BENHA MEDICAL JOURNAL bmj

Print ISSN 1110-208X.

Online ISSN 2357-0016

Original article

Isolated Ulnar Fractures Postoperative Infection: Incidence and Possible Causes

Samir M Monib, El Sayed M. Elshenawy, Mohamed I. El-Ashhab, Eslam A. Tabl

Department of Orthopaedic Surgery, Faculty of Medicine Benha University, Egypt.

Corresponding to: El Sayed M. Elshenawy Department of, Orthopaedic Surgery, Faculty of Medicine, Benha University, Egypt.

Email:

sayedm7md@gmail.com

Received:

Accepted:

Abstract

Background: Isolated ulnar shaft fractures are frequently caused by direct trauma to the ulna while the arm is raised overhead in defence against a blow; hence, they are frequently referred to as "nightstick fractures." The aim of this work was to assess the possible causes and incidence of postoperative infection following isolated ulnar fractures treatment. **Methods:** This prospective study was conducted on 40 patients aged from 20 to 65 years old, both sexes, and approved from the Ethical Committee Orthopaedic Surgery Department in Banha University Hospital on isolated ulnar fractures patients treated with open reduction and internal fixation for 7 months. Patients were further subdivided into two groups according to incidence of infection to surgical site infection (SSI) group (n=12), and no SSI group (n=28). **Results:** There were statistically significant association between SSI and old age, DM, smoking, low surgeon volume, long operating time, anaemia, leucocytosis, low serum albumin, and hyperglycaemia. Smoking (OR, 4.55; P, 0.020), low surgeon volume (OR, 3.44; P, 0.021), operation time longer than 120 minutes (OR, 3.95; P, 0.015), albumin lower than 35 g/L (OR, 6.48; P, 0.001), and RBS more than 200 mg/dl (OR, 6.20; P, 0.001) were detected as major independent postoperative SSI risk factors. **Conclusions:** As demonstrated in our study, smoking, low surgeon volume, operation time longer than 120 minutes, albumin lower than 35 g/L, and RBS more than 200 mg/dl were detected as major independent postoperative SSI risk factors .

Keywords: Isolated Ulnar Fractures; Postoperative Infection; Incidence; Possible Causes

Introduction

Isolated ulnar shaft fractures are frequent injuries to the forearm. As they are frequently the consequence of direct trauma to the ulna while the arm is raised overhead in defence against a blow, they are referred to as "nightstick fractures."

Isolated ulnar shaft fractures, despite their apparent benignity, can give rise to complications such as radioulnar synostosis, loss of motion, and nonunion [1]. Olecranon fractures, Monteggia fracture dislocations, and coronoid process fractures are typically excluded from studies examining the management of this injury. The optimal treatment for this fracture, which is reportedly unpredictable even when displaced and confined to the diaphysis, is the subject of considerable debate [2].

Isolated fractures of the ulnar shaft have a debatable optimal management. Treatment of these fractures has been endorsed regarding both operative and non-operative approaches. Frailty or long arm plaster of Paris casts, functional braces, ace wraps (elastic bandages), and slings are the nonoperative treatment options. Plates and intramedullary nails are potential options for surgical intervention [3].

Complications associated with nonoperative management include malunion, pain, deformity, and a reduction in the range of motion of the elbow and wrist. Operative fixation carries the potential for infection, non-union, and hardware prominence, and hardware removal may necessitate a subsequent operation [4].

Adults sustain 1%–2% of all limb fractures due to diaphyseal fractures involving both bones in the forearm. A high degree of complications is associated with the surgical treatment of these fractures. Malunions accounted for 7% of cases, radioulnar synostoses for 4%, and postoperative neurological lesions for 9% [5].

Orthopaedical surgeons and patients frequently encounter the difficult and pervasive complication of postoperative infection. Particularly in the context of musculoskeletal trauma, where the prevention and treatment of these infections are complicated by the presence of multiple factors, infection is an inherent risk associated with any surgical procedure. The following are examples of contributing factors: gross tissue contamination, loss of soft-tissue coverage, surgical dissection and soft-tissue stripping, the presence of metal implants, associated injuries, prolonged hospital stays with nosocomial bacterial exposure, and host factors such as perioperative malnutrition [6].

We aimed to assess the possible causes and incidence of postoperative infection following isolated ulnar fractures treatment.

