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D-Shape Asymmetric Excision of Sacrococcygeal Pilonidal Sinus With Primary Closure, Suction Drain, and Subcuticular Skin Closure: An Analysis of Risks Factors for Long-Term Recurrence

Luigi Brusciano, MD, PhD[1], Paolo Limongelli, MD, PhD[1], Gianmattia del Genio, MD, PhD[1], Salvatore Tolone, MD, PhD[1], Vincenzo Amoroso, MD[1], Giovanni Docimo, MD, PhD[1], and Ludovico Docimo, MD, PhD[1]

Abstract

Background. Few studies have reported long-term recurrence rates after asymmetric excision with primary closure in the treatment of sacrococcygeal pilonidal disease. *Methods*. A retrospective analysis of a prospectively maintained database of 550 surgical excisions performed for sacrococcygeal pilonidal disease between 1988 and 2005 was performed. *Results*. A total of 550 patients with a diagnosis of pilonidal sinus underwent surgical excision over a period of 17 years. Thirty-eight out of the 550 patients (3.5%) were lost at follow-up. At a mean follow up of 11.2 ± 5.3 years, median 11 years (range = 3-22), the recurrence rate was 8.9%. Actuarial 1-, 5-, 10-, and 20-year disease-free survival rates were 98%, 94%, 92%, and 83%, respectively, with a median overall disease-free survival of 10 years (95% confidence interval [CI] = 3-15). When patients were stratified according to several variables known to influence recurrence, an age of less or ≥22 years (odds ratio [OR] = 1.5, 95% CI = 0.3-7.5, *P* = .001), a family history of sinus (OR = 5.9, 95% CI = 2.7-12, *P* = .0001), and intraoperative methylene blue use (OR = 6.3, 95% CI = 1.2-31, *P* = .024) were indicated as independent predictors of disease-free survival rates. *Conclusions*. D-shape asymmetric excision and scar lateralization, with primary multilayer subcuticular closure, suction drain insertion, and skin closure in patients with sacrococcygeal pilonidal disease is a safe and adequate surgical treatment offering an effective healing rate as well as low recurrence. Several features are likely to predict a better or a worse long-term recurrence rate in patients undergoing surgery for sinus pilonidalis.

Keywords

colorectal surgery, surgical treatment sinus, asymmetric excision

Introduction

Pilonidal sinus disease (PSD) is an inflammatory condition characterized by epithelial median tracks situated in the skin of the natal cleft above the anal canal. It seems to be an acquired pathology due to penetration of a broken hair within a deep anal cleft. Such a disease is complicated by abscess, negative impact on working days, and permanent discomfort. To date, several surgical techniques have been reported in the literature with recurrence occurring even 20 years after operation.[1] Among different surgical procedures, wide excision to the level of the sacrococcygeal fascia with open wound is probably the most reported treatment, carrying a 5% to 13% recurrence rate.[2,3] On the other hand, Limberg flap and Z-plasty have been reported with lower recurrence rates, respectively, of 0%[4] and 4%.[5] Conservative treatment with small surgical operations has also been proposed.[6] Patients with recurrent PSD or complex unhealed pilonidal wounds represent a challenge for

[1]Second University of Naples, Naples, Italy

Corresponding Author:
Luigi Brusciano, XI Division of General and Obesity Surgery Master of Coloproctology, Second University of Naples, Naples, Italy.
Email: luigibrusciano@tin.it

surgeon. Tissue loss from previous attempts at excision may further complicate surgical management and limit therapeutic options. Though factors such as an unrecognized sinus at the time of initial excision and repeated infection of the scar causing abscess and intergluteal cleft anatomy have all been related to recurrence, its mechanism is still not clear. The midline scar seems to be the most susceptible to poor wound healing and recurrence of PSD.[7,8] Surgical techniques based on either asymmetric or oblique incision, such as the Karydakis flap and the Bascom procedure, have also been advocated to improve surgical results and recurrence-free survival.[9] The aim of the present study was to evaluate the long-term recurrence of PSD managed by asymmetric D-shape excision and scar lateralization,[10] with primary multilayer subcuticular closure, suction drain insertion, and skin closure, and to identify which preoperative factors can negatively influence it.

Materials and Methods

A prospective database of all patients treated for PSD between January 1988 and December 2005, at our operative unit, was reviewed. The institutional review board approved the study, and informed consent to surgical treatment was obtained from all patients preoperatively. Patients with chronic nonrecurrent disease were included in this study. The data obtained were age, gender, body mass index, duration of symptoms, past history of drainage, type of disease (primary or recurrent), postoperative complications, and duration of hospital stay.

