



The Use of Paraspinal Transposition Flap for Recurrent Pilonidal Sinus, a New Histological Basis for Management of Pilonidal Sinus Disease

Ahmed Farag¹ · Sahar EMM Nasr¹ · Amal A. Farag¹ · Mohamed Yehia Elbarmelgi¹ 

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Abstract

The ability of the pilonidal sinuses to spread laterally into both gluteal regions, governed by the skin vulnerability, raises the theoretical probability of a similar skin characteristic of the donor site from which most of the flaps used for repair of the PNS are taken. The present study aimed at a clinical outcome and histologic study of the use of paraspinal transposition flap for treatment of recurrent pilonidal sinus disease. This was a prospective clinical study that enrolled all patients who presented to our General Surgery Clinic, Kasralainy Hospital, Cairo University, with recurrent pilonidal sinus in the period from July 2007 till August 2017. They underwent excision of their pilonidal sinus and the use of paraspinal transposition flap to cover the defect. Histologic studies were done for the skin from both areas. This study ended up with 84 adult patients with recurrent pilonidal disease. The follow-up period ranged from 9 to 108 months (mean 70.45 months). All the patients reported pain scores from 0 to 3 during the first postoperative week. Incidence of early minor complications including mild wound dehiscence, sloughing at the tip of the flap, wound infection, and edema occurred in 21 patients (25%). Three patients developed recurrence (3.57%). Histological examination revealed deep pits lined by stratified squamous epithelium (SSE) at the macroscopic healthy skin at the edge of resection. Those changes were absent in biopsies from the flap skin. The paraspinal flap has good results in management of recurrent pilonidal disease. Also, histological findings suggest that the skin over both glutei is as vulnerable as the skin of the excised sinus which is different from the skin over the lower back. This explains that use of that skin to cover the defect is more prone to develop recurrence.

Keywords Pilonidal · Sinus · Histology · Flap · Recurrence

What Does This Study Add to Literature?

This study provides a possible solution for a very common health problem in the field of general and colorectal surgery which is the recurrent pilonidal sinus. We describe the

paraspinal transposition flap which was used before in covering sacral defects in covering the defect which resulted from complete excision of the pilonidal sinus. We also did a histological study trying to explain the reason of multiple recurrences and prove the validity of this flap.

✉ Mohamed Yehia Elbarmelgi
dr.yeho@yahoo.com; dr.yeho@cu.edu.eg

Ahmed Farag
farag2a@gmail.com

Sahar EMM Nasr
sahamasr85@hotmail.com

Amal A. Farag
amal.farag@hotmail.com

¹ Kasr Alainy Hospital, Faculty of Medicine, Cairo University, Giza, Egypt

Introduction

Sacrococcygeal pilonidal disease is a common and well-recognized entity [1]. When the treatment is considered, there was a frequent lack of success of the surgical methods of excision regarding morbidity, healing, recurrence, and cure [1, 2].

The ability of the pilonidal sinuses to spread laterally into both gluteal regions [3], governed by the skin vulnerability suggested by Karydakakis [4], raise the theoretical probability

of a similar skin vulnerability of the donor site from which most of the flaps used for repair of the pilonidal sinus (PNS) are taken including the Karydakias flap itself. The used flap in this study was described before by Gupta et al. in 2014 in covering soft tissue defects [5]. Also, it was described by BS Mathur and colleagues in 2016 under the name of transverse lumbar perforator flap in treatment of lumbosacral defects [6].

Aim of the Study

The present study aimed at the assessment of the use of paraspinal transposition flap from the lower back just above the gluteal area in treatment of recurrent pilonidal disease. Also, the study aimed at histological comparison between the apparently healthy skin at the edges of excision of recurrent pilonidal sinuses and the skin of the suggested flap used in the operation.

Patients and Methods

Type of Study

The present study is a prospective clinical study.

Population of the Study

This study was conducted on all patients who presented to our General Surgery Clinic, Kasralainy Hospital, Faculty of Medicine, Cairo University, from July 2007 till August 2017 with recurrent pilonidal sinus disease.

