International Surgery Journal
George T et al. Int Surg J. 2020 Aug;7(8):2568-2572
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: http://dx.doi.org/10.18203/2349-2902.isj20203236

Original Research Article

Modified Karydakis procedure for uncomplicated pilonidal sinus

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Received: 13 April 2020
Revised: 05 July 2020
Accepted: 07 July 2020

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ABSTRACT

Background: Pilonidal sinus disease is a chronic infection of the natal cleft commonly affecting young adults. Out of the standard operative techniques, the Karydakis procedure is a relatively simple procedure associated with low rates of wound complications and recurrence. In this study we present a modified version of the Karydakis procedure to treat less extensive disease, which enables better skin closure without cavitation and tension.
Methods: Patients with uncomplicated pilonidal sinus who presented to our centre during the period from April 2015 to March 2019 were prospectively enrolled. Patients with recurrent or complex sinus disease were excluded. In those enrolled, our modified Karydakis procedure was performed. In this method, after excision a flap of skin and subcutaneous tissue was raised to one side and sutured across the midline by advancement in layers.
Results: 34 patients underwent our modified Karydakis procedure. 91% (31/34) of patients had uncomplicated recovery and could return to work after two weeks. There were minimal post-operative complications, in the form of erythema around the wound (8.8%), wound discharge (5.9%), seroma (5.9%) and infection (2.9%). No patient developed wound dehiscence or flap necrosis. There were excellent cosmetic results and no recurrence at one year post-surgery.
Conclusions: Our modification of the Karydakis procedure is a simple and effective surgery for the management of uncomplicated pilonidal sinus disease which achieves good results.

Keywords: Karydakis procedure, Layered closure, Pilonidal sinus

INTRODUCTION

Pilonidal sinus disease is a chronic infection of the hairy skin with the most common localisation in the natal cleft.[1] Incidence is about 26 per 100,000 population, affecting young adults more commonly and males twice as much as females.[2] The disease is now considered as an acquired condition of the hair follicles.[3] It is often associated with hirsute nature, obesity, sedentary occupation and local irritation or trauma.[4] The pathogenesis of this disease has not yet been conclusively established. Follicular hyperkeratosis leading to obstruction of the infundibulum of a hair follicle, secondary infection and fistulae formation is one such theory.[5] However, Karydakis hypothesised that fistulae arise only when free hairs perforate the vulnerable but still intact skin. The hairs in the subcutaneous sinus cavity are found to be broken without follicles.[6] Karydakis suspected that they become implanted in the natal cleft and then bore deeper into the subcutaneous tissue.[6] Bascom hypothesised that hyperkeratosis, obstruction, and follicular rupture are the primary events and that hairs only secondarily come to lie in the preformed openings.[5] A fistulous opening in the natal cleft is called a pit. A sinus is found in the subcutaneous tissue lined by granulation tissue in all cases.[3]

There is no standard or recommended elective treatment for Pilonidal sinus disease but evidence suggests that there is no one perfect technique to address all the

variables involved.[7] Essentially three different treatment options can be identified.[1] The standard treatment of excision and open wound treatment has the lowest recurrence. However, it requires the patient to take protracted time off work for post-operative wound management. Newer therapies include pit picking, fistuloscopy, phenol injection and laser treatment; but their outcomes are still debatable. The third group of treatment is excision and plastic reconstruction. These are technically demanding but have been shown to achieve relatively good results in the long term.[1] Given the various treatment options, it is important to adopt a patient-oriented approach when planning treatment, whereby the merits and drawbacks of treatments are explained to the patient and a shared decision is made depending on the individual circumstances.

Of the standard surgical treatments for pilonidal sinus, the Karydakis procedure has been shown to achieve faster healing times, lower rates of wound complications and a lower rate of recurrence.[8] The Karydakis operation involves mobilisation of full thickness skin and subcutaneous fat as a single flap across the natal cleft to the opposite side which is fixed to the sacrococcygeal fascia and surrounding adipose tissue.[9] However, it can be technically challenging in the setting of loose subcutaneous fat tissue and can also result in tensed wound closure which may increase the risk of wound dehiscence and flap necrosis. To overcome these limitations we developed a novel modification to the Karydakis procedure.

In this study we evaluated the results of our modified Karydakis operation for the treatment of uncomplicated pilonidal sinus, which we have adopted at our institution for the past five years.

METHODS

Patients who attended the outpatient clinic at Pushpagiri Institute of Medical Sciences, Kerala, India with pilonidal sinus disease were prospectively enrolled from April 2015 to March 2019.

Inclusion criteria

Only patients with simple sinuses were included. Additionally, we only included patients with secondary openings on one side and within two centimetres of the midline.

Exclusion criteria

Patients with recurrent sinuses or complex sinuses (i.e. sinuses which had signs of infection or abscess formation) were excluded.

The study had the approval of the local ethics committee of the institution.

