Medium term results after modified Karydakis operation: suitability as a day case procedure

EMMA L COURT, MAISAM Z. FAZEL, MIKE DWORLIN & BANDIPALYAM V PRAVEEN

Keywords: Pilonidal disease, Karydakis procedure.

Abstract

Background: Surgical treatment of pilonidal disease remains controversial.

Methods: Seventy-two patients (60 male) with this condition underwent a modified Karydakis procedure performed by a single surgical firm over a 6 year period. They were identified from theatre logs and their clinical notes scrutinised.

Results: The immediate post-operative course was uneventful in 70 cases, and 2 patients required additional wound care. The duration of hospital admission ranged from same day discharge in 39 of 42 of those planned as day procedures (3 failed due to anaesthetic issues), overnight-stay in 16 out of 30 in-patient cases, with a mean duration of stay for the remaining 14 in-patient cases of 4 days (range 2–6 days). These protracted stays were consequent to the use of drains at a time before arrangements existed locally to routinely discharge patients with them in situ. Median time off work was 3 weeks, with regular analgesia required most frequently for a 7-day period.

At the four week follow-up appointment, 4 patients were prescribed antibiotics:

- 3 for persistent discharge from the wound
- 1 for surrounding erythema and pain.

All 4 patients had been in-patients cases and their symptoms resolved without further intervention. At the discharge appointment, 94.4% of patients (68/72) were asymptomatic, with no further problems. There was only 1 recurrence, which required incision and drainage 20 months post-operatively. Sixty-seven patients (93.1%; 39 day-cases) were contacted by telephone for follow-up, ranging from 2–52 months post-discharge from clinic. Of those contacted, 64 patients remained asymptomatic.

Conclusion: Our results indicate that the modified Karydakis technique is an effective day-case procedure for pilonidal disease, carries minimal risk of complications and is curative in a high proportion of cases.

Introduction

Pilonidal disease involves a chronic granulomatous infection thought to be caused by penetration of a foreign body, typically hair, into the subcutaneous tissues. The male to female patient ratio is approximately 4:1. Onset of pilonidal disease coincides with puberty, whilst de novo pilonidal disease is rare above the age of 40 years. This suggests an association with the effect of sex hormones on pilosebaceous glands.

The pathogenesis of pilonidal disease remains controversial. Some authors suggest that the sinus is congenital in origin, but that pilonidal disease develops as a result of secondary factors, such as obesity, hirsutism, and endocrine changes. However, evidence is accumulating in support of an acquired theory, in which the pilonidal sinus represents a distorted hair follicle that becomes distended with keratin, and that pilonidal disease is in fact a form of foreign body granuloma. While pilonidal disease most commonly occurs in the region of the sacrococcygeal junction, it has been reported in the umbilicus and axilla.

Authors’ Addresses
EMMA L COURT
Department of Upper Gastrointestinal Surgery, Southampton General Hospital, Tremona Road, Southampton SO16 6YD
MAISAM Z FAZEL
MIKE DWORLIN
B.V. PRAVEEN
Department of Surgery, Southend University Hospital NHS Foundation Trust, Prittlewell Chase, Westcliff on Sea, Essex SS0 ORY
Its presence in the interdigital webs of barbers’ hands lends support to the acquired theory.\(^a\)

Hair characteristics are thought to play a role in development of pilonidal disease. Additional influences include moist, anaerobic conditions in the natal cleft,\(^a\) sedentary occupations, increased buttock friction produced by activities such as lorry driving, a deep natal cleft, hirsutism, poor personal hygiene and increased body weight.\(^b,2,4\)

Clinical presentation often includes abscess formation cephalic to the site of follicular infection. The average duration of symptoms exceeds 3 years.\(^a\) Malignant transformation is rare, but cases of squamous cell carcinoma and verrucous carcinoma have been reported.\(^a\)

