



## Original Research

## Minimally invasive surgery for the treatment of pilonidal disease. The Gips procedure on 2347 patients



Angelo Di Castro <sup>a</sup>, Francesco Guerra <sup>b,\*</sup>, Giovanni Battista Levi Sandri <sup>a</sup>,  
Giuseppe Maria Ettorre <sup>a</sup>

<sup>a</sup> Division of General Surgery and Liver Transplantation, San Camillo Hospital, Rome, Italy

<sup>b</sup> Division of Oncological and Robotic General Surgery, Careggi University Hospital, Florence, Italy

## HIGHLIGHTS

- According to its acquired pathogenesis, a number of minimally invasive procedures have been proposed over the last decade to treat pilonidal disease.
- Although not widely used, sinusectomy has shown encouraging results in a few reports worldwide.
- On a large series of consecutive patients, our experience confirms sinusectomy as a safe and effective procedure for both primary and recurrent pilonidal disease.
- Sinusectomy combines the well-known advantages of a less invasive technique while assuring limited rates of complications and recurrence.

## ARTICLE INFO

## Article history:

Received 15 September 2016

Received in revised form

6 October 2016

Accepted 26 October 2016

Available online 29 October 2016

## Keywords:

Pilonidal disease

Trephines

Minimally invasive surgery

## ABSTRACT

**Background:** Pilonidal disease is a quite common chronic inflammatory disease that causes discomfort, embarrassment and absence from work or school. In line with its acquired pathogenesis, a number of surgical alternatives to conventional *en bloc* excision have been proposed over the last decades, yielding encouraging results. We reviewed our experience with minimally invasive sinusectomy to evaluate its safety and efficacy.

**Methods:** this study was a review of a prospectively maintained database of consecutive patients over a 7-year period. From November 2009 to December 2015, 2347 patients with pilonidal disease were operated on using the Gips procedure. Patients received surgery as a day-case procedure under local anesthesia. Operative and perioperative data were examined.

**Results:** there were 1714 men (73%) and 633 women (27%) in the study; the median age was 19 years. Recurrent diseases in patients who had previously undergone surgery elsewhere composed 61% of cases. Globally, 102 cases of clinically relevant postoperative complication occurred (4.3%). At a median follow up of 16 months, the recurrence rate was 5.8%. The treatment of recurrent disease did not correlate to increased recurrence rate following sinusectomy. Recurrent patients were more likely to be male and have delayed wound healing.

**Conclusions:** the Gips procedure for the treatment of pilonidal disease is safe and feasible. It has a low complication and recurrence rate, early return to daily activities and offers a good cosmetic result.

© 2016 IJS Publishing Group Ltd. Published by Elsevier Ltd. All rights reserved.

## 1. Introduction

In accordance with its acquired foreign body pathogenesis [1,2], pilonidal disease (PD) should be essentially managed with complete removal of the pits, fibrous tracts, debris and remaining hairs

[3–5].

Nonetheless, conventional excision down to the sacral fascia with or without midline or asymmetrical closure is still the most performed procedure worldwide [6–8]. This surgery often requires general anesthesia and long periods of postoperative care that are connected with considerable impact on public health. In addition, it is associated with a notable recurrence rate and a cosmetic result that notoriously can be devastating [4,7].

Over the last years, a dramatic shift toward managing patients

\* Corresponding author. Via dei Sabelli, 211, 00185, Rome, Italy.

E-mail address: [fra.guerra.mail@gmail.com](mailto:fra.guerra.mail@gmail.com) (F. Guerra).

with PD in an outpatient setting has been observed. Indeed, a number of less invasive techniques have been proposed over the last decades with the aim of avoiding wide extirpations, and several recent review analyses have observed substantive data in favor of more limited resections [4,9] and off-midline closure [4,7,10] as compared with conventional excisional surgery. In 2008, an innovative minimally surgical technique for PD has been introduced by Gips and colleagues who reported on a large consecutive series including more than 1300 patients [3]. The procedure involves the extirpation of pilonidal pits together with underlying fistulous tracts and hair debris through the use of skin trephines. As stated in the original article, the procedure combines the principles of a minimally invasive method proposed by Lord and Millar [11] and the individual excision of midline openings proposed by Bascom [12].

