Diseases of the Colon & Rectum

Efficacy of Anal Fistula Plug in Closure of Crohn's Anorectal Fistulas

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PURPOSE: The efficacy of Surgisis® anal fistula plug in closure of Crohn's anorectal fistula was studied. METHODS: Patients with Crohn's anorectal fistulas were prospectively studied. Diagnosis was made by histologic, radiographic, or endoscopic criteria. Variables recorded were: number of fistula tracts (primary openings), presence of setons, and current antitumor necrosis factor therapy. Under general anesthesia and in prone jackknife position, patients underwent irrigation of the fistula tract by using hydrogen peroxide. Each primary opening was occluded by using a Surgisis® anal fistula plug. Superficial tracts amenable to fistulotomy were excluded. RESULTS: Twenty consecutive patients were prospectively enrolled, comprising a total of 36 fistula tracts. At final follow-up, all fistula tracts had been successfully closed in 16 of 20 patients, for an overall success rate of 80 percent. Thirty of 36 individual fistula tracts (83 percent) were closed at final follow-up. Patients with single fistulas (with 1 primary opening) were most likely to have successful closure using the anal fistula plug. Successful closure was not correlated with the presence of setons or antitumor necrosis factor therapy. CONCLUSIONS: Closure of Crohn's anorectal fistula tracts using Surgisis® anal fistula plug is safe and successful in 80 percent of patients and 83 percent of fistula tracts. Closure rates were higher with single tracts than complex fistulas with multiple primary openings. [Key words: Crohn's disease; Anorectal fistula; Surgisis® anal fistula plug; Fistulotomy; Endoanal flap; Fibrin glue]

Surgical treatment of anorectal Crohn's fistulas is challenging and results vary widely. Simple, superficial fistulas may be treated safely with fistulotomy,[1–3] but these represent a minority of Crohn's fistulas. More complex procedures such as endoanal advancement flaps are associated with a failure rate as high as 75 percent.[2] Overall, proctectomy is required in 12 to 20 percent of patients with Crohn' fistulas.[2–5]

Setons are a safe option, and prevent recurrent abscess, however they do not close the tract, and patients experience persistent drainage.[3,6] Antitumor necrosis factor therapy is reported to close approximately 50 percent of Crohn's fistulas in 50 percent of patients.[7] However, repeat infusions are required every six to eight weeks and ultrasound evidence shows the fistula tracts persist, irrespective of clinical response.[8]

Recent studies using the Surgisis® anal fistula plug reported successful closure of cryptoglandular fistulas in 86 percent of cases.[9] Surgisis® anal fistula plug (Cook Surgical, Inc., Bloomington, IN), is a bioabsorbable xenograft, made of lyophilized porcine intestinal submucosa. The material has inherent resistance to infection, produces no foreign body or giant cell reaction, and becomes repopulated with host cell tissue over a period of 3–6 months.[10,11] A prospective evaluation of Surgisis® anal fistula plug in closing Crohn's anorectal fistula was performed.

PATIENTS AND METHODS

Patients with Crohn's anorectal fistula were prospectively enrolled during a two-year period. Patients were enrolled in a consecutive manner. Superficial fistulas, which could be safely treated by fistulotomy were excluded. Wide-diameter fistulas not suitable for a plug were first matured for 6–8 weeks using

Dr. David Armstrong has a patent-licensing agreement with the manufacturer of Surgisis® (Cook Surgical, Inc., Bloomington, IN).

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Dis Colon Rectum 2006; 49: 1569–1573
DOI: 10.1007/s10350-006-0695-y

Published online: 25 September 2006

setons and topical 10 percent metronidazole (SLA Pharma®, Watford, UK), before plugging. Diagnosis of Crohn's disease was made by histologic, radiographic or endoscopic criteria. Variables recorded were: number of fistula tracts, (primary openings), presence of seton(s), current antitumor necrosis factor therapy, presence of proctitis and prior proctectomy and reanastomosis.

Anal Fistula Plug Technique

All patients underwent mechanical bowel prep the day before surgery, followed by 2 g of metronidazole by mouth the same evening. A broad-spectrum parenteral antibiotic was given on induction of anesthesia. All procedures were performed under general anesthesia and in a prone jackknife position. All fistula tracts and primary openings were identified using conventional fistula probe and/or hydrogen peroxide instillation. All tracts were irrigated with hydrogen peroxide; however, the tract was not curetted to avoid enlarging or damaging the fistula tract.