The commonest treatment for acute exacerbation of pilonidal abscess is incision and drainage, but recurrence following this procedure ranges from 21–55%, which suggests this technique is not curative in most cases.\(^a\) Approximately 40% of patients treated by incision and drainage require further surgical treatment, but Bascom proposed that this rate can be reduced to 15% if the pilonidal pit is conservatively excised at 5 days post-drainage.\(^a\)

Many treatments have been advocated for long-term control of pilonidal disease, with variable incidences of complications such as wound infection, haematoma, impaired healing and recurrence (reviewed by Allen-Mersh\(^a\) and Chintapatla\(^a\)). Reported techniques include laser depilation, diathermy of the pilonidal pit, laying open and healing by secondary intention, excision of the pilonidal sinus with partial closure (marsupialization) or split-skin grafting. Excision and primary closure using an asymmetric/oblique incision (Z-plasty, rotation and advancement flap, V-Y advancement flap, Limberg transposition flap, rectangular rhomboid and W-plasty and the Karydakis asymmetric advancement technique) are popular as they aim to reduce or obliterate the natal cleft.

Allen-Mersh highlighted common flaws in study designs, including retrospective analysis, unclear patient selection criteria, lack of randomisation, absence of control groups, short or incomplete follow-up, with a lack of cost assessment and inconvenience of treatment options to the patient.\(^*\) Since that time, authors have strived to produce scientifically sound studies, which include randomised controlled trials comparing methods for both the surgical treatment of pilonidal disease,\(^6-8\) and post-operative care.\(^9\) However, no single method currently satisfies all criteria for an optimal treatment i.e. minimally invasive, short in-patient stay (ideally day-case and under local anaesthesia), reduced post-operative morbidity, cosmetically acceptable result and low risk of complications or recurrence.\(^a\) At the present, the surgical method employed remains heavily dependent upon the personal choice of the surgeon and available resources.\(^a\)

The Karydakis procedure is an asymmetrical excision technique first described in 1973.\(^a\) The sinus complex is completely excised using a vertical eccentric elliptical incision. A thick flap is produced by undercutting the medial edge and advancing it across the midline to produce a lateral, vertical scar to reduce the risk of recurrence. Initially, the technique was successfully applied to a cohort of 6,545 with less than 1% recurrence; this has subsequently been reproduced by others with similar rates of success.\(^6,9,12-14\) In a cohort of 141 patients, Kitchen reported a recurrence rate of only 4% that required further surgery,\(^a\) and a study of 28 patients conducted by Anyanwu reported no recurrence over a follow-up period of 3 years.\(^a\) Anderson et al have demonstrated the effective use of the Karydakis technique as a day-case procedure in 51 patients at their tertiary referral centre.\(^a\)

Here, we describe our experience with a modified Karydakis procedure, in which a ‘D’ or ‘sickle-shaped’ incision is made which encompasses the pilonidal complex, allowing excision of the tissue down to the fascia, with undercutting to create a short thick flap to advance across the midline. This not only reduces the depth of the natal cleft (so hairs are less likely to gather) but it also takes the whole wound off the midline, providing no entry point for new hairs, and provides a supple wound based on muscle, rather than bone.

**Patients and Methods**

Consecutive patients with sacrococcygeal pilonidal disease who underwent a modified Karydakis procedure performed between September 2001 and January 2008 by a single surgical firm (comprising 2 Consultant surgeons and 2 Specialist Registrars) were identified from theatre logs. The age at which the procedure was performed was noted. Occupation and Body Mass Index (BMI) were also recorded for comparative purposes.

**Pre-Operative:** Information regarding the nature [pain, swelling, discharge, abscess and pruritus] and duration of pre-operative symptoms was obtained from case notes. The total number of sinuses, together with details of previous antibiotic therapy and surgical procedures was also noted. This included the time elapsed between the last operation and the subsequent Karydakis procedure. The scheduled type of operation was recorded for each patient [elective day-case, or in-patient]. Anaesthetic risk or social circumstances dictated the requirement for in-patient treatment.

