined delayed presentation as presentation to us at or after three weeks of injury. Exclusion criteria included presentation before three weeks of date of injury, and patients who did not have complete previous clinical and radiological records. Permission was taken from the institutional review board. Informed consent was obtained from every patient.

History taking, clinical examination and study of previously carried investigations were aimed at finding out reasons for delayed presentation. History details covered: mode of injury, injury to treatment timing, investigations carried, type of treatments received and details of treating persons. Study and documentation of all previous clinical records and investigations was undertaken. Findings from recent clinical and radiological examination were compared with the previous ones. Based on our findings, grouping of delayed presentations was done. Analysis of reasons amongst these groups formulated reason subgroups which ultimately led towards factors responsible for delayed presentations.

Results

We had 113 delayed presenting foot and ankle injury cases out of 482 total cases of foot and ankle injuries. 15 cases were excluded due to lack of complete records making final case count of 98 cases.

Twenty different varieties of delayed presenting foot and ankle injuries were found, spectrum of which comprised of 27 cases of ligament injuries, 10 cases of tendon injuries, 5 cases of osteochondral injuries and 56 cases of bony injuries.

Table 1 demonstrates a list of all delayed presenting injuries found in our study with numbers.

Out of 98 total cases, 14 cases were part of polytrauma with five different case varieties. Midfoot trauma with 4 cases each of navicular and cuboid fractures and 3 cases of lisfranc injuries was most commonly associated with polytrauma. Fracture neck talus was seen in 2 cases and fracture base of the fifth metatarsal was seen in 1 case.

Table 2 demonstrates a list of delayed presented cases as part of polytrauma.

Study of previous treatment records showed that before reaching us, our study group undertook 5 different varieties of treatments. Based on types of treatments taken, we could categorise them as: cases with only home treatment, only quack and alternative medicine specialist's treatment, only family physician's treatment, only qualified orthopaedic surgeon's treatment and combination of all treatments. 26 cases did not receive any kind of treatment from qualified orthopaedic surgeons. Case distribution was 4 cases of only home treatment, 4 cases of treatment from quacks and alternative medicine specialists and 18 cases of treatment from family physicians (Figure 1); 72 cases were assessed by qualified orthopaedic surgeons. Out of these 72 cases, 41 cases received primary treatment and the remaining 31 cases received secondary treatment (after failure of other treatments) from qualified orthopaedic surgeons; 93 cases received a combination of treatments.

Table 3 demonstrates the varieties of treatments taken by our cases with numbers.

Twenty six cases who did not get treated by qualified orthopaedic surgeons before reaching out to us were classified as direct delayed presentation group. Home treatment cases, quack and alternative medicine treated cases, and family physician treated cases formulated this group. Twelve different varieties of injuries seen in this group comprised of 17 cases of bony injuries, 5 cases of ligament injuries, 3 cases of tendon injuries and 1 case of osteochondral injury.

Table 4 demonstrates case distribution for direct delayed presentation group with numbers.

There were 72 cases who were treated by qualified orthopaedic surgeons before reaching out to us and these were classified as

Table 1

Delayed presenting foot and ankle injuries with numbers

(total n=98)	Number of cases
Fibula fracture	3
Syndesmotic sprain	3
Syndesmotic injury with fracture	11
Deltoid ligament injury	2
Calcaneus body fracture	4
Anterior process calcaneus fracture	5
Lateral talar process fracture	10
Posterior process talus fracture	5
Osteochondral fracture of talus	5
Fracture neck of talus	2
Fracture of navicular	4
Fracture of accessory navicular	1
Fracture of cuboid	5
Fracture of cuneiform	2
Lisfranc injury	23
Fracture of base of 5 th metatarsal	3
Sesamoid injury	2
Tendoachilles rupture	4
Peroneal tendon injuries	2
Rupture of tibialis anterior tendon	2

Table 2

Delayed presenting cases as a part of polytrauma.

(total n=14)	Number of cases
Fracture base of 5 th metatarsal	1
Fracture neck of talus	2
Navicular fracture	3
Cuboid fracture	4
Lisfranc injury	4

Table 3

Type of treatment taken by our cases with numbers.

