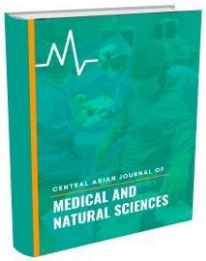

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Article

Understanding the Factors Impacting Success Rates of Laser Fistula Surgery: An Evaluation

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Abstract: This study aims to evaluate the efficiency of laser treatment for fistulas, a common yet challenging condition due to its recurrent nature. Despite various treatment approaches, a significant knowledge gap exists regarding the long-term success rates and patient quality of life post-surgery. Using clinical data from 87 patients across different hospitals in Iraq, this research employs a retrospective analysis of medical records to assess laser surgery outcomes. The findings reveal that laser fistula surgery has a high success rate (73.56% excellent, 22.99% good) with minimal complications, lower pain levels, and improved quality of life. The results suggest that laser surgery is an optimal treatment for fistulas, offering faster recovery and reduced recurrence rates. These implications highlight the potential of laser treatment as a preferred method, encouraging further adoption and study to enhance surgical outcomes for fistula patients.

Keywords: Laser Fistula Surgery, Fistula, Complications, Quality of life, Hospitalization stay

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1. Introduction

Fistula is a health problem that has been known since historical times. Hippocrates, a Greek physician who lived from 460 to 370 BC, described the treatment of an anal fistula with a fistulotomy and the use of a cutting seton made with horsehair [1]. This condition has presented a challenge to the skills of surgeons of all times [2 – 5]. Complex anal fistulas are defined as those that have undergone surgical treatment on more than one occasion, those that are not of cryptoglandular origin, anterior fistulas in women, and those whose surgical approach requires the sectioning of more than 30% of the sphincter apparatus [6,7,4,8].

It is challenging to obtain precise data on the prevalence of anal abscesses. Several factors contribute to this difficulty, with two particularly noteworthy reasons [9]. First, a significant proportion of cases resolve spontaneously without medical intervention [10]. Second, many instances are diagnosed and treated in the office but not reported or registered [11].

Anorectal fistula (ARF) represents the chronic phase of an anorectal abscess in the majority of cases of cryptoglandular origin [12,13]. Anorectal abscesses are classified as

primary or nonspecific when they have a cryptoglandular origin and as secondary or specific when they are related to other diseases, such as Crohn's disease, tuberculosis, trauma, previous anorectal surgery, anal or rectal cancer, radiation, lymphomas, leukemias, among other causes [14]. The majority of anorectal abscesses have a cryptoglandular origin (90 to 97%). Anal crypts may become obstructed as a result of trauma, the presence of foreign bodies, or the accumulation of fecal matter [13,15]. Fistulas are classified according to the trajectory they follow through these spaces and the relationship they have with respect to the anal sphincters. The classification system most widely used in clinical practice is that of Parks [16].

Pain is the primary symptom, typically of a stabbing nature and often accompanied by a sense of disabling intensity [17]. It may be exacerbated by activities such as sitting, walking, coughing, or sneezing. In some cases, an area of painful inflammation may develop, accompanied by hyperthermia and local hyperemia. Other symptoms may include transanal suppuration, fever, and rectorrhagia [18]. The general condition is not affected unless other diseases, such as diabetes or immunosuppression states coexist. In these patients, the evolution is very rapid and serious, with the potential to spread throughout the perineum, giving rise to Fournier's gangrene, which can put the patient's life at risk. In cases where a fistula has already been established, the most frequent complaint is the presence of one or several holes on the periphery of the anal opening through which purulent secretion drains continuously or intermittently [19]. Gas or fecal matter is rarely expelled during defecation through these holes. The presence of secretion or feces irritates the skin, causing itching. The pain is typically mild, although, in instances where there is some branching without free drainage, the discomfort can be constant and progressive. When the perianal secondary orifices are also occluded, symptoms and signs similar to those of an anorectal abscess reappear [20].

Fistulectomy is the complete removal of the fistula. This is achieved by introducing a stylet through the secondary fistulous orifice until it exits through the primary orifice. It is important to avoid forcing the stylet as this can result in false paths. In cases where the primary orifice cannot be identified, it is possible to instill hydrogen peroxide or milk through the secondary orifice to identify the primary [21]. An incision is made in the skin, extending from end to end of the fistula, following the path previously identified by the stylet. The incision is then deepened with an electrobisturis until the fistulous path is completely excised, thus allowing the retrieval of a piece containing the stylet. The recurrence rate is between 4 and 14%, with a variable degree of incontinence ranging from 17 to 33% [22].