Surgical Management

All patients were admitted to the hospital the day before surgery. The natal cleft was shaved the day before surgery. Patients underwent surgery under general or spinal anesthesia. One gram of third-generation cephalosporin was given intravenously during the induction of anesthesia. Patients were placed in the prone position with their legs apart, a rising cushion underneath their pelvis and with traction plasters on their buttocks. Legs were slightly abducted and buttocks strapped apart by adhesive tapes to well stretch the natal cleft contour. Using surgical drapes, anus was excluded from the marked operative field. An "asymmetric excision" is carried out performing a D-shape incision varying from 7 to 8 cm in length and 3 to 4 cm in width and down to the presacral fascia. The excision containing the pilonidal sinus and the surrounding affected tissue is performed down to the periosteum in the midline and gluteal fascia laterally. The surgical cavity is washed up with H_2O_2, iodopovidone, and local antibiotic, and a small size suction drain gushing out from another opening at sideways of the incision is positioned inside the "D-shape vertical section." The wound is temporarily packed until the gloves, towels, and instruments are changed.

Meticulous hemostasis is done by means of electrocautery. All specimens were examined pathologically. Wound reconstruction was performed by mattress sutures of 0 polypropylene through the epidermal, subepidermal, and presacral fascia and sutured without tension in several layers with re-absorbable stitches. Skin was sutured carefully with non-re-absorbable monofilament. Pressure ("tie-over") wound dressing was applied and removed on the third postoperative day. Patients were discharged on the second day after the operation and recommended to avoid pressure on the surgical site for 10 to 15 days postoperatively and to bathe at least 5 times per week. Suction drain was removed when fluid stopped draining.

Postoperative Evaluation

A recurrent sinus was assessed by clinical examination at the outpatient clinic by a competent observer, independent of the operating team. Early failures were not included in the overall recurrence rate because recurrence was defined when symptoms of the disease recurred after an interval following complete wound healing.

Statistical Analysis

Statistical analysis was performed on the patients who completed the postoperative evaluation using SPSS for Windows (version 17.0; SPSS, Inc, Chicago, IL). Results are expressed as mean ± standard deviation unless indicated otherwise. Overall survival was calculated from the date of operation to date of death or last follow-up. Recurrencee-free survival was calculated from the date of operation to the date of recurrence or last follow-up. Overall survival and recurrence-free survival probabilities were estimated by the Kaplan–Meier method and compared by means of the log rank test. The Cox proportional hazards model was used for multivariate analysis. $P < .05$ was considered statistically significant.

Results

A total of 550 patients underwent surgical excision of PSD over a period of 17 years. Overall, the most observed symptoms were pain in 82%, mass or swelling in 77%, and occasional discharge in 36%. The mean duration of symptoms was 25 ± 12 months. Median patients' age was 32 years (range = 16-46). Thirty-eight out of the 550 patients (3.5%) were lost at follow-up. Preoperative and postoperative data of 512 patients who completed long-term follow-up are summarized in Table 1. The median operative time was (median [range] 45 [35–58] minutes).

Table 1. Demographics and Postoperative Data in Patients Undergoing Asymmetric Excision and Long-Term Follow-Up.

Parameters	Asymmetric (N = 512)
Demographics	
Age (years)	28.1 ± 2.5
Sex ratio (male–female)	390:122
Body mass index (kg/m^2)	27 ± 5
Duration of symptoms (months)	25 ± 12
Sinus	
Single	388
Multiple	124
Type of disease	
Primary	486
Recurrent	26
Abscess drainage (≥1 procedure)	32
Postoperative data	
Operative time (minutes)	38 ± 5
Hospital stay (days)	2.2 ± 1.3
Healing (removal of stitches)	14.4 ± 1.5
Closed suction drainage	8.4 ± 1.4
Partial wound dehiscence	10

Length of hospital stay was 2.2 ± 1.3. The healing time (removal of stitches) and timing of removal of closed suction drainage was, respectively, 14.4 ± 1.5 and 8.4 ± 1.4. Partial wound dehiscence was recorded in 10 patients. Specifically, an overall high rate of wound dehiscence was observed in patients with a body mass index more than 40 (4/61, 6.5%, vs 6/451, 1.3%; $P \geq .006$). Among all patients experiencing a wound dehiscence, 7 out of 10 had undergone surgery during summertime. No malignant tissue was observed in all the analyzed specimens. Eighty-seven (20%) of the 433 patients presenting at the operation with single sinus were found with multiple sinuses. Granulation tissue was reported in all cases. Foreign body giant cells were overall seen in 81% of the patients. Hairs were found in the sinus cavity in 55% (282 patients) of all specimens. All specimens showed evidence of either an acute or a chronic inflammation.

