

Healing of the perineal wound after proctectomy in Crohn's disease patients: only preoperative perineal sepsis predicts poor outcome

W. Li¹ · L. Stocchi² · F. Elagili² · R. P. Kiran³ · S. A. Strong⁴

Received: 15 February 2017 / Accepted: 30 July 2017 / Published online: 12 October 2017
© Springer International Publishing AG 2017

Abstract

Background The aim of our study was to assess perineal wound healing in patients with Crohn's disease (CD) who undergo proctectomy or proctocolectomy with end ileostomy and to evaluate the influence of various factors including types of perineal dissection on eventual wound healing.

Methods Data for patients with CD who underwent proctectomy or total proctocolectomy with end ileostomy from 1995 to 2012 were reviewed. The relationship between perineal wound healing and demographics, patient characteristics, and other factors was assessed using univariate and multivariate analyses.

Results The perineal wound healed by 12 weeks in 72 (52.9%) out of 136 patients (63.2% female, mean age 41 ± 13 years); delayed healing occurred in 35 patients (25.7%), and in 29 patients (21.3%), there was non-healing.

On multivariate analysis, the only factor associated with delayed healing and non-healing was preoperative perineal sepsis ($p = 0.001$).

Conclusions After proctectomy or proctocolectomy for CD, perineal wound healing is poor and poses a particular challenge for patients with preoperative perineal sepsis. These findings support a preoperative discussion regarding CD patients that examines potential outcomes and the consideration of measures such as the initial creation of defunctioning ostomy or control/drainage of local sepsis prior to proctectomy.

Keywords Crohn's disease · Proctectomy · Proctocolectomy · Perineal wound · Healing

Oral presentation at the Society of Surgery of Alimentary Tract (SSAT) Annual Meeting (in conjunction with DDW 2013), Orlando, Florida, May 17–21, 2013.

This study was conducted at the Cleveland Clinic.

✉ S. A. Strong
sstrong2@nm.org

¹ Department of Gastrointestinal Surgery, Guangzhou First People's Hospital, Guangzhou Medical University, Guangzhou, Guangdong, China

² Department of Colorectal Surgery, Digestive Disease and Surgery Institute, Cleveland Clinic, Cleveland, OH, USA

³ Division of Colorectal Surgery, Columbia University Medical Center, New York Presbyterian Hospital, New York, NY, USA

⁴ Division of Gastrointestinal Surgery, Digestive Health Center, 676 North Saint Clair Street, Suite 650, Chicago, IL 60611, USA

Introduction

Crohn's disease (CD) can affect any portion of the intestinal tract including the colon, ileocolon, and anoperineum, and 12–20% of patients with CD will ultimately require proctectomy with creation of a stoma for failed medical therapy or disease complications [1–6]. While the operation is intended to safely relieve debilitating symptoms and improve quality of life, impaired postoperative perineal wound healing can be a persistent problem complicating 7–40% of procedures [7]. This rate is much higher than that associated with proctectomy for other forms of benign or malignant disease [8–11], and the manifestations of impaired healing can range from superficial skin separation to a long presacral tract with an associated cavity.

Several risk factors have been inconsistently reported as predictors of impaired perineal wound healing, and these include sex, age, presence of a high fistula-in-ano, perioperative steroid usage, intraoperative contamination, and wound

management [8, 12, 13]. Different methods of perineal dissection and forms of wound closure have been employed in an effort to reduce the likelihood of impaired perineal wound healing [14, 15].

We hypothesized that several risk factors are associated with impaired perineal wound healing after proctectomy for CD, and that some of these factors can be modified. Therefore, the aims of our study were to assess perineal wound healing after proctectomy for CD and evaluate the influence of various factors on eventual healing using an institutional database and chart review.