Inclusion Criteria

Patients with recurrent pilonidal disease (PND) were included in the present study. All had failed the trial of conservative treatment to recurrence after surgery using regular epilation of hair at weekly interval, local antiseptic solutions such as povidone iodine 10% and intermittent course of systemic antibiotics if there is local or systemic evidence of spreading infection before decision for surgical intervention. All patients suffered from recurrent Pilonidal disease. Thirty-six patients had had midline recurrences, 18 patients had had off midline recurrence, and 30 patients had had combined type of recurrence. See Table 1. They underwent total 187 procedures. Sixty-six of those procedures were primary closure, 52 had open method, 9 Bascom procedure, 6 Limberg flaps, 6 Karydakias procedure, and 48 unknown procedures.

Exclusion Criteria

- Extremes of age (below 10 years and above 90 year)

- Contraindications to general or regional anesthesia
- Skin disease which may impair wound healing, e.g., scleroderma, organ failure and coagulopathy

Primary End Points

To prove on histological bases that the skin close over the gluteal region that is used in most flaps in the surgery of pilonidal sinus has the same vulnerability of the skin over the midline and is more prone to develop recurrences than the skin of the lower part of the back is interesting.

Secondary End Points

Assessment of the use of paraspinal transposition flap from the lower back just above the gluteal area in treatment of recurrent pilonidal disease was performed.

Surgical Technique

The operation was done under general anesthesia in the prone position, and 1 g of one of the third-generation cephalosporins combined by 200 mg metronidazole was given intravenously 1 h before anesthesia. Antithrombotic prophylaxis was given in the moderate and high-risk patients for thromboembolic events. Marking of the site of the resection and the proposed site of the paraspinal flap was done on the operating table just before sterilization. (Fig. 1a, e).

The excision was done en block including the midline and paramedian recurrence with a 1–2-cm safety margin from the skin and down to the pre-sacral Fascia (Fig. 1b). The excised specimen was sent for histopathologic examination as well as biopsies from the edge of the grossly healthy skin left over the gluteus maximus on both sides.

The flap was raised from the skin and deep fascia over the lower back based on the L5 and/or S1 posterior perforator [7] with a length and width according to the defect area ranging from 10 to 12 cm length and of constant width of 7.5 cm i.e. 3 in.) (Fig. 1b). The flap was raised as a fasciocutaneous flap from lateral to medial. The medial dissection was continued over the fascia covering the sacrospinalis muscle, and then the fascia of the flap is sutured temporarily to the dermis of the flap by 2/0 polyglycolic acid or polygalactin suture in order to avoid the shearing effect between the skin and fascia during dissection and transfer of the flap.

Preparation of the recipient area was done by undermining the lateral edges of the recipient area at the level below the deep fascia and superficial to the gluteus maximus muscles on both sides. Control of the bleeders was done by diathermy and rarely by under-running sutures. The edges of the donor site were mobilized as needed guided by the surface of the gluteus

Table 1 Demographic data and patient characteristics

| | | | |
|--------------------|-----------------------------|---------------------------------|-----------------------------|
| Age | Range = 18–39 years | Mean = 26.43 years | |
| BMI | < 35–63 patients (75%) | > 35–18 patients (21.5%) | |
| | | > 40–3 patients (3.5%) | |
| Smoking | Smokers = 48 patients (57%) | Non-smokers = 36 patients (43%) | |
| Mode of recurrence | Midline recurrence | Off midline recurrence | Combined type of recurrence |
| | 36 patients (43%) | 18 patients (21.3%) | 30 patients (35.7%) |

maximus and dorso-lumbar fascia in order to achieve primary closure of the donor site (Fig. 1c).

The flap spontaneously moved to the resection site and the tip of the skin of the flap trimmed and taken for histopathologic examination. Three strategic sutures are taken at the apex of the flap with the lower end of the recipient area and on both sides of the flap with the skin of the buttocks. Two or three more 2/0 silk sutures were taken as strategic sutures to close the donor site (Fig. 1d, f). The flap spontaneously moves to the resection site and the tip of the skin of the flap trimmed and taken for histopathologic examination.

Suction drain 16 F is inserted under the dissection area, i.e., the donor site, both gluteii and the flap. The wounds were closed in 2 layers using polyglycolic acid 3/0 for the fascia, and multiple running subcuticular polypropylene suture 3/0 as needed starting from the distal part of the donor area and

ending at the proximal end of the recipient area at the side contralateral to the flap. Care was taken to avoid inversion at this particular point (Figs. 1c and 2). The shapes of the wounds after 1 week (Fig. 1g) and after 1 month (Fig. 1h) are displayed.

