

The Effect of Anesthesia on Plastic Surgery on the Hand

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Abstract: Background: Among specialties, plastic surgery was the most extensive. It covers an extensive variety of anomalies in different body domains, age groups, and genders. Since 2015, our hospitals have begun reporting data on the medical characteristics of patients hospitalized within the burn as well as plastic surgery units. Objective: This study was aimed to analysis and evaluate the clinical findings of patients who underwent plastic surgery on the hand. Patients and methods: A total of 72 patients with hand burns who underwent laser surgery were recruited. The patients' ages ranged between 20 and 50 years. The data were collected from different hospitals in Iraq over a period extending from 5 July 2022 to 26 November 2023. A questionnaire was administered post-surgery to assess the quality of life and health status of patients, as well as to evaluate the severity of the burn, identify complications resulting from anaesthesia and surgery, quantify the extent of pain, and determine the range of motion and function of the burned hand after surgery using the DASH scale. Results: In terms of laser surgery under anaesthesia, the clinical findings of patients with burned hands revealed that the severity of the burn was classified as first-degree in 16 cases, second-degree in 24 cases, and third-degree in 30 cases. The locations of the burns were fingers in 30 cases, palm in 20 cases, and back in 22 cases. Flames were the most common cause of the burns, present in 29 cases. The most common cause prevalent in the patients was found to be 29 cases. Imaging tests revealed that patients who underwent X-ray scans numbered 38, while those who underwent CT scans numbered 34. The operative time was found to be 2.60 ± 0.33 minutes. Bleeding was found to be present in 12 cases. Anesthesia was classified into local (LA), regional (RA), and general (GA). The number of cases classified as general anaesthesia (GA) was 40, regional anaesthesia (RA) was 18, and local anaesthesia (LA) was 14. The follow-up period was 12 months, with an average length of stay in the hospital of 8.31 ± 2.96 days. Five cases resulted in ICU admission, and the mortality rate was two cases. Conclusion: In order to repair damaged parts of the skin, tissues, as well as underlying structures—which can result in impaired hand function, limited mobility, and hopelessness—plastic surgery is essential in the treatment of hand burns.

Keywords: Laser Surgery; Hand Burned; Local Anesthesia; Regional Anesthesia; QoL scale; Complications; and General Anesthesia.

INTRODUCTION

Burns represent the fourth most frequent type of trauma worldwide, following traffic accidents, falls, and interpersonal violence [Thorne, C. H. *et al.*, 2014]. They are produced by the action of various physical agents, including flames, hot liquids or objects, radiation, electric current, and cold. They can also be caused by chemical agents, such as caustic substances and biological agents. Burns have been the cause of more than 8,991,000 injuries, and approximately A study published by James *et al.* estimated that 120,632 deaths occur annually globally due to burns. The majority of cases, approximately 80%, are caused by dry thermal sources such as fire or flames and wet ones such as scalds, affecting both adults and children [Khashaba, H. A. *et al.*, 2012 - Jeschke, M. G. *et al.*, 2015].

Hypertrophic scars (HTS) are the most well-known complications and affect between 94% and 94% of burn survivors. They are characterised by altered vascularisation, dyschromia, structural changes, tightness, abnormalities in healthy

perilesional skin, pain, itching, debilitating contractures, and disfigurement, with consequent stigmatisation, functional, psychosocial and quality of life (QoL) deterioration, associated with significant costs for health systems. [Schiefer, J. L. *et al.*, 2016 – Hamza, A. A, 1993]

The holistic approach to burn scars (CQ) encompasses a range of interventions designed to enhance the appearance, alleviate associated symptoms, and address functional alterations. However, the effectiveness of these interventions is variable and often disappointing [Louri, N. A. *et al.*, 2014 – Mock, C. *et al.*, 2009]. Surgery remains an important component of the management of contractures, as it can effectively release tension and increase the range of mobility [www.tradearabia.com]. However, it is associated with high recurrence rates and the benefit is often limited to the surgical site. The advent of laser therapies, which are derived from the English acronym of Light Amplification by Stimulated Emission of Radiation, has led to the development

of fractional ablative lasers (LAF), which could potentially replace surgery in certain cases. [World Health Organization; Balagué, N. *et al.*, 2013]

Furthermore, these lasers can be employed before surgery to soften scars, thereby enhancing surgical and cosmetic outcomes. LAF CO₂, when used in isolation, has been demonstrated to produce clinical improvement in scars through the more specific destruction of dermal components and the subsequent promotion of tissue remodelling. This has been shown to result in improvements in itching, pain, and flexibility. [American society of plastic surgeons]