Materials and methods

All patients with CD treated with completion proctectomy or proctocolectomy with creation of ileostomy at the Cleveland Clinic between 1995 and 2012 were identified from a prospectively maintained, institutional review board-approved CD database, corroborated by patient charts as necessary. Completion proctectomy was carried out following either a previous ileocolic or ileorectal anastomosis. None of the patients included in the present study underwent ileostomy creation prior to proctectomy or proctocolectomy. Collected data included: baseline demographics; tobacco usage; hemoglobin and serum albumin levels at the time of index surgery; steroid exposure within 1 month of index surgery; exposure to biologic medications within 3 months preceding proctectomy or proctocolectomy, preoperative presence of uncomplicated anoperineal disease, ano/rectovaginal fistula, high fistula-in-ano, or rectal disease; method of anorectal dissection (i.e., intersphincteric, extrasphincteric), and surgical management of the perineal wound (i.e., primary closure of all layers, secondary closure of skin), reoperation due to perineal wound infection or incomplete healing. The technique of perineal wound closure was left to the discretion of the operating surgeon. We also assessed whether adjunctive procedures were performed to promote wound healing, specifically negative pressure wound therapy or myocutaneous flaps either at the time of proctectomy or to treat a chronic perineal wound. Perineal sepsis was defined as bacterial invasion of the soft tissues in the anoperineal area due to anorectal abscess or fistula-in-ano, associated or not with other manifestations of CD including anal fissure/ulcer, anorectal stenosis/stricture, and skin tags. High fistula-in-ano was defined as an anal fistula having a tract directed over the top of the puborectalis muscle, with the internal opening located at the anorectal ring or cephalad to the anorectal ring in the rectum. Perineal wound healing was classified as normal healing (within 3 months), delayed healing (between 3 and 6 months), and non-healing (beyond 6 months); the non-healing group included patients with a chronic presacral sinus.

Statistical analysis

Univariate analysis was used to examine the relationships between the recorded variables and perineal wound healing (normal healing versus delayed healing combined with non-healing; presacral sinus versus non-presacral sinus). Quantitative data were expressed as mean \pm standard deviation (SD), and the associations with categorical variables were analyzed by the Fisher exact test or Chi-square test. Risk factors with a univariate p value below 0.10 were subsequently examined by multivariate analysis using forward stepwise logistic regression. A p value of < 0.05 was considered statistically significant.

Results

During the 18-year time interval, 136 patients with CD underwent proctectomy or proctocolectomy with creation of a stoma. Preoperative perineal sepsis was identified in 57 patients, 4 of whom underwent anorectal surgery before proctectomy (incision and drainage of anorectal abscesses in 2 cases, non-cutting seton drainage of anorectal fistulas in another 2 patients). Most patients underwent perineal dissection in the intersphincteric plane followed by complete primary layered closure of the entire perineal wound, while 28% ($n = 38$) had incomplete perineal wound closure without immediate approximation of their skin margins, which were left to heal by secondary intention (i.e., secondary closure of skin). No patients underwent negative pressure wound therapy or myocutaneous flap at the time of their index surgery. Seventy-two patients achieved normal healing, while 35 experienced delayed healing and 29 experienced non-healing of the perineal wound. Among the 29 patients with a non-healing wound, 9 patients developed a chronic presacral sinus (Table 1). A total of 27 patients (20%) required between 1 and 8 reoperations for perineal wound debridement. Only 1 patient was treated with gluteal thigh myocutaneous flap due to large open perineal wound, rapidly developing 6 days after total proctocolectomy and following an initial examination under anesthesia for debridement of infected and necrotic tissue. Two patients received postoperative negative pressure wound therapy. In one case, an initial examination under anesthesia was carried out following 6 months of unsuccessful nonoperative management of a non-healing perineal wound to accomplish debridement of the chronic granulation tissue followed by placement of negative pressure wound therapy 3 days after the examination under anesthesia while the patient was in the hospital. In the other case, the patient was treated with examination under anesthesia for perineal wound debridement 8 months following total proctocolectomy, at which time negative wound pressure therapy was initiated. The

Table 1 Patient characteristics and disease-related variables ($n = 136$)