Type of treatment taken	Number of cases
Only home care	4
Only quack or alternative medicine specialists treatment	4
Only family physician's treatment	17
Only qualified orthopaedic surgeon's treatment	41
Combination treatments	93

Table 4

Case distribution for direct delayed presentation group.

(total n=26)	Number of cases
Fibula fracture	3
Calcaneus body fracture	3
Anterior process calcaneus fracture	2
Lateral talar process fracture	3
Posterior process talus fracture	1
Osteochondral fracture of talus	2
Fracture of cuneiform	1
Lisfranc injury	5
Fracture base of 5 th metatarsal	2
Sesamoid injury	1
Tendoachilles rupture	2
Peroneal tendon injuries	1

indirect delayed presentation group. Clinicians either failed to suspect or failed to diagnose these injuries before these cases presented to us. Nineteen different varieties of injuries seen in this group comprised of 38 cases of bony injuries, 23 cases of ligament injuries, 9 cases of tendon injuries and 2 cases of osteochondral injuries.

Table 5 demonstrates the case distribution of indirect delayed presentation group with numbers.

Comparison between the two groups showed that fracture fibula cases were found only in direct delayed presentation group. Cases such as: syndesmotic injury, deltoid ligament injury, talus neck



Fig. 1. Lateral view of both ankles of a patient who took treatment from quack showing fracture of posterior process of talus on left side marked with circle.

fracture, fracture navicular, fracture cuboid and rupture of tibialis anterior tendon were found only in the indirect delayed presentation group.

Table 6 demonstrates the group-wise case distribution.

Amongst 72 cases in the indirect delayed presentation group it was observed that in some cases, clinicians did not suspect significant injury and did not prescribed any radiological investigations at all. All such 5 cases formulated a failure to suspect subgroup. Calcaneus body fracture, fracture of posterior process of talus, fracture of cuboid, fracture of base of fifth metatarsal and rupture of tibialis anterior tendon, contributed one case each.

Whilst in rest of the cases, clinicians suspected significant injury and did investigate, but failed to diagnose them. All such 67 cases comprised of the failure to diagnose subgroup. Significant numbers were contributed by lisfranc injuries, syndesmotom injuries and talar process fractures (Figure 2).

Table 7 demonstrates the case distribution in reason subgroups of indirect delayed presentation group with numbers.

Amongst the failure to diagnose subgroup three different types of failure were noticed:

1) Clinicians assessed these cases with clinical and radiological examinations but failed to do proper analysis. Failure of analysis led to delayed diagnosis and indirect delayed presentation. This was labelled as analytical failure (type A). Fifteen cases of type A failure comprised of 8 bony injuries, 5 ligament injuries and 2 tendon injuries (Figure 3).

2) Clinicians relied only on available radiology and did not investigate cases with further radiological investigations. Failure of investigations led to delayed diagnosis and delayed presentation. This was labelled as investigative failure (type I). Ten cases of type I failure comprised of all fracture cases.

3) Clinicians failed to do precise clinical and radiological analysis of cases and also failed to investigate case with further radiological investigations. Failure of analysis and failure of investigation, both together led to delayed diagnosis and delayed presentation. This was labelled as combined failure (type C). Forty-two cases of type C failure comprised of 15 pure ligamentous injuries, 14 osteoligamentous injuries, 3 osteochondral injuries and 2 tendon injuries (Figures 4 and 5).

Table 8 demonstrates the failure types and cases with numbers.

From previous radiological records, it was observed that before presenting to us, the patient cohort underwent 84 total radiological investigations comprising of 38 ankle series x-rays, 44 foot series x-rays, 1 CT scan and 1 MRI.

Table 9 demonstrates the type of radiology used with numbers.

Table 5

Case distribution for indirect delayed presentation group.

