

Review Article

# Intraoperative Technical Errors in Hand Surgery: Prevalence and Potential Root Causes

Abdulrahim Aljayar\*

Associated Professor, University of Benghazi Consultant Orthopedics and Hand Surgery Aljayar Clinic, Benghazi.

Corresponding Author: Abdulrahim Aljayar, Associated Professor, University of Benghazi

Received: 📅 2023 Aug 22

Accepted: 📅 2023 Sep 01

Published: 📅 2023 Oct 20

## Abstract

Despite all the efforts made by healthcare systems worldwide to prevent medical errors, their incidences are increasing, prompting the World Health Organization to describe it as an epidemic problem.

Realize it is a thorny, sensitive topic, and hard to reach a consensus even among professional experts, however despite the scarcity of resources, especially concerning hand surgery in particular, and the reluctance of some individuals and official institutions to provide information about it, we decided to address the issue because of its importance, by analyzing 245 cases that were detected among patients referred to the hand surgery unit or who attended the outpatient hand clinics in Benghazi between January 2020 and December 2021, in a trial to estimate its size, identify the most prevalent, and trace their possible root causes.

**Keywords:** iatrogenic complications, Technical errors, malpractice, Patient safety.

## Introduction

The increasing number of medical malpractice claims in recent years can be either attributed to the increased awareness of citizens' rights to better health care or the unfortunately increased incidence of such malpractice.

Although we prefer the first, we cannot rule out the possibility of the second that we made a hypothesis for our research. Despite the scarcity of sources about technical errors related to hand surgery specifically, we tried to determine the size and possible root causes of this growing health problem, [1] by analyzing 245 cases detected among patients referred to the hand surgery unit at Al-Jala Trauma Hospital, as well as the attendees of our outpatient clinics in Benghazi, between January 2020 and December 2021.

## Methods

Data for this analytic study were gathered from the admission records and operation department records at Al-Jala Hospital, Ebn-Sena and the Libyan International Hospital, as well as the hand out-patient archives at Aljayar Clinic and Mays Medical Center, as well as the referrals of the Medical Insurance Counsel in Benghazi between January 2020 and December 2021.

According to the discharge papers, the personal information, dates of admission and discharge, of those who attended our hand surgery clinics for consultation or treatment of adverse

events after previous surgeries, was collected.

The cause of the original problem, initially given diagnosis upon admission, as well as the final diagnosis, as well as the time, type, and duration of previous surgeries, as well as the type of anesthesia and whether or not a tourniquet and TV monitor, and loupes have been used.

The surgeon's qualification (specialist, senior registrar, registrar, House officer, or trainee.) Upon presentation, the presenting complaint, clinical examination results, and relevant investigation results were all collected.

The intended correction is explained to the patient/family, and a consent document is signed.

Finally, at their last follow-up visits, a questionnaire was distributed to determine the patient's or family's satisfaction with the result of the correction's outcome (Very satisfied, Satisfied, Dissatisfied).

To facilitate handling the problem, the day, divided into four-hour intervals, and the surgical errors were classified as preoperative, intraoperative, and postoperative errors, which is adopted as the bases of our analysis.

**Exclusion**

Excluded are the pre and postoperative errors [40% & 21% respectively], as well as errors that the patient was unaware

of that were detected accidentally during the clinical examination or X-rays. However, errors that the patient or family aware of, even if they were accepted, are included.



**Figure 1:** Malpractice cases, including (a) tourniquet injury, (b and c) extravasation, and intraarterial injection.



2/a) Do not rely on a single view.



2/b) Do not accept underexposed images.

**Figure 2:** Diagnostic errors, a type of preoperative surg when the surgeon accepts a single (a) or inadequate X-ray exposure (b)



**Figure 3:** Poor splinting is another example of a preoperative error.

## Results And Discussion

The rising number of medical malpractice claims can be attributed to either the commandable, awareness of citizens' rights to the best possible health care, or to the unfortunate, real increasing incidence of these errors.

However, with the spread of knowledge channels and media interest, the possibility of being both cannot be ruled out. [2,4]

Although we prefer the first, we cannot ignore the possibility of the second, which is the hypothesis we used in this research.

