2023-08-10

Magnitude Of Complications Of Radioulnar Shaft Fractures And Associated Factors In Adults Treated In Tibebe Ghion Specialized Hospital In 2023 Gc, Ethiopia

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COLLEGE OF HEALTH AND MEDICAL SCIENCES

DEPARTMENT OF ORTHOPEDICS AND TRAUMA SURGERY

MAGNITUDE OF COMPLICATIONS OF RADIOULNAR SHAFT FRACTURES AND ASSOCIATED FACTORS IN ADULTS TREATED IN TIBEBE GHION SPECIALIZED HOSPITAL IN 2023 GC, ETHIOPIA

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A RESEARCH THESIS TO BE SUBMITTED TO BAHIR DAR UNIVERSITY COLLEGE OF MEDICINE AND HEALTH SCIENCES, DEPARTMENT OF ORTHOPEDIC AND TRAUMA SURGERY FOR THE PARTIAL FULFILLMENT FOR THE REQUIREMENTS OF SPECIALTY IN ORTHOPEDICS AND TRAUMA SURGERY

AUGUST/2023 G.C

BAHIR DAR UNIVERSITY COLLEGE OF MEDICINE AND HEALTH SCIENCES SCHOOL OF MEDICINE

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	Study design	Cross sectional study
	Study project	Magnitude of complications of radioulnar shaft fractures and associated factors
	Study area	TGSH, department of orthopedics and Trauma surgery

Declaration

I, the under signed, declared that this is my original work has never been presented in this or any other university, and that all the resources and materials used for the research, have been fully acknowledged.

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ACKNOWLEDGEMENT

I would like to express my deepest gratitude and sincere appreciation to my advisors Dr. Worku Belay (Assistant Professor of Orthopedic and Trauma Surgery) and Mr.Tebkew Shibabaw who were beside me by giving their valuable ideas, constructive comments and guidance in conducting this research thesis. I also like to thank Bahir Dar University College of Medicine and Health Sciences for giving me this great opportunity to do this Clinical Research and its cooperation to support me to complete this study.

Acronyms and Abbreviations

AAU……..…..Addis Ababa University
AO…… Arbeitsgemeinschaft für Osteosynthesefragen
BDU …….Bahir Dar University
CI……..…….Confidence Interval
DASH …….. Disability of Arm, Shoulder and Hand
DCP……Dynamic Compression Plate
DRUJ……Distal Radioulnar Joint
GA……..Gustillo-Anderson
GC……... Gregorian calendar
GP……General Practitioner
IMN …….Intramedullary Nail
LMICs…….Low-and Middle –Income Countries
OR……..……Odds Ratio
ORIF……..Open Reduction and Internal Fixation
OTA …… Orthopaedic Trauma Association
PI……...Principal Investigator
PRUJ ……..…...Proximal Radioulnar Joint
RTA …….Road Traffic Accident
RU…….Radioulnar
SPSS…….....…Statistical Package for Social Science
TGSH…….……Tibebe Ghion Specialized Hospital
WHO…….…..….... World Health Organization

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Abstract

Background: Timely presentation and treatment with appropriately selected treatment option for radioulnar fractures significantly affect their outcomes. Delay in presentation and delay in time to treat these fractures, poor surgical techniques results in number of complications. Magnitude of complications and associated factors of radioulnar shaft fractures are not well studied in Africa. Study done in USA on Complications of plate fixation of forearm fractures by involving 87 diaphyseal forearm fractures (64 patients) which were treated by plating showed major complications occurred in 18 (28%) patients.

Objective: Objective of this study is to assess magnitude of complications with radioulnar shaft fractures and associated factors among patients treated in Tibebe Ghion Specialized Referral Hospital

Methods: Cross–sectional study was used to conduct this study. The sample size was calculated using Epi info 7.2.50 software versions with the population survey feature and with the assumption of 0.05 margin of error and 28% expected frequency. The sample size was 134 patients, from which 126 were included. Data was collected using data collecting format and transferred to SPSS version 23 for analysis. Frequency and cross tabulation was used to summarize descriptive statistics. Means and percentage were used for numerical variables. Graphs and tables are used for data presentation and dissemination. Cross tabulation and chi-square test were used for detecting the presence of associations between variables. P-Value <0.05 used to determine the association of variables and OR with 95% CI was used to determine the strength of association.

Result: A total of 126 out of 134 patients (94.03%) were included: 102 males and 24 females with the Average age of 27.28 +/-8.940 years. The prevalence of complications after radioulnar shaft fractures was 35.7%. Results of Binary logistic regression showed that time of patient presentation after trauma (AOR = 12.295; 95% CI 3.691 – 40.963) and time to undergo surgery after their presentation to hospital was significantly associated with complications (AOR = 17.534; 95%CI 5.249 – 58.565).

Conclusion: The overall prevalence of complications after radioulnar shaft fractures is higher than when compared to other studies. The independent risk factors for complications were presentation after 72 hours of trauma and undergoing definitive surgery after 24 hours of presentation.