The plug was pulled tip-first into the internal opening (Fig. 1) until resistance was encountered (Fig. 2). The excess plug material was trimmed flush with the mucosa, and the plug was buried into the primary opening using a figure-of-eight 2–0 vicryl or 0 chromic suture, which was inserted deep to the internal sphincter muscle. The plug was trimmed at skin level at the secondary opening. Care was taken not to occlude the secondary opening to allow drainage of material and to avoid a closed system. At the end of the procedure, the plug was completely buried within the fistula tract (Fig. 3). In the case of multiple separate fistulas, this was repeated for each fistula tract.

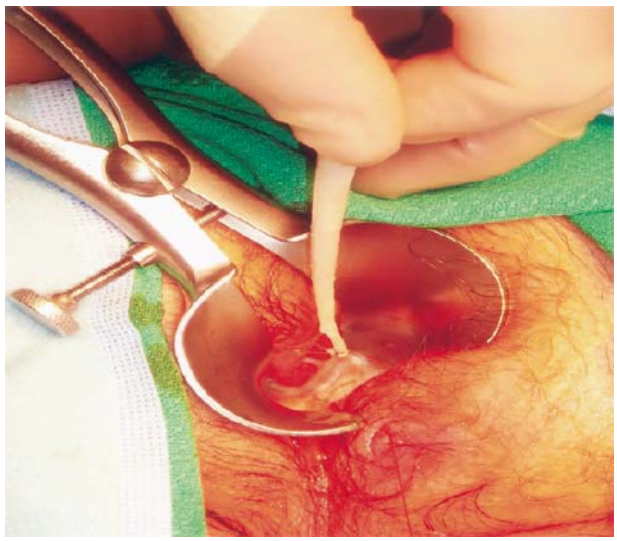

Figure 1. The fistula tract is irrigated with hydrogen peroxide, and a plug is pulled into the tract.

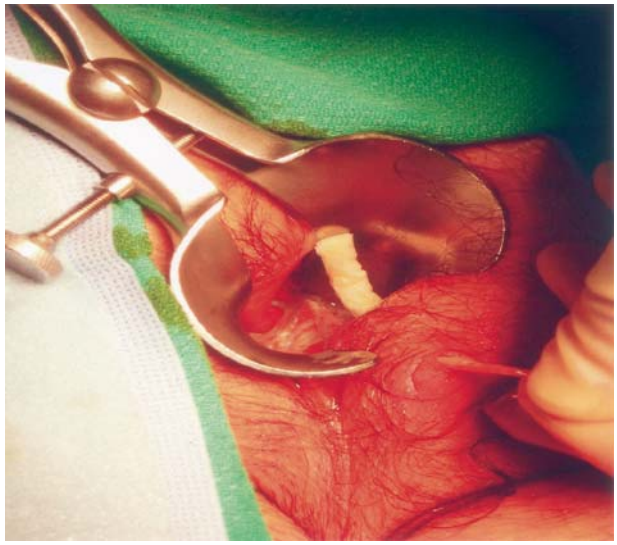

Figure 2. The plug is pulled into the primary fistula opening until resistance is felt, so occluding ingress to the fistula tract.

In the event of an excessively large-diameter fistula, the tract was "matured" using setons and 10 percent topical metronidazole, for a period of six to eight weeks, before anal fistula plug insertion. This narrows the diameter of the fistula tracts to dimensions that are amenable to "plugging."

Follow-Up

All patients were instructed to stay on a clear liquid diet for 48 hours, avoid any strenuous activity, take warm sitz baths as needed, and apply topical 10 percent metronidazole *t.i.d.* The patients were followed up at two weeks, four weeks, and then on an individual basis as clinically appropriate. Median follow-up in weeks was calculated for fistulas that were successfully closed. The status (open *vs.* closed) of the fistula was determined at final follow-up. Success criteria were defined as: closure of all secondary openings; absence of fistula drainage; and absence of abscess formation. In patients with multiple openings, the presence of one persistent tract was considered an overall failure, even if one or more tracts had been successfully closed.

