Recurrent pilonidal sinus disease: medium-term outcome after Karydakis flap procedure

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Received 25 February 2016
Accepted 1 April 2016

The Egyptian Journal of Surgery
2016, 35:241–247

Background
Failure of surgery for pilonidal sinus results in substantial burden on the patient and the surgeon. Hence, in this study we address the role of Karydakis flap procedure in recurrent cases.
Patients and methods
Ninety-two patients with recurrent pilonidal disease were managed by Karydakis flap procedure on a day-case basis. Data collected included demographics, operative time, wound complications, time taken to return to work, and recurrence.
Results
There were 80 men and 12 women in this study. The mean age of the patients was 33±10 years. The mean duration of illness was 22±12.8 months. The mean operative time was 42.3±10?min. Patients were followed up for a mean duration of 39.7±13.6 months. Postoperative wound seroma occurred in 15 (16.3%) cases, partial disruption in eight (8.9%) cases, hematoma in six (6.5%) cases, and wound infection in two (2.2%) cases. Only one patient has had recurrence of the disease so far.
Conclusion
Karydakis flap is a safe and effective treatment modality in these patients given its short operative time, excellent cosmetic appearance, low recurrence and morbidity rates, short learning curve, and rapid return to daily activities.

Keywords:
Karydakis procedure, outcome after Karydakis flap, recurrent pilonidal disease

Egypt J Surg 35:241–247

1110-1121

Introduction

The major concern of patients with pilonidal sinus submitted for surgery is recurrence of the problem after a certain period of time, which may occur in up to 40% of postsurgical excision and lay open cases [1–3]. There is a famous dictum that the most common cause of recurrence is recurrence.

Causes of recurrence are multifactorial. Operative factors include missing a sinus tract or tension on sutures placed in the midline. Poor postoperative course with wound infection creating new side tracts through the fibrosed wound catalyzed by accumulation of dead tissue or debris, sweating, friction, and poor hygiene are strong contributors to recurrence [4]. The recurrent disease usually presents with coccygeal pain on top of indurated discharging sinus (es) at the site of previous surgery.

Surgery for recurrent pilonidal disease is more technically demanding; the anatomy is distorted and the extensive scar tissue may mask the new sinus tracts. Moreover, there is a need for a wider excision area to ensure adequate treatment.

The ultimate goals in the treatment of recurrent disease are elimination of recurrence with effective wound healing, low morbidity, and early return to work [5–7]. Various surgeries have been proposed but none is ideal for all cases.

Karydakis invented a surgical technique based on paramedian skin suturing after complete excision of the lesion [8]. The idea is to displace normal skin into the midline and straighten the antenatal cleft to replace the pathologically abnormal skin in this area with normal healthy skin that is expected to be recurrence resistant. The aim of the present study was to evaluate the feasibility, efficacy, success, and safety of the Karydakis technique in patients with recurrent pilonidal disease.

Patients and methods

This is a retrospective review of 92 patients who underwent Karydakis procedure for recurrent pilonidal disease over a 3-year period from October 2012 to October 2015 at the Department of

Gastrointestinal Surgery, Alexandria University Hospital, Egypt, and Damanhour Educational Hospital. The study was approved by the Ethics Committee of the Faculty of Medicine, Alexandria University.

Patients showing manifestations of recurrent pilonidal sinus after previous excisional surgery were recruited (Figs 1 and 2) after excluding patients with a previous simple incision/drainage of pilonidal abscess. Patients were asked about their symptoms, previous episodes of the disease regarding postoperative wound care, duration between operation and recurrence, and number and type of previous operations performed.