In their report, the authors described a very limited rate of postoperative complications, an early return to daily activities and a significantly low rate of disease recurrence, being the evaluation of most patients of up to ten years after surgery. Despite these excellent surgical outcomes and the associated good cosmetic result, the intervening years have seen the procedure failing to obtain diffuse acceptance in clinical practice, with only scarce data having been reported so far [3,5,13].

Herein we present our experience with the Gips procedure (GP).

## 2. Materials and methods

Over a 7-year time frame, 2347 consecutive, unselected patients with primary or recurrent PD received surgery. There were no exclusion criteria or contraindication to the minimally invasive technique apart from patient refusal to provide consent for the technique. A procedure-specific informed consent was obtained by each patient.

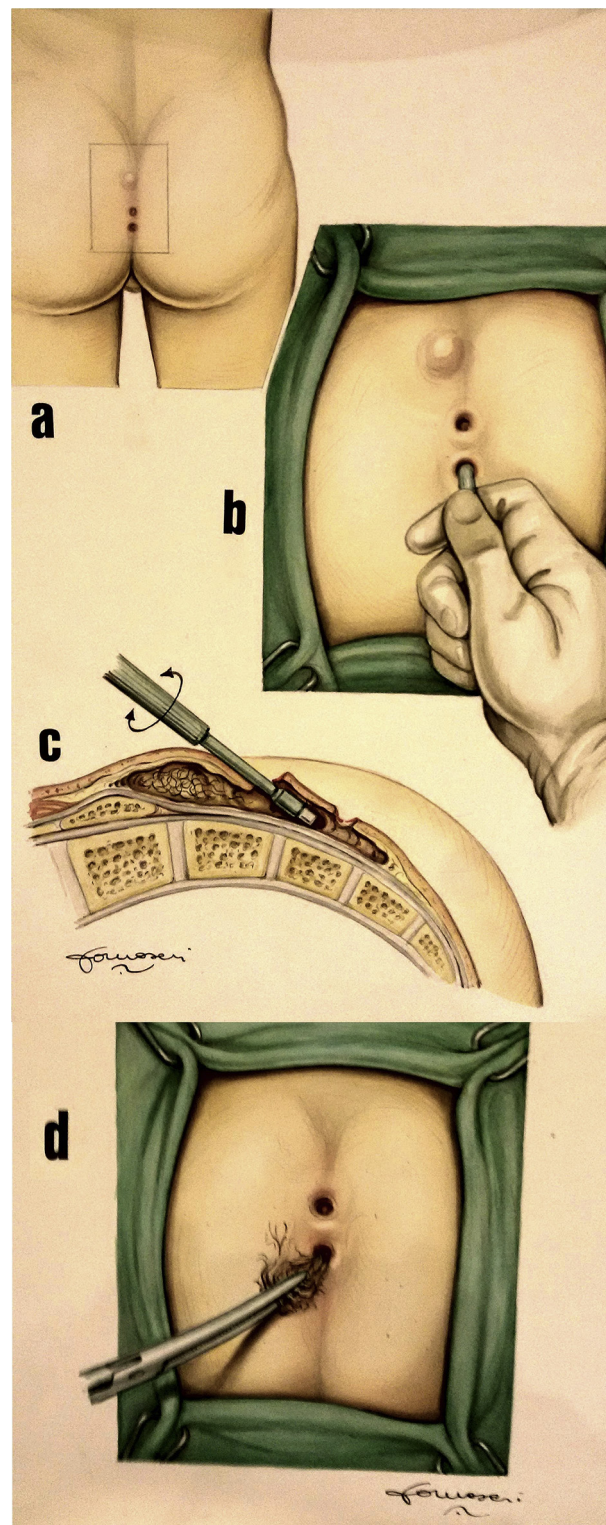
### 2.1. Surgical approach

All procedures were performed by the same expert surgeon (ADC) at two different Institutions (a tertiary Hospital and a private medical clinic), which serve as a referral center for minimally invasive surgery for primary and recurrent PD. All patients were scheduled for day-case surgery.