Long-Term Outcome

Postoperative follow-up to assess recurrence rates was completed in 512 patients. In the remaining patients, this was not accomplished because of an untraceable address or phone number, some patients being abroad, or unrelated death. At a mean follow-up of 11.2 ± 5.3 years, median 11 years (range = 3-22), recurrence rate was 8.9%. About 19% of recurrences after surgery occurred within the first postoperative year. Actuarial 1-, 5-, 10-, and 20-year recurrence-free survival rates after asymmetric excision were 98%, 94%, 92%, and 83%, respectively, with a median overall disease-free survival of 10 years

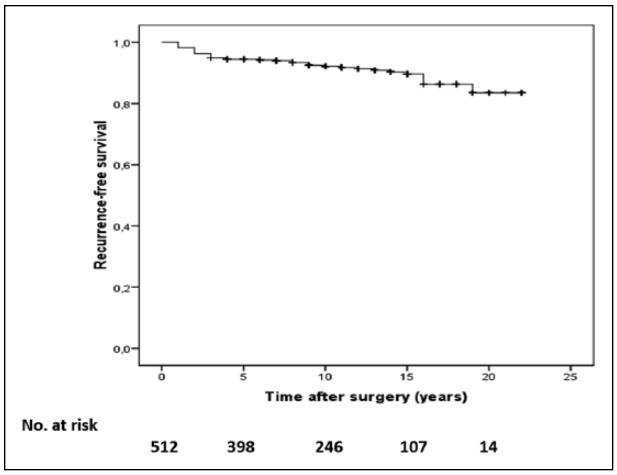

Figure 1. Recurrence-free survival rates after asymmetric excision in patients with sacrococcygeal pilonidal disease.

(95% CI = 3-15) (Figure 2). When patients were stratified according to several variables known to influence recurrence (Tables 2), an age of less or ≥22 years (OR = 1.5, 95% CI = 0.3-7.5, $P = .001$), a family history of sinus (OR = 5.9, 95% CI = 2.7-12, $P = .0001$), and intraoperative methylene blue use (OR = 6.3, 95% CI = 1.2-31, $P = .024$) were indicated as independent predictors of disease-free survival rates (Table 2).

Discussion

Sacrococcygeal pilonidal disease affects mainly young adults after puberty and occurs predominantly in males. There are 2 different pathogenetic theories, congenital and acquired,[11-13] but nowadays the acquired theory has gained general acceptance. Bascom suggested that a cyst evolves from ruptured infected hair follicles,[14] whereas Karydakis[15] reported hair penetration is concomitantly due to forced loose hair insertion through vulnerable skin at the depths of the natal cleft. It is generally agreed that treatment of choice for PSD should warrant quick wound healing, short hospital stay and time off work, as well as low recurrence rate,[16] but a common basis for treatment is still lacking.[17] Wide local excision with primary closure has been advocated by some authors because of shorter healing time, but it is associated with an increased incidence of recurrent disease likely due to midline scar.[18] Skin flaps to cover a sacral defect after wide excision have also been described; rhomboid flap technique involves creation of a flap to achieve primary closure and obliterate the deep natal cleft. This technique was initially reserved for complex or recurrent PSD not responding to simple conservative operative techniques, but subsequently recommended as first-line management for all types of chronic

Table 2. Follow-Up Period and Recurrence Rate in Patients Undergoing Asymmetric Excision.

	Recurrence-Free Survival (%)						
Variables	5 Years	10 Years	15 Years	20 Years	*P* (Univariate)	*P* (Multivariate)	OR (95% CI)
Age (years)							
<22 (A, n = 311)	91	89	86	77	.001	.619	1.5 (0.3-7.5)
≥22 (A, n = 201)	98	96	94	92			
Family history							
No (A, n = 408)	94	92	90	87	.049	.0001	5.9 (2.7-12)
Yes (A, n = 103)	95	89	85	57			
Body mass index							
<25 (A, n = 268)	93	91	87	87	.422		
≥25 (A, n = 244)	95	93	92	78			
Methylene blue							
No (A, n = 304)	91	88	85	77	.0001	.024	6.3 (1.2-31)
Yes (A, n = 208)	99	98	96	92			
Epilation							
No (A, n = 305)	93	91	88	85	.611		
Yes (A, n = 207)	95	92	89	80			

Abbreviation: OR, odds ratio; CI, confidence interval.