(total n=72)	Number of cases
Syndesmotom sprain	3
Syndesmotom injury with fracture	11
Deltoid ligament injury	2
Calcaneus body fracture	1
Anterior process calcaneus fracture	3
Lateral talar process fracture	7
Posterior process talus fracture	4
Osteochondral fracture of talus	3
Fracture neck of talus	2
Fracture of navicular	4
Fracture of accessory navicular	1
Fracture of cuboid	5
Fracture of cuneiform	1
Lisfranc injury	18
Fracture of base of 5 th metatarsal	1
Sesamoid injury	1
Tendoachilles rupture	2
Peroneal tendon injuries	1
Rupture of tibialis anterior tendon	2

Table 6

Case comparison between two delayed presentation groups.

	Direct delayed presentation group (total n=26)	Indirect delayed presentation group (total n=72)
(total n=98)		
Fibula fracture (total n=3)	3	
Syndesmotom sprain (total n=3)		3
Syndesmotom injury with fracture (total n=11)		11
Deltoid ligament injury (total n=2)		2
Calcaneus body fracture (total n=4)	3	1
Anterior process calcaneus fracture (total n=5)	2	3
Lateral talar process fracture (total n=10)	3	7
Posterior process talus fracture (total n=5)	1	4
Osteochondral fracture of talus (total n=5)	2	3
Fracture neck of talus (total n=2)		2
Fracture of navicular (total n=4)		4
Fracture of accessory navicular (total n=1)		1
Fracture of cuboid - (total n=5)		5
Fracture of cuneiform -(total n=2)	1	1
Lisfranc injury - (total n=23)	5	18
Fracture of base of 5 th metatarsal -(total n=3)	2	1
Sesamoid injury - (total n=2)	1	1
Tendoachilles rupture - (total n=4)	2	2
Peroneal tendon injuries - (total n=2)	1	1
Rupture of tibialis anterior tendon - (total n=2 cases)		2

Table 7

Case distribution in subgroups of indirect delayed presentation group.

	Failure to suspect subgroup (total n=5)	Failure to diagnose subgroup (total n=67)
(total n=72)		
Syndesmotom sprain		3
Syndesmotom injury with fracture		11
Deltoid ligament injury		2
Calcaneal body fracture	1	
Anterior process of calcaneus fracture		3
Lateral talar process fracture		7
Posterior process talus fracture	1	3
Osteochondral injury of talus		3
Fracture neck of talus		2
Fracture navicular		4
Fracture of accessory navicular		1
Cuboid fracture	1	4
Cuneiform fracture		1
Lisfranc injury		18
Fracture base 5 th metatarsal	1	
Sesamoid injury		1
Tendoachilles rupture		2
Peroneal tendon tear		1
Tibialis anterior rupture	1	1



Fig. 2. Anteroposterior weight bearing view of delayed presentation of a case of Lisfranc injury. Bony fleck seen in between first and second intermetatarsal space is marked with a line and circle.

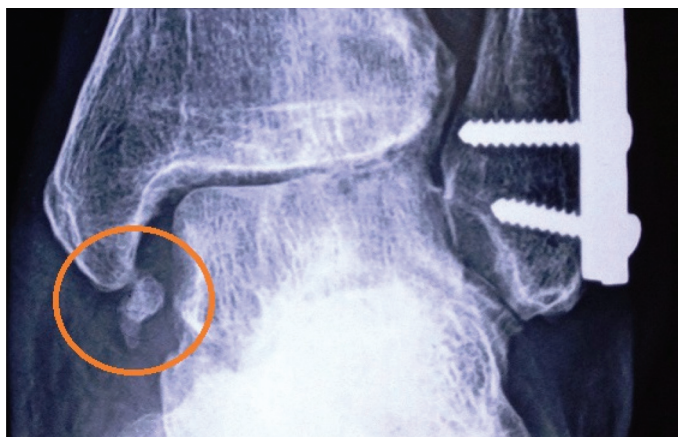


Fig. 3. Close up of anteroposterior view of delayed presentation of a case of deltoid injury. Circle marks the presence of bony piece in medial gutter of ankle.

Amongst failure to diagnose cases, in 3 cases who presented to our centres, primary clinicians from our centres failed to diagnose these 3 cases which led to delayed diagnosis and indirect delayed presentation. 2 cases of osteochondral injury of talus were combined failure (type C) and 1 case of cuboid fracture was investigative failure (type I).