The patient is placed in the prone position, with buttocks gently taped apart exposing the disease. No antibiotic prophylaxis was used routinely during surgery. After skin preparation, local anesthesia is administered. Each fistulous opening is next probed to assess depth and direction of underlying tracts (Fig. 1 a, b). All visible median pits and lateral fistulous skin openings are thus excised by using skin trephines of various diameters (Fig. 1c). Once the pilonidal cavity is reached, attention is directed to remove all residual underlying diseased tissues through all available accesses made (Fig. 1d).

Trephines skin openings are left open. A light gauze bandage is eventually applied with a minimum of tape and skin traction. Patients were thus kept in the supine position during a 1–2 h clinical observation before discharge. A very limited number of patients with complicate and wide disease underwent a 2-step procedure to ensure radical surgery.

In the postoperative period, no regular medication is recommended and daily routine activities are allowed. The patients are encouraged to sleep in the supine position and wash with running water the sacrococcygeal region several times a day. Postoperative regular epilation of the sacrococcygeal area was also recommended to all patients. All patients were routinely followed by the same surgical group on a weekly interval basis until complete wound healing.



**Fig. 1.** Each median pit and fistulous lateral opening is probed to assess direction and depth of underlying tracts (a, b). Excision is thus performed using trephines of various diameters (c). Through all available accesses, all diseased tissues are extirpated (d).

Surgical outcomes such as median hospitalization time, median time to resume patient's normal activities, median time to complete wound healing, complications and recurrence rate were investigated as main outcomes and registered. All parameters,

including recurrence rate, were recorded according to the latest follow up available.

## 2.2. Statistical analysis

Statistical analysis was performed using the Statistical Package for the Social Sciences v 20.0 (SPSS Inc., Chicago, IL, US). Data are presented in descriptive statistics. To determine whether categorical variables were statistically different between independent samples, the Z-test for proportions was used. Statistical significance was set at the two-tailed 0.05 probability level.

## 3. Results

During the period between November 2009 and December 2015, 2347 patients of median age 19 (range 13–65) years underwent surgery. Of these, 1714 patients (73%) were male. 1443 patients (61%) had previous abscess drainage or recurrent disease at presentation and had previously undergone surgery elsewhere, with the median time interval for referral to our center from the patient's original surgery being 13 (0–27) months.

9 patients with complicate disease (whereby 7 with recurrent disease) underwent a planned 2-step procedure to achieve radical extirpation. The median operative time was 28 min (range 21–75). The median hospital stay was 6 (2–36) hours, while the median time to daily activities was 1 day (range 0–16), with 77% of patients being able to resume work or school activities within 2 days after surgery. Overall, 63% of patients reported no need for analgesics consumption following surgery.

A total of 102 patients (4.3%) experienced postoperative complication, whereby 66 patients had postoperative bleeding. Five patients who presented postoperative bleeding required surgical hemostasis, whereas the remaining patients were successfully managed with external compression alone. Other minor complications included 19 wound infections, 27 cases of prolonged postoperative analgesics consumption (intended as the need for oral analgesics assumption exceeding the first week after surgery) and three cases of reduced sensation near the operation site.

The median time to complete wounds healing was 4 weeks (1–21). Delayed wound healing, intended as a complete healing process lasting more than 8 weeks, was experienced by a total of 329 patients (14%). Patient characteristics and surgical outcomes are summarized in Table 1.

On total, at a median follow-up of 16 (range 1–55) months, 137 patients had recurrent disease (5.8%). Of these, 43 patients (31%) with early recurrence received further sinusectomy via the same method within the first year following surgery. The group of patients who had recurrence was compared to the non-recurrent group to investigate possible differences. There was not

statistically significant difference on recurrence rate between patients who received surgery for primary (58) or recurrent/complicated (78) disease ( $Z = 1.12, p = 0.28$ ). Contrariwise, in the recurrent group, the percentage of male patients and that of patients who had delayed wound healing following sinusectomy were statistically different as compared to the non-recurrent group ( $Z = 3.18, p < 0.02$  and  $Z = -5.02, p < 0.01$ , respectively). Detailed data on recurrences are given in Table 2.

