Early Outcomes of The Treatment of War Related Fractures of Lower Extremities by Interlocking Nails In Taiz Yemen

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Abstract

Introduction: Gunshot injuries are major problems worldwide that have a great impact on health budget and economy. Extremities are the most frequently involved sites in gunshot injuries, lower limbs being more involved as compared to upper limbs. The management of these injuries is challenging and has wide range of methods, initiated from non-operative 'low technique' splinting through external fixation to internal fixation with locked intramedullary nails. The benefits of internal fixation are rapid mobilization, immediate pain relief, accelerated rehabilitation, and maintenance of independent living.

Objectives: To evaluate short term outcome of immediate interlocking nail of war-related traumatic lower limb fracture in Taiz Yemen .

Patients and methods*:* Observational retrospective study that collected from files and medical records with planned questionnaire and analyzed by used SPSS.

Results: the most patient was male with 95% and mean age was 29.40±11.120 years. Gunshot injury was the most common mechanism in 88% of patients. We found the femur fracture higher than tibia and class IIIA was the highest frequency of injury. Vascular and nerve injuries represented as associated injury with IMN fixation with 11.1% and 13.3%, respectively. While 2.2% was the percent of complication to each infection, bleeding, and DVT among patients with IMN fixation.

Conclusion: Treatment of lower limb war related fractures must be individualized according to Gustilo-Anderson grade injuries in order to achieve a favorable outcome. Intramedullary nailing is an effective treatment strategy with minimal complications.

Keywords: Intramedullary Nail, Lower Limb, Traumatic Fracture, and War.

Introduction

Gunshot injuries are major problems worldwide that have a great impact on health budget and economy.[1] Each year, approximately 30,000 to 50,000 Americans are killed secondary to gunshot wounds. This upper range nearly equals the number of fatalities (59,021) sustained during the 12 years (1961 to 1973) of the Vietnam war.[2] About 30,136 persons were fatally wounded by firearms representing 18.4% of all injury-related fatalities.[3] Extremities are the most frequently involved sites in gunshot injuries, lower limbs being more involved as compared to upper limbs.[4]

Tissue damage secondary to missile is result of three mechanisms: a) Crushing tissue along the bullet pathway; b) Cavitation, which can be a temporary or permanent cavity due to the transient stretching of the tissue along the path of the bullet. C) Propagation of shock wave into tissues distance from the bullet pathway.[5–7]

Lower limb missiles fractures represent a significant burden to many low and middle-income countries (LMIC) around the world.[8] The management of these injuries is challenging and has wide range of methods, initiated from non-operative 'low technique' splinting through external fixation to internal fixation with locked intramedullary nails[9].

There is no statistically significant difference in the clinical outcome between those treated with immediate and delayed reamed intramedullary locked nailing. However, Nicholas, Bergman, and coworkers have both recommended immediate reamed intramedullary nailing regardless of bullet velocity. [9,10] Even though there was extensive bony commination and soft tissue disruption in these high velocity injuries, the immediate insertion of an intramedullary nail did not appear to disturb fracture or soft tissue healing. When coupled with wound irrigation and debridement, and a delayed primary closure, no significant increase in deep wound infections were noted.[11] Furthermore, Intramedullary nailing is provides good access to soft tissues without bulky external hardware, allows early range of motion of the knee and ankle and causes minimal soft tissue stripping at the fracture site.[12] in addition, those treated with immediate interlocking nails had a shorter hospital stay with a significant decrease in hospital expenses and better outcame.[13]

Patients and methods

Our research is a retrospective descriptive study of war fractures to the lower extremities treated with intramedullary interlocking nails at Taiz located in Yemen . The study was conducted over a period of 4 years, from 2017_2020. The inclusion criteria were missile to the lower extremities with long bone fractures that were followed up for a one month. The exclusion criteria were patients with gunshot injuries to the lower extremities without fracture. All the patients were adequately resuscitated and stabilized in the Emergency Room (ER). Wound debridement was done to excise necrotic tissue and copious irrigation was done with saline. Intravenous third generation cephalosporin (ceftriaxone), gentamicin and metronidazole was administered at presentation to all the patients and continued for five days. Biographical data and information on when the patient was shot and on the assailant were obtained. The neurovascular status of the injured limbs was examined to document neural and vascular injuries. Radiographs of the affected limb were taken in two planes anterior-posterior (AP) and later- al views (LAT) to determine the pattern of injuries. The fracture was classified using the Gustilo-Anderson method of classification of open fractures as high velocity gunshot classified grad 3. The data obtained were analyzed using the Statistical Package for Social Sciences (SPSS) 24 and the test of significant association was done using Chi square; the level of significance was $P<0.05$