Table 10 demonstrates our own failure to diagnose cases with failure types.

Discussion

Selection of differently located centres for the present study reduced the bias associated with single centre observations, widened geographical spread and increased study numbers. Data collection was done prospectively over three years followed by retrospective analysis. Out of a total of 482 cases of foot and ankle injuries, 112



Fig. 4. Anteroposterior view of delayed presented peroneal tendon injury case. Presence of a bony fleck at outer border of fibula is marked with a circle.

were delayed presentations but only 98 cases were selected for this study as they had complete previous records. Our cut off of delayed presentation was presentation at or after three weeks post injury. In underdeveloped countries like India, choice of treatments by most of the patients is either home treatment, or treatment by quack and alternative medicine specialists, or treatment by primary physician [9]. Therefore patients would then be forced to access a qualified orthopaedic surgeon following a failure of solely one or a combination of such treatments [9]. Moreover, working at a dedicated foot and ankle centre, most of our cases present to us as higher centre referrals after a few weeks of failed initial treatment. Hence the post injury three weeks cut off period for our case selection justified true delayed presentations in our context. Exclusion of 15 cases, who could not produce complete previous clinical and radiological records, was justified because based on these records only we aimed to find out reasons for delayed presentations.

Rate of delayed presentations in our series was 20%. No similar studies were available for comparison. Twenty different kinds of foot and ankle injuries were noticed in 98 delayed presentations, spectrum of which covered bony, ligamentous, osteoligamentous, osteochondral and tendon injuries. This suggested that delayed presenting injuries involved every element of musculoskeletal system for clinicians to be suspicious at evaluation. Lisfranc injuries, syndesmosis injuries and lateral talar process fractures were amongst the commonest delayed presentations. This observation was in line with observations found in literature [2,4,10–12]. Isolated cases like fracture of accessory navicular, syndesmotom sprain, deltoid injury, cuneiform fracture and rupture of tibialis anterior tendon presented late. A probable reason explaining this could be the lack of familiarity with these uncommon injuries.

Only 14 of our cases were part of polytrauma. Our numbers were low in comparison to a few similar studies [5,8]. This can be accounted for as our institute is a dedicated foot and ankle centres and not a level I trauma centres. No polytrauma associated cases neglected their foot and ankle injury and they were all treated by qualified orthopaedic surgeons only, who in turn, failed to diagnose them in time. The cases mainly comprised of navicular, cuboid, Lisfranc and talus injuries. This observation matched in some form with observations in literature [4–6].

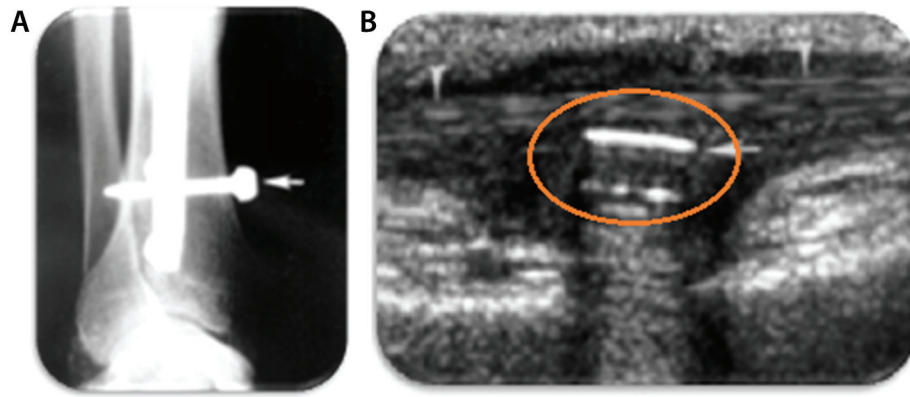


Fig. 5. (A) Lateral view and (B) USG picture of a case with partial rupture of tibialis anterior tendon. Note presence of distal locking screw marked on a radiograph with arrow. Note circle marked on USG is showing tendon rupture.