Postoperative Period and Follow-Up

Oral fluids were allowed 4 h after surgery and light meal 8 h after surgery, with resumption of normal diet the next day; 16 patients were discharged home the same day, and the rest were discharged on the next postoperative day on their request. Drains were removed on the 7th postoperative day in 69 patients and after 10 days in the remaining 15 patients.

Follow-up was done by clinical examination at the outpatient clinic after 1 week for removal of the suction drains and

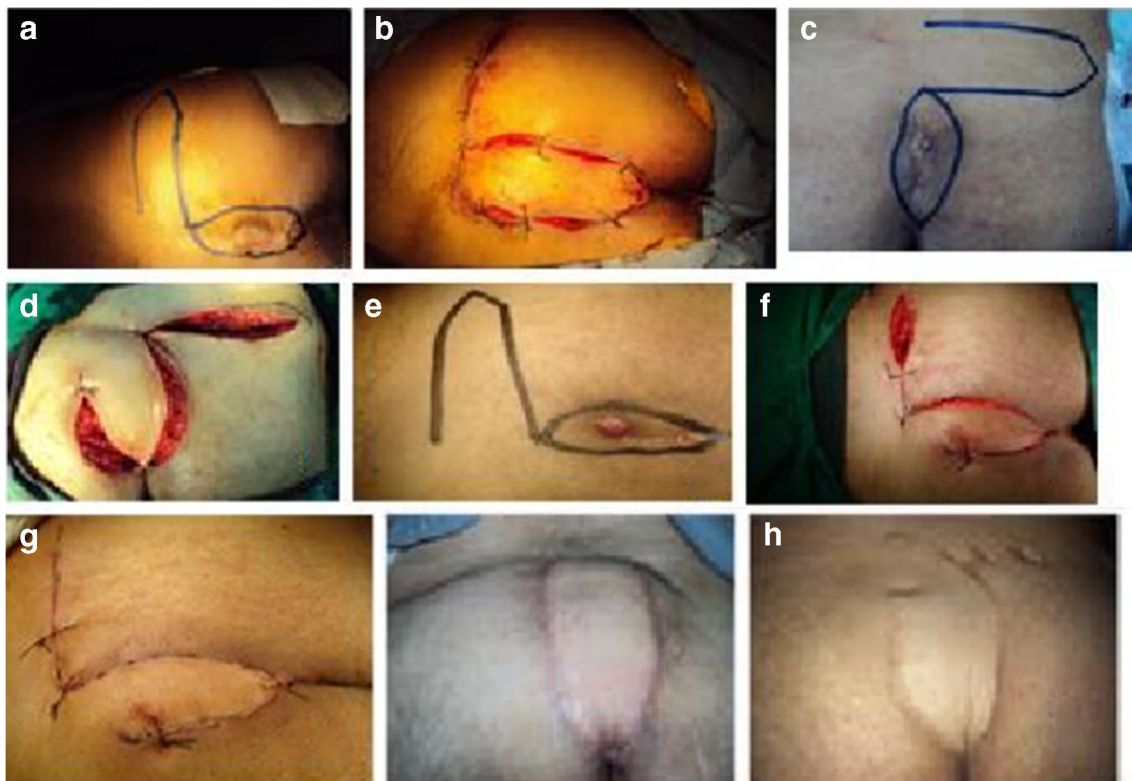
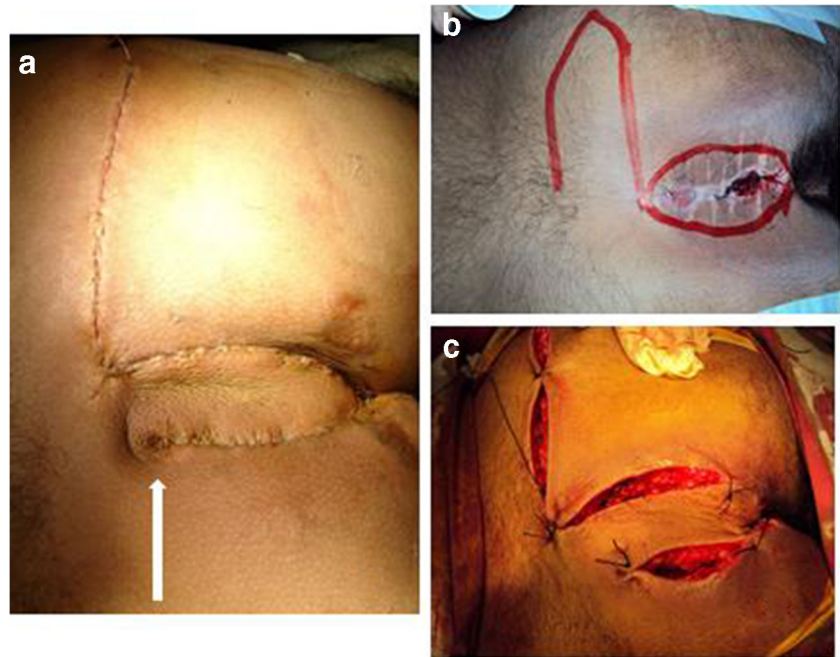