Variable	Number n (%)
Age (years)*	41 ± 13
Sex: female	86 (63)
BMI (kg/m ²)*	25.3 ± 5.9
Preoperative tobacco use	65 (47)
Preoperative perineal sepsis	57 (42)
Preoperative high fistula-in-ano	11 (8)
Perineal wound closure method	
Primary closure of all layers	98 (72)
Secondary skin closure	38 (28)
Preoperative steroid use	78 (57)
Preoperative biologic use	13 (10)
Anorectal dissection technique	
Intersphincteric	126 (93)
Extrasphincteric	10 (7)
Perineal wound outcome	
Normal healing (< 3 months)	72 (53)
Delayed healing (3–6 months)	35 (26)
Non-healing (> 6 months)	29 (21)

* Data were given as; mean ± standard deviation

patient ultimately had successful elective perineal wound closure 7 months later.

Univariate analysis

Univariate analysis of the recorded variables showed that there were two factors associated with a significantly greater risk for delayed healing or a non-healing perineal wound following proctectomy for patients with CD. Firstly, the presence of preoperative perineal sepsis was associated with a significantly increased incidence of delayed healing or a non-healing perineal wound ($p = 0.001$). Secondly, surgical management of the perineal wound by leaving the skin edges open and employing packing to allow the wound to heal by secondary intention was also associated with significantly poorer perineal wound healing ($p = 0.02$).

None of the other factors, including age, sex, American Society of Anesthesiologists (ASA) class, body mass index (BMI), hemoglobin and albumin levels, comorbidities (i.e., diabetes mellitus, chronic obstructive pulmonary disease, cardiac disease), surgical procedure, preoperative tobacco usage, preoperative presence of high fistula-in-ano, preoperative steroid or biologic usage, and anorectal dissection technique during the course of proctectomy (intersphincteric vs. extrasphincteric), were associated with delayed healing or a non-healing wound (Table 2).

None of the factors examined, including age, sex, ASA class, BMI, comorbidities, surgical procedure, preoperative

tobacco usage, preoperative perineal sepsis, preoperative presence of high fistula-in-ano, preoperative steroid usage within 1 month, and anorectal dissection technique during the course of proctectomy (intersphincteric versus extrasphincteric), were associated with postoperative presacral sinus (Table 3).

Multivariate analysis

All factors associated with impaired perineal wound healing ($p < 0.10$) were included in the multivariate analysis, which identified only 1 factor independently associated with delayed healing and non-healing of the perineal wound after proctectomy, which was the presence of preoperative perineal sepsis at the time of surgery (Table 4).

Discussion

The present study emphasizes the difficulties in accomplishing healing of the perineal wound after proctectomy for CD, a unique clinical circumstance that cannot be easily compared to perineal healing after abdominoperineal resection for rectal cancer [16–18]. Some specific risk factors have been reported in previous series [8, 9, 11, 12, 19], but the most recent analysis focusing on perineal wound healing after proctectomy for CD dates from 1999 [19]. Our study therefore provides novel, comprehensive, contemporary information on this topic.

Our incidence of non-healing perineal wound of 21% is consistent with the rates reported in the literature, which vary from 14 to 50% [20, 21]. Our data did not indicate any association between perineal wound healing and sex, preoperative smoking, or preoperative steroid use, consistent with previous reports [11, 19, 22]. In addition, no significant association existed between age and perineal wound healing, similar to at least one previous report that indicated age greater than 40 years was not associated with worse rates of healing [23]. Other authors have also failed to find any association between BMI and complicated perineal wound healing, although they examined mixed populations including abdominoperineal resection for cancer [18, 24].

Our study also indicates that packing of the wound instead of primary layered perineal wound closure was associated with impaired perineal wound healing, at least on univariate analysis. The most common reason for packing the wound rather than closing all the individual layers was the preoperative presence of perineal sepsis, which may well be the primary factor for poor wound healing. The influence of individual surgeons could affect healing rates, but much of that effect is likely related to the surgical approach (e.g., method of dissection, management of perineal wound) rather than surgeon's skill.

