

Closure of Fistula-in-Ano Using a Radial-Emitting Laser Probe: Initial Experience in Lagos, Nigeria

Abstract

Background: Fistula-in-ano treatment has remained quite challenging with high failure rates and a potential for damage to the anal sphincteric complex leading to flatal or faecal incontinence. The treatment of fistula-in-ano using the fistula laser closure (FiLaC) as a minimally invasive, sphincter-saving procedure for complex disease has recently been documented. **Objectives:** This review aimed to report the outcome of using it at the Lagos University Teaching Hospital. **Patients and Methods:** The procedures were performed with a radially emitting laser fibre from Biolitec AG–CeramOptec (Bonn, Germany). The duration of symptoms, type of fistula, duration of the procedures, and postoperative complications were evaluated. **Results:** Eleven male patients had laser fistula-in-ano closure. The age range was 33–51 years, with a median age of 39 years and an interquartile range (IQR) of 37–47 years. Five patients were noted to have high fistula/e, whereas six had low fistula/e, seven had a single tract each, and three had three tracts each. The duration of surgery ranged, approximately from 3 to 60 min, with a median of 19 min and IQR of 9–33 min. Postoperative pain was mild in all patients and were all discharged as day case. There was no postoperative wound infection, anal incontinence, anal stenosis, and subcutaneous abscess. However, there was a recurrence in two patients. **Conclusions:** FiLaC has been demonstrated to be a reliable and safe sphincter-saving procedure for treating fistula-in-ano even for complex and high fistulae that is feasible in our subregion.

Keywords: *FiLaC, fistula-in-ano, laser, minimally invasive, sphincter-preserving*

Introduction

Fistula-in-ano (FIA) treatment has remained quite challenging, despite several techniques that have been developed and have high failure rates of up to 33% and a potential for damage to the anal sphincteric complex leading to flatal or faecal incontinence.^[1,2] Even new innovations such as the anal fistula plug, fibrin glue, grafting with biomaterials, ligation of intersphincteric fistula tract, new seton, over-the-scope clip proctology, and video-assisted anal fistula treatment have yielded varying degrees of success, with mostly unsatisfactory results when the fistula tract is complex.^[2] Only total excision of the fistula tracts (including the accessory ones and subsequent repair of the anal sphincter) has yielded acceptable healing rates. However, this is also associated with incontinence in up to 20% of cases.^[1,3] Thus, no ideal FIA repair technique has been recognised to date.^[4]

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The concept of “burning” the fistula using a laser is not new, but only a few data are available. This was usually done with the laser energy emitted linearly from the end of the probe.^[4] Laser use for the treatment of FIA, employing the fistula laser closure (FiLaC), is a minimally invasive, sphincter-saving procedure for complex disease that employs a radial-emitting disposable laser fibre for endofistular therapy. It has recently been documented in German, Italy, Turkey, and Denmark.^[1,5] It involves sealing the fistula lumen with diode laser energy, with the resultant coagulation caused by the laser energy being limited to the fistula tract, and thus, no loss of sphincter function has been documented with this procedure.^[4,6,7]

This “Fistula Tract Laser Ablation” device from Biolitec AG–CeramOptec (Bonn, Germany) is an endofistular treatment modality, and its long-term outcomes have been reported by three groups, in Germany, Italy, and Turkey where it was found to have clear advantages.^[4,6-8] However, to date,

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there is no documented use of this procedure in the West African subregion.

We, therefore, investigated the use of the radial fibre fistula laser closing (FiLaC) device for the treatment of FIA among a group of Nigerian FIA patients and present our preliminary findings, highlighting its potentials and challenges.

Materials and Methods

Preoperative

This is a retrospective study appraising the closure of FIA using a radial emitting laser probe, performed at the Lagos University Teaching Hospital, Lagos, from September 2017 to May 2023 following approval from the Health Research and Ethics Committee of the Hospital. Written informed consent was obtained from all patients. After a detailed history, physical evaluation, routine blood tests, and proctoscopy, the procedure was done for each patient. Fistulae were classified using the Parks' classification system. All patients had a loose draining seton placed, for at least 6 weeks, using a 2-mm latex vessel loop (Ethiloop, Ethicon Products, Norderstedt, Germany) before the procedure, to help establish a homogenous tract calibre and facilitate the closure of accessory tracts.