Surgical procedure

Patients were admitted to the inpatient department 2 h before the operation. During that period, complete shaving of the intergluteal region, buttocks, and perineal regions was performed and consent taken with regard to the surgery and possible complications. In the operating theater, general or spinal anesthesia was given and patients were placed in the prone jack-knife position, followed by stretching of the lateral gluteal skin using adhesive tapes for a broad view of the field. Before incision, prophylactic third-generation cephalosporins (2 g of ceftriaxone) was administered, to be continued for 5 days postoperatively. The incision site was marked in a D-shaped manner with the vertical limb 1–2 cm lateral to the midline and the curved limb encompassing the lateral sinuses seen (Fig. 3). Side tracts were assessed initially with the catheter of a small intravenous cannula with injection of methylene blue for delineation of side tracks. Using electrocautery (power 4), the incision was made and deepened into the sacral fascia and laterally to the fascia overlying the gluteus maximus (Fig. 4). Particular attention was paid to hemostasis using monopolar electrocautery at each step. After complete excision

Figure 1

Recurrent pilonidal sinus disease after previous excision and lay open showing excess granulation tissue.

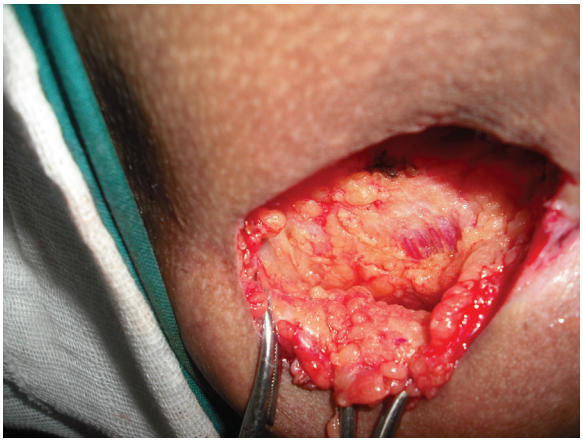
Figure 2

Another case with evident flattening of the intergluteal fold.

Figure 3

Final scar after 3 months.

Figure 4



Recurrent case after previous excision and primary midline suturing with abundance of hair.

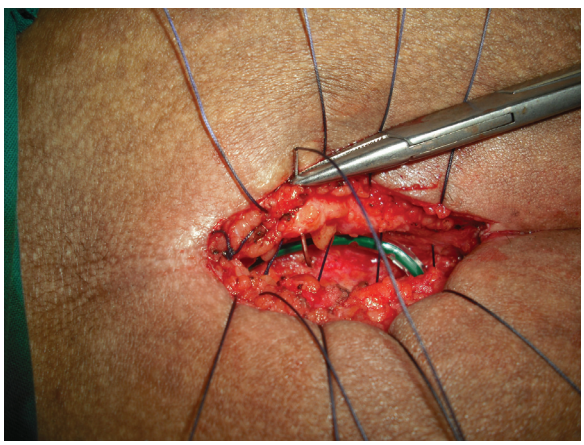
(Fig. 5), absence of any side track was checked by injecting hydrogen peroxide solution into the midline pits and checking for any bubbling from the sides of the specimen. If bubbling was noticed, further excision was continued at the leaking site.

At this stage, the surgeon is ready to mobilize the midline side of the flap by undermining between the subcutaneous tissue and gluteus muscle sheath using monopolar diathermy creating a thickness that varied from 2 to 6 cm. Mobilization is done until the two sides meet without tension. This accomplishes the goal of Karydakis of making the incision away from the midline and at the same time flattening the natal cleft. A redivac drain (12 Fr) is then inserted to discard any postoperative collection. Multiple interrupted stay subcutaneous sutures are applied using Vicryl 2/0 and tied sequentially to support the wound (Figs 6–8). The skin is closed with interrupted vertical mattress Prolene (PROLENE propylene,

Figure 5

D-shape incision surrounding the whole disease.

Figure 6



Excision until the level of the sacrococcygeal fascia.

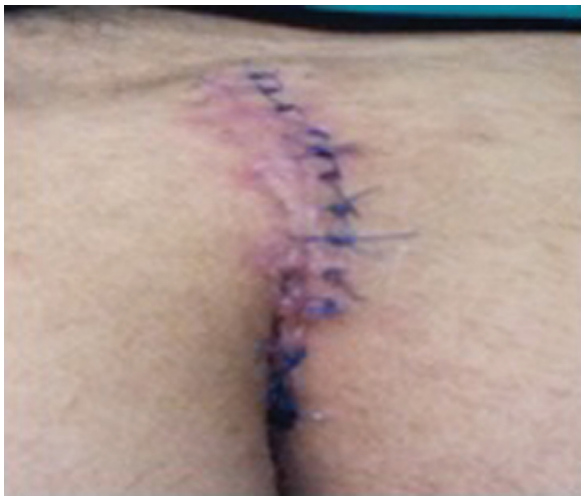
Figure 7

The remaining cavity after complete excision.