Patients and methods

This prospective study was conducted on 40 patients aged from 20 to 65 years old, both sexes, and approved from the Ethical Committee Orthopaedic Surgery Department in Benha University Hospital on patients with isolated ulnar fractures treated with open reduction by plating and internal fixation for 7 months during the period from January to July 2022.

Exclusion criteria were patients with comorbidity which makes them unfit for surgery, Monteggia fractures was excluded from the study, pathological ulnar fracture, and periprosthetic ulnar fracture.

Patients were further subdivided into two groups according to incidence of infection to surgical site infection (SSI) group (n=12), and no SSI group (n=28)

All patients were undergone history taking including name, sex, age, occupation, associated injuries, address, associated medical conditions, mechanism of trauma, and time elapsed before surgery, physical examination (looking for signs of infection), clinical examination including side affected, deformity, swelling, the neurovascular affected limb status, associated injuries, redness, and tenderness, radiological investigation [standard antero-posterior and lateral X-ray views, CT Scan in complex multiplane fractures cases, with frontal and sagittal plane reconstructions may be helpful in planning the surgical treatment, axial computerized tomography, and with contrast to detect sinuses, and MRI. D. Imaging studies: such as X-rays or MRI, can also be used to assess for signs of infection, such as bone changes or fluid collection around the surgical site.

Laboratory investigation as infection profile including erythrocyte sedimentation rate (ESR), complete blood count (CBC) C-reactive protein (CRP), culture and sensitivity test was done on a sample of fluid or tissue from the surgical site was collected and analysed for the presence of bacteria or other pathogens, infection profile then a culture and sensitivity tests and accordingly antibiotics were administrated, debridement, irrigation was done for patients exhibiting deep SSI.

Surgical technique:

Under general anaesthesia or a brachial plexus block, the technique was executed by 6 distinct trauma surgery department' surgeons. The patients were positioned in the supine position, supporting the injured limb on a hand table. A tourniquet was applied in 13 cases. Irrigation and debridement were performed on all the exposed fracture. To perform ulnar fixation, the arm was positioned either vertically in neutral rotation or in complete supination on a supporting role with slight elbow flexion, as determined by the surgeon. An incision was performed longitudinally along the ulnar border of the forearm, 5–7 cm proximal to the ulnar styloid. Using a separate Henry approach, volar plate fixation was utilized to treat 17 cases with fractures of both bones in the forearm (7 cases with distal radius fracture plate 2.5 mm–Medartis Aptus and 10 cases with variable angle LCP volar distal radius plate 2.4 mm–Synthes and). Following internal fixation, the DRUJ remained stable in all cases.

The superficial branch of the ulnar nerve, which may traverse the surgical field in the distal portion of the approach, was protected with special care. Preserving the periosteum, the pronator quadratus muscle was detached ulnarly and retracted radially. The fracture was secured provisionally using K-wires after being reduces. The plate was temporarily fastened with K-wires and positioned under fluoroscopic control on the palmar surface of the ulnar shaft. Following the insertion of the initial screw into the oblong aperture, the remaining cortical screws in the shaft were inserted following any necessary length adjustments. At least 3 monocortical locking screws were utilized to secure the ulnar head while maintaining the integrity of the distal radioulnar joint. The overall stability was enhanced through placement of screws in multiple directions from the palmar and ulnar regions. Following two layers of meticulous hemostasis wound closure, a forearm splint was administered until suture removal 10 to 14 days after surgery [7].

Superficial and deep surgical site infection:

Some key clinical indicators that helped us differentiate between superficial and deep surgical site infections. Wound appearance: Superficial SSIs typically presented with erythema, warmth, and slight oedema while deep SSI had deeper wound breakdown, undermining of wound edges and seropurulent discharge, but no exposure of hardware was noticed. Pain and tenderness: Superficial SSIs cause localized pain and tenderness at the incision site, while deep SSIs produce a more diffuse and deep-seated pain and tenderness. Systemic symptoms: Deep SSI was more likely associated with systemic symptoms such as fever, chills, and malaise, whereas superficial SSI does not produce these systemic effects.