All patients underwent mechanical bowel preparation with Picolax sachets or magnesium sulphate and clear fluids the day preceding the procedure. All laser procedures were performed as day cases under spinal anaesthesia, caudal block, or pudendal block as indicated. Intravenous 1-g ceftriaxone and 500-mg metronidazole were usually administered at the commencement of anaesthesia.

Intraoperative

With the patients in the lithotomy position, a disposable proctoscope with a diameter of 23 mm was inserted into the anal canal. The procedure was performed with a radially emitting laser from Biolitec AG–CeramOptec through a “Leonardo DUAL 45” diode laser platform emitting laser energy of 10 W at a wavelength of 1470 nm (Biolitec Biomedical Technology GmbH, Jena, Germany). The fistula tract was curetted with a thin plastic cytology brush, thereby not enlarging the tract, and irrigated with normal saline. Using the Seldinger manoeuvre, the probe housing the laser fibre was inserted through the perineal fistula opening until it reached the internal opening. Subsequently, the probe was pulled back until the tip of the probe was a few millimetres proximal to the internal opening. Laser energy was then applied as the laser probe was withdrawn through the external opening at a speed of 1 mm/s, with the fibre delivering laser energy homogeneously at 360°. This caused controlled local tissue shrinkage and protein denaturation of the tract around the fibre to a depth of 2–3 mm, with little or no likelihood of perifistular

collateral thermal damage. Overburning was avoided. When there was no longer any water in the tissue and the temperature exceeded 100°C, a white smoke vaporisation effect was observed.

A gentle withdrawal of the probe for a few centimetres and then pushing it again toward the internal opening sufficed to obliterate any remaining space in the tract. Energy application was terminated when the tip of the probe was a few millimetres distal to the external opening. No suture was placed at the internal or external openings, and no dressings or topical agent was applied.

Postoperative

All the patients were discharged on the same day of surgery, with comprehensive postoperative instructions. Patients were discharged with a prescription of oral antibiotics (usually cefuroxime 500 mg 12 hourly and metronidazole 400 mg 8 hourly) for 5 days, stool softener (Fybogel) for 1 week, sitz baths, and analgesics. There were no dietary restrictions. Follow-up was scheduled at 1 week, 6 weeks, 3 months, 6 months, and 12 months after surgery and then yearly thereafter. Patients were instructed to return to the clinic in the intervening period if symptoms recurred. Patients were assessed as healed when all symptoms completely disappeared, with no evidence of recurrence and no requirement for additional interventions. Patients with suspected recurrence were to be assessed by magnetic resonant imaging and/or endorectal ultrasonography. If there was treatment failure, the type of further treatment was determined by the surgeon and may include repeat laser treatment. Data were collected on patient demographics, fistula type, prior surgical treatments, the amount of energy used to close the tracts, the duration of the procedure, faecal continence, complications, and recurrence.

Statistical analysis

The data were analysed with STATA version 13.0 (Stata Corporation, College Station, Texas). Continuous data were presented as median and range, whereas categorical data were presented as proportions.

Results

Eleven patients had closure of FIA with a radial emitting laser probe during the study period. They were all males, with age range of 33–51 years, a median age of 39 years, and an interquartile range (IQR) of 37–47 years. All patients presented with perianal purulent discharge, duration ranging from 8 weeks to 624 weeks, with a median of 52 weeks and an IQR of 39–104 weeks [Table 1]. Seven patients (63.6%) had perianal abscess/fistula as the first presentation but four had recurrent fistula, three of which had been previously operated upon. Two others had had two previous surgeries each and one had five previous surgeries before presentation. The types of previous fistula

Table 1: Symptoms (n = 11)

Parameter	No. of patients (%)
Perianal discharge (number)	11 (100)
Duration (median, IQR) weeks	52 (39–104)
Pain	
Present	10 (90.9)
Absent	1 (9.1)
Recurrent fistula	
Present	4 (36.4)
Absent	7 (63.6)
Previous fistula surgery	
Present	3 (27.3)
Absent	8 (72.7)