1. Introduction

1.1. Background

Radial shaft fractures are defined as fracture occurring between the radial necks proximally and the junction of the metaphysis and diaphysis distally, approximately 3 cm proximal to the distal articular surface. Ulnar shaft fractures are defined as those occurring between the distal aspect of the coronoid proximally and the ulnar neck distally (1). the Monteggia fracture is a fracture of the proximal ulna associated with a dislocation of the radial head(2). The Galeazzi fracture is a fracture of the middle to distal one-third of the radius associated with dislocation or subluxation of the distal radioulnar joint (DRUJ)(3).

Musculoskeletal injuries are a major public health problem globally, contributing a large burden of disability and suffering(4). In high income countries, adult fracture incidence is said to be 1,351/100,000/year(4). In low and middle income countries, the overall incidence of musculoskeletal injuries ranges from 779 to 1574/100,000/ year(5).

Study done in Ethiopia to see Radiological and clinical details of major adult limb fractures, Addis Ababa, Ethiopia, showed Mean age was 35 years with a male to female ratio was 3:1 and nearly half (202, 48%) of the traumatic fractures were due to road traffic accidents. The highest frequency of fracture occurred on the femur (68, 15%), tibiofibular bones (63, 14%) and the humerus (61, 13.5%). Compound fracture occurred in 90 (21.3%) of the cases(7).

Study done in Eastern Ethiopia on patterns of fractures and their current hospital management shows, the majority (71%) of the patients were aged between 15-54 years, while 237 (18%) were under 15 Years .Only 154 (11%) were over 54 years. The bones involved included Tibia/Fibula (25%), Femur (22%), Ankle (15%), Pelvis (7%), Radius/Ulna (6%), and humeral shaft (5%). Closed fractures accounted for 1037 (77%) and open fractures for 317 (23%)(8).

The most widely used fracture classification of fractures of the forearm is the AO/OTA classification. Radioulnar shaft fractures are identified by the number 22 (2 for forearm, 2 for shaft). Type A fractures are simple fractures, type B are wedge fractures, and type C are complex fractures. Monteggia fractures are classified as types A1.3 (simple) and B1.3 (wedged). Furthermore, Monteggia fracture dislocations in which both the radius and ulna are fractured are classified as type A3.2 or B3.2. Conversely, Galeazzi fracture dislocations are classified as types A2.3 (simple) and B2.3 (wedged). Galeazzi fracture dislocations in which both the radius and ulna are fractured are classified as type A3.3 or B3.3(1).

The main goal of treatment of fractures of the forearm bone is to recover full and painless function of the forearm and upper extremity(1). Plate fixation is the most commonly used technique for the treatment of shaft fractures of both forearm bones. However, all fractures are difficult to treat with plate fixation because of soft tissue injuries, fracture patterns, or the patient's condition whereby other treatment options are indicated(9).

Historically, forearm fracture–dislocations have had poor outcomes with conservative management; however, early recognition of these injuries and advances in fixation techniques have led to much improved results. If the principles of restoration and maintenance of anatomic

alignment are followed and the injury is treated acutely, then good outcomes can be expected. If these injuries are missed, various salvage options based on the restoration or recreation of anatomy are available depending on the injury, although the outcomes are not as good(10).

There are a lot complications related with radioulnar shaft fractures from injury itself and their treatments. Among these complications, Post-traumatic radioulnar synostosis(incidence up to 9.4%) has potentially serious functional impact which results in total prono-supination loss leads to severe functional impairment, not only in sports but in everyday life(11). Surgical management of these fractures associated complications like : postoperative neurological lesions(9%), and malunion cases(7%)(12). Malunion of bones compromises the Interosseous space and may limit forearm rotation. Additionally, malunion results in imbalance of forearm musculature, potentially leading to pain at the radioulnar joint and loss of grip strength(13). Nonunion after compression plating of forearm fractures occurs in 5% of cases(13). Refracture occurred in 11% of patients after removal of implants(13).

The presence of associated injuries was a strong predictor of a compromised end result. These patients had more pain, greater loss of forearm rotation, and longer times to fractures of the union(14). Treatment with ORIF resulted in better outcomes than treatment with other options, largely because it minimizes malalignment and the resulting loss of forearm rotation. These two factors were closely associated with the inability to return to the same work following injury(14).

Outcomes of treatment after radioulnar shaft fractures can be affected by type of treatment option undertaken and each option has its own advantage and disadvantages (9, 15-17). The range of movement of the forearm and wrist, grip and pinch strength can measured for objective evaluation and standardized radiographs can also evaluated to see bony unions(16).

1.2. Statement of the problem

Adult forearm fractures account for 1–2% of all fractures of the limbs(12). The incidence of forearm fractures is generally at 0 to 4 per 10 000 population per year and consistently higher for males from 15 to 44 years with a common odds ratio of 5.4 (95% CI 3.2 to 9.0)(18).

Study done Ethiopia shows, radioulnar fractures accounts 6% from long bone fractures(8). Another study done at Teaching Hospital, AAU, Ethiopia showed that isolated radius fracture was 10.22 %, isolated ulna fractures 4.44 % and combined radioulnar fractures 7.55 %(7).