Table 8

Type wise cases in failure to diagnose subgroup.

(total n=67)	Failure type a: analytical failure (total n=15)	Failure type i: investigative failure (total n=10)	Failure type c: combined failure (total n=42)
Syndesmotic sprain	3		
Syndesmotic injury with fracture			11
Deltoid ligament injury	2		
Anterior process of calcaneus fracture	3		
Lateral talar process fracture			7
Posterior process talus fracture	3		
Osteochondral injury of talus			3
Fracture neck of talus		2	
Fracture navicular		4	
Fracture of accessory navicular	1		
Cuboid fracture		4	
Cuneiform fracture	1		
Lisfranc injury			18
Sesamoid injury			1
Tendoachilles rupture	2		
Peroneal tendon tear			1
Tibialis anterior rupture			1

Table 9

Utilized routine radiological investigations with numbers.

(total n=84 investigations)	Number of cases where they were prescribed
Ankle series x-rays: AP, OBL and LAT	38
Foot series x-rays: AP and OBL	44
CT scan	1
MRI	1

Table 10

Our failure cases with failure subtypes

(total n=73)	Reason for failure (total n=3)	Type of failure
Osteochondral injury of talus (total n=2)	Failure to diagnose	Type C: Combined failure
Cuboid fracture (total n=1)	Failure to diagnose	Type I: Investigative failure

Twenty six cases in our study who formed the direct delayed presentation group neglected their injuries and did not receive treatment from qualified orthopaedic surgeons. One-third of these cases (8 out of 26) just settled down with unscientific home remedies, remedies suggested by quacks or by alternative medicine specialists. Inference from this observation was, in spite of availability of modern era trauma care, patients in developing countries like India; still neglected their injuries and were inclined towards unscientific treatments. Two thirds of these cases (18 out of 26) continued with family physician’s treatment. These patients waited an excess length of time for family physician’s treatment to succeed and did not realise the need to quickly reach out to qualified orthopaedic surgeons. Family physicians on the other hand continued treating these cases and did not refer them timely to specialists. Lisfranc injury, fracture of fibula, osteochondral fracture of talus and lateral talar process fracture, which were initially neglected by patients were later on also not diagnosed by family physicians. In fact patients did not neglect gross bony injuries like cuneiform fracture, calcaneus body fracture and sesamoid injuries

but family physicians did fail to diagnose them. These observations suggest that for prevention of delayed presentations of foot and ankle injuries in developing countries like India, education of family physicians shall play a bigger role over education of patients.

There were 72 cases in our study who formed the indirect delayed presentation group, who did receive treatment from qualified orthopaedic surgeons, and still presented late to us because of delayed diagnosis on the part of the treating clinicians. Of these, 5 cases treating orthopaedic surgeons did not advice any radiological investigation as they did not suspected significant injury. These cases comprised of the failure to suspect subgroup. High index of suspicion lacked in all these cases in spite of timely presentation by patients to clinicians. Interestingly, this subgroup cases such as calcaneus body fracture, osteochondral injury of talus and fracture of base of fifth metatarsal which were undiagnosed by qualified orthopaedic surgeons were same as those not neglected by patients and those not referred timely to specialists by family physicians in direct delayed presentation group. This means medical factors for failure outweighed the patient factors.

Comparison between two delayed presentation groups showed that fracture fibula cases were found only in direct delayed presentation group probably because it did not affect much on patient's activities of daily living. Syndesmotic injury, deltoid ligament injury, talus neck fracture, fracture navicular, fracture cuboid and rupture of tibialis anterior were found only in indirect delayed presentation group, reasons being difficulty in diagnosis of these cases and also these cases significantly affected on patient's activities of daily living. While further comparing both groups of delayed presentation, injuries treated by family physicians in direct delayed presentation group were a subset of injuries found in the indirect delayed presentation group. Thus injuries missed by family physicians were by and large missed by qualified orthopaedic surgeons also.