**Karydakis Procedure:** All operations were performed under general anaesthesia with patients in the prone position and the buttocks taped apart as previously described.\(^a\) A single dose of broad-spectrum antibiotic was given on induction of anaesthesia. Hair in the gluteal and sacral regions was shaved. A ‘D’ or ‘sickle-shaped’ eccentric vertical elliptical skin incision encompassing the pilonidal sinus complex was made, lateral to the midline [Figure 1]. This was extended down to the presacral fascia, and the sinus...
complex excised en bloc [Figure 2]. Tissues were dissected and haemostasis achieved using diathermy. The excised wedge of tissue was submitted for histological analysis in all cases. The presence or absence of pus was recorded. A skin flap was mobilised to permit apposition of the wound, which was then closed in two layers, lateral to the midline, creating a shallower natal cleft [Figure 3]. Subcutaneous tissues were sutured using an absorbable suture, and the skin closed with Nylon or Proline®. A Mepore® bio-occlusive dressing was applied to the wound. A drain was used in over half the cases and volume drained recorded.

**Post-operative Care:** The duration of in-hospital stay was noted. Patients were discharged with analgesia [opioid/ non-opioid and non-steroidal anti-inflammatory drugs] and 3–5 days of broad-spectrum antibiotics in most cases. Laxatives were prescribed in 37 patients. Bed-rest was recommended for 3 days. All patients were advised against sitting for 14 days post-operatively, and were counselled regarding wound care. Notes on the post operative course were recorded and any complications, such as bleeding, infection, increased pain or wound breakdown were acknowledged therein.

**Follow-Up:** Patients were followed-up as out-patients from 4 to 6 weeks post-operatively. The date on which sutures were removed was recorded. If the post-operative course was uneventful, and the wound healing satisfactorily, patients were discharged at this stage. In the remaining cases, follow-up continued until acceptable symptom resolution and wound healing was achieved. Any further treatment was recorded.

The telephone interview incorporated questions regarding the total number of post-operative days requiring regular analgesia, the duration of time off work following the procedure, and whether the procedure was effective, or if symptoms had recurred following discharge from clinic.

**Results**

Seventy-two patients were identified from theatre logs; 60 male and 12 female patients [male to female 5:1] with a mean age of 33.1 years (median 30 years, range 15–57 years). The BMI of 83.3% of these patients exceeded the accepted upper normal limit of 25, with mean BMI being 28 (median 27, range 22.6 – 34). Ten patients considered themselves particularly hirsute, but this was recorded in the case notes of only 5 patients.

Signs and symptoms of pilonidal disease among the 72 cases included pain [66/72, 91.7%], swelling [58/72, 80.6%], discharge [46/72 63.8%], abscess [35/72 48.6%], and pruritus [14/72, 19.4%]. Duration of symptoms ranged from 1 – 120 months (mean 22 months, median 7 months).
Of the 72 patients, 28 had undergone previous surgical procedures, 62 had received antibiotic therapy for recurrent pilonidal sinus disease, and 10 patients had received no previous treatment. A total of 36 previous operations had been performed in 28 of the patients prior to the modified Karydakis procedure (single operation N = 26, two operations N = 1 and eight operations N = 1). The types of operation included incision and drainage (N = 31), excision and laying open (N = 2), excision and primary closure (N = 1), sacral rotation flap (N = 1), and Bascom’s procedure (N = 1). The time elapsed from any previous operation ranged from 6 months to 16 years (median 2.1 years).

The modified Karydakis procedures were either scheduled elective day-case procedures (N = 42), or elective in-patient cases (N = 30), with 66 procedures performed by consultant surgeons and the remaining 6 cases performed by specialist registrars within the surgical firm.

Intra-operatively, a single sinus was most commonly observed (range 1 – 6 sinuses). Pus was present in 16 cases.