Management of these fractures associated complications like: postoperative neurological lesions (9%), malunion (11%), and radioulnar synostoses (4%)(12). The risk of radioulnar synostosis has been associated with a single incision approach(19). Inadequately treatment and/or reduction of both bone forearm fractures can significantly lose motion and function(19). Radioulnar synostosis following forearm trauma have a pro- found effect on upper extremity function and the ability to perform many activities of daily living(20). The presence of other injuries was a

strong predictor of a compromised end result, primarily because of more pain, greater loss of forearm rotation, and less frequent return to the same work(14).

1.3. Significance of the Study

For patients with radioulnar shaft fractures, early presentation to health care facilities after trauma, timely treatment of these fractures with appropriate treatment option and rehabilitation significantly affects their outcomes. Mechanism of injury, delay in patient presentation, delay in providing definitive treatment for fractures, poor surgical techniques, and suboptimal postoperative care lead to many complications with subsequent poor clinical and functional outcomes. There is no study on this topic in our setup and also in our country as to my review. This research will not only try to fill the gap of lack of studies done in our setup on this topic but also can aid for other hospitals in Ethiopia as well as other Low and Middle Income Countries (LMICs) which face similar burden from the complications and associated conditions with these injuries. In addition, it may also aid for policy makers, multilateral donors in university, service providers and thereby solve the problems related to complications after forearm bone fractures. As this is the first study in our setup it also will be used as a baseline for other future studies

1.4. Literature Reviews

Magnitude of complications of radioulnar shaft fractures

There are numerous complications after radioulnar shaft fractures which are result from initial injury by itself and how they treated then after. Poor clinical and functional outcomes follows these complications which put the extremity with limited function to do activities range from personal care to return to pre-injury works.

Study done in USA to assess Complications of plate fixation of forearm fractures by involving 87 diaphyseal forearm fractures (64 patients) which were treated by plating showed major complication occurred in 18 (28%) patients. Nonunion occurred in six patients: three of 18 bones treated with four screws (17%), but only three of 69 bones fixed with five or more screws (4.3%), a nonunion rate four times higher for bones plated with four screws. Screws loosened in three fractures, all involving the ulna. Radioulnar synostosis occurred in seven forearms, and in five of these the forearm injuries were associated with multiple system trauma involving head injury. Two patients had osteomyelitis(21).

Report from study done in USA on treatment of Forearm Shaft Fractures by Double-Plating on Twenty-nine diaphyseal fractures of the forearm in twenty-one patients were treated by the double-plate method showed two refractures after removal of the plates and screws, one minor infections, and two cases of radio-ulnar synostosis(22).

Results of AO plate fixation of forearm shaft fractures in adults on series of 111 forearm fractures in 108 individuals involving 177 individual bones, and treated by AO plating studied in USA in 1983 showed deep infection occurred 6 times, and non-union in 7 bones. Cross-union developed in 6 patients, all of whom had sustained head injuries. Seven patients sustained operative nerve injuries(23).

Retrospective multicenter study done in France in 2016 to evaluate pre- and postoperative complications of forearm fractures showed that before surgery, 12 patients had neurological impairment (9%). At the last follow-up, nine patients had persistent neurological disorders (6.9%). Nine patients with nonunion were observed (6.9%) and five patients had radioulnar synostosis (3.8%)(12).

Study done in Korea in 2007 to determine Outcomes Following Plate Fixation of Fractures of Both Bones of the Forearm by Comparing with the uninjured arms showed, the injured arms had reduced strength of forearm pronation (70 %), forearm supination (68%), wrist flexion (84%), wrist extension (63%,), and grip (75%). In addition, the injured arms had a significantly reduced active range of forearm supination (90% of that of the uninjured arm), forearm pronation (91%), and wrist flexion (82%)(24).

Another study in Korea in 2010 on radioulnar fractures treated with Intramedullary Fixation showed Complications include radio-ulnar synostosis (especially in fractures of the radius and ulna at the same level), transient posterior interosseous nerve palsy (from interlocking screw placement), nail migration, iatrogenic fractures, malunion, and nonunion(25).

In 2014 study done in Italy on patient treated by Plating of diaphyseal fractures of the forearm showed 4 cases of non-union (6.2%), which occurred in 2 ulnae and in 2 radii of 4 patients, 3 men and 1 woman, mean age 34.5 (range 22-60 years). Thus, the non-union rate per patient was 8.5%. The cases of non-union involved the following kind of fractures, according to the AO classification: 3 type C1, of which one of these was open, Gustilo II and one type A2. The first three types were complicated fractures: 1bifocal ulnar fracture, 1 comminuted ulnar fracture, 1 open fracture of the radius, Gustilo II. In the last one, plate rupture took place due to poor patient compliance(26).

Prospective study done Turkey in 2012 to evaluate the clinical and radiographic outcome after open reduction and internal fixation of the forearm diaphyseal fractures by Dynamic Compression Plate (DCP) showed that out of 77 fractures, there was two superficial infections that healed by debridement and antibiotics, and one deep infection which caused to delayed union and underwent reoperation including change of implant and bone graft. Two radial nerve injuries occurred after operation for radius fracture(27).

