

CASE REPORT: Treatment of Perianal Fistula using 1064 nm Nd:YAG Laser

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ABSTRACT

Objectives: To investigate the efficacy of 1064 nm Nd:YAG laser in the treatment of perianal fistula.

Material and Methods: A patient with anal fistula was referred for laser treatment. The first treatment session was performed using long pulse (LP) 1064 nm Nd:YAG laser, (SP Dynamis, Fotona, Slovenia) with parameters of 200-240 J/cm², 4 mm spot, 15-20 ms, 1-1.5 Hz and five shots in the nodule of the hole. The drainage stopped for 6 months. The drainage and pain returned 8 months post treatment and was treated again using Nd:YAG laser, but this time with 600 µm laser fiber and in Quasi Continuous Wave (QCW) mode with an intensity of 18 W. A total energy of 1329 J was delivered during this treatment. Follow-up was done daily for one week post treatment. Two weeks after the fiber laser treatment, the pain was completely gone, but there was still a small amount of fluid discharge. A second session using laser fiber was performed with QCW mode, 18 W and a total energy of 1541 J. The treatment was done under local anesthesia. The pain was tolerable and there was no need for hospitalization.

Results: Drainage reduced significantly, with the pain completely gone after the first fiber laser treatment. The drainage cleared after second fiber laser treatment with no recurrence observed 20 months post treatment.

Conclusion: The treatment of anal fistula has seen many advancements, although failure and recurrence rates are high, with most patients requiring multiple surgeries. This case demonstrates good long-term results for perianal fistula treatment using 1064 nm Nd:YAG with laser fiber in QCW mode. The treatment was safe, there were no side effects and the patient's satisfaction was high.

Keywords: perianal fistula, drainage, Quasi Continuous Wave (QCW) mode, Nd:YAG 1064 nm laser, fiber.

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I. INTRODUCTION

Perianal fistula is a chronic abnormal communication between the epithelialized surface of the anal canal and (usually) the perianal skin. An anal fistula can be described as a narrow tunnel with its internal opening in the anal canal and its external opening in the skin near the anus [1,2,3].

The incidence rate varies from as low as 0.7% to as high as 37% in different cases. Males are twice as likely to develop an anal fistula compared to females [1,2].

Pathophysiology: An anal fistula originates from the anal glands located between the internal and external anal sphincter and drains into the anal canal. Acute infection of the anal crypt leads to an anorectal abscess; an anal fistula represents the chronic form of this infection. The fistula consists of the infected crypt and a tract extending to the site of drainage. It is, therefore, vital to drain an abscess as close to the anus as possible to avoid the formation of a long fistulous tract. Fistula may also be a secondary cause of infections due to trauma, fissures, tuberculosis, Crohn's disease, carcinoma, radiation, actinomycosis and chlamydia [1].

Diagnosis: Patients present with persistent purulent drainage from the external and internal opening of the fistula. An indurated tract is often palpable and may be painful [1].

While the treatment of anal fistula has seen many advancements, surgeons have long struggled to find the most effective method to treat anal fistula as the recurrence after surgery varies between 7% and 50% [5].

There are various treatments traditionally used in the management of anal fistula:

- A simple fistula can be treated by fistulotomy (opening the fistulous tract), curettage, or cautery of the tract, in order to indirectly initiate a healing process.
- Fistulectomy (complete excision of the fistulous tract) is not indicated, as the magnitude of tissue

loss associated with the procedure increases the risk of compromising sphincter function.

- c) Lay-open of fistula-in-ano: an operation to cut the fistula open may cause incontinence.
- d) Cutting seton: may cause incontinence and flatus.
- e) Fibrin glue injection: injecting the fistula with biodegradable glue in order to close the fistula from the inside out, and let it heal naturally [1,5,7].

The most troubling complication associated with the treatment of anal fistulas is fecal incontinence, due to anal sphincter damage and recurrence [1,2,4,5,6,7].

Laser therapy was described as a treatment option for anal fistula in the 1980s. Laser therapy works by using photothermal destruction of the epithelial cells lining the fistula tract to promote a healing process resulting in collagen remodeling, shrinkage of the tissue, and closure of the track. Laser therapy is a minimally invasive surgery that represents an alternative treatment with the benefit of reducing the risk of post-operative fecal incontinence as a side effect of anal fistula surgery [3,4,5,6,7].

II. CASE

A 44-year-old man complained of unpleasant odors followed by drainage and pain from the perianal area. A hole with a nodule of smooth consistency was present (Fig.1a). The patient was referred for surgery by the general surgeon, but the patient refused and asked for an alternative and was referred for laser treatment. The patient is a cyclist. Based on previous experiences with two cases of treating post-operative fistula relapse using long-pulse 1064 nm Nd:YAG laser (Fotona SP Dynamis, R33 handpiece, 4 mm spot size, 15-20 ms, 200-240 J/cm², 1-1.5 Hz without anesthesia, with cooling), we decided to treat this patient with the same protocol and settings. Five treatment sessions were done within the course of three months, with the drainage and pain gone after the fourth treatment.