Table 2 Univariate analysis of factors associated with significantly greater risk for perineal wound healing

Variable	Early healing, <i>n</i> (%)	Delayed healing <i>n</i> (%)	Non-healing <i>n</i> (%)	Early healing versus delayed healing or unhealed wound	
				OR (95% CI)	<i>p</i> value
Age (years)*	43 ± 12	41 ± 15	37 ± 12	1.10 (0.97–1.26)	0.14
Sex: female	47 (55)	21 (24)	18 (21)	0.83 (0.41–1.67)	0.6
ASA class				0.52 (0.16–1.69)	0.28
I, II	57 (57)	23 (23)	20 (20)		
III, IV	15 (42)	12 (33)	9 (25)		
BMI (per 5 kg/m ² increase)*	26.1 ± 6.2	22.4 ± 5.1	25.8 ± 5.3	1.35 (0.92–1.99)	0.12
Preoperative hemoglobin (g/dL)*	12.7 ± 2.0	12.9 ± 1.4	12.1 ± 2.0	1.06 (0.88–1.28)	0.53
Preoperative serum albumin (g/dL)*	4.0 ± 0.4	4.0 ± 0.6	3.9 ± 0.6	1.02 (0.90–1.14)	0.81
DM	3 (75)	0 (0)	1 (25)	2.74 (0.28–27.02)	0.62
COPD	0 (0)	0 (0)	1 (100)	N/A	0.47
Cardiac disease	6 (75)	0 (0)	2 (25)	2.82 (0.55–14.49)	0.28
Surgical procedure				0.76 (0.39–1.51)	0.44
Proctectomy	34 (57)	17 (28)	9 (15)		
Proctocolectomy	38 (50)	18 (24)	20 (26)		
Preoperative tobacco use	31 (49)	17 (27)	15 (24)	0.78 (0.39–1.53)	0.46
Preoperative perineal sepsis	20 (35)	20 (35)	17 (30)	0.28 (0.14–0.57)	0.001
Preoperative high fistula-in-ano	4 (36)	2 (18)	5 (45)	0.48 (0.13–1.72)	0.26
Secondary skin closure	14 (37)	12 (32)	12 (32)	2.49 (1.15–5.38)	0.02
Preoperative steroid use	38 (49)	20 (26)	20 (26)	0.69 (0.35–1.37)	0.29
Preoperative biologic use	8 (62)	2 (15)	3 (23)	1.47 (0.46–4.76)	0.52
Anorectal dissection technique					
Intersphincteric	68 (54)	31 (25)	27 (21)	1.76 (0.47–6.54)	0.52
Extrasphincteric	4 (40)	4 (40)	2 (20)	0.57 (0.15–2.11)	0.52

* Data were given as; mean ± standard deviation

ASA American Society of Anesthesiologists, BMI body mass index, DM diabetes mellitus, COPD chronic obstructive pulmonary disease, CI confidence interval, OR odds ratio

It is notable that in our patients no association was seen between the method of dissection and perineal wound healing, unlike previous series in which extrasphincteric dissection was significantly associated with poorer wound healing [11, 19]. This might again depend on patient selection because in those series an extrasphincteric dissection was disproportionately associated with perineal sepsis and high fistulas. In our series, an extrasphincteric dissection was infrequently employed, limiting the power of detecting such differences. This disparity is likely due to the characteristics of our institutional practice, which has traditionally used intersphincteric dissection without excision of all external openings of anorectal fistulas provided the causative internal openings are removed during the proctectomy.

The critical factor associated with delayed healing or a non-healing perineal wound in our study was the presence of preoperative perineal sepsis, which concurs with the observations of other authors [9, 20, 23]. It is possible that preoperative perineal sepsis results in more serious inflammation around the anoperineal area and poorer healing ability for

this particular tissue. A possible approach to reduce the risk of postoperative complications affecting the healing of the perineal wound could be stoma diversion prior to proctectomy. In this respect, a combined series assessing patients undergoing proctectomy from two centers for a variety of indications reported a perineal wound complication rate of 15% following proctectomy for inflammatory bowel disease [24]. The authors proposed an initial total abdominal colectomy to allow optimization of general health, nutritional status, and discontinuation of medications potentially interfering with perineal wound healing. However, it is important to note that their group with inflammatory bowel disease included a large proportion of patients (43%) with ulcerative colitis. In addition, the study excluded cases in which the perineal wound was intentionally left open to heal by secondary intention. Therefore, the specific data from this particular series are difficult to compare with the current study. Strategies to reduce the risk of perineal wound breakdown might include surgical drainage of sepsis and optimization of medical management. Patients included in the present