Another prospective study in Pakistan in 2014 on Outcome of Forearm Shaft Fractures in Adults Treated by Dynamic Compression Plate (DCP) showed that there was 02(3.08%) superficial infection that healed by debridement and antibiotics, and 01(1.54%) deep infection which caused to delayed union and underwent reoperation. Two (3.08%) radial nerve injuries occurred after operation(28).

Retrospective study done in Korea in 2015 to compare the Outcomes of Surgical Treatment with Plating Only(group A) and Combined Plating and Intramedullary Nailing(group B) showed a radiologic union was achieved in 30/31 of group A and 14/16 cases of group B and average union time was 11.1 and 17.8 weeks, respectively. According to the Grace and Eversmann rating

system, group A had excellent results in 15 cases, good in 14, acceptable in one, and unacceptable in one. Group B had excellent results in three cases, good in nine, acceptable in two, and unacceptable in two. The average DASH score was 7.1 points (range, 0 to 19.2 points) in group A and 15.1 points (range, 0 to 29.6 points) in group B. Three cases of nonunion with unacceptable results achieved a bony union by additional procedures and the functional results of these cases improved to good or excellent(9).

There was study done in China in 2016 to compare clinical and biomechanical of four different fixations of Adult diaphyseal both-bone forearm fractures on Forty cadavers by grouping : both-bone plate fixation or both-bone intramedullary nailing, plate fixation of ulna and intramedullary nailing of radius and intramedullary nailing of ulna and plate fixation of radius. In the biomechanical study, intramedullary nailing of ulna and plate fixation of radius had similar results with that using both-bone plate method under axial, bending and torsional loading, suggesting the more stable fixation compared with the other two groups. In clinical research, both-bone intramedullary nailing was related to shortest operative time, smallest wound size and periosteal stripping area compared with other three groups. Patients receiving intramedullary nailing of ulna and plate fixation of radius showed the lowest incidence of postoperative complications and the best functional recovery outcome comparing with other three groups of patients(29).

There is no study done in Africa and particularly in Ethiopia either to assess magnitude of complications of radioulnar fractures or measure their outcomes.

Factors associated with complications of radioulnar shaft fractures

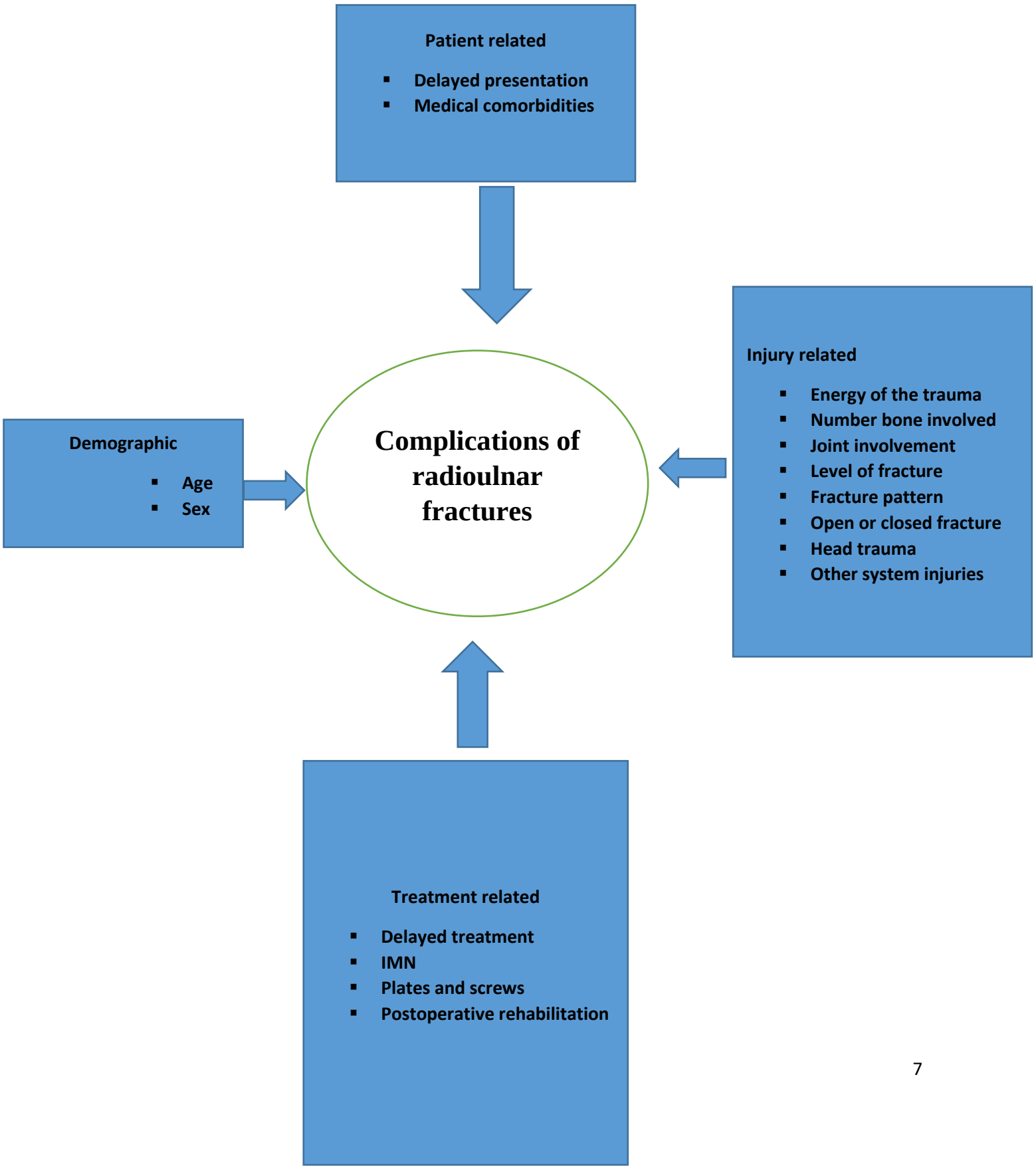
Study done on Adult post-traumatic radioulnar synostosis shows, Post-traumatic radioulnar synostosis in fracture of one or both forearm bones is a relatively rare complication, of potentially serious functional impact. Incidence of post-traumatic radioulnar synostosis may reach up to 9.4% of forearm fractures. Risk factors can be trauma and treatment related factors. Trauma-related: monteggia fractures, fracture of both forearm bones at the same level, open fracture, significant soft-tissue lesion, comminutive fracture, high-energy kinetic fracture, associated cranial trauma, or bone fragments on the interosseous membrane. Treatment-related: excessive trauma-to-surgery interval, single (Boyd) approach for synthesis of both forearm bones, cortical screws too long (extending beyond the second cortex), primary bone graft, prolonged immobilization or delayed rehabilitation(11).