## 4. Discussion

The current inherent literature fails to provide reliable data to draw definitive conclusions on which surgery can be considered the option of choice to treat pilonidal disease [4,9,10,14]. Although randomized controlled trials in pilonidal surgery are limited [15–19], less invasive techniques have so far compared favorably to conventional excision with midline closure both in terms of surgical and cosmetic outcome [4,9,13,15,17]. Indeed, in previous reports, the rate of disease recurrence after conventional extirpation ranges from 0% to 41% (also depending on follow-up periods) [4,16,19–22], and between 6% and 16% following other so-called minimally invasive surgeries [3,4,17,19,23]. Similarly, overall morbidity ordinarily ranges between 5% and 49% and between 4% and 14% for conventional [4,16,19–22] and minimally invasive surgery [3,4,17,19,23], respectively. At this regard, our data, which are basically consistent with those reported in the literature regarding sinusectomy [3,13,17,23], compare favorably with those associated to both conventional excision and less invasive techniques.

For the treatment of both primary and recurrent, complicated PDs, several reports have yielded excellent results with the use of lateral or asymmetrical incisions with the aim of keeping skin closures out of the natal cleft, thus avoiding a midline wound [9,14,16,18,19,21,22]. Nevertheless, these procedures ordinarily require too extensive dissections for a day-case surgery setting. Again, the GP can be used in the setting of recurrent pilonidal disease or complex, unhealed pilonidal wounds (Fig. 2), which together composed more than a half of our patients. Notably, the patients who experienced recurrence following our procedure were not more likely to be those with recurrent or complicated diseases at presentation.

Ideally, the optimal treatment modality for pilonidal disease should be easy to perform, have limited complication and recurrence rates and fast return to daily activities [4,10,19]. The GP, and generally sinusectomy has shown to respond effectively to these demands [3,13,17,23] while providing good cosmetic results through a relatively simple procedure at limited costs. Indeed, although a specific cost-analysis has not been performed, is likely that the use of local anesthesia, the fact that the procedure can be easily performed as a day-case surgery, and the early resume of daily activities provide a global advantage over other surgeries [4,17,19,23].

Our results confirm these data in a large series including both primary and recurrent pilonidal disease. Our study has several limitations, essentially due to its retrospective nature and the absence of a control group. Despite this, our data were gathered

**Table 1**  
Patient characteristics and surgical outcomes.

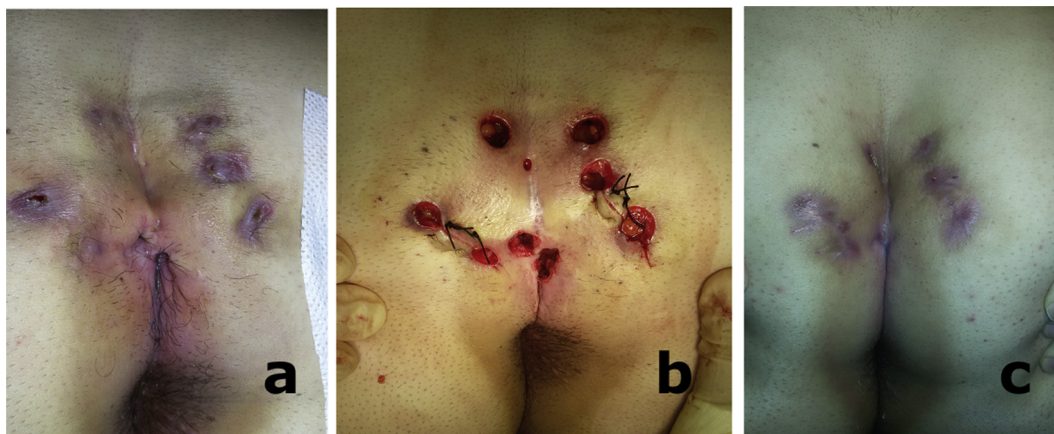
Total patients	2347
Males	1714 (73%)
Median age	19 years (range 13–65)
Previous procedures	1443 (61%)
Median time from previous procedure	13 months (0–27)
Postoperative complications	102 (4.3%)
Bleeding	66 (5 requiring surgical hemostasis)
Prolonged analgesic assumption	27
Wound infection	19
Reduced local sensation	3
Median hospital stay	6 h (range 2–36)
Median time to daily activities	1 (range 0–16)
Median time to wound healing	4 weeks (range 1–21)
Delayed wound healing	329 (14%)