Table 3 Univariate analysis of factors associated with significantly greater risk for presacral sinus

Variable	Non-presacral sinus, n (%)	Presacral sinus, n (%)	OR (95% CI)	p value
Age (years)*	42 ± 13	35 ± 7.8	0.76 (0.56–1.04)	0.11
Sex: female	81 (94)	5 (6)	1.41 (0.36–5.51)	0.72
ASA class			1.19 (0.27–5.29)	0.56
I, II	90 (93)	6 (7)		
III, IV	37 (100)	3 (0)		
BMI (per 5 kg/m ² increase)*	25.46 ± 5.90	23.07 ± 6.03	0.66 (0.30–1.46)	0.3
DM	4 (100)	0 (0)	N/A	1
COPD	0 (0)	0 (0)	N/A	0.37
Cardiac disease	7 (88)	1 (13)	2.14 (0.23–19.62)	0.43
Surgical procedure			2.94 (0.59–14.72)	0.3
Proctectomy	58 (97)	2 (3)		
Proctocolectomy	69 (91)	7 (9)		
Preoperative tobacco use	57 (90)	6 (10)	2.42 (0.58–10.11)	0.3
Preoperative perineal sepsis and diseases	51 (89)	6 (11)	2.98 (0.71–12.46)	0.16
Preoperative high fistula-in-ano	9 (82)	2 (18)	3.75 (0.68–20.74)	0.16
Secondary skin closure	93 (95)	5 (5)	0.46 (0.12–1.80)	0.27
Preoperative steroid use	73 (94)	5 (6)	0.91 (0.23–3.54)	1
Anorectal dissection technique				
Intersphincteric	119 (94)	7 (6)	0.24 (0.04–1.32)	0.13
Extrasphincteric	8 (80)	2 (20)	4.25 (0.76–23.90)	0.13

* Data were given as; mean ± standard deviation

ASA American Society of Anesthesiologists, BMI body mass index, DM diabetes mellitus, COPD chronic obstructive pulmonary disease, CI confidence interval, OR odds ratio

Table 4 Multivariate analysis of factors associated with significantly greater risk for delayed or non-healing perineal wound

Variable	OR (95% CI)	p value
Preoperative perineal sepsis	3.36 (1.64–7.04)	0.001
Secondary skin closure (vs. primary closure)	2.23 (1.00–5.08)	0.051

Using forward stepwise selection of variables with $p < 0.10$

CI Confidence interval, OR odds ratio

retrospective study, conducted during a relatively long-time frame, were rarely treated with biologic medications. It is therefore possible that in the future optimal medical management might lead to improved perineal wound outcomes.

Conclusions

The perineal wound resulting from proctectomy or proctocolectomy for CD is frequently associated with poor healing and poses a particular challenge for patients with preoperative perineal sepsis. As preoperative perineal sepsis is the only independent factor associated with impaired healing,

these findings support a preoperative discussion that examines potential outcomes and the consideration of measures such as the initial creation of a defunctioning ostomy, control/drainage of local sepsis, and optimization of medical treatment prior to proctectomy in patients with CD considered to be at high risk for perineal wound problems.

Compliance with ethical standards

Conflict of interest This manuscript has been seen and approved by all authors. The authors have no conflicts of interest including relevant financial interests, activities, relationships, and affiliations.

Ethical approval All applicable ethical standards were followed in the conduct of the study and preparation of the manuscript.

Informed consent Informed consent was obtained from all individual participants included in the study.