Study done on Complications of plate fixation of forearm fractures shows, major complication occurred in 18 (28%) patients. Nonunion occurred in six patients: three of 18 bones treated with four screws (17%), but only three of 69 bones fixed with five or more screws (4.3%), a nonunion rate four times higher for bones plated with four screws. Screws loosened in three fractures, all involving the ulna. Radioulnar synostosis occurred in seven forearms, and in five of these the forearm injuries were associated with multiple system trauma involving head injury. Two patients had osteomyelitis. Both were victims of massive crush injury and delayed internal fixation, and both required removal of the implant; but eventually the fractures healed. Plate fixation of forearm fractures can have a high complication rate(21).

Acute compartment syndrome is a devastating complication of both bone forearm fractures treated with or without surgery. If compartment syndrome is confirmed or suspected, emergent fasciotomy should be performed. Complications following the surgical intervention of both bone forearm fractures include infection, bleeding, non-union, malunion, cross-union, and neurovascular injury. These are minimized by routine surgical safety measures, including medically optimizing the patient prior to surgery, using standard approaches, and administering antibiotics perioperatively. The use of bone-grafting for significantly comminuted or segmental fractures may decrease the risk of non-union. The risk of radioulnar synostosis has been associated with a single incision approach. Inadequately treatment and/or reduction of both bone forearm fractures can significantly lose motion and function. Malunion particularly limits the pronation-supination movements. Hardware may become bothersome and necessitate removal. There is an increased risk of refracture after plate and screw removal. Initial characteristics of the fracture, early removal, lack of bracing after hardware removal, and characteristics of the plate all appear to influence the risk of refracture. Disruption of the proximal or distal radioulnar joints, as well as the radiocapitellar joint, should be appropriately evaluated for and treated as there are unique complications with these injuries(30).

2. Conceptual framework

Figure 1 ***Conceptual framework***



3 . Objective

3.1 General objective:

- To assess magnitude of complications after radioulnar shaft fractures and associated factors among patients with radioulnar shaft fractures treated in Tibebe Ghion Specialized Hospital from January /2020 GC- January/ 2022 GC, Bahir Dar, Ethiopia

3.2 Specific objective:

- To determine magnitude of complications of radioulnar shaft fractures among Patients with radioulnar shaft fractures treated in TGSH.
- To find out associated factors for complications of radioulnar shaft fractures among Patients with radioulnar shaft fractures treated in TGSH.

4 . Methods and Materials

4.1 Study Design and Period

Cross sectional study design was conducted from March/ 2023- July/ 2023GC

4.2 Study Area

The study was conducted at TGSH which is found in Bahir Dar, the Capital City of the Amhara regional state which is 565 km away from Addis Ababa, the Capital City of Ethiopia. TGSH is tertiary teaching hospital of Bahir Dar University College of medicine and health science under Bahir Dar University. The hospital started giving service in January 2019 G.C and it is the largest hospital in the city. Currently, the hospital is delivering different clinical services to the region. The hospital provides obstetrics, pediatrics, internal medicine, ophthalmology, general surgery, gynecology, ENT (ear, nose, and throat) and orthopedic surgery services. A wide range

of procedures are performed. This study was done among trauma cases who visited at TGSH with diagnosis of radioulnar shaft fractures.