Eight months post-treatment, the drainage and pain returned. We decided to change the approach from only external laser treatment of the perianal hole with the nodule to internal laser irradiation of the whole length of the fistula. The treatment was done with 600 μ m bare laser fiber using the same laser but in Quasi Continuous Wave (QCW) mode, with a parameters of 18 W, 40 Hz, 0.3 ms, and a total energy of 1329 J. The fiber was inserted through the perianal fistula, about 10 cm in length. The laser irradiation of the fistula started at the deepest end of the fistula (at the opening in the anal canal) and was delivered by pulling back the fiber while shooting along the whole

length of the fistula until the fiber tip reached the opening at the perianal hole. The treatment consisted of five passes of fiber through the whole length of the fistula.



Fig.1: a) Before and b) after 1st treatment using LP 1064 nm Nd:YAG (SP Dynamis, Fotona)

The treatment was done under local anesthesia using lidocaine and adrenaline injection at the rectal end and the perianal part with no blade and no sutures. Tampons were inserted in the hole after treatment, until drainage and blood cleared. Two weeks after the fiber laser treatment, the pain was completely gone, but there was still a small amount of fluid discharge. Another treatment using laser fiber was done with QCW mode at 18 W and total energy of 1541 J.

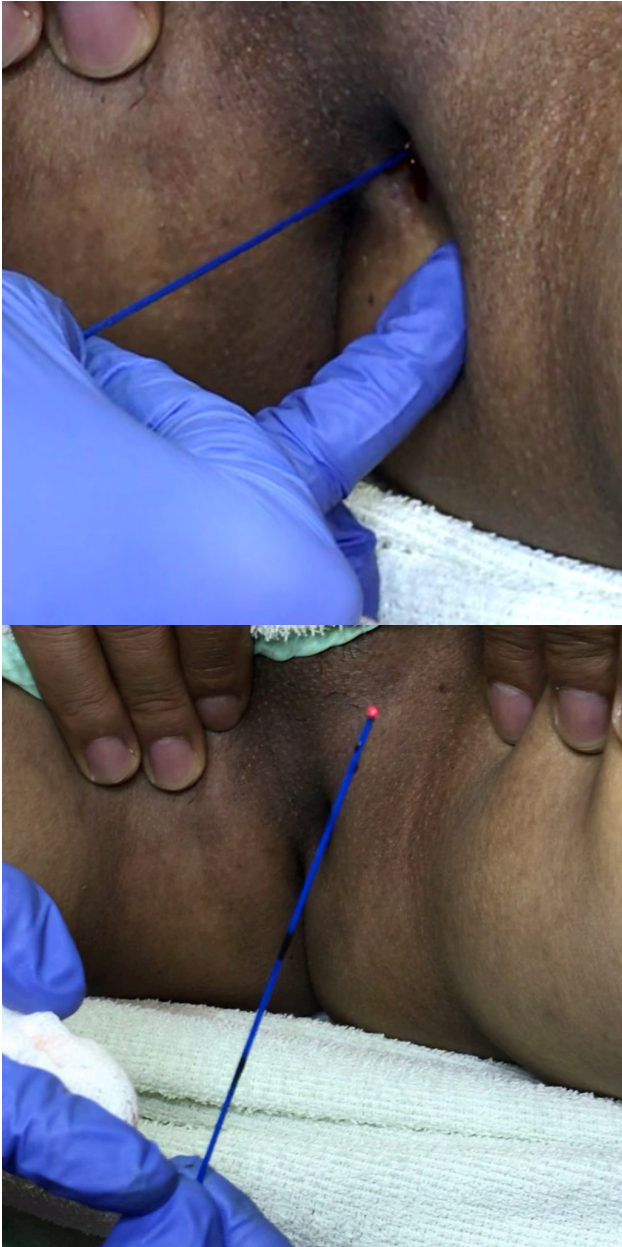


Fig 2.: a) Procedure detail and b) pulled-out fiber showing the length of the treated fistula

On the fourth day after the second treatment using laser fiber, erosion was observed in the skin of the hole (see Fig.3). To accelerate the healing of this perianal skin erosion, a treatment of antibiotic (Levofloxacin 500 mg) once per day for seven days

and laser treatment of low-power, long-pulse 1064 nm Nd:YAG Laser for wound healing was given.