Fig. 1 a Recurrent hidradenoma after primary closure and design of the flap. b Resection after flap transposition and strategic stitches. c Recurrence after Karydakis procedure with reshifting of the scar into the midline and design of the flap. d The patient after resection and transfer

of the flap with the three strategic sutures. e Recurrence after unknown procedure with minimal off-midline. f Flap after mobilization. g Flap after final suturing. h Flaps after complete healing (short- and long-term follow-up)

Fig. 2 **a** The flap which developed recurrence due to inversion and dog ear at the site of meeting of the proximal part of the flap and the proximal recipient area (arrow). **b** Recurrent pilonidal sinus after primary closure. **c** The flap after mobilization and strategic stitches avoiding dimpling and dog ears at the site in **a**



the strategic stitches if any are left, 2 weeks and then after 1, 3, 6, and 12 months postoperatively and yearly for the longest possible follow-up. Out-of-schedule visits were booked for patients in cases of complications and during preparation of this manuscript. Follow-up period ranged from 9 to 108 months with a mean of 70.45 months as some patients did not complete the whole planned follow-up period.

All the patients were instructed to continue removing the hair once weekly at the operation site and for a 10-cm distance starting 2 weeks postoperatively or to have permanent epilation of hair from the affected area using modern available techniques.

Statistical Analysis

Data were described in terms of frequencies (number of patients), mean, range, and percentage where appropriate.

Results

This study ended up with 84 adult patients with recurrent pilonidal disease. The follow-up period ranged from 9 to 108 months with mean 70.45 months. The mean age and BMI (body mass index) and smoking habits of patients are illustrated in Table 1. All patients suffered from recurrent pilonidal disease. Thirty-six patients had had midline recurrences, 18 patients had had off midline recurrence, and 30 patients had had combined type of recurrence. See Table 1. They underwent from 1 to 6 previous operations (total 187

procedures, average = 7.05 procedures per patient). Sixty-six of those procedures were primary closure, 52 had open method, 9 Bascom procedure, 6 Limberg flaps, 6 Karydakis procedure, and 48 unknown procedures. Twenty out of the 84 patients included in the study were done in our institution before recurrence in which 12 had had primary closure, 3 had had excision with open method, and 5 had had Karydakis procedure.

All the patients reported pain scores from 0 to 3 using VAS (visual analogue score 0 to 10) during the first postoperative week. Incidence of minor complications was seen in 21 cases during the early postoperative period (25%). Table 2 shows the details of these minor complications. All those cases were managed by repeated dressing using povidone iodine, sitz baths. Systemic antibiotics were added in the infected cases

Table 2 Clinical outcome

| Clinical aspect | Outcome | | | | | | | | |
|--|--|------------------------------|--------------------------|----------------------|-------------|--|----------------------|---------------------|---------------------|
| Postoperative pain | All patients report a pain score from 0 to 3 | | | | | | | | |
| Minor complications (total = 21, 25%) | <table border="1"> <tr> <td>Sloughing < 2 cm of the flap</td> <td>Partial wound dehiscence</td> <td>Mild wound infection</td> <td>Wound edema</td> </tr> <tr> <td>6 patients (7.14%), 3 of them were smokers and 3 were smokers with high BMI (> 35)</td> <td>9 patients (10.71-%)</td> <td>3 patients (3.57-%)</td> <td>3 patients (3.57-%)</td> </tr> </table> | Sloughing < 2 cm of the flap | Partial wound dehiscence | Mild wound infection | Wound edema | 6 patients (7.14%), 3 of them were smokers and 3 were smokers with high BMI (> 35) | 9 patients (10.71-%) | 3 patients (3.57-%) | 3 patients (3.57-%) |
| Sloughing < 2 cm of the flap | Partial wound dehiscence | Mild wound infection | Wound edema | | | | | | |
| 6 patients (7.14%), 3 of them were smokers and 3 were smokers with high BMI (> 35) | 9 patients (10.71-%) | 3 patients (3.57-%) | 3 patients (3.57-%) | | | | | | |
| Recurrence (n = 84) | <table border="1"> <tr> <td>Number = 3 patients</td> <td>Percentage = 3.57</td> </tr> </table> | Number = 3 patients | Percentage = 3.57 | | | | | | |
| Number = 3 patients | Percentage = 3.57 | | | | | | | | |