4.3 Source Population

All adult patients with diagnosis of radioulnar shaft fractures and treated in TGSH from January 1 /2020 to January 30/2022G.C.

4.4 Study population

All adult patients with diagnosis of radioulnar shaft fractures and treated in TGSH from January 1/2020 to January 30 /2022 G.C.

4.5 Eligibility criteria

4.5.1 Inclusion criteria

- Adult patients with radioulnar fractures treated , have follow up minimum of 12 weeks and whose operation note and other detail data is found from patient record chart

4.5.2 Exclusion criteria

- Patients who has incomplete recorded data on patient record chart and not followed for minimum of 12 weeks

4.6 Sample size and Sampling technique

The sample size was calculated using Epi info 7.2.50 software versions with the population survey feature and with the assumption of 0.05 margin of error and 28 % expected frequency. The population size from EOPD, OPD and operation registration books on the study period is 236, which gave a sample size of 134.

4.7 Study Variables

4.7.1 Dependent Variables:

- Complications after radioulnar shaft fractures

4.7.2 Independent Variables

- Age

- Sex
- Medical comorbidities
- Mechanism of injury
- Associated injury
- Severity of injury (Gustilo Anderson classification)
- Bone involved
- Level of fracture (at the same or different)
- Joint involvement
- Pattern of fracture
- Time from injury to presentation to hospital
- Time from injury to definitive surgery
- Type of operative treatment
- Rehabilitation after surgery

4.8 Operational Definitions

- Early bone fixation: - fixation of fractures done within 24 hours of patient presentation
- Delayed bone fixation: fixation after 24 hours of patient presentation

4.9 Data Collection Tools and Data Collection Procedure

Data collecting format was prepared by including variables that should be studied. It was prepared in English since patient data is recorded on patient chart is with English language. Data was collected in March 2023 GC. Based on the above inclusion & exclusion criteria's patients' data was extracted from the patients' charts as needed by four physicians by using data collecting format.

4.10 Data quality assurance

Pre-test was done on 5 charts from selected patients**.** The data collectors was given two days refreshment training and also supervised closely and the filled format was checked by the principal investigator for completeness and errors was being identified and corrected.

4.11 Data processing and analysis

The collected data was entered using SPSS software version 23 by the principal investigator. Frequency and cross tabulation was used to summarize descriptive statistics. Means and percentage was used for numerical variables. Cross tabulation, binary logistic regression analysis was used to analyze the association between variables. Graphs and tables was used as appropriate for data presentation and dissemination. A P value of < 0.05 was used as the criterion for statistical significance and OR with 95% confidence interval was be used to indicate the strength of association.

4.12 Ethical considerations

Before data collection Ethical clearance was obtained from institutional review board of Bahir Dar University research ethics committee with protocol number: 619/2022. The name of the studied participant is not recorded on the data collecting format and all the information taken from the chart was kept strictly confidential and in secured place. The information retrieved was used only for the study purpose. There was no risk on studied participants because of their participation in this study and also no direct benefits from the study; however, their participation had significant benefit in the achievement of the study.

4.13 Dissemination:

The finding of this study was be presented as one of the partial fulfillments of specialty certificate training in the department of orthopedic surgery, Bahir Dar University.

5. Results

Total patients involved in this study were 126 out of 134 which gives response rate of 94.03%. Forty five cases were developed different types of complications from 126 with incidence of 35.7%. There were 102 males (81%) and 24 females (19%) with the average age of 27.28 years +/- 8.940 with minimum and maximum values of 15, 60 respectively.

Bullet injuries were the leading mechanism of injury which accounts 68 (54%) followed by fall down (19.8%). Sixty patients (47.6%) were presented after 72 hours of the traumas. Patients with open fractures were 78 (61.9%) and the majority of them with GA IIIA. The fracture involved both bones in 97 cases (77%), radius 14(11.1%) and ulna 15(11.9%) of cases. Most of both bones fractures were occurred at the same level.

Seventy patients (55.6%) had simple/wedge fracture patterns and 56 (44.4%) cases with complex patterns. Joint involvement in the injuries were 13 (10.3%) from which 7 of them proximally and 6 distally. Associated injuries were total of 21 from which 10 of them had head injuries and 11 are involved other systems.

Regarding time of surgery after patient presented to hospital, 65 (51.6%) were operated within 24 hours. Intramedullary nail was done for 59(46.8%) patients and plates and screws for 67 (53.2%) of them. Early mobilization were started for 93 (73.8%) of patients.
Stiffness was the most common complication accounts 27 out of 45 cases (21.4%), followed by nonunion (6.3%), hardware prominence(6.8%) and infection(3.2%).

Patients who presented after 72 hours of trauma had developed complications 12.295 times than whose who presented before 72 hours (AOR = 12.295; 95% CI 3.691 – 40.963) and those who undergo surgery after 24 hours of presentation developed complications 17.534 times than those who operated after 24 hours of presentation (AOR = 17.534 ; 95%CI 5.249 – 58.565).
The demographic data are given in Table 1 and 2. Lists of the operative and clinical factors for participants given in table 3 showing that frequency in count and percentage. The mechanism of injuries are shown by using pie chart.
Result of Binary logistic regression analysis of characteristics of study displayed in the table 4.

