



Laser Ablation Facilitates Closure of Chronic Enterocutaneous Fistulae

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ABSTRACT

This report describes the use of laser ablation for treatment of chronic enterocutaneous fistulae (ECFs) after failure of conservative therapy. Three patients underwent laser ablation for treatment of 8 ECFs. Mean duration of fistula patency was 28 months with mean fistula output of 134 mL/day. The initial technical success was 100% with no major or minor complications. Three ECFs required repeat treatment. At mean follow-up of 53 days, 7 of the fistulae were occluded. One fistula showed a markedly reduced output of 10 mL/day.

ABBREVIATION

ECF = enterocutaneous fistula

Enterocutaneous fistulae (ECFs) may occur from complications related to abdominal surgery and visceral interventions (1). Conservative treatment of an ECF includes control of the fistula output with dietary modification or fistula diversion along with protection of adjacent skin with emollients and avoidance of superinfection to facilitate spontaneous closure. If conservative treatment fails, minimally invasive interventional approaches may be attempted; however, the current available methods are ideal only for low-output, narrow-channel fistulae devoid of distal obstruction or inflammatory bowel disease (1). Treatment with fibrin sealant often requires multiple sessions with a success rate of only 36.5% reported in 1 study (2), whereas the use of biologic plugs may be associated with a 33% fistula recurrence rate (3).

When these minimally invasive approaches fail, usually in the setting of high-output ECFs, patients may require bowel resection with diversion or reanastomosis. These

procedures may have a high surgical morbidity, and patients with medical comorbidities may not be candidates. Nonsurgical candidates often must manage their draining fistulae with long-term ostomy appliances or drainage catheters to control fistula output and prevent skin breakdown. Laser ablation diodes are designed to deliver controlled and precise thermal energy to facilitate complete vein closure. The delivery of controlled thermal energy to a relatively narrow epithelial lining of a fistula tract may result in closure. Successful use of lasers for treatment of anal fistulae has previously been reported (4,5). This report describes the use of laser ablation for treatment of chronic ECFs.

CASE REPORTS

This retrospective study was conducted with institutional review board approval. From June to August 2017, 3 patients with a total of 8 chronic ECFs were treated with laser ablation after failed conventional treatment. All procedures were discussed and agreed upon with providers, referrers, and patients with formal patient consent obtained after discussion of the potential risks, benefits, and alternatives.

Technique

All procedures were performed in a hybrid operating room/angiography suite using a Siemens Artis zee system (Siemens Healthcare GmbH, Erlangen, Germany) under conscious sedation. A fistulogram was obtained with nonionic contrast material to determine the maximum width and length of the fistula tract. The tract length in millimeters

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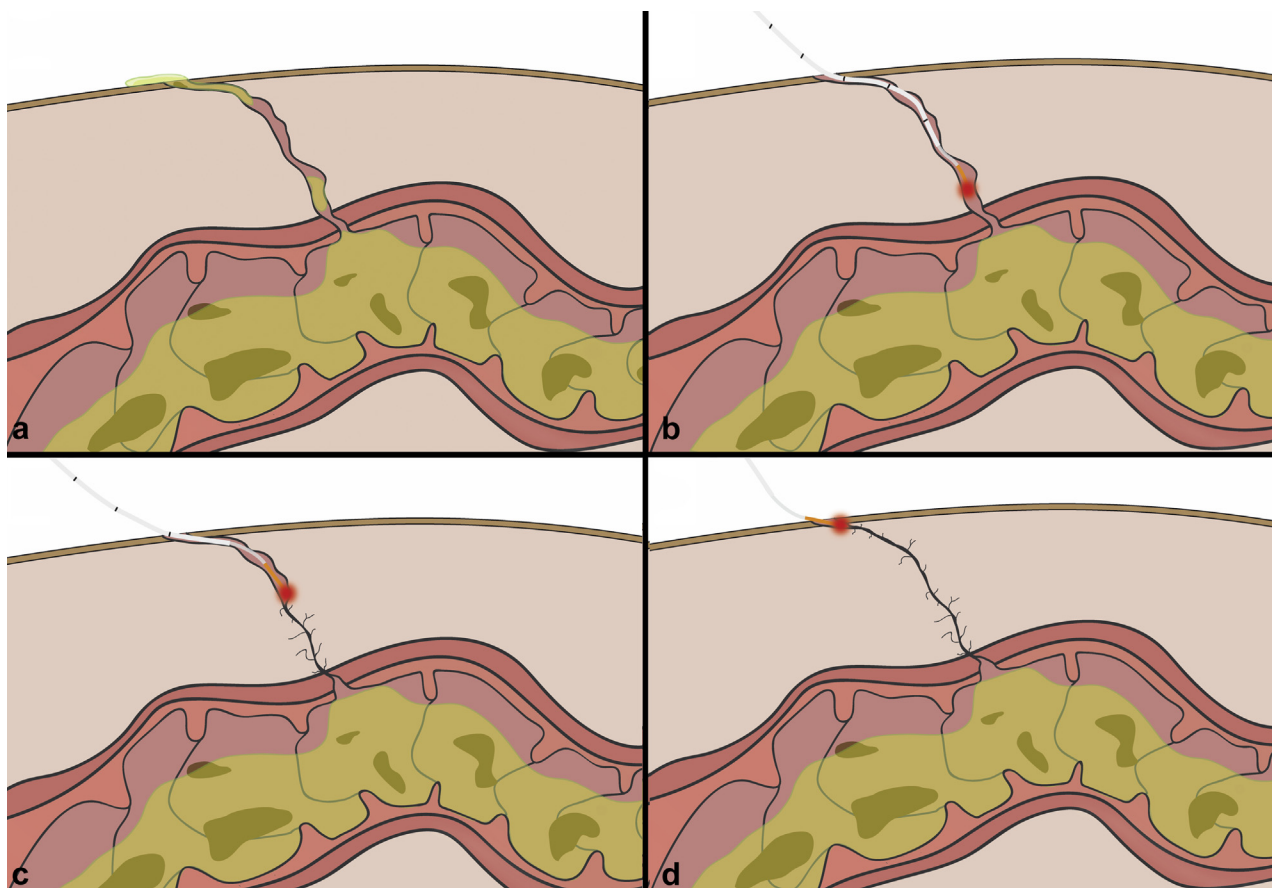