**Table 2**  
Pattern of recurrences at a median follow up of 16 months (range 1–55).

	No recurrence	Recurrence	Total	p
Total patients	2210	137	2347	—
Delayed healing	290	39	329	<0.01*
Previous procedures	1365	78	1443	0.25
Male patients	1630	84	1714	<0.02*

\* Statistically significant.





**Fig. 2.** A case of complex, recurrent pilonidal disease at presentation (a), in the immediate postoperative (b) and about 1,5 months after surgery (c).

from a prospective database that covers a wide period including one of the largest available numbers of pilonidal surgeries [3,4,9,13,17,24]. A further limitation to the strength of our data lays in the fact that we present a relatively limited follow up interval that ranges between 1 and 55 months (median 16 months). Nonetheless, there is some evidence that about 70% of recurrences are experienced during the first two years after surgery for primary pilonidal disease. Moreover the interval between surgery and recurrence seems to be even lower for recurrent disease, which represents the majority of our series. Indeed, the percentage of recurrences within two years rises to nearly 75% and 95% following second and third surgery, respectively; being 1.4 and 1.1 years the median interval to recurrence [25].

## 5. Conclusions

In summary, the GP provides the benefits of minimally invasive surgery (i.e.: less postoperative pain and discomfort, faster return to work or school and shorter hospital stay) without compromising recurrence and complications rates. The GP may thus represent a valid option of treating PD.

## Disclosure

All the aforementioned authors declare no competing commercial, personal, political, intellectual, or religious conflict of interests in relation to the present work. No grant or other financial support has been received for the drawing up of the present paper.

## Ethics approval

All procedures were in accordance with the ethical standards of the institutional and national research committee and with the Helsinki Declaration and its later amendments or comparable ethical standards.

## Acknowledgements

The Authors are thankful for the excellent illustrations provided by Dr Fornasari.

## References

- [1] Hardaway RM Pilonidal cyst neither pilonidal nor cyst. *Arch. Surg.* 958;76: 143–147.
- [2] D.H. Patey, R.W. Scarff, Pathology of postanal pilonidal sinus; its bearing on