Significance of antitumor necrosis factor therapy, multiple fistulas, and presence of setons was determined by Fisher's exact test. Use of the Surgisis® anal fistula plug was approved by the institutional review

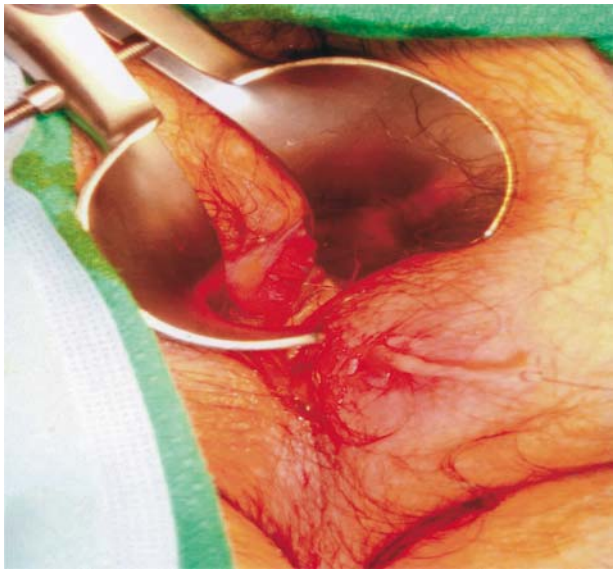

Figure 3. The excess plug is trimmed at the level of the primary opening and is secured into place using a deep figure-of-eight 2-0 vicryl or 0-chromic suture. The tip of the plug is trimmed at the level of the secondary opening. Care is taken to avoid complete closure of the secondary opening to allow free drainage of fluid and avoid a closed system.

board, and informed consent was obtained in all patients. The study was self-funded, and no financial support was requested or received. The senior author (D.N.A.) receives royalties on sales of the product.

RESULTS

Twenty patients were prospectively studied during a two-year period. Seven patients (35 percent) had multiple fistula tracts and multiple (2–6) primary openings, for a total of 36 individual fistulas tracts in the series.

Six patients (30 percent) had one or more setons through the fistula tracts at the time of surgery, three of whom had multiple setons through multiple tracts. One patient had multiple J-pouch-perianal fistulas, and two patients had rectovaginal fistulas. Median follow-up was ten (range, 3–24) months.

At final follow-up, 16 of 20 patients (80 percent) had successful closure of all their fistula tracts. Of the 36 individual fistula tracts, 30 (83 percent) were successfully closed and 6 (17 percent) persisted.

Successful closure was significantly associated with single fistula tracts, and failed closure was significantly associated with multiple fistula tracts ($P < 0.01$, Fisher's exact test; Table 1). All 13 patients with single fistula tracts had successful closure of their fistula tracts. Of those seven patients with multiple tracts, three patients (43 percent) had closure of all fistulas.

Six patients (30 percent) had setons in place, in a total of 11 fistula tracts, to mature the tracts before closure. Four patients (20 percent) were receiving antitumor necrosis factor therapy at the time of surgery. There was no significant correlation between successful closure and presence of setons or antitumor necrosis factor therapy (Tables 2 and 3). Fifteen patients (75 percent) had proctitis (3 of whom had strictures), seven (35 percent) had associated colitis, and three (15 percent) had small-bowel disease. Three patients (15 percent) had undergone previous proctectomy and reanastomosis, and six additional patients (30 percent) had undergone previous bowel resection (ileocolic resection, total or subtotal colectomy). There was no statistical correlation between the presence of proctitis, stricture, or anastomosis and closure rates.

DISCUSSION

Closure of Crohn's anorectal fistulas is a difficult surgical challenge. The surgical anatomy of the fistula tracts is very variable, and fistulotomy often is not an option, because it will inevitably result in incontinence. Setons are useful to prevent recurrent abscess formation, but patients experience persistent drainage from the persistent tracts.[3,6] Rectovaginal fistulas and more complex J-pouch-anal fistulas represent the most difficult technical challenges, and resection and permanent stomas often result.[2–5]

The anal fistula plug was developed to close the primary fistula opening, using a suturable, absorbable material. Surgisis® was considered a suitable material because it is bioabsorbable, has an inherent resistance to infection, and can be implanted into infected surgical fields.[10,11] The conical shape of the

Table 1.
Patients (n = 20) with Crohn's Fistulas: Impact of Single *vs.* Multiple Tracts on Closure Rates

	Fistula Closed	Fistula Open	Total
Single fistula	13[a]	0	13
Multiple fistula	3	4	7
Total	16	4	20

[a] $P < 0.01$, Fisher's exact test.

