

## **Gunshot Fractures Of The Extremities In A Community Clash: The Experience Of Two Teaching Hospitals In Nigeria**

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### **Abstract**

**Background:** *Civil strife often leads to large numbers of patients with severe injuries. The gunshot injuries sustained in the communal clash between the Ifes and Modakekes in Nigeria were the subjects of this study.*

**Method:** *The history was recorded for each patient presenting at the hospital with gunshot injuries from the clash. Each patient was examined and followed up through subsequent treatment in the wards and clinics. The period of follow-up was two years.*

**Results:** *Ninety-seven (52.4%) of the 185 patients who had gunshot injuries sustained fractures over a two-month period, but 90 of these attended follow-up till the final assessment. The femur (28 patients) followed by the tibia and fibula (21) were most commonly fractured. Nine (10%) were Gustillo-Anderson grade II, 42 (46.7%) were grade IIIA, 26 (28.9%) grade IIIB and 7 (7.8%) grade IIIC open fractures. The primary surgical treatment was debridement and fracture stabilization 84 (93.3%) and 6 (6.7%) had amputation. Seventy three (81.9%) had repeat surgeries. The initial complication rate (1.5 per patient) was high but most of the complications resolved leaving 15 (16.7%) with permanent disability. No mortality was recorded.*

**Conclusion:** *There is need to improve the preparedness and alertness of hospitals for mass casualty.*

### **Introduction**

The extremities are more commonly injured in firearm incidents than any other parts of the body<sup>1-5</sup>. The incidence is increasing,<sup>6</sup> and this may be due to a general increase in the civilian incidence of gunshot injuries which are occurring in epidemic proportions in certain parts of the world<sup>1, 6-8</sup>. Fractures are the most common injuries sustained when the extremities are injured by firearms<sup>2, 3, 9</sup> and their treatment can be difficult<sup>10</sup>.

The Ifes and the Modakekes are Yoruba speaking people of Western Nigeria who speak different dialects of the Yoruba language. In the last century, there were three outbreaks of communal conflicts between them. The one reported in this study was the latest, and it lasted two and a half months from 3<sup>rd</sup> March to 23<sup>rd</sup> May 1999. The two teaching hospitals where the study took place were the nearest to the warring communities.

The management of a large number of complex fractures presenting within a short time as seen in wars and conflicts is difficult and the experience is worth sharing.

This work was designed to study the pattern of limb

fractures secondary to gunshot injuries in civilian tribal conflict and to highlight the problems faced by hospitals in managing such patients in a resource poor environment.

### Patients and Methods

The records of all patients with fractures secondary to gunshot injuries from the Ife-Modakeke clash were reviewed after two years of follow-up. The sex, age, site of fracture, the Gustillo-Anderson grading of the fractures, associated injuries, treatment offered as well as their complications were extracted.

The patients were then examined in the outpatient department to determine if they still had any complication or functional impairment as a result of the injury they sustained by way of documenting the final outcome. All the patients that defaulted from clinic follow-up before the final assessments were excluded from the study.

The Ile-Ife unit of the Obafemi Awolowo University Teaching Hospital Complex catered only for the victims from Ile-Ife. It had in its employment three orthopaedic surgeons and four orthopaedic resident doctors. The LAUTECH Teaching Hospital Osogbo is 45 Km away from the war front and it catered mostly for those from the Modakeke faction. There

### Results

One hundred and eighty five patients were brought to the accident and emergency departments of the Obafemi Awolowo University Teaching Hospitals, and Ladoke Akintola University of Technology Teaching Hospital Osogbo with gunshot injuries. One hundred and seventy one. (91.9%) of these had injuries involving the upper and the lower limbs. Ninety seven (52.4%) sustained fractures but only 90 of these were seen at the final assessment. There were 88 (97.8%) males and 2 (2.3%) females with male to female ratio of 44:1. The mean age was  $30.8 \pm 10.1$  years while the range was 14-65years. The age group most commonly affected was the 20-29 years with 39 (43.3%) patients.

Only 35 (38.9%) patients came directly to the hospital, the remaining 55 (61.1%) were referred from other hospitals, 7 (7.8%) of which were from traditional bone setters where they had treatment.

**The Fractures:** The femur was the most commonly fractured bone (Table 1). Except when adjacent bones in the same segment of a limb were fractured together, no patient fractured more than one bone. 42 (46.7%) patients had Gustillo-Anderson grade

**Table1 : The bones fractured**

Fractured Bones	Number of patients	Percentage of 90
Femur	28	31.1
Tibia and fibula	21	23.3
Humerus	15	16.7
Radius and ulna	10	11.1
Foot bones	10	11.1
Hand hands	6	6.7
<b>Total</b>	<b>90</b>	<b>100.0</b>

3A, 26 (28.9%) had grade 3B, 9 (10.0%) had grade 2, 6 (6.6%) had grade 3C while 7 (7.8%) which involved the hands and feet were not graded. No patient had grade 1 open fracture.