There were 67 remaining cases from the indirect delayed presentation group which comprised of the failure to diagnose subgroup, as these cases did get radiologically investigated by qualified orthopaedic surgeons, but still remained undiagnosed. Nineteen different varieties of foot and ankle injuries were noticed in failure to diagnose subgroup. Even with on hand radiological investigations, clinicians not only failed to diagnose 22 cases of ligament injuries, 9 cases of tendon injuries and 3 cases of osteochondral injuries but also failed to diagnose 34 cases of bony injuries (3 cases being combined bony and ligament injuries). Further analysis of clinician's failure to diagnose was carried out where three types of failure to diagnose on part of clinicians were observed. They were analytical failure (type A), investigative failure (type I) and combined failure (type C).

Analytical failure was seen in 15 cases where clinicians failed in the precise clinical and radiological analysis of injuries leading to delayed diagnosis and indirect delayed presentation. In non-bony injury cases like syndesmotic sprains, deltoid ligament injuries and tendoachilles ruptures with normal radiology, failure was due to lack of proper clinical analysis. In bony injury cases like fracture anterior process calcaneus, posterior talar process fracture poor analysis of radiology played a role. In case of middle cuneiform fracture both clinical and radiological analysis failed.

Investigative failure was seen in 10 cases where clinicians failed to prescribe specialized or advanced radiological investigations for correct diagnosis leading to delayed presentation and indirect delayed diagnosis. For diagnosis of fractures of talus neck, navicular and cuboid specialized radiology like Canale and Kelly view or medial oblique views or CT scans were not advised.

Combined failure was seen in 42 cases where clinicians not only failed to analyse the injury clinically and radiologically, but also failed to further investigate the case leading to delayed presentation and delayed diagnosis. Commonest combined failure was seen with lisfranc injuries because neither precise clinical evaluation was done nor any weight bearing radiology was used. No case of osteochondral injury of talus underwent MRI examination because of clinical analytical failure superadded with failure to investigate further. Syndesmotic injury together with fractures also witnessed analytical and investigative failures as no gravity stress views or CT scans were requested. Sesamoid and peroneal tendon injuries were neither suspected nor analysed and hence not investigated. In fact for a total of 98 cases, only 84 radiological investigations were utilized comprising of ankle and foot series x-rays, CT scan and MRI. Weight bearing x rays, specialized x-rays and USG were never prescribed. CT scan examination was done instead of MRI in a case with rupture of tibialis anterior tendon where MRI was not possible because of presence of metallic implant. MRI examination was done in one case of a posterior process talus fracture which failed to point out to diagnosis. This was indicative of lack of awareness about requirement of indicated radiological investigations for a given case.

Foot and ankle surgeons at our centres were not immune to investigative failures. Primarily, cases of cuboid injury were not diagnosed because of investigative failure on our part. We had combined failures in two cases of delayed diagnosis of osteochondral injuries of talus where we failed to analyse them and also failed to investigate them further with MRI. This alarming observation of delayed diagnosis even by specialists supported observations by other workers suggesting need for high index of suspicion for foot and ankle injuries [10–12].

Critically looking at our study, there were many weaknesses of study. Our study numbers were small. We had more of secondary subtle cases and less of high velocity and polytrauma cases. More over though this study was conducted at three different centres, all centres had the same clinicians. In the future extended prospective studies should be carried out at multiple centres with an increased number of cases.

Conclusions

Rate of delayed presentation of foot and ankle injuries was found to be as high as 20% in developing country like ours. Patients did neglect injuries and did prefer initial unscientific treatment modalities over scientific treatment modalities unless forced by failures.

Failure on the part of clinicians was found in form of lack of high index of suspicion, failure to analyse radiological investigations and lack of knowledge about indicated radiology. It was alarming to note that qualified orthopaedic surgeons contributed more in delayed presentations by way of delayed diagnosis of foot and ankle injuries by them, which in turn led to indirect delayed presentations. Contrary to conventional belief, failure on patient's part was of lesser magnitude than failure on part of family physicians, qualified orthopaedic surgeons and foot and ankle specialists. Training and education of more and more clinicians in the field of foot and ankle orthopaedics in developing countries seems to be the way forward to address this concerning issue.

Conflict of interest

None declared.

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