Figure 8

Closure of subcutaneous tissue by interrupted stay sutures after inserting a redivac drain.

Figure 9



Sequential tying of subcutaneous sutures; the wound is closed without tension.

Figure 10

Final wound after closure.

Figure 11

Closure of skin with interrupted nonabsorbable sutures lateral to the midline.

Ethicon, summer-ville, NY, USA) 2/0 sutures (Figs 9–11).

Patients were discharged from the hospital on the same day of admission. Postoperative NSAIDs and antiedematous drugs were prescribed for 1 and 2 weeks, respectively. The suction drain was removed when the discharge was less than 25 ml of fluid, usually after 5–6 days. Skin sutures were left for 2 weeks. We delayed suture removal in those with BMI more than 30 kg/m^2 for 3 weeks for secure wound healing. Patients were followed up twice a week for 3 weeks and were asked to come every 3 months for regular examination of the wound; otherwise they were interviewed by telephone. On follow-up visits patients were asked about their opinion regarding the surgery and their degree of satisfaction (excellent, moderate, poor). To prevent recurrence, patients were instructed to shave the hair of the natal cleft regularly, avoid prolonged sitting, and reduce their weight. Recurrence was considered when pits reappeared in the intergluteal sulcus. All continuous data were expressed as mean ±SD and percentage.

Results

This retrospective study was carried out on 92 patients with recurrent pilonidal sinus disease after a previous surgical treatment. The mean age of the patients was 33 ±10 years (range: 16–62 years). There was an obvious male predominance as there were 80 (87%) men but only 12 (13%) women included. The mean BMI was 29.3±3.7 kg/m^2, with a minimum of 23 kg/m^2 and a maximum of 38 kg/m^2. A positive family history of pilonidal sinus was seen in 11 patients.

Chronic unhealed wound with foul-smelling discharge and hair inside unhealthy granulation tissue was the most common presentation, found in 73 patients. Low back and coccygeal aching pain was present in 65 patients and local tender swelling in 47 patients. The average interval between recurrence and surgery was 22±12.8 months (range: 4–60 months). Patients underwent one to three previous excisional surgeries: excision and midline suturing in 43 patients, excision and lay open in 35 patients, Limberg flap in three patients, and Karydakis flap in two patients. In nine patients, the type of previous surgery was unknown. Table 1 shows the preoperative data of the studied patients.

All patients were surgically treated with Karydakis procedure on a day-case basis. The mean operative time was 42.3±10.1 min (range: 30–70 min). After recovery, patients were discharged home within 12 h. Patients returned to their work within 2–3 weeks after stitch removal. The mean duration of follow-up was 39.7±13.6 months (range: 6–60 months). No patient was lost to follow-up.

Postoperative wound seroma occurred in 15 (16.3%) cases, partial disruption/dehiscence in eight (8.9%) cases, hematoma in six (6.5%) cases, and wound infection in two (2.2%) cases. All were treated successfully with repeated dressings. Only one patient has experienced recurrence until now. During follow-up patients were asked to rate their satisfaction with the procedure; 79 (85.8%) patients had an excellent opinion, nine (9.7%) patients were moderately satisfied, and four (4.3%) patients

Table 1 Clinical data of patients undergoing treatment for recurrent pilonidal disease with the Karydakis procedure

Data	*N* (%)
Mean age (years)	33±10 (16–62)
Male : female (ratio)	80 (87) : 12 (13) (6.6 : 1)
Mean BMI (kg/m^2)	29.3±3.7 (23–38)
Presentation	
Chronic unhealed wound	73 (79.3)
Low back pain	65 (70.6)
Swelling	47 (51)
Mean duration (months)	22±12.8 (4–60)
Last surgery	
Excision and midline suturing	43 (46.7)
Excision and lay open	35 (38)
Limberg flap	3 (3.2)
Karydakis flap	2 (2.1)
Unknown	9 (9.7)

Table 2 Early postoperative complications in the studied patients

Complications	*N* (%)
Seroma	15 (16.3)
Partial disruption (dehiscence)	8 (8.9)
Hematoma	6 (6.5)
Infection	2 (2.2)
Recurrence	1 (1.1)

expressed poor satisfaction. Data regarding early postoperative complications are summarized in Table 2.