Eighteen patients with fractures had significant injuries to other tissues in the limb. There were four (4.4%) arterial injuries, 12 (13.3%) peripheral nerve and two (2.2%) burn injuries. Only one (0.5%) of the 185 with limb injuries had significant associated injury to other regions of the body. This patient had a gunshot injury to the abdomen.

**Treatment:** All the patients were resuscitated. They were also given anti tetanus serum (ATS) as well as tetanus toxoid because it was difficult to obtain reliable history of their immunization status from the patients or their bearers. All had parenteral antibiotics for between 5 and 35 days, while 53 continued with oral antibiotics for between 2 and 28 weeks.

Debridement was done as soon as materials for the surgery were ready. This consisted of irrigation with 3-4litres of saline, hydrogen peroxide and final irrigation with 280mg Gentamicin in 500mls saline. We placed all femoral fractures on skeletal traction while all other long bone fractures with Gustillo-

Anderson stage I and II had POP casts and those with stage III fractures had external fixation. The patients with Gustillo-Anderson grade II fractures had wound debridement in the accident and emergency unit theater and subsequent immobilization with either POP cast or skeletal traction. Patients with grade III fractures had their initial wound care in the main operation theater and immobilization with skeletal fixation. We did not use internal fixation for the initial management of the fractures. 18 (20.0%) had their first surgeries within 6 hours, 29 (32.2%) between 6 and 12 hours, 24 (26.7%) between 12 and 24 hours and the remaining 19 (21.1%) after 24 hours.

A total of 220 surgical procedures were done for the patients giving an average of 2.4 procedures per patient. Only 17 (18.9%) patients had one surgical operation each and four of these were amputations. forty one (45.5%) patients had 2 surgeries, 18 (20.0%) had three while 6 (6.7%), 5 (5.6%) and 3 (3.3%) had surgical operations four, five and six times respectively each. Table 2 shows the patients' first surgeries. The debridement done was in combination with other procedures for all the patients except the six that had limb amputation.

**Table 2: Initial (emergency) surgeries for the patients**

<b>Surgery</b>	<b>Number of patients</b>	<b>Percentage</b>
Débridement + skeletal traction	28	31.1
Débridement + external fixation	23	25.6
Debridement + casting	20	22.2
Fasciotomy + debridement	6	6.7
Debridement + primary closure + skeletal traction	7	7.7
Amputation	6	6.7
<b>Total</b>	<b>90</b>	<b>100.0</b>

**Table 3: Subsequent surgeries done for the patients**

<b>Surgery</b>	<b>Number of patients</b>	<b>Percentage</b>
Debridement + casting	30	23.2
Removal of external fixator	23	17.7
Secondary closure	21	16.2
Skin grafting	17	13.1
Sequestrectomy	15	11.5
Open reduction and internal fixation	10	7.7
Removal of Kirschner wires	5	3.9
Débridement & external fixation	4	3.2
Osteoclasis	3	2.3
Refashioning of amputation stump	2	1.2
<b>Total</b>	<b>130</b>	<b>100.0</b>

Thirty one of the initial surgeries were done by orthopaedic surgeons, 24 by orthopaedic registrars, 30 by general surgeons and 5 by surgical residents. All 9 patients with grade II and 20 of the patients with Gustillo-Anderson IIIA fractures were initially operated upon by resident doctors while consultant surgeons did the remaining surgeries. The complication rate of those operated by consultant surgeons was less than those operated by surgical residents; this was however not statistically significant ( $p > 0.05$ ). All 9 patients with grade II and 20 of the patients with Gustillo-Anderson IIIA fractures were initially operated upon by resident doctors while consultant surgeons did the remaining surgeries. The complication rate of those operated by consultant surgeons was less than those operated by surgical residents; this was however not statistically significant ( $p > 0.05$ ).

Table 3 shows the subsequent surgeries. Ten of the

fractures which did not unite with external splinting had open reduction and internal fixation as well as bone grafting. All of them united thereafter.

**Initial complications:** one hundred and thirty five complications were recorded in the patients. These include: joint stiffness 38 (42.2%), delayed union 20 (22.2%), superficial infection 20 (22.2%), muscle atrophy 18 (20.0%), osteomyelitis 15 (16.7%), malunion 10 (11.1%), non-union 8 (8.9%) and compartmental syndrome 6 (6.7%). Table 3 shows some of the surgical procedures that were used to treat the complications.