The therapeutic approach proposed in the literature should be guided by the characteristics of the scar (anatomical location, type of lesion, colour, thickness, tension, time of evolution, and activity) and involves selecting the most appropriate laser device and determining the benefit of combined therapy (surgical and non-surgical), in order to achieve the optimal result. [Kitzinger, H. B. *et al.*, 2012; O'Reilly-Shah, V. N. *et al.*, 2017]

PATIENTS AND METHODS

We conducted a cross-sectional study of patients with hand burns, which included 72 patients whose ages ranged between 20-50 years. Laser surgery data were collected under general anesthesia, local anesthesia, and regional anesthesia from different hospitals in Iraq, which ranged from July 5, 2022, to November 26, 2023. Demographic and clinical data included age, gender, and body mass index (underweight, normal weight, overweight, and obesity). And concomitant diseases, smoking factor, ASA classification %, level of work, and monthly income. Patients who had undergone serious surgeries in other places or had serious diseases were excluded. Patients who were less than 20 years old or older than 40 years were included, while patients who had extreme degrees of burn exposure and were associated with comorbidities were included. Patient results were

designed and analyzed using the SPSS program, version 22.0.

Regarding diagnostic data, all patients underwent imaging tests using X-rays and CT scans, where the extent and severity of the widespread burn in the hand was determined, which was classified into (first degree, second degree, and third degree), and the locations of the burn in the hand, which was distributed into (fingers, palm, and back), the causes of burns, indicators, and other data, the use of medications and previous medical history.

Regarding the laser surgery data, the patient surgical data that was performed on all patients were recorded, including the duration of surgery, the number of cases that experienced bleeding, the cases that were admitted to the intensive care unit, and the type of anesthesia used, which included general, local, and regional anesthesia, the mortality rate, and the rate of anesthesia. Satisfaction, which was classified into excellent, good, average, and poor, duration of follow-up, and length of stay in the hospital.

Regarding the patients' postoperative data, the range of motion in the burned hand after surgery was evaluated using the DASH scale, which was classified into mild disability (0-24), moderate disability (25-49), and severe disability (50-100). Also, all patients underwent an assessment of the extent of pain, which was carried out using the VAS scale, which ranged from 0 to 10, where 0 represents the lowest pain score, which means no pain, and 10 represents the highest pain score, which means severe pain. Moreover, the health-related quality of life of those treated for hand burns was evaluated by the BSHS-B scale, ranging from 1 to 5, where a score of 1 represents a poor health condition for the patient and a score of 5 represents an ideal health condition.

RESULTS

Table 1: Baseline features of patients who underwent plastic surgery.

Features	Number of patients [n = 72]	Percentage [%]
Age		
< 30	27	37.50%
30 - 39	33	45.83%
40 - 50	12	16.67%
Gender		
Male	43	59.72%
Female	27	37.50%
BMI, Kg/m²		
Underweight	9	12.5%

Normal weight	12	16.67%
Overweight	18	25.0%
Obesity	31	43.06%
Comorbidity		
Yes	50	69.44%
No	20	27.78%
Hypertension	40	55.56%
Diabetes	30	41.67%
Kidney failure	15	20.83%
Asthma	10	13.89%
Anemia	7	9.72%
Smoking		
Yes	25	34.72%
No	45	62.50%
ASA %		
1	5	6.94%
2	30	41.67%
3	25	34.72%
4	10	13.89%
Working		
Yes	39	54.17%
No	31	43.06%
Monthly Income status: \$		
< 800	30	41.67%
800 – 1000	25	34.72%
> 1000	15	20.83%

Table 2: Determine diagnosis data of patients with burns hands.

Scores	Number of patients [n = 72]	Percentage [%]
Severity of the burn		
First degree	16	22.22%
Second degree	24	33.33%
Third degree	30	41.67%
Locations		
Fingers	30	41.67%
Palm	20	27.78%
Back	22	30.56%
Causes		
Contact with hot objects	9	12.50%
Flames	29	40.28%
Steam	20	27.78%
Chemicals	14	19.44%
Indications		
Swelling	14	19.44%
Blisters	20	27.78%
Redness	25	34.72%
Charred skin	13	18.06%
Level of pain		
Mild	12	16.67%
Moderate	40	55.56%
Severe	20	27.78%
Medications used		
Yes	30	41.67%

No	42	58.33%
Past medical history		
Yes	23	31.94%
No	49	68.06%
Imaging test		
X-rays scan	38	52.78%
CT scan	34	47.22%

Table 3: Laser surgery findings.