References

1. Fry RD, Shemesh EI, Kodner IJ, Timmcke A (1989) Technique and results in the management of anal and perianal Crohn's disease. Surg Gynecol Obstet 168:42–48

2. van Dongen LM, Lubbers EJ (1986) Perianal fistulas in patients with Crohn's disease. *Arch Surg* 121:1187–1190
3. Buchmann P, Keighley MR, Allan RN, Thompson H, Alexander Williams J (1980) Natural history of perineal Crohn's disease: en year follow up: a plea for conservatism. *Am J Surg* 168:42–48
4. Williamson PR, Hellinger MD, Larach SW, Ferrara A (1995) Twenty-year review of the surgical management of perianal Crohn's disease. *Dis Colon Rectum* 38:389–392
5. Williams JG, Rothenberger DA, Nember FD, Goldberg SM (1991) Fistula in ano in Crohn's disease. Results of aggressive surgical treatment. *Dis Colon Rectum* 34:378–384
6. Basu A, Wexner SD (2002) Perianal Crohn's disease. *Curr Treat Options Gastroenterol* 5:197–206
7. Anthony JP, Mathes SJ (1990) The recalcitrant perineal wound after rectal extirpation. *Arch Surg* 125:1371–1377
8. Broader JH, Masselink BA, Oates GD, Alexander Williams J (1974) Management of the pelvic space after proctectomy. *Br J Surg* 61:94–97
9. Irvin TT, Goligher JC (1975) A controlled clinical trial of three different methods of perineal wound management following excision of the rectum. *Br J Surg* 62:287–291
10. Baudot P, Keight MR, Alexander-Williams J (1980) Perineal wound healing after proctectomy for carcinoma and inflammatory disease. *Br J Surg* 67:275–276
11. Lubbers E-JC (1982) Healing of the perineal wound after proctectomy for nonmalignant conditions. *Dis Colon Rectum* 25:351–357
12. Scammell BE, Keighley MR (1986) Delayed perineal wound healing after proctectomy for Crohn's disease. *Br J Surg* 73:150–152
13. Marks CG, Ritchie JK, Todd IP, Wadsworth J (1978) Primary suture of the perineal wound following rectal excision for inflammatory bowel disease. *Br J Surg* 65:560–564
14. Beck DE (2001) Management of anorectal Crohn's fistulas. *Clin Colon Rectal Surg* 14:117–128
15. Tompkins RG, Warshaw AL (1985) Improved management of the perineal wound after proctectomy. *Ann Surg* 202:760–765
16. Althumairi AA, Canner JK, Gearhart SL et al (2016) Risk factors for wound complications after abdominoperineal excision: analysis of the ACS NSQIP database. *Colorectal Dis* 18:0260–0266
17. Asplund D, Prytz M, Bock D, Haglund E, Angenete E (2015) Persistent perineal morbidity is common following abdominoperineal excision for rectal cancer. *Int J Colorectal Dis* 30:1563–1570
18. Musters GD, Sloothaak DA, Roodbeen S, van Geloven AA, Bemelman WA, Tanis PJ (2014) Perineal wound healing after abdominoperineal resection for rectal cancer: a two-centre experience in the era of intensified oncological treatment. *Int J Colorectal Dis* 29:1151–1157
19. Yamamoto T, Bain IM, Allan RN, Keighley MRB (1999) Persistent perineal sinus after proctocolectomy for Crohn's disease. *Dis Colon Rectum* 42:96–101
20. Corman MI, Veidenheimer MC, Coller JA, Ross VH (1978) Perineal wound healing after proctectomy for inflammatory bowel disease. *Dis Colon Rectum* 21:155–159
21. Zeitels JR, Fiddian-Green RG, Dent TL (1984) Intersphincteric proctectomy. *Surgery* 96:617
22. Bardot P, Keighley MRB, Alexander-Williams J (1980) Perineal wound healing after proctectomy for carcinoma and inflammatory disease. *Br J Surg* 67:275–276
23. De Dombal FT, Burton I, Goligher JC (1971) The early and late results of surgical treatment for Crohn's disease. *Br J Surg* 58:805
24. Bertucci Zoccali M, Biondi A, Krane M et al (2015) Risk factors for wound complications in patients undergoing primary closure of the perineal defect after total proctectomy. *Int J Colorectal Dis* 30:87–95