- treatment, *Lancet* 2 (1946) 484–486.
- [3] M. Gips, Y. Melki, L. Salem, R. Weil, J. Sulkes, Minimal surgery for pilonidal disease using trephines: description of a new technique and long-term outcomes in 1,358 patients, *Dis. Colon Rectum* 51 (2008) 1656–1662.
- [4] F. Guerra, G. Giuliani, S. Amore Bonapasta, D. Coletta, F. La Torre, Cleft lift versus standard excision with primary midline closure for the treatment of pilonidal disease. A snapshot of worldwide current practice, *Eur. Surg.* 48 (2016) 269–272, <http://dx.doi.org/10.1007/s10353-015-0375-z>.
- [5] D. Doll, Minimal surgery for pilonidal disease using trephines: description of a new technique and long-term outcomes in 1,358 patients. Invited commentary, *Dis. Colon Rectum* 51 (2008) 1662–1663.
- [6] I.J. McCallum, P.M. King, J. Bruce, Healing by primary closure versus open healing after surgery for pilonidal sinus: systematic review and meta-analysis, *BMJ* 336 (2008) 868–871.
- [7] M.R. Thompson, A. Senapati, P. Kitchen, Simple day-case surgery for pilonidal sinus disease, *Br. J. Surg.* 98 (2011) 198–209.
- [8] A. Senapati, N.P. Cripps, K. Flashman, M.R. Thompson, Cleft closure for the treatment of pilonidal sinus disease, *Colorectal Dis.* 13 (2011) 333–336.
- [9] J.M. Enriquez-Navascues, J.I. Emparanza, M. Alkorta, C. Placer, Meta-analysis of randomized controlled trials comparing different techniques with primary closure of chronic pilonidal sinus, *Tech. Coloproctol.* 18 (2014) 863–872.
- [10] A. Al-Khamis, I. McCallum, P.M. King, J. Bruce, Healing by primary versus secondary intention after surgical treatment for pilonidal sinus, *Cochrane Database Syst. Rev.* 1 (2010) CD006213.
- [11] P.H. Lord, D.M. Millar, Pilonidal sinus: a simple treatment, *Br. J. Surg.* 52 (1965) 298–300.
- [12] J. Bascom, Pilonidal disease: origin from follicles of hairs and results of follicle removal as treatment, *Surgery* 87 (1980), 567–72. 9.
- [13] T. Levinson, T. Sela, S. Chencinski, E. Derazne, D. Tzur, H. Elad, Y. Kreiss, Pilonidal sinus disease: a 10-year review reveals occupational risk factors and the superiority of the minimal surgery trephine technique, *Mil. Med.* 181 (2016) 389–394.
- [14] S.R. Steele, B.W. Perry, S. Mills, W.D. Buie, Practice parameters for the management of pilonidal disease, *Dis. Colon Rectum* 56 (2013) 1021–1027.
- [15] I. Iesalnieks, A. Ommer, S. Petersen, D. Doll, A. Herold, German national guideline on the management of pilonidal disease, *Langenbecks Arch. Surg.* 401 (2016) 599–609.
- [16] S.A. Käser, R. Zengaffinen, M. Uhlmann, C. Glaser, C.A. Maurer, Primary wound closure with a Limberg flap vs. secondary wound healing after excision of a pilonidal sinus: a multicentre randomised controlled study, *Int. J. Colorectal Dis.* 30 (2015) 97–103.
- [17] M. Milone, L.M. Fernandez, M. Musella, F. Milone, Safety and efficacy of minimally invasive video-assisted ablation of pilonidal sinus: a randomized clinical trial, *JAMA Surg.* 151 (2016) 547–553.
- [18] A. Guner, A. Boz, O.F. Ozkan, O. Illeli, C. Kece, E. Reis, Limberg flap versus Bascom cleft lift techniques for sacrococcygeal pilonidal sinus: prospective, randomized trial, *World J. Surg.* 37 (2013) 2074–2080.
- [19] B. Sevinç, Ö. Karahan, A. Okuş, S. Ay, N. Aksoy, G. Şimşek, Randomized prospective comparison of midline and off-midline closure techniques in pilonidal sinus surgery, *Surgery* 159 (2016) 749–754.
- [20] Y. Oram, F. Kahraman, Y. Karıncaoğlu, E. Koyuncu, Evaluation of 60 patients with pilonidal sinus treated with laser epilation after surgery, *Dermatol Surg.* 36 (2010) 88–91.
- [21] T. Karaca, O. Yoldaş, B.Ç. Bilgin, S. Ozer, S. Yoldaş, N.G. Karaca, Comparison of short-term results of modified Karydakias flap and modified Limberg flap for pilonidal sinus surgery, *Int. J. Surg.* 10 (2012) 601–606.
- [22] A. Tavassoli, S. Noorshafie, R. Nazarzadeh, Comparison of excision with primary repair versus Limberg flap, *Int. J. Surg.* 9 (2011) 343–346.
- [23] C. Soll, D. Dindo, D. Steinemann, T. Hauffe, P.A. Clavien, D. Hahnloser,

- Sinusectomy for primary pilonidal sinus: less is more, *Surgery* 150 (2011) 996–1001.
- [24] S. Petersen, K. Wietelmann, T. Evers, N. Hüser, E. Matevossian, D. Doll, Long-term effects of postoperative razor epilation in pilonidal sinus disease, *Dis. Colon Rectum* 52 (2009) 131–134.
- [25] D. Doll, C.M. Krueger, S. Schrank, H. Dettmann, S. Petersen, W. Duesel, Timeline of recurrence after primary and secondary pilonidal sinus surgery, *Dis. Colon Rectum* 50 (2007) 1928–1934.