Early and Late Surgical site infection:

Surgical site infection constituted a prevalent postoperative complication, accounting for approximately 5 % of cases. This complication may manifest in its early or late stages. It may manifest itself within 30 days of surgery in early cases, and between one- and two-years following prosthesis placement and surgery in late cases. Orthopaedic surgeries and traumatic patients exhibited a higher incidence of late-onset surgical site infections compared to other fields of study, with an estimated 20 % of all surgical site infections occurring in orthopaedic patients.

Follow up:

The follow up period of 18 months was done clinically: localized pain, tenderness, and discharge at the incision site, radiologically: standard anteroposterior and lateral views Xray, however it was of little value at the initial few weeks and fail to indicate changes over time, and laboratory: CRP of which, the change over time is more beneficial compared to the absolute value. ESR & CBC were also used.

Sample Size Calculation:

The sample size was measured utilizing Epi-Info (Epidemiological information package) software version 7.2.5.0. Based on a previous study carried out [8] to ascertain the incidence of postoperative infection after isolated cubital tunnel release and to identify pertinent patient-related risk factors. It reported that a total of 330 (2.17%) postoperative infections were detected in 15,188 studied cases. So, with expected frequency 2.17% and acceptable margin of error (MOE) of 5% and level of confidence of 97%, the total sample size was 40 patients.

Statistical analysis:

Utilizing SPSS v28, statistical analysis was conducted (IBM Inc., Armonk, NY, USA). As means and standard deviations, quantitative variables were performed (SD). The frequency and percentage (%) of qualitative variables were utilized in the Chi-square test for analysis. A multivariate logistic regression was also used to estimate the relationship between more independent variables. A two-tailed P value < 0.05 was deemed to indicate statistical significance.

Approval code: Ms8-12-2022

Case presentation

Case 1

Patient underwent ORIF with plate and screws. Patient has no past history of diabetes, but he is a heavy smoker. patient developed superficial SSI two weeks after the fixation. Laboratory finding revealed elevated levels of CRP over the next two weeks after SSI. patient successfully treated with parenteral antibiotics. **Figure 1**

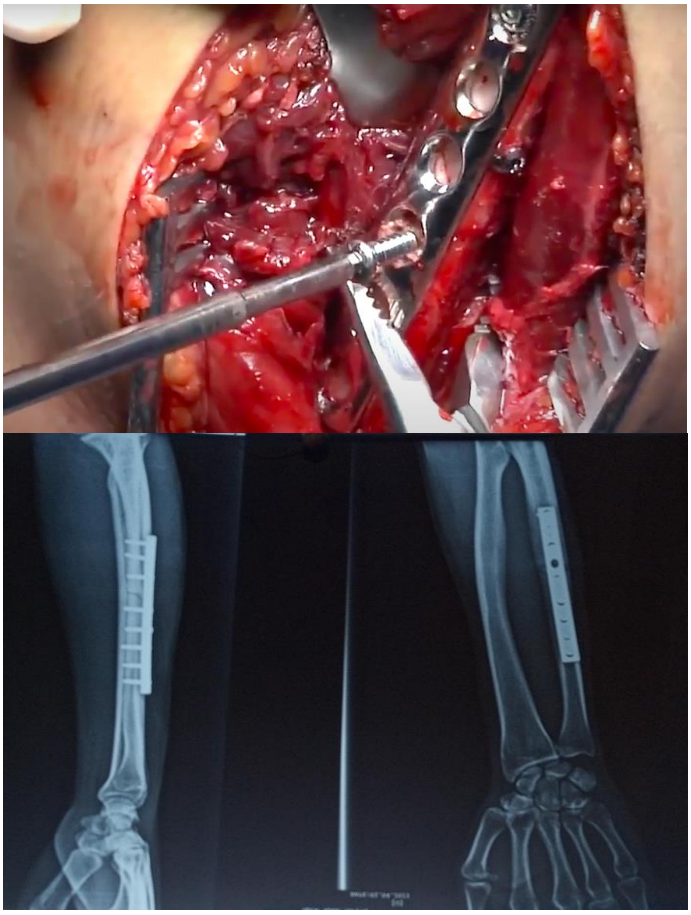

Fig. 1: A 43-year-old male patient sustained closed mid 1/3 right ulnar fracture.