A drain was inserted in 44 cases (Bellovac N = 40, Robinson N = 4]. Drains were most frequently removed on the 4th post-operative day (range 1 – 5 days), with a median total volume drained of 50ml (range 0 – 240ml).

Post-operative course was uneventful in 68 cases. Four of the in-patient cases were prescribed antibiotics when seen in clinic at 4 weeks, 3 for persistent discharge from the wound, and one for surrounding erythema and pain. All 4 cases resolved without further intervention.

The duration of hospital stay ranged from day-stay to 12 weeks (range 1 – 5 days), with a median total hospital stay of 4 days (range 2 – 6 days).

Forty-eight patients were discharged with opioid analgesia, 30 cases with non-opioid analgesia, and 20 cases were prescribed non-steroidal anti-inflammatory drugs. Oral antibiotic courses of 3- or 5-day duration were prescribed in 50 cases, and 37 patients received a 2-week supply of laxatives.

Removal of sutures in 45 patients occurred in primary care at 3 weeks and during clinic follow-up appointments at 4 weeks in 20 cases. Alternate stitches were removed earlier (1–2 weeks) in 7 cases with wound discharge or erythema.

The most frequent duration of out-patient follow-up was 6 weeks (range 1 – 60 months). At the discharge appointment, 68 patients (94.4%) were asymptomatic and problem free. In 2 patients, pilonidal symptoms had resolved, but one patient experienced neuralgic pain, and one other patient continued to complain of swelling and pruritus 38 months post-operatively. Only one patient (1.38%) experienced recurrence of pilonidal disease, which required incision and drainage 20 months post-operatively.

The median time off work was 3 weeks (range 1 – 13 weeks), with regular analgesia required most frequently for a 7 day period (mean 16 days, range 1 – 70 days).

Sixty-seven patients were successfully contacted for follow-up by telephone (93.1%), at periods ranging from 2 – 52 months post-discharge from clinic (median 30 months). Of those contacted, 64 (88.9%) patients were asymptomatic and 66 (91.7%) were completely satisfied with the procedure and outcome.

Discussion

The treatment of pilonidal sinus is determined by its clinical course. Many cases first present with an acute abscess, where drainage is felt to be adequate. This provides definitive treatment in approximately half of these cases, but if the disease persists beyond 10 weeks, additional surgery should be considered.

Surgical treatment of chronic pilonidal sinus is divided into open excision, primary closure, laying open and excision with flap closure. Laying open is the simplest technique, but the healing time is prolonged and the recurrence rate is comparatively high [10%]. The open excision technique requires prolonged hospitalization, daily wound dressing, and can be complicated by wound breakdown caused by premature closing of the skin edges prior to complete healing. Excision of the diseased tissue down to the post sacral fascia is a widely accepted requirement, but the appropriate method of wound closure remains a matter of debate. Primary closure of the wound is a simplistic technique but carries a high recurrence rate due to persistence of the natal cleft. Bascom advocates reducing the depth of the natal cleft as a curative measure.

Wound tension has a marked influence on treatment success. Tension-free closure improves patient comfort and shortens hospital stay. Flap procedures have the potential to reduce wound tension. Numerous flap transposition and advancement techniques have been described, with varying results (reviewed in depth by Allen-Mersh and Nessa).

The Z-plasty procedure has the disadvantage that part of the wound spans the midline and flap tip necrosis can occur in up to 20% of cases. The Limberg flap is a transposition technique suitable only for closure of rhomboid defects with angles of 60 and 120 degrees, but the laxity of adjacent skin is critical for the success of flap formation. This limits its use, despite low complication and recurrence rates [6% and 4.9%, respectively].