according to the culture and sensitivity results taken from the wound swap. All the mentioned cases healed spontaneously.

Three cases of recurrence were experienced during the follow-up period in 84 patients (3.57%). Two cases were lost to follow-up after 9 and 21 months, and both had no recurrence at the last follow-up and were included as the longest follow-up for those cases in the analysis.

All cases of recurrence were at the end of the incision at the site of contact between the proximal ends of the flap with the skin from the contralateral side which was invaginated by mistake (Fig. 2a). The recurrence appeared 5–7 months after surgery. One case was managed by limited excision of the invaginated area under local anesthesia and primary closure of the skin avoiding its inversion. The other cases were managed by re-operation with re-flapping done avoiding dog ears and invagination of the skin (Fig. 2b, c). Follow-up of those cases was then completed till the end of the study with no recurrence reported.

Histological examination using H&E stains revealed deep pits lined by stratified squamous epithelium (SSE) at the macroscopically healthy skin left over the gluteus maximus muscle on both sides (Fig. 3b, d), similar to those found in the skin of the excised specimen in 81 patients from a total of 84 patients included in the study (percentage = 96.5%) (Fig. 3a) and as described by other authors in the midline primary pits [8].

Biopsies taken from the tip of the flap were devoid of those deep invaginations lined by stratified squamous epithelium in all the 84 patients (Fig. 3c, e).

Discussion

The onset of PNS is rare both before puberty and after the age of 40. Males are affected more frequently than females, probably due to their more hirsute nature [8]. It had long been believed that hair follicles alone were the source of pilonidal disease [9]. Pilonidal disease is associated with visible pits in the midline of the natal cleft, which have the microscopic appearance of enlarged hair follicles. However, there is evidence to suggest that the enlargement of the follicles precedes hair gaining access and at operation hair is found in only half of cases [9].

Despite the fact that Karydakis had mentioned skin vulnerability as an offending factor in the pathogenesis of pilonidal sinus disease [4] and the availability of histological findings reported by many authors including the abnormal pits [10], yet there is no data on the donor site of flaps used for repair of such disease including Limberg, V-Y advancement, gluteus maximus myocutaneous, and Karydakis flaps.

Although originally felt to be of congenital origin secondary to abnormal skin in the gluteal cleft [4], to the best of the