Discussion

Pilonidal sinus is a common surgical problem in the Mediterranean countries, including Egypt, and affects young active adults of both sexes, resulting in long absences from work and massive economic loss. The problem worsens when the disease recurs after surgical excision, augmenting the total cost.

Recurrence is an impending threat for the patient with pilonidal sinus undergoing surgical treatment. Recurrence rates vary according to the surgical procedure. The rate of recurrence in different studies has been reported to be between 4 and 30% for the excision–open packing technique [9–11] and from 5 to 10% for marsupialization [9,12].

This investigation focused on evaluation of the effectiveness of the Karydakis procedure in the treatment of recurrent pilonidal sinus. We were able to recruit 92 patients for this report as our hospital is a tertiary referral center for a large population in northern Egypt (population about 30 million). The mean age of the patients was 33±10 years; the majority of patients (87%) were male and this coincides with all reports dealing with recurrent disease [13–15].

The most common presentation (79.3%) in the studied patients was refractory unhealed wound after the last operation. On examination, it was found that the wounds contained a lot of hair, and were partially healed with unhealthy granulation tissue with seropurulent or serosanguinous discharge and bad odor. In some patients, a history of partial healing and/or disruption could be obtained. In the study by Madbouly [14], pain was present in 75.5% and swelling in 32.6% of his patients.

There is a general consensus in the surgical community that closure techniques are preferred to lay open surgery in cases of recurrent pilonidal disease. Several drawbacks of open approaches were listed, including longer healing time, higher recurrence rate, and a negative impact on the quality of life. In contrast, flap procedures are more appealing to the patient because of shorter recovery time, faster return to work, and less risk of recurrence. Lee *et al.* [16] recommended primary closure to be used in the treatment of primary disease but flap reconstruction in the case of recurrences.

Karydakis principles are the cornerstone of flap closure procedures. All modifications aim at avoidance of a midline wound and shallowing of the intergluteal cleft by means of different techniques. The reason for this shallowing is to keep the intergluteal fold clear from any hair as it will fall off and will not embed inside this deep narrow wedge causing recurrence.

From our experience, the Karydakis procedure is a safe, feasible, and versatile surgical option. The side of the curved lateral side of the incision was chosen on the basis of the location of the lateral tracts to be included in the resection margin. Also, the length of the vertical limb can be adjusted to the whole length of the sinuses. Another advantage is its short learning curve; the operative time dropped from ~1 h in the first 10 cases to about half an hour in the subsequent cases.

Many flap procedures have been proposed for the definitive treatment of recurrent pilonidal sinus disease. The superiority of the Karydakis procedure comes from its simplicity. It does not require extensive dissections like Lemberg or Bascom flaps. The scar is tidy and in a straight line, which confers a cosmetic

advantage over the irregularly shaped scar of the Lemberg flap. The approach to these cases was similar to that for primary cases. The technique was also successful in patients with more than one previous surgical treatment. The mean operative time was 42.3 ±10.1 min, shorter than the time recorder by Madboulty [14] using the Lemberg flap in recurrent pilonidal disease as he needed a mean of 54.7±11.4 min to complete his procedure. Bali *et al.* [15] reported a mean operative time of 48 min when the Karydakis procedure was chosen to treat recurrent cases.

In contradiction, Bali *et al.* [15] in a prospective randomized study divided 71 patients with recurrent pilonidal disease into 37 patients treated with Limberg flap and 34 with Karydakis flap. They recommended the use of Limberg flap in recurrent cases because of lower complication rate, shorter length of hospital stay, earlier return to work, lower pain score, higher patient satisfaction, and faster healing rate.