Table 2.
Impact of Setons in Individual Fistula Tracts (n = 36) on Closure Rates

	Fistula Closed	Fistula Open	Total
Seton	8	3	11
No seton	22	3	25
Total	30	6	36

$P > 0.05$, Fisher's exact test.

plug inserted in the high-pressure area of the primary opening also adds an inherent mechanical stability, which avoids displacement or extrusion of the device. The higher pressures within the anal canal tend to maintain the plug-shaped device in place in the primary opening, thus minimizing risk of displacement. Mechanical stability of the plug also relies on firmly suturing the head of the plug to the primary opening, which is optimally covered by at least submucosa, and preferably internal sphincter. It is equally important to avoid closure of the secondary opening, which may risk abscess formation. The technique of inserting a fistula plug into a Crohn's fistula is the same as in cryptoglandular cases. The key steps are suturing the head of the plug securely into the primary opening and instructing patients to avoid any strenuous activity for at least two weeks. The fistula plug is not appropriate for superficial fistulas, which are best treated with fistulotomy. These were excluded in the current study.

The current study found that 80 percent of patients with anorectal Crohn's disease had complete closure of all fistula tracts, and 83 percent of individual fistulas were closed. Patients with multiple fistula tracts had a significantly higher failure rate because of persistence of one or more tracts. This is not surprising, because these patients represent the most difficult surgical challenge in a notoriously difficult disease process. In the seven patients with multiple fistulas, all primary openings were closed with a plug, but complete closure of all tracts was accomplished in only three cases. Of the remaining four patients, 10 of the original 16 tracts were successfully closed. The remaining open fistula tracts are in the process of repeat anal fistula plug insertion, and follow-up is ongoing at the time of writing. In the current series, 15 patients had Crohn's proctitis, and 3 had strictures; however, there was no correlation between the presence of rectal disease and outcomes. Because some correlation between rectal disease activity and outcomes may reasonably be expected, this may be a Type 2 error in the current series. No patient in the series required proctectomy, and none experienced alteration in continence.

Table 3.
Patients (n = 20) with Crohn's Fistulas: Impact of Antitumor Necrosis Factor Therapy on Closure Rates

	Fistula Closed	Fistula Open	Total
Antitumor necrosis factor therapy	2	2	4
No antitumor necrosis factor therapy	14	2	16
Total	16	4	20

$P > 0.05$, Fisher's exact test.

There was no significant association between presence of setons and successful closure. Replacing a seton with an anal fistula plug is technically simpler and easier than without a seton, because the tract is previously defined, the primary opening is previously located, and the cut seton can be used to "pull" the anal fistula plug into the fistula tract. Because of the complexity of the surgical anatomy, patients with multiple fistula tracts tended to have setons more often than patients with single tracts. Therefore, the failure to demonstrate higher closure rates in patients with setons is probably the result of their liberal use in the more complex, multiple fistula tracts. No statistical association was found between antitumor necrosis factor therapy and successful fistula closure. Because of the small number of patients receiving antitumor necrosis factor therapy in the current series, no definite conclusion can be reached. Further study of the impact of setons and antitumor necrosis factor therapy is required.

No patient in the plug group developed anorectal abscess despite inserting the plugs into an obviously contaminated field. Resistance to infection has been well described in previous studies of contaminated abdominal hernia repairs.[12–14] Infection resistance is likely imparted by the bioabsorbable properties of the plug, which is repopulation by native tissue, during the course of the ensuing months. The extracellular matrix is eventually completely replaced by host tissues, thus avoiding the risks of chronic infection seen with implanted synthetic materials.

CONCLUSIONS

Closure of Crohn's anorectal fistulas with Surgisis® anal fistula plug is a promising new technology. The plug seems to be a safe and effective means of closing Crohn's anorectal fistulas and avoids the risks of anorectal incontinence. Longer-term follow-up is obviously required and is currently in progress.

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