Fig 3.: a) Erosion 4 days after second laser fiber treatment and b) one month after the treatment of erosion

Post-treatment: the patient was advised to drink more water and adjust to a diet with more fiber for softer stool and advised against cycling and activities involving squatting down for one-month post-

Table 1. The effect of long-pulse 1064 nm Nd:YAG Laser (R33 handpiece, 4 mm, 200-240 J/cm², 15-20 ms, 1-1.5 Hz)

Symptoms	Before treatment	After 1st treatment	After 2 nd treatment	After 3 rd treatment	After 4 th treatment	After 5 th treatment
Drainage	+++	++	+	+	-	-
Pain	+++	+	-	-	-	-
Odor	+++	+	+	+	-	-

treatment. Follow up was conducted daily for one week, again after one month, six months (by phone), one year, and 20 months (by phone) post treatment.

Table 2. The effect of laser fiber delivery of 1064 nm Nd:YAG (QCW, 18 W, 0.3 msec, 40 Hz)

Symptoms	Before treatment	After 1st Treatment	After 2nd treatment
Drainage	++	+	-
Pain	++	-	-
Odor	++	-	-



Fig 4.: a) and b) 20 months after treatment, sent by the patient. A scar formed at the site of erosion.

After 4 treatments, drainage and odor were cleared; the pain stopped already after the first treatment. Based on previous experience, the protocol for this procedure consists of 5 treatments, so in spite of the absence of symptoms after the 4th treatment, we did also the 5th treatment. 8 months after the 5th treatment there was a recurrence.

The pain disappeared one week after the first laser fiber treatment. Erosion was found in the fourth day

after the second treatment. Drainage was cleared after second treatment. No recurrence was observed at 20 months follow-up (Fig. 4).

III. DISCUSSION

The use of 1064 nm Nd:YAG with laser fiber delivery seems to be very effective in the treatment of perianal fistula. In this case, QCW mode, 600 um fiber, 18 W of power and a total energy of 1300-1600 J were used. Two treatments were performed. The healing process was completed after the second treatment. This treatment was inspired by a study of successful treatments of varicose veins using Nd:YAG in QCW mode with the Fotona XP-2 laser, which result in 98.5% vein occlusion. The same study [8] also mentions a comparison of side effects, ecchymosis and pain between Nd:YAG and another laser wavelength, reporting a lower level of ecchymosis and pain for the Nd:YAG laser. Many studies about the treatment of anal fistula using laser fiber have been published, with most of the studies using a 1470 nm diode laser. This wavelength provides a higher absorption in water than Nd:YAG. On the other hand, Nd:YAG laser is not only absorbed by water but also by hemoglobin and melanin [8], offering better overall absorption in blood and pigments. A study by Wilhelm et al. reported 117 patients treated with the radial fiber fistula laser closing (Filac® device) [4]. Patients in this study followed a 25-month long observation (the minimum being six months), with primary healing showing in 64% of patients. A repeat procedure was performed in 31 patients who failed the initial treatment, with overall healing achieved in 88% of the patients [3, 4]. A retrospective observational study of 55 patients from Giamundo et al. executed between July 2010 and May 2014 using a diode laser at a wavelength of 1470 nm and radial laser fiber showed the median operation time of 20 (6-35) minutes, with no intraoperative complication, with the median duration of follow up of 20 (3-36) months. Primary healing was observed in 25 patients (71.4%). Eight failures (23%) and two recurrences at 3 to 6 months after the treatment were reported [6]. A retrospective study of 27 patients from Donmez et al. showed twenty-four patients (88.89%) fully recovered, with the procedure having failed in three patients (11.11%) [7].

In general lasers have been used as surgical tools for anal diseases since the eighties, with the first report of a CO₂ laser in 1981 being used to treat cryptogenic anal fistulae [9]. In 2001 Salim and Ahmed reported about six anal fistula cases treated with KTP laser combined with fibrin glue installation [10]. Other lasers with wavelengths of 810, 940 and 980 nm were also quite successfully used for anal fistulae treatment

over the past forty years. In spite of the very good results of laser procedures for anal fistula, these treatments are not yet very well established even though they are minimally invasive and very safe procedures in contrast with other surgical approaches that are associated with incontinence side-effect rates of 20%-43% and higher recurrence rates [3,4,5,6,7].

Our case, as well as our previous experiences with LP Nd:YAG showed that 1064 nm Nd:YAG laser is a good wavelength option for the treatment of anal fistula. After a change of the approach – from external only to internal irradiation along the whole fistula – we believe that internal treatment with fiber is superior to external as it is treating the whole length of the fistula, it requires fewer sessions and provides longer lasting results. We plan to use this approach in our future treatments of anal fistula.

IV. CONCLUSIONS

Treatment of perianal fistula is a challenge. The recurrence rate is astoundingly high, ranging from 7% to 50%, with most patients requiring multiple surgeries.

Laser treatment with 1064 nm Nd:YAG using fiber in QCW mode may be considered as the treatment of choice for perianal fistula, as this procedure proves to be safe, effective and minimally invasive, with no need for hospitalization.

Further studies on the treatment of anal fistula using 1064 nm Nd:YAG with laser fiber in QCW mode are warranted.

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