Table 2: Signs (n = 11)

Parameter	No. of patients (%)
Cryptoglandular	11 (100)
Coexisting pathology	
Anal fissure	1 (9.1)
Second-degree haemorrhoids	1 (9.1)
None	9 (81.8)

Table 3: Surgical findings

Parameter	No. of patients (%)
Level of fistula	
High fistula	5 (45.5)
Low fistula	6 (54.6)
No. of tracts	
1	7 (63.7)
2	0 (0)
3	3 (27.3)
Orientation of tracts	
Anterior	6 (54.4)
Posterior	5 (45.5)
With horseshoe extensions	1 (9.1)
Extent of external sphincter involvement	
>1/3	5 (45.5)
<1/3	6 (54.4)
Duration of procedure, median (IQR)	19 (9–33) min
Amount of energy delivered, median (IQR)	3377 (879.8–6000) J

surgeries they had could not be ascertained. None of the patients presented with acute sepsis or abscess, but one patient had drainage from an abscess in the perianal region. They all had normal continence to solid, liquid, and gas. None was diabetic, and no patient was on steroids or immunosuppressants.

All the patients presented with cryptoglandular type with two having coexisting pathology [Table 2].

The patients were managed together by certified surgeons. At surgery, five patients were noted to have high fistula/e, whereas six had low fistula/e, seven had a single tract each, and three had three tracts each [Table 3]. The length of the tracts ranged from 2.5 to 12 cm.

Table 4: Outcome of the procedures

Parameter	No. of patients (%)
Number of days post-op admission	
Day case	11 (100)
Perioperative complications	
None	10 (90.1)
Spinal headache	1 (9.1)
Late complication	0 (0)
Post-op continence	
Normal	11 (100)
Healed/closed fistula	7 (66.7)
Healing/resolving	2 (18.2)
Recurrent fistula	2 (18.2)

Duration of surgery ranged approximately from 3 to 60 min, with a median of 19 min and IQR of 9–33 min. The amount of energy delivered per patient ranged from 290 to 8722 J with a median of 3377 J and IQR of 879.8–6000 J. Blood loss was minimal in all patients. Perioperatively, one patient had spinal headache, which resolved with analgesia. Postoperative pain, using the verbal rating scale, was mild in all patients. The other 10 patients did not have any perioperative complications. All patients were discharged as day cases. There was no postoperative wound infection, anal incontinence, anal stenosis, and subcutaneous abscess. However, there was recurrence in two patients [Tables 4 and 5], within a median follow-up period of 62 weeks and an IQR of 4–63 weeks.

Discussion

The management of FIA has remained a challenge due to the high frequency of failures and recurrences documented in nearly all current surgical treatments for this condition. Determining the procedure to be offered can be difficult, especially for complex and high fistulae because of the very high risk of damage to the anal sphincter, a significant factor in decision-making. Many conventional procedures are very efficacious in healing FIA but tend to cause anal sphincter damage, resulting in faecal incontinence. Cutting setons with fistulotomies are usually correlated with good healing rates but are associated with significant rates of faecal incontinence.^[6] Therefore, sphincter-preserving fistula procedures should be the primary option for treating this condition as the risk of loss of/reduced continence is of great concern to most patients.^[6,9] Although a systematic review showed that ligation of intersphincteric tract and advancement flap has pooled success rates of approximately 70% and 75%, respectively, their incontinence rates are about 2% and 8%, respectively.^[10–12] A major advantage of FiLaC, a novel procedure documented in literature for treating complex FIA, is that there is no reported subsequent incontinence in most studies and not more than 1% in a few studies.^[4,6,13–15] It is also noted that some of its reported success rates^[6,16–18] compare satisfactorily with those of other sphincter-preserving procedures.^[10–12,19]