2. Patients and Methods

The methodology of this study involves a retrospective analysis of clinical data from 87 patients with anal fistulas who underwent laser surgery across various hospitals in Iraq between July 2022 and October 2023. Patients were selected based on their medical records, ensuring no prior operations except the initial surgery. The process began with a detailed medical history and physical examination in the knee-elbow position to determine the fistula's external openings, number, length, and relation to the sphincters. The internal openings of the fistulas were also identified where possible. Preoperative data, including laboratory results and comorbidities, were recorded.

On the day of surgery, patients were placed in the jack-knife position, and local anesthesia was administered in four quadrants, accompanied by sedation with ketamine and dormicum. The laser ablation procedure involved mechanically cleaning the fistula tract using a brush and curette, closing the internal opening with polyglactin sutures, and advancing a laser probe to perform intermittent laser applications at a wavelength of 1470 nm and 10 watts for three seconds. No intestinal preparation was required before the operation. Patients received cefuroxime 2 g intravenously on the day of surgery and were

discharged the following day. Follow-up appointments were scheduled at 15 days, one month, three months, six months, and twelve months post-surgery. Data collected included operation time, pain scores, complications, need for a second operation, incontinence, recurrence, and full recovery time. Pain was assessed using the Visual Analogue Scale, and fecal incontinence was measured using the Wexner scale. This comprehensive approach enabled a thorough evaluation of the effectiveness and outcomes of laser fistula surgery.

3. Results

Table 1. Basics characteristics of patients

Features	Frequency [n = 87]	Percentage [%]
Age		
25 – 30	34	39.08%
35 – 40	27	31.03%
45 – 50	26	29.89%
Gender		
Male	64	73.56%
Female	23	26.44%
BMI, Kg/m2		
Underweight	8	9.20%
Normal weight	24	27.59%
Overweight	25	28.74%
Obesity	30	34.48%
Comorbidities		
Yes	57	65.52%
No	30	34.48%
Hypertension	50	57.47%
Diabetes	20	22.99%
HIV	6	6.90%
Cardiovascular diseases	7	8.05%
Kidney diseases	8	9.20%
ASA %		
I	14	16.09%
II	23	26.44%

III	30	34.48%
IV	20	22.99%
Smoking		
Yes	32	36.78%
No	55	63.22%
Medication used		
Yes	27	31.03%
No	60	68.97%

Table 2. Laboratory findings

Items	**Laser Group**
WBC (x109/L)	11.2 ± 1.4
Hemoglobin (g/dL)	14.5 ± 0.8
Platelets (x109/L)	244.62 ± 33.18
Blood glucose level (mg/dL)	92.69 ± 14.30

Table 3. Diagnostic results

Data	**Frequency [n = 87]**	**Percentage [%]**
Types of fistulas		
Trans-sphincteric	56	64.37%
Inter-sphincteric	23	26.44%
Supra-sphincteric	5	5.75%
Superficial	3	3.45%
Degree of severity		
Mild	14	16.09%
Moderate	34	39.08%
Severe	39	44.83%
Symptoms		

Pain	80	91.95%
Swelling	42	48.28%
Redness	19	21.84%
Drainage of pus or blood	24	27.59%
Fever	78	89.66%
Fatigue	82	94.25%
Loss of appetite	11	12.64%
Abdominal tenderness	14	16.09%
Imaging tests		
Ultrasound	80	91.95%
CT scan	60	68.97%
MRI	34	39.08%

Table 4. Surgical data of patients

Variables	**Frequency [n = 87]**	**Percentage [%]**
Operative time, min	1.48 ± 0.52	
Anaesthesia use		
Local	36	41.38%
Regional	27	31.03%
General	24	27.59%
Intraoperative bleeding		
Yes	6	6.90%
No	81	93.10%
Blood loss, mL	72.14 ± 12.89	
ICU admission		
Yes	2	2.30%
No	85	97.70%