Results

The mean age was 29.40±11.12 years male 43(95%) and 2(5%) female. There were (88%) patients who sustained fracture injury due to gunshot and (12%) were explosive injuries. All patients presenting with lower limb fracture as 33(73.3%) patients with femur fracture and 12 (26,7%) patients with tibia fracture undergo Gustillo Anderson classification IIIA 34 cases (75.5%), IIIB 4cases (8.8%), IIIC 7 cases (15.5%)**.** Assisted injury were vascular injury 5 (11.1%) patients**.** Neurological injury (13.3%) patients**.** The frequency of interval from time of injury to fixation in operation theater less 8 hours 43(95%) patients with IMN fixation , and more the 8 hour 2(5%) patients. Fixation by integrade intramedullary nails in 43(95%) patients. Retrograde intramedullary nail 2(5%)patients. Complication were 3 (6.6%) patient as one (2.2) patient infection, one (2.2) patient lower limb swelling and one (2.2) patient with bleeding. Reoperation rate 6(13.3%) patients as debridement 4 (8.7%) patients and skin graft 2 (4.3%) patients. Mean hospital stay 3.40 day. The infection was one case from 45 cases with P value =0.827 no significant correlation between the infection and the IMN fixation in gunshot fracture in our study. There was infection in 1 cases which the interval between the injury and fixation is more than 8 hours

with p value = 0.025**.**

Discussion

The mean age of the patients enrolled in this study was 29.40±11.12 years. This is closed to the mean age which was found in many studies; 32.2±12.2 years by *Ogunlusi et al*. [12] On the other hand, many studies clearly show older than our mean age of patients that were 33 years by Khatri *et al.* [14] In contrast, other studies reported younger than our mean age of the patients as 17.4 years by Levy *et al*. [15]

Most of the studies are shown that, gunshot fracture to lower limbs affects males more commonly than females. This study showed male preponderance as (95%) males and (5%) females. Likely, Swanepoel *it al*. [16] (94%)men and (6%) female, . In contrast, male was lower percentage than our result by M Shuaib *et al.* [17] as (81%) patients.

The mechanism of injury in this study was mainly by gunshot injury as (88%) and by explosive injury as (12%). It is higher than Margaret *et al*. [18] that shows (63.3 %) of injuries resulting from explosive devices and (16.3 %) from gunshot wounds in Iraq and Afghanistan. But this study is lower than Saqib *et al*. [19] in USA in which all the patients injured by gunshot (100%).

According to the type of lower limbs fracture that fixed by IMN, we found most of fracture in femur (73.3%) patients and (26.7%) patients with tibia fracture. Similar to study done by Olasinde *et al*. [18] the fracture in femur (71.4%) patients and tibia (29.6%) patients. On the other hand femur fracture is higher than our study in Adel *et al.* [20] femur (77%) tibia (23%).

Analysis of the Gastilo Andersone classification of patients in this study revealed that IIIA (75.5%) patients, IIIB (8.8%) patients, IIIC (15.5%) patients. In contrast, other studies reported that result near our study like in Jai Prakash *et al*. [14] in India IIIA (73%) patients, IIIB (17%) patients, IIIC (10%) patients. On the other hand, many studies show deferent classification of gunshots fracture like Ali *et al.* [21] Gustillo Anderson IIIA = (100%)

The interval between injury and operation we found 43 (95%) patients before 8 hour, and more than 8 hours 2 (5%) patients. This is supported by a study from , Bogatsu *et al.* [22] But in other studies shows the time interval between injury and nailing more than 8 hour in Wright *et al*. [23], Wiss *et al.* [24] In our study could be because that because the conflict area inside the city so the distant to hospital is short and suitable for definitive management.

In this study the Fixation by intergrade antramedullary nails in 43(95%) patients and by retrograde

intramedullary nail 2 (5%) patients from IMN fixation. Defer to Dougherty *et al.* [25] intergrade IM nailing 25/68 (37%) Retrograde IM nailing 43/68 (63%). And Tornetta *et al*. [26] intergrade interlocking nailing all cases. In this study, the surgeons do integrand approach because they're afraid of knee sepsis, stiffness of the knee joint and use plate to distal femur fracture.

Regarding the associated injury with vascular injury we found in our study, there were (11%) patients need vascular intervention Near to Paul J *et al*.[25] (9%) patients and Levy *et al*. [27] (9%) patients. However lower vascular injury percentage we reported as Ferraro *et al.* [28] (6%) patients. Other studies reported higher percentage as Nicholas *et al*. [10,9] (25%) patients.

The neurological injury associated with lower limb fracture fixed by IMN in this study we found that there were (13%) patients had nerve injury at time of admission. It is near to Swanepoel *et al*. [16] (12%) patients, Other studies reported lower percentage studies by Jai *et al* [14] (7%)patients. A possible explanation is due to war and the high violence injury in our situation.

Of the 45 patients, 3(6.6%) patient had associated complication in this study. As wound infection (2.2%) as present of early infection following IMN fixation post gunshot in our study we found that patient male and smoker and the interval between the injury to operation was 12 hours. No significant to IMN. On the other hand there are studies near to our study; Perry *et al*. [28] The rate of superficial infection among them was one (2%) patient In contrast, another studies reported less frequency of early infection than my result; Cannada *et al.* [29] no patient had infection (0%). However, anther studies reported higher frequency of early infection than our result; Khatri *et al*. [14] there were 5 (17%) patients developed early superficial wound Infections.

We found in this study the post-operative DVT (2.2%) patient, but it is less than Wright *et al*. [30] who has no complication appear in his study, however it is higher than Peter *et al*. [31] (2.7%).

The overall mean hospital lengths of stay were 3.40 day likely Mehmet *et al*. [32] which was 4 day. However it is Lower than that reported by Abalo *et al*. [33] The average hospital stay was 11.3 days. In our setting the short of hospitalization due to the patient most of them young fighter without comorbidity. Regard to reoperation, we reported in this study (13.3%) patients had second look in operation room. that is Near to Peter *et al*. [34] reported (11%) of reoperation. However the reoperation rat in this study is less than Prakash *et al*. [14] which was (17.2%) patients. On other hand the re-operative rate in our study is more than Hilton *et al*. [35] which was (4.5%) patients.

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