Table 1.Age distribution of patients

	Minimum	Maximum	Mean	Std.Deviation
Age of patients	15	60	27.28	8.940

Table 2. Frequency distribution of demographic data (N=126)

Variable	Category	Frequency	Percent
Sex	Male	102	81
	Female	24	19

Table 3. Frequency distribution of Clinical and operative characteristics of patients

Variable	Category	Frequency	Percent
Medical comorbidities	Yes	4	3.2
	No	122	96.8
Mechanism of injury	RTA	16	12.7
	Bullet/blast	68	54.0
	Fall down	25	19.8
	Stick	17	13.5
Time of presentation	< 72 hours	66	52.4
	>= 72 hours	60	47.6
Soft tissue injury	Closed	48	38.1
	Open	78	61.9
Severity of open fracture	I	9	7.1
	II	3	2.4
	IIIA	66	52.4
Bone involved	Radius	14	11.1
	Ulna	15	11.9
	Both	97	77.0
Level of involvement	At same level	79	81.45
	At different level	18	18.55
Pattern of fracture	Simple/wedge	70	55.6
	Complex	56	44.4
Joint involvement	Yes	13	10.3
	No	113	89.7
Joint involved	Proximal	7	5.6
	Distal	6	4.8
Associated injuries	Yes	21	16.7
	No	105	83.3
Type of injuries	Head injury	11	8.7
	Other systems	10	7.9
Time of surgery	< 24 hours	65	51.6
	>= 24 hours	61	48.4
Type of surgery	IMN	48	38.1
	Plates and screws	78	61.9

Early range of motion	Yes	93	73.8
	No	33	26.2
Complications	Yes	45	35.7
	No	81	64.3
Types of complications	Infection	4	3.2
	Stiffness	27	21.4
	Nonunion	8	6.3
	Hardware prominence	6	6.8

Figure 2: Mechanism of injuries

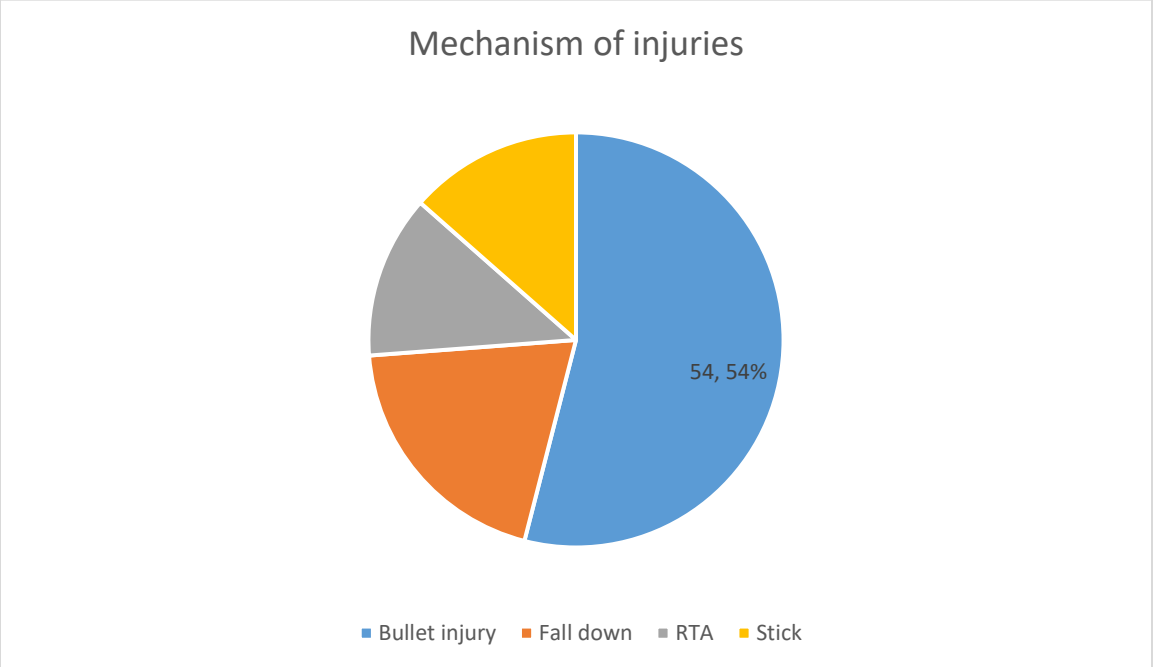


Table 4 Result of analysis by logistic regression

Variables	Category	Complication		COR(95%CI)	AOR(95%CI)	P-value
		Yes	No			
Time of presentation	< 72 hrs	10	56	1	1	
	>= 72 hrs	35	25	7.840(3.363-18.274)	12.295(3.691-40.963)	0.000
Soft tissue injury	Closed	10	38	1	1	
	Open	35	43	3.093(1.352-7.074)	0.619(0.140-2.733)	0.526
Fracture pattern	Simple/wedge	14	56	1	1	
	Complex	31	25	4.960(2.256-10.904)	1.802(0.364-8.917)	0.471
Time of surgery	< 24 hrs	8	57	1	1	
	>= 24 hrs	37	24	0.091(0.037-0.224)	17.534(5.249-58.565)	.000
Type of surgery	Plates and screws	18	60	0.233(0.107-0.507)	1.446(0.372-5.628)	0.594
	IMN	27	21	1	1	