Case 2

After 10 days of the operation the patient developed superficial SSI presented with erythema, hotness, redness, and slight oedema. Her ESR, CRP and WBC were above normal ranges. Patient successfully treated with another antibiotic regimen other than the postoperative prophylaxis. narrow spectrum antibiotics based on culture sensitivity test was used for two weeks with successful results. **Figure 2**

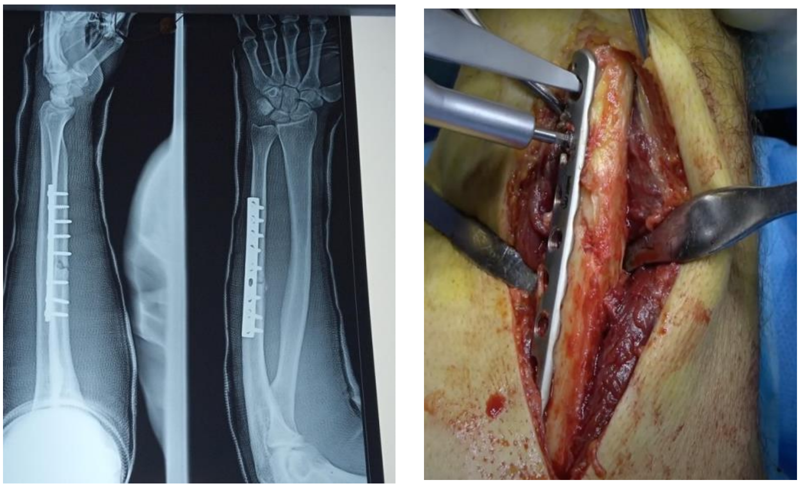

Fig. 2: A 50-year-old female patient diabetic underwent ORIF of mid 1/3 left ulna

Results

The average age of enrolled patients was 44.3 ± 14.5 years, body mass index (BMI)was 27.6 ± 4.9 kg/m^2, time to operative fixation of ulnar fractures was 6.5 ± 3.6 days, operating time was 110 ± 52 minutes, length of hospital stay was 45 ± 17.8 hours, level of haemoglobin was 11.6 ± 1.9 g/dl, WBC count was 9.2 ± 3.2 x10^9/L, serum albumin was 36.8 ± 5.1 g/L, and RBS was 178.5 ± 60 mg/dl. Males were 22 (55%) patients, while 18 (45%) were females, (32%) patients had a rural residence, while 27 (68%) had urban residence, 13 (3%) patients were classified as ASA grade I, 18 (45%) patients were grade II, and nine (23%) patients were grade III. In all, 12 (30%) patients were diabetic, 10 (25%) patients were smokers, 22 (55%) patients had right-sided ulnar fracture, while 18 (45%) had left-sided ulnar fracture patients reported accidental falls, 24 (60%) patients had transverse ulnar fractures, five (12.5%) patients had oblique fractures, two (5%) patients had spiral fractures, two (5%) patients had segmental fractures, two (5%) patients had wedge fractures, and five (12.5%) patients had comminated fractures, 19 (47.5%) patients sustained middle third ulnar fractures, seven (17.5%) patients had proximal ulnar fractures, 14 (35%) patients had distal ulnar fractures. time to fixation was more than 7 days in 22 (55%) patients, the surgeon volume was low in 16 (40%) surgeons, and high in 24 (60%) surgeons, the operating time was more than 120 minutes in 17 (42.5%) patients, the hospital stay was more than 48 hours in 21 (52.5%) patients, haemoglobin level was less than 10 g/dl in 10 (25%) patients, WBC count was more than 11 x109/L in 11 (27.5%) patients, serum albumin was less than 30 g/L in 15 (37.5%) patients, and RBS was more than 200 mg/dl in 12 (30%) patients. The male to female ratio and right to left ratio in our study group was 1.2:1. The rural to urban ratio in our study group was 1:2.3. **Table 1**

Table 2 showed that a statistically significant association was detected between SSI and old age, DM, smoking, low surgeon volume, long operating time, anaemia, leucocytosis, low serum albumin, and hyperglycaemia (P > 0.05). An insignificant association was detected between SSI and gender, obesity, residence, ASA grade, injury mechanism, time to fixation, and hospital stay length. Regarding, surgical site infection: the overall infection rate was 10% (4 patients). Superficial SSI was reported in three (7.5%) patients, whereas deep SSI was reported in one patient (2.5%). All patients received intravenous antibiotics treatment and wound disinfection with daily dressings. Surgical debridement and irrigation was applied in patients with deep SSI to promote wound healing. All patients were completely healed with no signs of infection and normalization of CRP after three weeks of antibiotics and daily dressing in the superficial SSI cases, compared to 8 weeks period needed to CRP to return to normal in deep SSI case.