Figure 1. Schematic illustration of the laser ablation technique for treatment of ECFs. (a) ECF involving the small bowel. (b) Laser diode catheter inserted in ECF with the tip positioned 1 cm from the outside surface of the small bowel confirmed by fluoroscopy. (c, d) Laser being retracted 1 cm every 5–10 seconds to ablate the fistula tract.

was determined by measuring the distance from the bowel lumen to the skin exit site and subtracting 10 mm. The entry site of the fistula tract into bowel was then marked under fluoroscopy.

Tumescent anesthesia was provided by infiltrating the wall of the fistula tract with 15 mL of 2% lidocaine hydrochloride (Hospira Inc, Lake Forest, Illinois). All laser ablation procedures were performed using the Delta 810-nm laser or VenaCure 1,470-nm laser, both part of the VenaCure EVLT system (AngioDynamics, Latham, New York). The laser diode catheter with a 600- μ m fiber was preloaded in the 4-F laser sheath and introduced into the fistula tract under fluoroscopy. The radiopaque tip of the laser fiber was positioned 10 mm outside the viscus to prevent thermal injury to the stomach or bowel wall. The power level was set to 14 W for the 810-nm laser and at 6 W for the 1,470-nm laser based on device manufacturer settings; the laser fiber chosen was based on availability. Using fluoroscopy and the markers on the laser sheath, ablation of the fistula tract was performed by retracting the laser 1 cm every 5–10 seconds. Care was taken to ensure the laser was deactivated when it was 3 mm from the skin surface to avoid injury.

Technical success was defined as closure of the fistula tract on repeat fistulogram immediately after laser ablation. Clinical

success was defined as closure or a significant decrease in the output of the fistula at follow-up. **Figure 1a–d** illustrates the laser ablation technique.

Patients

Patients are summarized in the [Table](#).

Patient 1. Patient 1 was a 45-year-old man with a prior history of ventral hernia repair complicated by bowel perforation. The patient developed 6 ECFs, which were present for 26 months and managed with ostomy appliances. The patient underwent several failed EVICEL Fibrin Sealant (Ethicon Inc, Somerville, New Jersey) injections for treatment of the ECFs. The patient was also not a surgical candidate given his medical comorbidities. The ECFs had outputs of 30–150 mL/d. An initial fistulogram was performed to determine tract diameter and length ([Table](#)). Initially, all 6 fistulous tracts were ablated with a Delta NeverTouch 810-nm laser diode catheter at 14 W for 284 seconds; 3,984 J was deposited into the fistulous tracts averaging 175 J/cm. Repeat fistulogram confirmed closure of all 6 fistula tracts. The patient presented 14 days later with recurrent output from 2 of the fistula tracts. The 2 fistula tracts were reablated with a

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