PSD.[19-21] Other authors reported a limited excision technique for noninfected PSD known as sinusectomy, performed on an outpatient basis, under local anesthesia with low morbidity and recurrence rate (5%), short time off work, but a median wound healing time of 5 weeks.[22] A previous study reported trephine technique as a new minimally invasive and simple outpatient procedure, associated with low morbidity, quick recovery, appealing aesthetic outcome, and low sinus recurrence rates.[23] Asymmetric excision of the sinus was first described by Karydakis as an eccentric elliptical incision with a flap mobilization from the medial side of wound and closure to one side of the midline. This technique keeps the incision away from the natal cleft, previously flattened to reduce buttock friction.[24]

The most difficult complication after surgery for PSD is a persistently nonhealing midline wound following laying open or excision of the primary disease. In June 1988, we introduced an asymmetric excision in our clinical practice, by adding some minor modifications. The concept of asymmetric excision was first developed by Karydakis where the sinus is excised using an eccentric elliptical incision, a flap mobilized from the medial side of wound and closure is to one side of midline. This technique allows surgeons to keep incision away from the natal cleft previously flattened to reduce buttock friction. Akinci and coworkers reported low collection rate with a modified Karydakis technique using a suction rather than Penrose drain for 2 to 3 days followed by skin subcuticular closure.[25] The latter was performed to avoid a number of needle holes in the natal cleft and reduce the likelihood of early hair insertion and postoperative recurrence. In this study, a subcuticular skin closure was employed to remove the vulnerable raphe and avoid any dead space. A skin suture was performed with very close stitches to improve suction drainage and without turning edges inward to avoid growth of hair inside the wound. Such combination of asymmetric excision, suction drains, and primary multilayer closure was an effective surgical approach to treating PSD with acceptable healing time and low rate of partial wound dehiscence. Patients had a low overall recurrence when compared to literature.[26] Recurrence rates were influenced by different features previously reported in association with worse recurrence-free survival rates.[27,28] In this study, younger patients (age < 22 years) without a family history of sinus and, those in whom intraoperative methylene blue was injected, still retained significantly better recurrence rates. Previously, Doll and coworkers showed that most sinuses were likely to arise around the age of adolescence deemed as the most vulnerable phase.[29] Patients are then more likely to be susceptible to sinus formation in their early period of life than later on. On the other hand, it has been reported that intraoperative methylene blue use is a rapid, harmless, and low-cost surgical step of sinus excision. It is conceivable, and the authors support its application in the standard surgical procedure since it is able to halve the long-term risk of disease recurrence. The present study had several limitations. Recurrence was evaluated only in relation to the type of sinus but was not correlated to the size of disease area. It is recognized that the larger areas of disease

containing more pits are deemed the most difficult to address. Another drawback is that some surgeon-related factors might have influenced the outcome, being the most senior surgeon to perform most of the sinus excisions. It is clear better results are most likely achieved by a surgeon having more expertise and who can also obtain a surge in patient volume. Finally, this is a large but single tertiary referral center study and does not allow determination of the long-term outcome in nonreferral hospitals.

In conclusion, D-shape asymmetric excision and scar lateralization, with primary multilayer subcuticular closure, suction drain insertion, and skin closure in patients with PSD, is a safe and adequate surgical treatment offering an effective healing rate as well as low recurrence. Several features are able to predict a better or a worse long-term recurrence rate in patients undergoing surgery for sinus pilonidalis.

Authors' Note

Brusciano and Limongelli contributed equally to this work.