As regards hospital stay, we discharged all patients on the same day of the operation with instructions for intramuscular antibiotic injection and adequate analgesia. They were provided with telephone numbers of the hospital and of the treating surgeon in case of emergency. No patient required readmission after discharge. On the first postoperative visit, they reported only mild pain, which subsided in subsequent days. Early return home is a major relief for the patient and reduces the insurance costs. Madbouly [14] discharged his patients on the same day of surgery. Patients returned to work after 2–3 weeks. In the study by Bali *et al.* [15], patients returned to work after a mean of 17 days, whereas in the report of Madbouly [14] the mean time to return to work was 5.6±2.3 days.

The postoperative course was satisfactory in the majority of patients. Bali *et al.* [15] reported seroma in 9.8%, infection in 16%, hematoma in 15%, and partial wound dehiscence in 4.2% of their patients treated with the Karydakis procedure. Iesalnieks *et al.* [13] performed the Karydakis procedure on 87 patients with recurrent pilonidal disease but 19% of their patients suffered complications with partial wound disruption. In contrast, Madbouly [14] reported wound seroma in two obese patients and wound infection in two cases without hematoma or dehiscence. The only complication found by Bascom and Bascom [17] while treating recurrent cases with the Bascom procedure were two wound infections.

We recommend the use of negative suction drain in the early postoperative days to eliminate any residual collections of serum or blood that may trigger wound infection especially in those with thick subcutaneous tissue. Patients were discharged with instructions to remove the drain when the amount was less than 25 ml, usually after 5–7 days, during their second visit to the outpatient clinic.

The traditional belief that lay open procedures are more secure in terms of low recurrence in comparison with flap procedures should be revised in light of the numerous reports with lower or at least the same rates of recurrence. The reported incidence of recurrence after the Karydakis procedure is generally less than 5% [13,18]. We found only one case of recurrence after 8 months of follow-up. This patient was managed early in the study and had complications postoperatively due to wound disruption. Despite advice, he did not comply with proper wound care and hair epilation. Further, the wound was subjected to repeated trauma leading to failure of complete healing. This patient was managed with the Lemberg flap and the condition resolved with no further recurrence on follow-up until now. Bali *et al.* [15] did not report any case of recurrence after use of the Karydakis flap for recurrent disease in 34 cases at a mean follow-up period of 27.6±8.3 months. Iesalnieks *et al.* [13] compared excision versus Karydakis flap in 124 patients with recurrence after previous excision of pilonidal disease. The recurrence rate was 43% in the excision group compared with only 3% (three cases) in the Karydakis group at 1-year follow-up. A recurrence rate of 4.3% (three cases) after a mean follow-up of 30 months was reported by Bascom and Bascom [17] on treatment of 69 patients with recurrent disease using a unique but complicated technique.

Surgery alone is not the single magical solution for recurrent disease and patient cooperation is as important as surgery. Compliance with proper hygiene, meticulous hair removal with depilators or creams, attention to trauma, and even the use of round pillows on prolonged sitting in addition to cessation of smoking are all necessary for ultimate cure of this condition.

Five recurrences after previous flap procedures (three Lemberg flaps and two Karydakis flaps) were treated by means of the Karydakis flap. Although more technically difficult, we succeeded in complete resection of all sinuses but with longer operative time and meticulous suturing to ensure proper wound closure. Removal of the suction drain was delayed in these patients for 1 week. The two previous cases of Karydakis flap application were not proper as the scar was close to the midline.

Lack of comparison with a control group and the retrospective design were the observed limitations of this study. Further prospective comparative studies with other flap techniques are suggested to confirm the reliability of the Karydakis technique.

In conclusion, although the ideal treatment for recurrent pilonidal sinus disease is debatable between centers, the Karydakis flap technique is a sound and reliable answer in these patients given its short recovery time, better cosmetic appearance, low recurrence and morbidity rates, and short learning curve, making it appealing to young surgeons. Further larger randomized controlled studies are needed to compare the different treatment options.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

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