Table 3 showed that smoking (OR, 4.55; P, 0.020), low surgeon volume (OR, 3.44; P, 0.021), operation time longer than 120 minutes (OR, 3.95; P, 0.015), albumin lower than 35 g/L (OR, 6.48; P, 0.001), and RBS more than 200 mg/dl (OR, 6.20; P, 0.001) were demonstrated as major independent risk factors of postoperative SSI.

Table 1: Patient, fracture, and surgical characteristics and laboratory data of the studied patients (n = 40)

		Patients (n = 40)
	Patient characteristics	
Age (years)	**Mean ± SD**	44.3 ± 14.5
	Less than 30 (n = 10)	10 (25%)
	30 – 50 (n = 13)	13 (32.5%)
	More than 50 (n = 17)	17 (42.5%)
BMI (kg/m^2)	**Mean ± SD**	27.6 ± 4.9
	Average (n = 10)	10 (25%)
	Overweight (n = 21)	21 (52.5%)
	Obese (n = 9)	9 (22.5%)
Gender	**Male**	22 (55%)
	Female	18 (45%)
Residence	**Rural**	13 (32.5)
	Urban	27 (67.5%)
ASA physical state	**Grade I**	13 (32.5%)
	Grade II	18 (45%)
	Grade III	9 (22.5%)
DM		12 (30%)
Smoking		10 (25%)
	Fracture characteristics	
DM	**Right**	22 (55%)
	Left	18 (45%)
Mechanism of injury	**Road traffic accident**	22 (55%)
	Assault	12 (30%)
	Accidental fall	6 (15%)
Pattern	**Transverse**	24 (60%)
	Oblique	5 (12.5%)
	Spiral	2 (5%)
	Segmental	2 (5%)
	Wedge	2 (5%)
	Comminuted	5 (12.5%)
Location	**Proximal third**	7 (17.5%)
	Middle third	19 (47.5%)
	Distal third	14 (35%)
	Surgical characteristics	
Time to fixation (days)	**Mean ± SD**	6.5 ± 3.6
	Less than 7	18 (45%)
	More than 7	22 (55%)
Surgeon volume	**Low**	16 (40%)
	High	24 (60%)
Operating time (min)	**Mean ± SD**	110 ± 52
	Less than 120	23 (57.5%)
	More than 120	17 (42.5%)
Hospital stays (hours)	**Mean ± SD**	45 ± 17.8
	Less than 48	19 (47.5)
	More than 48	21 (52.5)
Hb (g/dl)	**Mean ± SD**	11.6 ± 1.9
	Less than 10	10 (20%)
WBC Count (10^9)	**Mean ± SD**	9.2 ± 3.2
	Less than 10	12 (24%)
Serum albumin (g/L)	**Mean ± SD**	36.8 ± 5.1
	Less than 35	17 (34%)
RBS (mg/dl)	**Mean ± SD**	178.5 ± 60
	More than 200	14 (28%)

Data are presented as mean ± SD or frequency (%). BMI: body mass index, DM: diabetes mellitus, Hb: hemoglobin, WBC: White blood cells, RBS: random blood sugar

Table 2: Comparison of related variables of SSI

Variables	SSI (n=12)	No SSI (n=28)	*P* value
Age (> 50 years)	9 (75.0%)	8 (28.6%)	**0.024 ***
Gender (Male)	7 (58.3%)	15 (53.6%)	0.781
BMI (Obese)	4 (33.3)	5 (17.9%)	0.233
Rural Residence	8 (66.7%)	9 (32.1%)	0.941
ASA (Grade > I)	6 (50%)	21 (75%)	0.302
DM	7 (58.3%)	5 (17.9%)	**0.010**
Smoking	7 (58.3%)	3 (10.7%)	0.001
Mechanism (High Energy)	7 (58.3%)	21 (75%)	0.506
Interval (> 7 days)	5 (41.7%)	17 (60.7%)	0.267
Surgeon Volume (Low)	9 (75%)	10 (35.7%)	0.023
Operating Time (> 2 hour)	10 (83.3%)	7 (25.0%)	0.001
Hospital Stay (> 2 days)	6 (50.0%)	15 (53.6%)	0.836
Hb (< 10 mg/dl)	9 (75.0%)	1 (3.6%)	**0.001 ***
WBC (> 11 x10^9/L)	9 (75.0%)	3 (8.3%)	**0.001 ***
Albumin (< 35 g/L)	8 (66.7%)	7 (25.0%)	**0.013 ***
RBS (> 200 mg/dl)	7 (58.3%)	3 (10.7%)	**0.001 ***

