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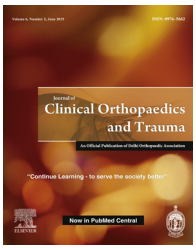

Original Article

Quantitative measurement of intra-compartmental pressure of the leg in acute traumatic injury: As a routine trend

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ABSTRACT

Background: Experience and literature regarding complications of lower extremity compartment syndrome led us to hypothesize that delayed diagnosis and limb loss are potentially preventable events. Clinical examination does play a role, but quantification of compartment pressure reading serves as confirmation and determines the need for surgical intervention and provides the only objective data in case of conflict.

Methods: We performed a prospective study of all cases of closed tibial fractures presenting to our trauma centre over a 3-year period (January 2009–June 2012). Variables reviewed included intra-compartmental pressure readings, location of the fracture and development of subsequent compartment syndrome requiring fasciotomy. Patients were divided into (1) Group A – proximal tibial fracture, (2) Group B – diaphyseal fracture and (3) Group C – Pilon fracture. Values of the injured and uninjured leg were taken and the data analyzed using SPSS version 22.

Results: 168 (41 females and 127 males) cases were analyzed. Mean pressure readings of the fractured limb were higher in Group A compared to the other groups. The mean difference in pressure values between the injured and uninjured limb recorded were of 15.1 mm Hg (Group A), 13.8 mm Hg (Group B) and 13.3 mm Hg (Group C). Patients who eventually underwent fasciotomy were 5 (10.8%) in Group A, 8 (10.3%) in Group B and 3 (6.8%) in Group C, and had initial baseline pressure difference of >18.5 mm Hg.

Conclusion: These data underscore the importance of routine recording of initial intra-compartmental pressure and relation of difference in compartmental pressure between injured and uninjured limb to eventual development of compartment syndrome requiring fasciotomy.

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Table 1 – Distribution of mode of injury in the study group.

Mode of injury	Number of patients
1. RTA	140 (83.3%)
2. Fall from height	18 (10.7%)
3. Assault	4 (2.3%)
4. Sports injury	6 (3.7%)
Total	168 (100%)

1. Background and Introduction

The most dreaded sequelae an orthopaedic surgeon expects in an injury to the leg is the development of compartment syndrome. Though early recognition and prompt treatment is the objective, diagnosis is usually delayed even after high suspicion and careful clinical evaluation, and by the time it is diagnosed, a considerable amount of physiological damage has already occurred before the frank development of pallor, pulselessness and so on.[3]

Measurement of compartment pressure continuously generally serves as an adjunct to clinical evaluation, but it is not available in most settings in our country[2] and has a limited use in patients with a low GCS (Glasgow Coma Scale) score or with an altered mental status.

Baseline elevations in compartments' pressure after the simple occurrence of a fracture before a clinical compartment syndrome develops are not defined. If such data exist it has the potential to influence the ultimate treatment outcome and provide better understanding and interpretation of pressure elevations during continuous pressure monitoring.[1]

Approximately 40% of all compartment syndromes occur after fractures of the tibial shaft.[2]

Anterior compartment is the most commonly involved compartment of the leg in acute compartment syndrome. Sheridan et al.,[4] Gershuni et al.[5] and McQueen et al.[6] reported consistent involvement of the anterior compartment in tibial fractures complicated by acute compartment syndrome. As such they stated that monitoring of all four compartments is cumbersome and it seems unlikely that the anterior compartment will not be involved in an acute compartment syndrome. They recommend routine monitoring of anterior compartment and other compartments need to be investigated only if there is clinical suspicion of involvement. We intended to measure the level of the anterior compartment pressure and differential pressure in injured and uninjured leg and analyze the data for any prognostic or causative significance.

2. Materials and methods

168 (41 females and 127 males) patients presenting to MMIMSR trauma centre over a 3-year period (January 2009–June 2012) were included in this study. Patients included had unilateral closed tibial fracture presenting within 6 h of injury. Patients who were excluded were with soft tissue injury to the contralateral side of the fractured tibia, with compound fractures of tibia/fibula, having life threatening injuries, polytrauma, associated with comorbidities and altered mental status. A prospective analysis of compartment pressure measurements was performed in the tibial fractures with the opposite leg as the control. Consent was obtained for the measurement of normal compartmental pressures of anterior compartment of injured and contralateral uninjured legs. Approval was obtained from the Maharishi Markandeshwar University Teaching Hospital, Research and Ethical Committee. Variables reviewed included:

1. Intra-compartmental pressure readings of both limbs.
2. Pressure difference between injured and uninjured limb.
3. Location of the fracture.

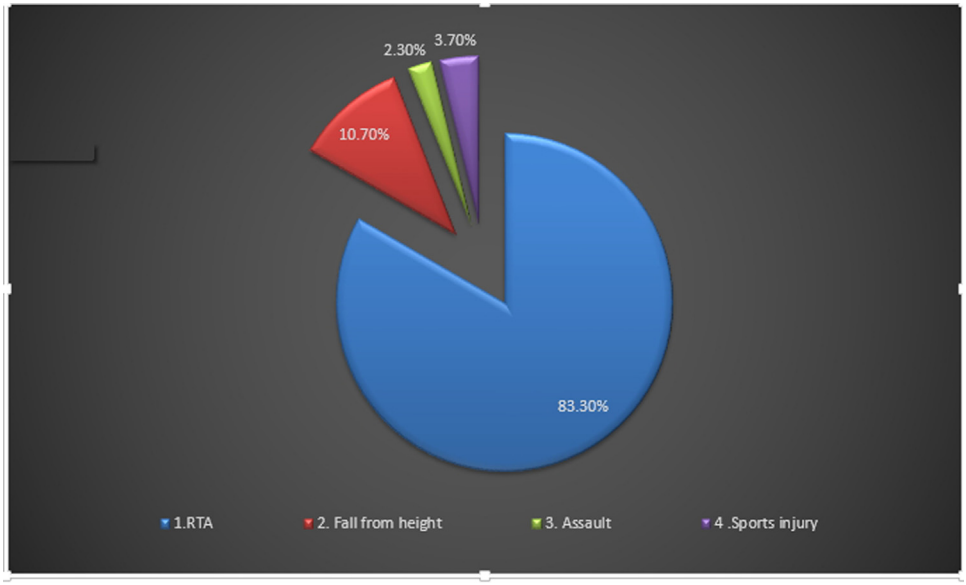

Fig. 1 – Distribution of mode of injury in the study group.