6. Discussion

The leading mechanism of injury in this study was bullet injury accounted for 54%, which is unlike study done in Addis Ababa, Ethiopia that Road traffic accident counted for 48 % (7). Open fractures accounted for 61.9% of cases in this study having big difference when compared to study done in Addis Ababa, Ethiopia that shows open fractures were only 21.3% (7).

The incidence of complications after radioulnar shaft fractures in this study was 35.7%, which is higher than complications reported in study done in USA with incidence of 28% (21). Among complications occurred after radioulnar shaft fractures in this study, stiffness was the most frequent complication which accounts for 21.4% , which is higher than stiffness reported in study done in UK accounted for 9.4%(11). Nonunion was 6.3% in this study, which is almost comparable with report from study done in USA which was 5% (13).

Among factors studied as possible contributory to development of complications after radioulnar fractures, two factors were significantly associated with occurrence of complications. There is a significant relationship at final model between presence of complications with the time of presentation of patient to hospital after sustaining trauma and the time at surgery done after they presented to hospital. When patients present early to health facility after sustaining trauma, it is easy to do definitive surgery because soft tissue swelling and injury allows for that and complications can be reduced. Delay to do definitive surgery can happened from patient or from treating facility. Despite delays from patients and health facility, the severity of injuries by itself can delay time to get definitive surgery. In this study patients who presented after 72 hours of trauma and who were undergo surgery after 24 hours of their presentation to hospital had more complications than others which was true in other studies (21).

7. Conclusion and Recommendation

This study showed that the incidence of complications in patients with radioulnar shaft fractures treated in TGSH is higher than incidences reported in other literatures. We understand that development of complications result from delay in presentation of patient to hospital after the injury and time to do surgery after they presented health facility. It was possible to identify the areas that need to be addressed to reduce the incidence of complications after radioulnar shaft fractures. But this study has some limitations. It is limited in that we studied small size of participants, for better conclusion it need more studies with increasing size of participants

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9. Annexes

A. Annex 1: - Consent form

Title of the Research Project: Magnitude of complications and associated factors of radioulnar fractures treated in TGSH, Bahir Dar, Ethiopia

Name of Investigator: Gadisa Mulatu (MD, Year IV Orthopedics surgery and traumatology resident)

Name of the Organization: Bahir Dar University, College of medicine and health sciences

Name of the Sponsor: Bahir Dar University

Introduction: This information sheet is prepared for Bahir Dar University, College of Medicine and Health Sciences Administration to make concerned offices clear about the purpose of research, data collection procedures and get permission to conduct the research

Purpose of the Research Project: To assess the magnitude of complications and associated factors of radioulnar fractures treated in TGSH, Bahir Dar, Ethiopia in from January 2020 GC – January 2022 GC

Procedure: In order to achieve the above objective, information which is necessary for the study will be taken from medical records of the patients.

Risk and/or Discomfort: Since the study was conducted by taking necessary information from medical chart, it was not inflict any harm on the patients.

The name or any other identifying information was not recorded on the data collection format and all information taken from the chart was be kept strictly confidential and in a safe. The data stored in to the computer also secured by password. The information retrieved only be used for the study purpose.

B. Annex 2: Data collection tool

Table 5: Data collection format used to collect data from patient chart at TGSH, Bahir Dar, 2023 GC

Serial number				
Socio-demographic	Age			
	Sex			
	Medical comorbidities 1) No 2) Yes			
	Mechanism of injury: 1. RTA 2. Bullet/blast 3. Fall down 4. Stick			
	Time from injury to presentation 1. <72 hrs 2. >= 72 hrs			
Fracture details	Is fracture open or closed 1) Closed 2) Open			
	If the fracture is open GA type 1) I 2) II 3) IIIA 4) IIIB 5) IIIC			
	Which bone/s is/are involved 1) Radius 2) Ulna 3) Both			
	If both involved 1) At the same level 2) At different level			
	Pattern of fracture 1) Simple/Wedge 2) Complex			
	Is there joint involvement 1) Yes 2) No			
	If yes to above question, which joint			

	1) Proximal 2) Distal 3) Both			
	Associated injuries 1) Yes 2) No			
	If yes to above question 1) Head injury 2) Other MS injuries			
Treatment details	Timing of treatment 1) Within 24 hrs 2) >=24hrs			
	Type of operative treatment 1) IMN 2) Plates and screws			
	Early mobilization 1) Yes 2) No			
Complications	Is there any complication 1) Yes 2) No			
	If yes to above question, what kind 1) Infection 2) Stiffness 3) Nonunion 4) Hardware prominence			