Table 5: Summary of patients

Patient	Sex	Age (years)	Clinical presentation	Findings at surgery	Amount of energy delivered (joules)	Duration of procedure (min)	Duration of hospital stay (days)	Perioperative event/complication	Later complication
1	Male	47	Perianal discharge Pain	High fistula Multiple	879.8		Day case	No	No
2	Male	49	Perianal discharge Pain	High fistula Single		60	Day case	No	No
3	Male	35	Perianal discharge Pain	Low fistula Single		20	Day case	No	No
4	Male	39	Perianal discharge Pain	Low fistula Single		30	Day case	No	No
5	Male	38	Perianal discharge Pain	Low fistula Single	290	40	Day case	No	No
6	Male	33	Perianal discharge Pain	Low fistula Single		34	Day case	No	No
7	Male	45	Perianal discharge Pain	High fistula Multiple	6000	18	Day case	No	No
8	Male	47	Perianal discharge Pain	Low fistula Single		10	Day case	No	No
9	Male	51	Perianal discharge Pain	High fistula Multiple	5256	6	Day case	No	No
10	Male	37	Perianal discharge Pain	High fistula Multiple	8722	9	Day case	No	No
11	Male	37	Perianal discharge	Low fistula Single	1499.6	3	Day case	Spinal headache	No

FiLaC involves sealing the fistula lumen with diode laser energy, with the resultant coagulation caused by the laser energy limited to the fistula tract, thus not resulting in loss of sphincter function. This study reports the outcome of a cohort of 11 patients who presented with FIA in our centre. Our patients' demographics are comparable to those of other similar studies with an age range of 33–51 years and a median age of 39 years. Studies by Ozturk *et al.*^[4] at Bursa, Turkey, showed a median age of 41 years and by de Bonnechose *et al.*^[14] in Paris, France, showed a median age of 43 years. The duration of our follow-up with a median period of 62 weeks and an IQR of 4–63 weeks was longer than that of most studies with a median follow-up of 10–48 months.^[5,10,14,15,17,18,20,21]

The primary healing rate of 66.7% in this study was comparable with findings by Wilhelm *et al.*^[7] in Cologne, Germany, who reported a primary healing rate of 64%; 66.8% by Giamundo *et al.*^[22] in Bra, Italy; 82% by Ozturk *et al.*^[4] at Bursa, Turkey; 62% by Isik *et al.*^[20] in Turkey; 74.7% by Wolicki *et al.*^[18] in Germany and 70% by De Hous *et al.*^[16] in Belgium comparable with those of other sphincter-preserving procedures^[10,11,19] but higher than healing rates reported by Nordolm-Carstensen *et al.*^[5] in Germany (44.1%), de Bonnechose *et al.*^[14] in France (44.6%), Serin *et al.*^[21] in Turkey (42.9%), Alam *et al.*^[23] in France (55%), Stijns *et al.*^[24] in Holland (20%), Marref *et al.*^[15] in France (45.6%), and Terzi *et al.*^[25] in Turkey (39.8%).

It is mostly effective in transsphincteric or high fistulas and due to the shrinkage phenomenon caused by the laser, the best outcomes are noted in longer fistulas as was also found in our study where we reported that two of the three patients with recurrence had short fistulae, whereas only one of four patients with high fistula had recurrence.^[15,22]

There was no anal sphincter incontinence post-FiLaC in all our patients, corroborating the evidences from FiLaC studies in Italy, the USA, Turkey, and France that demonstrated 0%–1% incontinence rate following laser treatment.^[4,6,10,13-15] There was also no complication among our patients as also documented in most other FiLaC studies where no morbidity was reported following the procedure,^[5,14-17,20,21] although a few studies reported minor, transient postoperative complications such as pain, moderate bleeding, and fever that resolved within a short period.^[6,26]

Limitations

There was a limitation with imaging investigations as most patients could not afford the cost of magnetic resonance imaging. The use of endoanal ultrasonography would have been cheaper although it is a less reliable imaging alternative. It is hoped that this would be employed in future studies at our centre.

Conclusion

FiLaC has been demonstrated to be a reliable and safe sphincter-saving procedure for treating FIA with very low complication rates, even for complex and high fistulae that are feasible in our subregion. It is recommended that it should be further studied.

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Conflicts of interest

There are no conflicts of interest.

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