Length of stay in hospital, days	0.85 ± 0.26	
Success rate %		
Excellent	64	73.56%
Good	20	22.99%
Bad	3	3.45%
Mortality rate		
Yes	0	0%
No	87	100%

Table 5. Postoperative complications

Complications	**Frequency [n = 87]**	**Percentage [%]**
No complications	72	82.76%
With complications	15	17.24%
Infection	7	8.05%
Bleeding	3	3.45%
Fistula recurrence	1	1.15%
Pain	2	2.30%
Urinary retention	1	1.15%
Difficulty passing stool	1	1.15%

Table 6. Assessment of pain scores related to patients after laser Fistula Surgery by VAS scale

Follow–up time	**Pain scores**
15 days	4.35 ± 1.42
One month	3.22 ± 0.5

Three months	3.18 ± 0.4
Six months	2.01 ± 0.07
12 months	0.8 ± 0.008

Table 7. Distribution of severity of fistula recurrence on patients after laser Fistula Surgery

Items	Number of patients [n = 87]	Percentage [%]
None	80	91.95%
Mild	4	4.60%
Moderate	2	2.30%
Severe	1	1.15%

Table 8. Assessment of quality of life for patients after laser Fistula Surgery

Items	QoL scale
Physical function	94.34 ± 4.21
Psychological function	92.11 ± 3.78
Social and emotional functions	88.57 ± 3.39
Dailly activity	84.13 ± 2.78

4. Discussion

American study shown treatment of fistulas as a challenging task in surgery due to its complex anatomy, relationship with sphincters, and potential complications such as recurrence and incontinence, where the primary goal in treatment is to repair the fistula without damaging the associated sphincter muscles, which surgical methods may decrease the risk of recurrence but increase the risk of incontinence, where surgeons must have a thorough understanding of the anatomical and physiological structure of the region and be experienced in fistula surgery [23,24].

Another study found repairing the fistula but minimizing harm to the sphincter muscles which are connected to it is the primary goal of treatment, which the risk in incontinence is increased; aggressive surgical approaches can decrease the possibility of recurrence, where surgeons have to be skilled in fistula surgery and maintain a solid grasp of the physiological and anatomical makeup of the area, which it works by affecting the synthesis of ATP (adenosine triphosphate), enhancing proteins production and modulating

cytokines thus, ensuring the closure of lumen using diode laser power [26]. It has been proved by research that the said technique is an efficient way of achieving total closure of the lumen without causing injuries to the sphincter muscles; a situation which will lead to a shrinkage in size and eventually its occlusion. The primary goal, however, is to distribute this energy evenly outside this lumen and not leave any vacuum in it. The major benefit is that it only targets the lumen and is, hence, less likely to cause harm to its neighbors. As such, its impacts do not exceed 2-3mm tissue depth, thereby reducing the chances for perforations or damages, particularly of sphincter muscles. Consequently, chances of becoming loose are low as there are no damage on the fistula tract sphincter muscles [27].

The method of laser ablation implies the closure of the internal opening by means of a flap or primary suture; mechanical instruments and brushes are used for canal cleansing and the removal of the external opening for drainage. There are studies that have referred to the closure of the internal opening but found others that did not. Anal fistulas have displayed good response levels in laser ablation treatment, especially when used as a supplementary intervention. The first cure success rate for laser ablation therapy remained at 64.1%, according to Wilhelm et al.'s research [28]. However, with recurrent intervention as well as secondary laser application, this percentage rose to 85%. This data lends credence to the idea that individuals with anal fistulas may benefit from laser ablation therapy as a first-line treatment. According to Bakhtawar and Usman, risk factors for recurrence included the architecture of the fistula (as classified by Parks), the level of experience of the surgeon, the use of improper technique, and inadequate postoperative care and follow-up [29].

5. Conclusion

The findings of this study underscore the efficacy of laser fistula surgery, demonstrating a high success rate with 73.56% of cases classified as excellent and 22.99% as good, while significantly minimizing complications and enhancing patient quality of life. The results indicate that laser surgery offers notable advantages, including reduced pain, quicker recovery times, and lower recurrence rates compared to traditional methods. These implications suggest that laser fistula surgery is a viable and potentially superior treatment option for patients, warranting its broader adoption in clinical practice. Further research is recommended to explore long-term outcomes and optimize surgical techniques, ensuring even greater success rates and improved patient experiences.

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