All patients had basic preoperative investigations only and no radiological imaging of any form was performed. Patients were admitted to our unit on the day before the surgery and the sacrococcygeal region was shaved and cleaned. A third-generation cephalosporin was used as antibiotic cover and administered one hour prior to surgery. All patients were operated under general anaesthesia with intubation. Patients were put in prone jack knife position with legs slightly abducted. The skin around the intergluteal sulcus was stretched using medical tape. Following this, our modified Karydakis operation was performed.

Modified Karydakis operation: operative technique

The skin was cleaned using 10% povidone iodine. A modification of the Karydakis operation was performed. Firstly, methylene blue was injected into the sinus openings to stain the tracks. An asymmetrical ellipse was then marked to encompass the pilonidal complex as shown in Figure 1A.

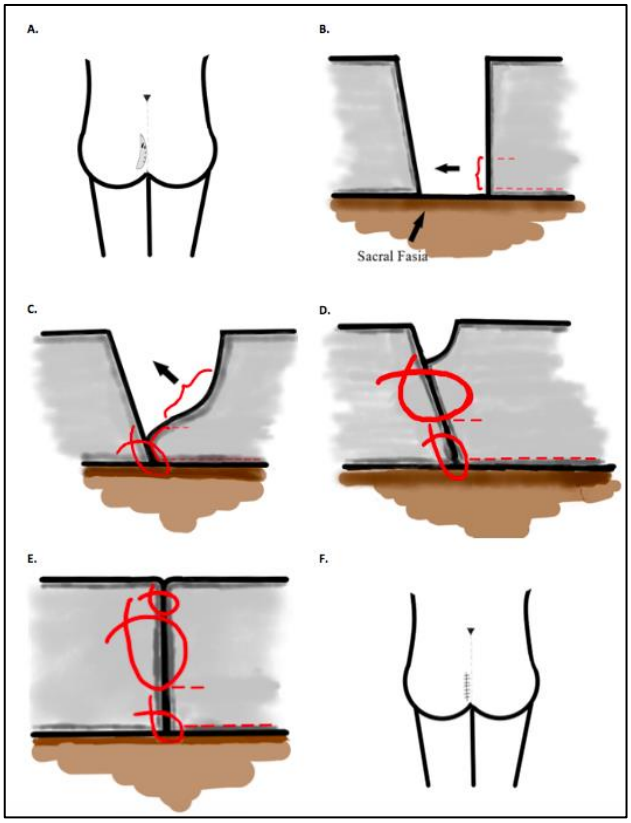

Figure 1: The modified Karydakis operation; A) Skin incision enclosing sinus openings B) Excision en bloc up to sacral fascia C) First fascial stitch D) Second layer stitch E) Third layer subcutaneous stitch F) Suture line in paramedian position.

The upper and lower ends of the ellipse were placed 1 to 2 centimetres away from the midline on the secondary sinus side. The incision was deepened to the sacrococcygeal fascia level using a scalpel. Bleeding was

controlled by pressure to clearly visualise any stained tracks left behind. These were then included by further extension. The tissues comprising the sinus tracks were removed en bloc (Figure 1B) and meticulous haemostasis was achieved using diathermy. The medical tape used to stretch the skin was then released. The tissues on the semilunar aspect of the incision on the secondary sinus side were not mobilized and flap was created on the contralateral side by raising tissues by sharp dissection over the sacral fascia and gluteus maximus muscle. A size 16 Redivac drain was first placed over the deep fascia and brought out laterally. The deep part of the single layer flap was stitched to the opposite side on to sacral fascia using a number 1 vicryl suture (Figure 1C). Then another layer stitch was applied above using 1-0 vicryl; here limited mobilization of the superficial tissues was also done if necessary, to relieve any tension encountered whilst suturing (Figure 1D). A subcutaneous suture with 2-0 vicryl was then made to approximate the skin edges to complete this layered closure (Figure 1E). Skin was closed with interrupted 3-0 nylon suture with the suture line remaining lateral to the midline (Figure 1F).

Statistical analysis

Data was analysed in terms of age, gender, severity of the disease, operative technique, postoperative complications and duration of stay in the hospital. Statistical analysis was performed using Statistical Program for Social Sciences (SPSS Inc., SPSS for Windows, Chicago, IL, USA, 1999) version 10.

RESULTS

A total of 34 patients with uncomplicated pilonidal sinus disease underwent our modification of the Karydakis procedure. Patients were aged between 16 and 44 (Table 1). There were 30 males and 4 females. None of them had significant comorbidities except type II diabetes mellitus and hypertension in three patients.

Table 1: Age distribution of patients included in study.

Age (years)	Frequency
<20	2
20-29	15
30-39	14
≥40	3

Table 2: Sex distribution of patients in study.

Sex	Frequency
Male	30
Female	4

All 34 patients had a smooth post-operative recovery. A suction drain was kept in situ until the drain output became less than 20 ml in 24 hours. All patients were discharged on the 3rd or 4th post-operative day after removal of the drain. Three patients developed redness around the wound, and they were started on oral antibiotics and discharged.