Recognize that it is a complex issue, hard to reach a consensus on even among the field experts, not to mention the constant debate about it in court corridors, with lowers and those concerned with patient safety.

Where some see that, tightened penalties for perpetrators and victims compensation is an effective way to reduce the phenomenon. [5,6]

Healthcare providers think that harsh penalties will have little effect, impact, especially given that the majority of errors are caused by system or process failures that lead to practitioners making errors that are beyond the clinician's control. [7]

On the contrary, they will force them to practice defense medicine to protect themselves at the expense of patient care, and evade honest documentation and voluntary declaration of their mistakes in order to learn from them to avoid repetition. [8]

Therefore, addressing the issue is necessary to highlight its impact on both the victim and the error perpetrator, [8] who is sometimes referred to as the second victim, and recognize the serious consequences of this increasing public health problem, [10,11,12] which has increased from (94,000) errors in 1990 to (142,000) errors in 2013, with a death rate of 230,000 to 400,000 each year and an economic cost estimated in billions of dollars annually, What prompted the World Health Organization (WHO) to describe it an "endemic concern". [13]

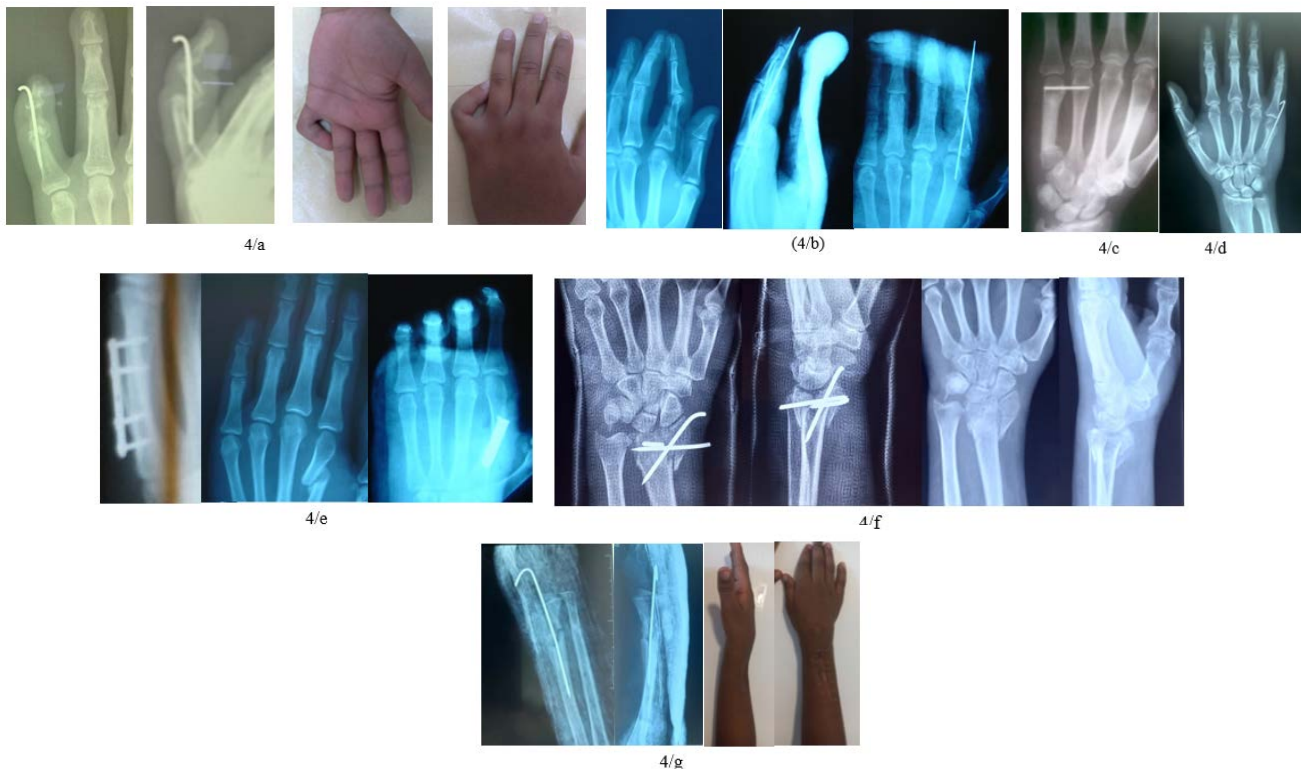
(245) cases of surgical errors in relation to hand surgery have been collected over the years (2020-2021).