Data are presented as frequency (%). BMI: body mass index, ASA: American society of anesthesiologists, DM: diabetes mellitus, Hb: hemoglobin, WBC: white blood cells, RBS: random blood sugar

Table 3: Multivariate logistic regression analysis

Variables	OR	95% CI		*P* value
		Lower	**Upper**	
Age (> 50 year)	1.23	0.51	2.11	0.139
DM	2.45	0.75	3.24	0.051
Smoking	4.55	2.36	7.51	**0.020**
Surgeon Volume (Low)	3.44	1.22	5.01	**0.021**
Operating Time (> 2 hour)	3.95	2.11	6.74	**0.015**
Hb (< 10 mg/dl)	1.43	0.25	2.23	0.144
WBC (> 11 x10^9/L)	1.24	0.43	2.14	0.128
Albumin (< 35 g/L)	6.48	4.33	8.78	**0.001**
RBS (> 200 mg/dl)	6.20	4.87	8.55	**0.001**

OR: odd ratio, CI: coefficient interval, BMI: body mass index, DM: diabetes mellitus, Hb: hemoglobin, WBC: white blood cells, RBS: random blood sugar

Discussion

Isolated ulnar shaft fractures are a prevalent type of injury. When the forearm is raised to shield the head from the impact of a blunt object, the fracture typically takes place, with the ulna bearing the primary load of the trauma (nightstick fracture). Additionally, it may transpire due to a fall from a roof or a road traffic accident risk. [9]

As demonstrated in our study, 13 (3%) patients were classified as ASA grade I, 18 (45%) patients were grade II, and nine (23%) patients were grade III. In all, 12 (30%) patients were diabetic, and 10 (25%) patients were smokers.

In supporting our results reported that in Patients with Isolated Ulnar Fractures (N = 164) group regarding ASA class, 86 (52%) were classified as grade I, 53 (32%) were classified as grade II and 24 (15%) were classified as grade III. Present smoking were30 (18%) and Diabetes in 13 (8%).[10]

As demonstrated in our results regarding side of injury, 22 (55%) patients had right-sided ulnar fracture, while 18 (45%) had left-sided ulnar fracture. The right to left ratio in our study group was 1.2:1.

A total of 34 patients were presented with a right-sided fracture, while 23 patients were presented with a left-sided fracture.

As shown in our results regarding mechanism of Injury, 22 (55%) patients sustained ulnar fracture in road traffic accident, 12 (30%) patients reported assault, and six (15%) patients reported accidental falls.

In consistent with our results that from isolated ulna fractures cases, 38 % of the injuries caused by a direct blow, 14 % for pedestrian road traffic accidents and 31 % from a simple fall. [12]

In consistent with our results it was revealed that in seventy patients the injury mechanism involved low-energy falls (8/70, 11.4%), sports (2/70, 2.9%), and high-energy injuries (60/70, 85.7%) [13].

In our findings regarding fracture pattern, 24 (60%) patients had transverse ulnar fractures, five (12.5%) patients had oblique fractures, two (5%) patients had spiral fractures, two (5%) patients had segmental fractures, two (5%) patients had wedge fractures, and five (12.5%) patients had comminuted fractures.

In supporting our results it was reported that in seventy patients with isolated ulnar shaft fractures regarding fracture pattern, the fracture patterns were 17 transverse, two segmental, 31 oblique, and 20 wedge [13].

In our study regarding fracture location, 19 (47.5%) patients sustained middle third ulnar fractures, seven (17.5%) patients had proximal ulnar fractures, and 14 (35%) patients had distal ulnar fractures.