Patients were reviewed in the outpatient clinic on the 8th and 15th post-operative day. Two more patients developed signs of inflammation of the wound with serous discharge on the 8th post-operative day and were commenced on antibiotics (Table 3). All patients had sutures removed on the 15th post-operative day and could progressively return to normal activities. Two patients developed a subcutaneous collection on the 15th post-operative day which was drained and eventually healed by dressings. One patient, who suffered from type II diabetes mellitus and obesity, developed infection of the lower part of the wound, which needed partial debridement and subsequent re-suturing. No patient developed wound dehiscence or flap necrosis. 31 out of the 34 patients could return to work after two weeks. All patients were advised to follow up in clinic after one year of the operation. Those who did not turn up to clinic were contacted by telephone. However, four patients could not be traced. All reviewed patients did not have recurrence at one year and were happy with the outcome of the surgery and cosmetic results.

Table 3: Post-operative complications of modified Karydakis operation (n=34).

Complication	Percentage of total patients
Erythema of wound	3 (8.8)
Discharge from wound	2 (5.9)
Seroma	2 (5.9)
Infection	1 (2.9)

DISCUSSION

Pilonidal sinus disease is a common condition affecting young adults, especially males. The peak incidence for sacrococcygeal pilonidal sinus disease is encountered between 15 and 24 years of age.[10] Yildiz et al reported a prospective patient cohort consisting of 223 (86.8%) males and 34 (13.2%) females, with a mean age 27.15±7.71 years.[11] In our prospective case series, 88% were males and 12% females, with a mean age of 30.1.

The principle of the original Karydakis procedure is essentially flattening of the natal cleft and lateral shift of the midline scar, thus preventing hair lodgement within in the natal cleft and further recurrence. Although it is associated with good post-operative results, it can be technically challenging in certain situations.

Some surgeons have encountered the problem of the stitch cutting through loose subcutaneous fat tissue when attempting to suture. In our procedure**,** this problem was overcome by using thicker suture material through the

sacrococcygeal fascia on the opposite side.[6] Another limitation of the procedure is the potential for wound dehiscence and flap necrosis due to tension following wound closure. Our modification of Karydakis advancement flap involves suturing the deeper part of the full thickness flap to the fascia opposite after adequate mobilization. This was followed by a second layer suture above with limited mobilization if required to relieve any tension. (Figure 1C and D). This layered closure also helps to avoid any cavity formation. A further subcutaneous suture was also made (Figure 1E), and skin was closed with interrupted 3-0 nylon suture (Figure 1F). By adopting these modifications, we could achieve tension-free closure of the wound without any cavity formation and with better lateralisation of the suture line. Accordingly, none of our patients developed wound breakdown or flap necrosis as a complication in the immediate post-operative period.

Our modification of the Karydakis procedure demonstrated minimal post-operative complications, similar to other large studies of the original procedure, in the form of erythema around the wound (8.8%), wound discharge (5.9%), and seroma (5.9%).[10,11] Notably, the infection rate (2.9%) in our study was lower than those reported by other studies of the original procedure.[10-12] Furthermore, there were no cases of flap necrosis or wound dehiscence in the post-operative period which have been reported to occur in up to 5.9% of patients following the original procedure.[12] In our case series, the mean hospital stay was 3.5 days similar to other studies.[11,12] One of the major advantages of the original Karydakis procedure is that it results in early return to daily activities postoperatively. This has been reported to be 12.4-20 days.[13] In our study, the time elapsed to return to daily activities was two weeks for the vast majority of patients (91% i.e. 31/34). There was no recurrence at one year follow up.

The goals of the ideal surgical procedure should include short hospital stay, rapid healing of the surgical wound, a minimally painful post-operative period, low recurrence, simple and straightforward wound management, and rapid return to premorbid function. This could be achieved in the vast majority of the patients in our study with our modification of the Karydakis procedure. Moreover, patient satisfaction and cosmetic acceptance were excellent with this technique.

One limitation of the original Karydakis procedure is that in patients having secondary sinuses too far away from midline, it would be difficult to perform as the area of excision and advancement becomes very large.[10] This will require more complex procedures. Hence, we were selective in our inclusion criteria of choosing patients with secondary openings only on one side and within two centimetres of the midline. We believe careful selection of patients with simple uncomplicated sinuses is key to facilitate minimal post-operative complications with no recurrence, as reported in our study. For more complex sinuses with infection and recurrence, we would not recommend this procedure.

CONCLUSION

We demonstrate that our novel modification to the Karydakis operation is an effective yet simple procedure for the management of uncomplicated pilonidal sinus disease. It results in relatively short hospital stays, swift recovery to normal functional status, minimal post-operative complications and excellent cosmetic results.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: George T, Mathew J. Modified Karydakis procedure for uncomplicated pilonidal sinus. Int Surg J 2020;7:2568-72.