After the excluding pre and postoperative errors, errors that the patient was unaware of, and 14 missed cases, we were left with 96 cases of intraoperative technical errors to investigate (39.1%), compared to (56.7%) in the Kingdom of Saudi Arabia, [14] (40%) in Egypt, [15] (35%) in the United States, [16] and (14%) in France [12].

As an art and science hand surgery, requires in addition to personal abilities, needs solid training to refine skills, and the best use of delicate equipment, which may explain these high rates, especially when practiced by nonqualified surgeons.

In decreasing order of frequency, the patterns of surgical error were as follows:

1) Inadequate procedures, were found in 63 cases at a rate of (65.6%), with the majority of them being poor reduction and/or loose fixation.



**Figure 4:** Poor reduction and loose fixation are two examples of insufficient procedures.



2) Intraoperative inflicted injuries, by the surgical team on the patient, to themselves or their colleagues were reported and detected in 20 cases, (20.8%).

Three self inflicted injuries to surgeons, needle pricks.

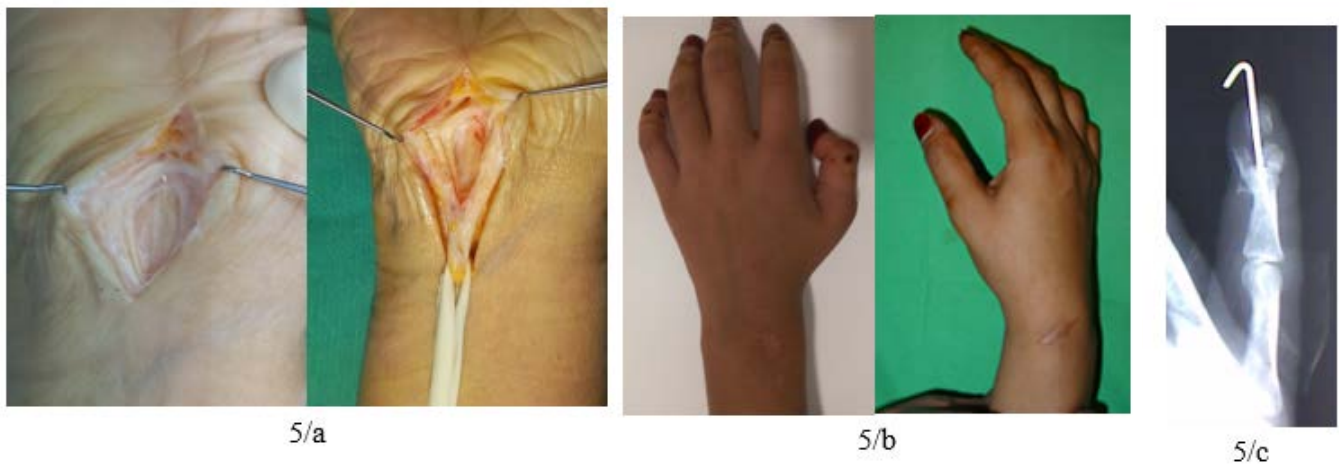
Two patients suffered ulnar nerve injuries, one while being dissected for nerve transposition in cubital tunnel syndrome, and the other after the ulnar vessels were ligated to control bleeding.

Five partial median nerve injuries, occurred during carpal tunnel release.

Three injuries involved the radial nerve's sensory branch, [2] after attempts to release the first dorsal compartment for de-Quervian disease, and [1] after dorsal wrist ganglion excision.

Four tendon injuries, [2] during dorsal wrist ganglion excision, [1] in an attempt of first annular pulley release for trigger finger, and [1] during corrective osteotomy of malunited fracture distal radius.