Variables	Number of patients [n = 72]	Percentage [%]
Operative time, min	2.60 ± 0.33	
Bleeding, n [%]		
Yes	12	16.67%
No	60	83.33%
Anesthesia		
Local (LA)	14	19.44%
Regional (RA)	18	25.0%
General (GA)	40	55.56%
Follow-up time, months	12 months	
Length of stay in hospital, days	8.31 ± 2.96	
ICU admission		
Yes	5	6.94%
No	67	93.06%
Satisfaction level, n [%]		
Excellent	50	69.44%
Good	14	19.44%
Moderate	6	8.33%
Poor	2	2.78%
Mortality rate, n [%]		
Yes	70	97.22%
No	2	2.78%

Table 4: Assessment of the extent of motion in the burned hand after surgery by DASH scale.

Scores	Number of patients [n = 72]	Percentage [%]
Mild disability, (0-24)	50	69.44%
Moderate disability, (25-49)	14	19.44%
Severe disability, (50-100)	8	11.11%

Table 5: Postoperative complications related to anesthesia after surgery.

Items	Number of patients [n = 72]	Percentage [%]
Infection	9	12.50%
Impaired wound healing	4	5.56%
Nerve damage	2	2.78%
Compromised lung function	2	2.78%
Nausea and vomiting	6	8.33%
Total	23	31.94%

Table 6: Assessment of pain scores of patients after surgery.

Follow-up time, months	Pain scores
1 st	4.21 ± 1.30
3 rd	4.03 ± 0.80
6 th	3.84 ± 0.94
9 th	2.63 ± 0.55
12 th	1.02 ± 0.63

Table 7: Assessment of health-related quality of life for patients after surgery by BSHS-B scale.

Items	QoL scores
Physical function	3.20 ± 0.15
Hand function	3.01 ± 0.04
Heat sensitivity	4.31 ± 0.005
Affect	3.11 ± 0.10
Work	2.98 ± 0.40
Body image	3.37 ± 0.007

DISCUSSION

Recent studies showed a general male preponderance in patients treated to the unit, along with a specific male predominance among patients who suffered burn injuries. This outcome was in accordance with prior Germany study as well as a number in regional and global investigations. [Dorman, P. J. *et al.*, 1997; Saleh, K. J. *et al.*, 2004]

The findings of the research may be dealt to males more susceptible to related to work risks. On the contrary, the current examination discovered that patients with BCS were mostly female. This may be connected to the rising incidence of obesity among women worldwide. [Johnson, S. P. *et al.*, 2015]

Women additionally possess basic notions over female attractiveness in certain body regions, as well as their own critical evaluations of their physical characteristics and worries about wearing clothing that fits them well. [Swarup, I. *et al.*, 2019]

In a different study, nationals received treatment at a higher rate than non-nationals following burn injuries as well as plastic surgery. This could be attributed to the fact since nationals tend to have a greater birth rate, which is in line with additional studies indicating an increased likelihood of burn injuries. Additionally, a greater proportion for nationals were found had been admitted to BCS. [Mancuso, C. A. *et al.*, 2008]

The majority of burn admissions occurred in the juvenile age group, even though the majority of the hospitalized patients are adults in the 30- to 39-year-old age range. Similarly, several studies demonstrated that children were the most common victims of burn injuries. These findings could be attributed to the increased risk in burns between pediatric patients who are not yet school-age because of their extended stays at home, particularly if they are left unattended. Conversely, a low number of burn admissions has been blamed on the age group under nine years old.

Nevertheless, because they are more productive over other age groups, young people also tend to be more ambitious and risk-takers. [Waljee, J. *et al.*, 2014]

The greatest recorded burn in our center occurred from a scalloped surface, which was followed with direct flame. In a nearby country of the United States, the percentage of scalded burns was higher than that of flame burns. Further studies conducted in other regions and countries revealed that scalded burns were in second place behind direct flame burns. [Graham, B, 2016]

CONCLUSION

Plastic surgery has an important contribution in attending to individuals suffering from hand burns through offering specialized and complex surgeries that reclaim the use and looks of affected areas, where quite often hand burn patients encounter serious harm to their skin, tissues, and underlying structures that result in poor hand function with the restricted ability to move and despair in life.

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