Declaration of Conflicting Interests

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References

1. Allen-Mersh TG. Pilonidal sinus: finding the right track for treatment. *Br J Surg*. 1990;77:123-132.
2. Spivak H, Brooks VL, Nussbaum M, Friedman I. Treatment of chronic pilonidal disease. *Dis Colon Rectum*. 1996;39:1136-1139.
3. Sondenaa K, Nesvik I, Andersen E, Soreide JA. Recurrent pilonidal sinus after excision with closed or open treatment: final result of a randomised trial. *Eur J Surg*. 1996;162: 237-240.
4. Akca T, Colak T, Ustunsoy B, Kanik A, Aydin S. Randomized clinical trial comparing primary closure with the Limberg flap in the treatment of primary sacrococcygeal pilonidal disease. *Br J Surg*. 2005;92: 1081-1084.
5. Fazeli MS, Adel MG, Lebaschi AH. Comparison of outcomes in Z-plasty and delayed healing by secondary intention of the wound after excision of the sacral pilonidal sinus: results of a randomized, clinical trial. *Dis Colon Rectum*. 2006;49:1831-1836.
6. Soll C, Hahnloser D, Dindo D, Clavien PA, Hetzer F. A novel approach for treatment of sacrococcygeal pilonidal sinus: less is more. *Int J Colorectal Dis*. 2008;32: 177-180.
7. Trent JT, Kirsner RS. Wounds and malignancy. *Adv Skin Wound Care*. 2003;16:31-34.
8. Solla JA, Rothenberger DA. Chronic pilonidal disease. An assessment of 150 cases. *Dis Colon Rectum*. 1990;33: 758-761.
9. Petersen S, Koch R, Stelzner S, Wendlandt TP, Ludwig K. Primary closure techniques in chronic pilonidal sinus: a survey of the results of different surgical approaches. *Dis Colon Rectum*. 2002;45:1458-1467.
10. Docimo L, Pacifico F, Guida G, Docimo G, Sparavigna L, Papagno P. La lateralizzazione della cicatrice nel trattamento chirurgico del sinus pilonidalis. *Chirurgia*. 1998;11:239-244.
11. Karydakis GE. The etiology of pilonidal sinus. *Hellenic Arm Forc Med Rev*. 1975;7:411-416.
12. Karydakis GE. New approach to the problem of pilonidal sinus. *Lancet*. 1973;2:1414-1415.
13. Karydakis GE. The problem of pilonidal sinus in the Greek Army. *Hellenic Arm Forc Med Rev*. 1973;7:512-520.
14. Bascom J. Pilonidal disease: long-term results of follicle removal. *Dis Colon Rectum*. 1983;26:800-807.
15. Karydakis GE. Easy and successful treatment of pilonidal sinus after explanation of its causative process. *Aust N Z J Surg*. 1992;62:385-389.
16. Sharma PP. Multiple Z-plasty in pilonidal sinus a new technique under local anesthesia. *World J Surg*. 2006;30: 2261-2265.
17. Chintapatla S, Safarani N, Kumar S, Haboubi N. Sacrococcygeal pilonidal sinus: historical review, pathological insight and surgical options. *Tech Coloproctol*. 2003;7:3-8.
18. Anyanwu AC, Hossain S, Williams A. Karydakis operation for sacrococcygeal pilonidal sinusdisease: experience in a district general hospital. *Ann R Coll Surg Engl*. 1998;80:197-199.
19. Lodhi FB, Ijaz S, Shafio M. Pilonidal sinus: use of Limberg flap in the treatment. *Prof Med J*. 2006;13:435-439.
20. Eryilmaz R, Sahin M, Alimoglu O. Surgical treatment of sacrococcygeal pilonidal sinus with the Limberg transposition flap. *Curr Surg*. 2005;62:387-390.
21. Abu Galala KH, Salam IM, Abu Samaan KR. Treatment of pilonidal sinus by primary closure with a transposedrhomboid flap compared with deep suturing: a prospective randomized clinical trial. *Eur J Surg*. 1999;165:468-472.
22. Soll C, Dindo D, Steinemann D, Hauffe T, Clavien PA, Hahnloser D. Sinusectomy for primary pilonidal sinus: less is more. *Surgery*. 2011;150:996-1001.
23. Gips M, Melki Y, Salem L, Weil R, Sulkes J. Minimal surgery for pilonidal disease using trephines: description of a new technique and long term outcomes in 1,358 patients. *Dis Colon Rectum*. 2008;51:1656-1662.
24. Doll D, Krueger CM, Schrank S, Dettmann H, Petersen S, Duesel W. Timeline of recurrence after primary and secondary pilonidal sinus surgery. *Dis Colon Rectum*. 2007;50:1928-1934.
25. Akinci OF, Coskun A, Uzunkoy A. Simple and effective surgical treatment of pilonidal sinus asymmetric excision and primary closure using suction drain and subcuticular skin closure. *Dis Colon Rectum*. 2000;43:701-706.

26. Limongelli P, Brusciano L, Di Stazio C, et al. D-shape asymmetric and symmetric excision with primary closure in the treatment of sacrococcygeal pilonidal disease [published online October 8, 2013]. *Am J Surg*. doi:10.1016/j.amjsurg.2013.06.013.
27. Doll D, Novotny A, Rothe R, et al. Methylene blue halves the long-term recurrence rate in acute pilonidal sinus disease. *Int J Colorectal Dis*. 2008;23:181-187.
28. Doll D, Matevossian E, Wietelmann K, Evers T, Kriner M, Petersen S. Family history of pilonidal sinus predisposes to earlier onset of disease and a 50% long-term recurrence rate. *Dis Colon Rectum*. 2009;52:1610-1615.
29. Doll D, Friederichs J, Dettmann H, Boulesteix AL, Duesel W, Petersen S. Time and rate of sinus formation in pilonidal sinus disease. *Int J Colorectal Dis*. 2007;23:359-364.