Two joints destroyed by Kirchner wires fixation, in addition to One diathermy burn, mistaken connection of monopolar diathermy



**Figure 5:** Inflicted injuries (a) median nerve and (b) the extensor pollicis longus tendon,, and (c) destruction of the distal phalanx base.

3) Wrong decision, nine cases (9.3%), two cases of incorrect exposure, three cases of improper flap design, one closure eponychial fold, and three mismatched tendon connections.



**Figure 6:** wrong decision, (a) closure of eponychial fold, (b and c) wrong approaches, (d and f) wrong flap designs, (g) wrong connection of flexor digitorum profundus and extensor digitorum communis on top of the amputation stump, (h) misconnection of extensor pollicis longus to extensor carpi radialis longus tendon, and (k) misconnected extensor digitorum communis of the little finger to extensor carpi ulnaris tendon.

4) Excessive procedures, (4.1%) represented by excessive fixation of four fractures.



**Figure 7: Excessive procedures**

In general, finishing the surgical procedures in a way less or more than should be, except for some minor differences, inadequate treatment leads to almost the same problems as the excessive treatment does.

Both may lead to disastrous complications such as; the complexity of procedure, predispose to injury, infection, delay or non-healing, scarring, deformity, and functional impairment.

**Table 1**

Inadequate Treatment	Excessive Treatment
Wound gaping	Skin necrosis
Haematoma collection	Edema
Bleeding	Ischemia
Redisplacement	Distruction
Scaring	Scaring
Contractures	Contractures
Deformity	Deformity
Delayed or non healing (loosening)	Delayed or non healing (distruction and mechanical block)
Foreign body reaction	Foreign body reaction
Infection	Infection

(68.0%) of the cases (64) were operated in an emergency, (70.2%) under general, and (29.7%) under local anesthesia.

The standred arm tourniquet was used in 62.7% of the cases, while TV monitoring was used in only (21) 22.3% of them, and loupes magnification was not used in any of them. Because extensive hand injuries and diseases are typically referred to hand surgeons or specialists, these errors typically occur following simple rather than complex procedures such as closed fractures, de-Quervian disease, CTS, or ganglion excision. [17]

Although the majority of the cases were handled as emergencies by junior doctors with less than three years of experience, a significant proportion (34%) were handled by senior surgeons.

This finding is reinforced in another study of 430 cases of medical malpractice between 1989 and 2019, found that cases performed by surgeons without a hand surgery subspecialty degree were more likely.[18]

That is why there has rarely been litigation related to com-

plex surgical procedures. Instead, they usually occur because of errors in routine procedures (carpal tunnel release, fracture fixation, etc.). This is likely because of the extensive skills acquired by the subspecialty surgeons through effective training and certainly, their personal abilities to deal with this type of surgery.

Or because routine cases are usually done by junior doctors who don't have much experience or specialists who don't have much skills to do complicated cases.

Our analyses also revealed a higher percentage of technical errors in government hospitals (78.7%) than in private hospitals, which is consistent with the findings of other studies results. [14, 19, 20]

While The American Academy of Orthopaedic Surgeons (AAOS) reported that lack of suitable and effective equipment is responsible for 29% of intraoperative errors in hand surgery, [15] it accounted for 32.4% of these errors in our case, forcing the surgeons to make modifications or to use less effective alternatives, which increase the possibility of making mistakes.[2,3]

But in most cases, whether the procedure was insufficient or over, or injuries inflicted, poor performance is at best a common factor, among the possible root cause list of surgical errors as follows:

- Lack of surgeon's training.
- Lack of standardized rules and control.
- Lack of equipment.
- Rush to complete cases.

79 errors required one or more corrective interventions (82.2%).

Finally, after surgical intervention to correct these errors, 12 (15.1%) patients were dissatisfied, 39 (49.3%) were satisfied, and 28 (35.4%) were very satisfied and returned to normal life.

Which means that whatever reform efforts were successful, will not be sufficient to satisfy at least 15.1% of these injuries.