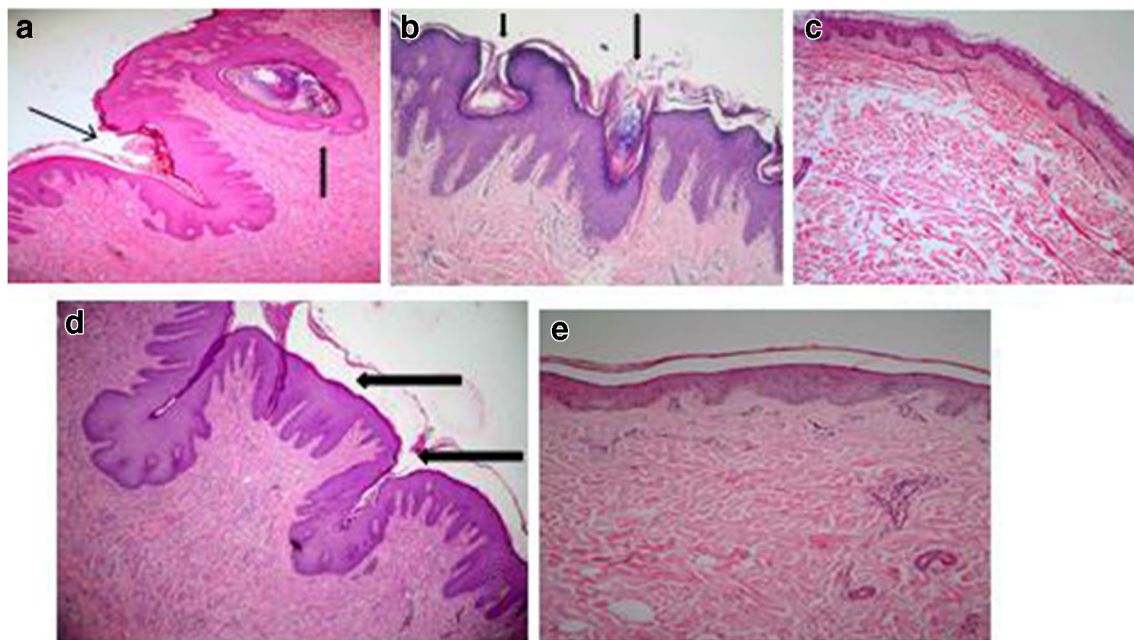


Fig. 3 **a** A photomicrograph of a skin section obtained from the resected skin around a pilonidal sinus showing a pit (thin arrow) lined by a thick keratinized stratified squamous epithelium of the epidermis and an infected dilated hair follicle (thick arrow) (H&E $\times 40$). **b** A photomicrograph of a skin section obtained from the skin over the gluteus maximus after resection of a pilonidal sinus of the same patient in Fig. 2 a showing pits (arrows) lined by a thick heavily keratinized stratified squamous epithelium of the epidermis (H&E $\times 100$). **c** A

photomicrograph of a skin section obtained from the transverse lumbar flap of the same patient in Fig. 2a, b showing absence of pits (H&E $\times 100$). **d** A photomicrograph of a skin section obtained from the skin over the gluteus maximus after resection of a pilonidal sinus in another patient, showing deep pits (arrow) lined by a thick keratinized stratified squamous epithelium of the epidermis (H&E $\times 40$). **e** A photomicrograph of a skin section obtained from the transverse lumbar flap in the same patient in Fig. 2e, showing absence of pits (H&E $\times 100$)

authors' knowledge no histologic study was done to compare the skin of the gluteal area around the PNS with the normal skin of the lower back in the same patients which may give an insight on the cause of recurrence after different methods of closure including the use of flaps from the gluteal area around the excised sinus. The lack of such histologic studies in our opinion is most probably due to predominance of the acquired theory [11].

In the present work, a histological study of the skin from the pilonidal sinus area and the apparently healthy skin at the resection margin shows the same kind of histological vulnerability, mainly the deep pits lined by keratinized stratified squamous epithelium invaginated deep into the dermis and subcutaneous tissue. The histologic features of those pits are quite similar to those reported in the midline pits by other authors [10].

It is worth mentioning also that pilonidal sinus is treated with other methods rather than closure of the wound with acceptable success rate such as wide excision with open silastic foam dressing [12]. Also, it has been successfully treated by using a highly alkaline seton called kshar sutra, an ancient Indian technique which does not require plastic surgical operation and hospital admission and can be done as office procedure. [13]

The skin of the used flap described before [5, 6] showed the lack of such vulnerability as compared to the proposed site of other flaps (Fig. 3c, e). In addition, the proposed flap is less or non-hairy, achieves flattening of the natal cleft, and avoids midline scars (Figs. 1 and 2).

The limitation of this study is that it is not a comparative study; however, a large controlled trial is needed between the suggested flap and other techniques in order to have a final conclusion. The strength of this study—in the authors' opinion—are the long period of follow-up and the histological study that was done.

In conclusion, we think that the used flap, namely, paraspinal transposition graft [5] or transverse lumbar flap [6], is a very good option for treatment of recurrent pilonidal sinus disease based on the new histological finding and explanation of the disease described in this work aiming at elimination of the skin microscopic vulnerability in hirsute males, a fact not addressed by the other commonly used flaps. Not only this but also our suggested flap avoid midline scars and lead to flattening—elevation of the natal as recommended by Scott and his co-workers [11]. However, due to complexity of the procedure, we suggest that this flap should be used for recurrent PNS which recur after the use of less complex and simple flaps.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Informed Consent and Ethical Committee The study was approved by the ethical committee of Kasr-Alainy hospital, Cairo University. An informed written consent was taken from each patient before surgery.

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