**Duration of hospital admission:** This ranged from 11-301 days with a mean of 53.1 days.

**Duration of immobilization:** The mean duration of immobilization was 81.7 days it ranged between 37 days for a patient who had traction discontinued for open reduction and internal fixation to 689 days.

**Final outcome:** No mortality was recorded among

the patients. Fifteen (16.7%) patients still had some disability after two years of follow up; these were 6 (6.7%) cases of limb shortening, 5 (5.6%) patients with joint stiffness and 4 (4.4%) patients with osteomyelitis.

## Discussion

Fractures are among the injuries commonly sustained from gunshot<sup>1,3,4</sup>. Ninety seven (52.4%) of our patients had extremities fractures. The lower limbs were about 1.9 times more frequently fractured than the upper limbs. This tallies with the finding by several authors<sup>1,3,7</sup>. The reasons given for this may be due to the assailants' intent to demobilize the victims<sup>8</sup>. Besides, the lower limbs present a larger surface area than the upper limbs.

However the severity of the associated soft tissue injuries seen in these patients (more than 70% have grade III open fractures) is at variance with the findings in studies on civilian gunshot injuries<sup>5,10,11</sup>. However, the present study concerns a period of civil disturbance, a combat fought by civilians with intent to maim and kill their opponents.

The extents of the injuries caused by gunshots are mainly due to the muzzle velocity of the bullets, their weights measured in grains and the distances between the assailants and their victims<sup>12</sup>. The people involved in the fighting reported in this study lived in two communities so intertwined that they have virtually become one and, some of the shots were at close ranges. Furthermore, shadows of shrapnels were seen on some of the x-ray films; confirming the high velocity nature of the assaulting weapon.

The treatment of these patients was hampered by several factors. Firstly, the clash started suddenly and presented the hospitals with a mass casualty situation which they were ill prepared for. There was the

sudden arrival of many patients, with various degrees of injuries demanding urgent attention. This disaster situation was maintained throughout the two months period of the strife, the situation was somehow worsened by the fact that whilst the initial treatment was free and aggressive towards saving the lives of the victims, the freedom of expense was discontinued for definitive treatment of stable patients. Therefore for many of the patients subsequent surgeries were often delayed because of their inability to pay for the procedures.

Except the six patients who had immediate amputation, every other patient had wound debridement in conjunction with various other procedures (table 2), these were inadequate in some cases because the surgeries were delayed and their extent not adequate due to lack of facilities. For example, wound irrigation was done with 3-4L of normal saline using simple irrigation in most cases whereas most authors advocate up to 9L of pulsatile lavage. This may explain the high complication rate recorded in this study compared to some reported findings<sup>1,4,11,13</sup> as well as the high re-operation rate. Some other authors have also reported high re-operation and complication rates<sup>14,15</sup>.

Although, various reports encourage open reduction and internal fixation for grades 1, 2, 3A Gustillo Anderson fractures, patients' selection must be individualized and adequate manpower and equipment made available to achieve good results<sup>16</sup>. Therefore in this study, apart from Kirschner wire fixation of hand fractures, open reduction and internal fixation was not done as a primary procedure in any of these patients. The reasons for this cautious approach are many: one is the large number of patients seen compared to available orthopaedic surgeons. Secondly, implants were not available in the hospitals, most times. The sizes of the implant needed were usually estimated and given to patients

to procure from vendors or manufacturer's representatives who had their offices in Lagos which is over 200Km away from either hospitals, It is obvious that doing emergency osteosynthesis in a setting like this is virtually impossible. Furthermore in our practice, as advocated by some authors<sup>11,16</sup>, we are reluctant to do implant surgery for open fractures secondary to high-energy trauma for fear of infections. We carried out open reduction and internal fixation only when there was non-union and the wounds had healed; ten patients had this procedure.

Gunshot limb fractures are hardly fatal<sup>9,17</sup> but they are associated with long-term disability<sup>9</sup>. While no death was recorded in our series, 15 (16.7%) of our patients had disability lasting longer than two years. The long period of admission and immobilization in many of the patients also points to the toll that the injuries can take on the patients and their income, the surgeon and the hospital resources.

This study shows how ill prepared the hospitals were to tackle the challenges posed by the sudden influx of many patients with gunshot injuries. A situation where only 20% of patients with gunshot injuries had their surgeries within 6 hours is unsatisfactory. To avoid this kind of situation in the future, hospitals should adopt protocols which can incorporate a triage system that is regularly rehearsed. The protocol should include some means of getting by the fastest ways possible, the appropriate implants and imaterials required for the management of such difficult cases which even at the best of times is fraught with many pitfalls. A further benefit of such a protocol is that it can be applied to other causes of mass casualties such as natural disasters and major road traffic accidents.

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Oluwadiya K. S, et al. - Extremities Gunshot Fractures

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