In consistent with our results it was found that fractures were frequently observed in the mid-shaft (31/70 or 44.3%), distal third (27/70, or 38.6%), and proximal third (12/70 or 17.1%) of the ulnar shaft. [13]

In the present study, we reported that the mean time to operative fixation of ulnar fractures was 6.5 ± 3.6 days, ranging from 1 to 14 days. Time to fixation was more than 7 days in 22 (55%) patients. The surgeon volume was low in 16 (40%) surgeons, and high in 24 (60%) surgeons. The mean operating time was 110 ± 52 minutes, ranging from 39 to 192 minutes. The operating time was more than 120 minutes in 17 (42.5%) patients. The mean length of hospital stay was 45 ± 17.8 hours, ranging from 12 to 70 hours. The hospital stay was more than 48 hours in 21 (52.5%) patients.

Ongoing with our results it was reported that the operation time (minute) in plate group was 46.3±16.0 while in IMN group the operation time (minute) was 30.5±6.0. Regarding Union time (week) in plate group was 13.7±1.4 while in IMN group Union time (week) was 12.8±1.2 [11].

Our study revealed according to Surgical Site Infection that the overall infection rate was 30%. Superficial SSI was reported in seven (17.5%) patients, whereas deep SSI was reported in five (12.5%) patients. Antibiotics were administered intravenously, and wounds were disinfected for every patient. Patients with deep SSI were treated with surgical debridement and continuous negative pressure suction to accelerate the healing process. In two patients, an exchange of fixation from internal to external was performed.

Consistent with our findings identified surgical site infections in 28 patients, of which 6 % [9 % CI, 4 % to 6 %] had them [10]. Of these patients, 18 had superficial surgical site infections and 10 had deep surgical site infections. One patient developed a deep infection after a secondary surgical procedure after nonunion, while nine patients developed a deep infection subsequent to the primary operation.

In contrast with our results who evaluated the outcomes of intramedullary (IM) multifunctional ulna nailing in patients with diaphyseal ulnar fractures. No patient was diagnosed with deep infection, nonunion, or radioulnar synostosis [15].

As shown in the current study, a statistically significant association was detected between SSI and old age, DM, smoking, low surgeon volume, long operating time, anaemia, leucocytosis, low serum albumin, and hyperglycaemia. An insignificant association was detected between SSI and gender, obesity, residence, ASA grade, injury mechanism, time to fixation, and hospital stay length (P > 0.05).

Ongoing with our results it was documented that the overall incidence of wound infections was 0.79 % [16]. Analysis revealed that the incidence of infection was significantly higher among patients with open injuries in comparison to those with closed injuries (1.7 % vs. 0.7 %, P < 0.001). The 30-day infection risk was independently influenced by the diagnosis of, obesity, smoking, and an American Society of Anaesthesiologists class greater than two (all P < 0.05). There was no significant difference in the rate of infection between groups, regardless of the efficiency of the surgery (1.8 % vs. 1.1 %, P = 0.431).

In agreement with our results, in a Multicenter Evaluation of 640 patients with Fracture Nonunion a total of 640 individuals were included. 57% were male with a mean age of 49 years. Serologically, increased erythrocyte sedimentation rate, mean platelet volume (MPV), and platelets and decreased absolute lymphocyte count, hemoglobin, mean corpuscular hemoglobin, mean corpuscular haemoglobin concentration, and albumin were associated with septic non-union while lower calcium was associated with nonvascular nonunion ($P < 0.05$) **[17]**.

As demonstrated in our study, smoking (OR, 4.55; P, 0.020),), low surgeon volume (OR, 3.44; P, 0.021), operation time higher than 120 minutes (OR, 3.95; P, 0.015), albumin lower than 35 g/L (OR, 6.48; P, 0.001), and RBS more than 200 mg/dl (OR, 6.20; P, 0.001) were detected as major independent postoperative SSI risk factors.

In agreement with our results who reported that risk factors for adverse events identified in the multivariable analysis included type-II, higher BMI, and operations performed by junior residents[10].

Limitations: Brief duration of follow-up and a limited sample size

We recommended that future research should employ well-designed randomized controlled trials or large comparative observational studies, incorporate a representative sample of patients with comparable age, gender, and disease severity, ensure that the sample size is sufficient to yield meaningful conclusions and control confounding factors, and have a longer follow-up period to accurately assess long-term outcomes. Furthermore, multicenter research should be considered in future investigations.