## Conclusion

This study concluded with the importance of focusing on the quality of health care in all aspects, personnel, workplaces, and equipment, especially in the public sector, that appropriate training in hand surgery reduces the risk of intraoperative technical errors, and that work to identify the root causes of will allow planning control solutions.

## References

1. Kellogg, K. M., Hettlinger, Z., Shah, M., Wears, R. L., Sellers, C. R., Squires, M., & Fairbanks, R. J. (2017). Our current approach to root cause analysis: is it contributing to our failure to improve patient safety?. *BMJ quality & safety*, 26(5), 381-387.
2. Pakis, I., Yayci, N., Karapirli, M., & Polat, O. (2008). The role of legal autopsy in the investigation of death cases due to medical malpractice. *Turkiye Klinikleri Tip Bilimleri Dergisi*, 28(1).
3. Lt, K. (2000). *To err is human: building a safer health system*. Institute of Medicine, Committee on Quality of Health Care in America.
4. Glickel, S. Z. (2009). The ethics of expediency. *The Journal of hand surgery*, 34(5), 799-807.
5. Madea, B., & Preuß, J. (2009). Medical malpractice as reflected by the forensic evaluation of 4450 autopsies. *Forensic science international*, 190(1-3), 58-66.
6. Herring, J. (2014). *Criminal law: Text, cases, and materials*. Oxford University Press, USA.
7. Delacroix, R. (2017). Exploring the experience of nurse practitioners who have committed medical errors: A phenomenological approach. *Journal of the American Association of Nurse Practitioners*, 29(7), 403-409.
8. Oyeboode, F. (2013). Clinical errors and medical negligence. *Medical Principles and Practice*, 22(4), 323-333.
9. Johnson, S. P., Adkinson, J. M., & Chung, K. C. (2014). Addressing medical errors in hand surgery. *The Journal of hand surgery*, 39(9), 1877-1882.
10. Herndon, J. H. (2013). The patient first. Above all do no harm (primum non nocere). *JBJS*, 95(4), 289-290.
11. Cobb, T. K. (2012). Wrong site surgery—where are we and what is the next step?. *Hand*, 7(2), 229-232.
12. Agout, C., Rosset, P., Druon, J., Brilhault, J., & Favard, L. (2018). Epidemiology of malpractice claims in the orthopedic and trauma surgery department of a French teaching hospital: a 10-year retrospective study. *Orthopaedics & Traumatology: Surgery & Research*, 104(1), 11-15.
13. Ghaffar, U. B., Ahmed, S. M., & Faraz, A. (2015). A review of the frequency of medical error in Saudi Arabia: an emerging concern. *Journal of Evidence Based Medicine and Healthcare*, 2(52), 8692-5.
14. Mwaheb, M. A. (2016). Screening of Alleged Medical Malpractice in Egypt (Fayoum Governorate). *J Forensic Res* 7: 341. doi: 10.4172/2157-7145.1000341 Page 2 of 4 *J Forensic Res*, an open access journal ISSN: 2157-7145 Volume 7 • Issue 5 • 1000341. *Neurologist*, 2(3.60), 3.
15. Mells, A. J., Padela, M. T., Sleiman, B., Chamernik, B., Zarling, B. J., & Sayeed, Z. (2018). Walk a Mile in the Leadership's Shoes: Why Focus on Quality Improvement?. *Orthopedic Clinics*, 49(4), 411-417.
16. Regenbogen, S. E., Greenberg, C. C., Studdert, D. M., Lipsitz, S. R., Zinner, M. J., & Gawande, A. A. (2007). Patterns of technical error among surgical malpractice claims: an analysis of strategies to prevent injury to surgical patients. *Annals of surgery*, 246(5), 705-711.
17. Sasor, S. E., & Chung, K. C. (2020). Litigation in hand surgery: a 30-year review. *Plastic and Reconstructive Surgery*, 146(4), 430e-438e.
18. Di Nunno, N., Dell'Erba, A., Viola, L., Vimercati, L., Cina, S., & Vimercati, F. (2004). Medical malpractice: a study of case histories by the Forensic Medicine Section of Bari. *The American journal of forensic medicine and pathology*, 25(2), 141-144.