Conclusions:

Smoking, low surgeon volume, operation time longer than 120 minutes, albumin lower than 35 g/L, and RBS more than 200 mg/dl were detected as major independent postoperative SSI risk factors.

References:

1. Erickson BJ, Seigerman DA, Romeo AA. Acute fractures in sport: Elbow. Fractures in Sport. 2021;7:141-53.
2. van den Brand C, Kelly A-M. Orthopaedic emergencies. Textbook of Adult Emergency Medicine E-Book. 2014;5:163-9.
3. Hussain A, Nema SK, Sharma D, Akkilagunta S, Balaji G. Does operative fixation of isolated fractures of ulna shaft results in different outcomes than non-operative management by long arm cast? J Clin Orthop Trauma. 2018;9:86-91.
4. Bartolotta RJ, Daniels SP, Verret CI, Fufa DT, editors. Current fixation options for elbow, forearm, wrist, and hand fractures. Semin Musculoskeletal Radiol; 2019: Thieme Medical Publishers.
5. Marcheix PS, Delclaux S, Ehlinger M, Scheibling B, Dalmay F, Hardy J, et al. Pre- and postoperative complications of adult forearm fractures treated with plate fixation. Orthop Traumatol Surg Res. 2016;102:781-4.
6. Berkes M, Obremskey WT, Scannell B, Ellington JK, Hymes RA, Bosse M. Maintenance of hardware after early postoperative infection following fracture internal fixation. J Bone Joint Surg Am. 2010;92:823-8.
7. Stock K, Benedikt S, Kastenberger T, Kaiser P, Arora R, Zelger P, et al. Outcomes of distal ulna locking plate in management of unstable distal ulna fractures: a prospective case series. Arch Orthop Trauma Surg 2023;143:3137-44.
8. Camp CL, Tebo CC, Degen RM, Dines JS, Altchek DW, Werner BC. Patient-related risk factors for infection following ulnar nerve release at the cubital tunnel: An analysis of 15,188 cases. Orthop J Sports Med. 2018;6:232-43.
9. Davis DD, Kane SM. Nightstick fracture. StatPearls. 4. Treasure Island (FL): StatPearls Publishing

Copyright © 2023, StatPearls Publishing LLC.; 2023. p. 22-9.

10. Vasara H, Aspinen S, Kosola J, Sartanen J, Naalisvaara T, Myllykoski J, et al. Adverse events after surgical treatment of adult diaphyseal forearm fractures: A retrospective analysis of 470 patients. JB JS Open Access. 2023;8:43-51.
11. Kibar B, Kurtulmuş T. Treatment of adult isolated ulnar diaphyseal fractures: A comparison of new-generation locked intramedullary nail and plate fixation. Eklem Hastalik Cerrahisi. 2019;30:246-51.
12. McQueen MM, Jupiter JB. Radius and ulna. J Clin Orthop Trauma. 1999;5:33-9.
13. Coulibaly MO, Jones CB, Sietsema DL, Schildhauer TA. Results of 70 consecutive ulnar nightstick fractures. Injury. 2015;46:1359-66.
14. Szabo RM, Skinner M. Isolated ulnar shaft fractures. Retrospective study of 46 cases. Acta Orthop Scand. 1990;61:350-2.
15. Saka G, Sağlam N, Kurtulmuş T, Özer C, Uğurlar M, Akpınar F. Interlocking intramedullary ulna nails in isolated ulna diaphyseal fractures: a retrospective study. Acta Orthop Traumatol Turc. 2013;47:236-43.
16. Ryan DJ, Minhas SV, Konda S, Catalano LW. Surgical site infection after open upper extremity fracture and the effect of urgent operative intervention. J Orthop Trauma. 2020;34:258-62.
17. Shapiro JA, Stillwagon MR, Tornetta P, 3rd, Seaver TM, Gage M, O'Donnell J, et al. Serology and Comorbidities in Patients With Fracture Nonunion: A Multicenter Evaluation of 640 Patients. J Am Acad Orthop Surg. 2022;30:179-87.

To cite this article: Samir M Monib, El Sayed M. Elshenawy, Mohamed I. El-Ashhab, Eslam A. Tabl. Isolated Ulnar Fractures Postoperative Infection: Incidence and Possible Causes. BMFJ XXX, DOI: 10.21608/bmfj.2024.276735.2039