With the fasciocutaneous V-Y advancement flap it is necessary to incise the gluteal fascia and a section of the gluteus muscle to obtain mobility, resulting in an average hospital stay of 5 days. The complication rate varies widely (0%–17%), but recurrence rate is reported to be low in small studies. The technique is recommended for recurrent and complicated pilonidal disease.
The Karydakis procedure is an advancement flap technique that avoids a midline wound. Following excision of the pilonidal sinus complex, one wound edge is undermined, advanced against the other wound edge and sutured. Authors report a low rate of recurrence (<1%–4%)\(^2, 3, 6, 10, 13\), with complications occurring in 8.5–9%\(^3, 6, 10, 13\) and a hospital stay of 3–4 days\(^6, 10, 13\). The ‘D’ and ‘sickle-shaped’ incisions are modifications of the Karydakis procedure, with a reported success rate of 80%\(^2, 4\). However, in the current study, these achieved cure in 88.9% of cases at the last clinic follow-up appointment.

The mean age of patients in this study (33.1 years) is higher than reported in other studies\(^6, 9\), but the cohort included a number of patients over the age of 40 years and it is possible that these patients had tolerated symptoms for many years or experienced persistent recurrent pilonidal disease.

Over 80% of the patients in this study were overweight (83.3% BMI>25), which is consistent with reports that development of pilonidal disease is related to obesity\(^4, 22\). Authors also suggest that although Karydakis procedure is an appropriate treatment for pilonidal disease, a high BMI increases the risk of both intra- and post-operative complications\(^22\). This was not the case in our study; patients with BMIs exceeding 30 experienced an uneventful post-operative course. However, the significance of this observation is uncertain in this relatively small cohort.

Reports claim that pilonidal disease is most common in hisrute males\(^4, 2\), but only 10 patients in this group considered themselves to be hisrute and 5 cases alone were documented in the patient notes.

The patients in this study experienced typical signs and symptoms of pilonidal disease. It is reported that symptoms are often endured for 3 years or more\(^6\). Mean duration of symptoms in our cohort was 22 months, but ranged from 1 month to recurrent pilonidal disease spanning a period of 10 years. The fact that a number of patients in this study sought medical attention early in the course of their pilonidal disease may have contributed to the success of surgical treatment.

Of the 72 patients in this study, 28 had undergone previous surgical procedures, 62 had received antibiotic therapy for recurrent pilonidal sinus disease, and 10 had received no previous treatment. A total of 36 previous operations had been performed in 28 of the patients prior to the Karydakis procedure. Of 31 incision and drainage treatments, 6 were performed in a single patient. This is consistent with reports that the technique is suitable for relief of acute symptoms, but recurrence is common\(^6, 13\). The time elapsed from a previous operation ranged from 6 months to 16 years [median 2.1 years]. This data further reinforces the notion that pilonidal disease is frequently recurrent, requiring repeated therapy to achieve cure.

The modified Karydakis procedures were either scheduled elective day-cases (N = 42), or elective in-patient cases (N = 30). The decision to perform the procedure as an in-patient case was made for anaesthetic concerns or social issues.

Intra-operatively, although a single sinus was most commonly observed, up to 6 sinuses were simultaneously recorded, which demonstrates the complexity of pilonidal disease. Furthermore, pus was present in 16 cases, which reinforces the view that chronic infection is a common feature of pilonidal disease\(^4, 8\).

Thorough haemostasis was achieved in all cases, which is widely acknowledged to be critical to treatment success and avoidance of complication\(^5, 7, 8, 10, 16, 16\).

Gurer et al. advocate the use of suction drainage to prevent complications due to fluid collections in the Karydakis technique\(^8\). However, in the current study, drains had been used in all 4 cases that experienced infection post-operatively, suggesting that drain insertion is not necessarily protective against such complications. In addition, the use of drains initially dictated in-patient treatment, prolonging hospital stay in the early stages of our experience with this technique at a time when facilities to discharge patients with drains in situ were not routinely available.

Post-operative course was uneventful in 68 cases. Four patients [5.6%] were prescribed antibiotics when seen in clinic at 4 weeks, 3 for persistent discharge from the wound, and one for surrounding erythema and pain. All 4 cases resolved without further intervention. This is superior to other reports of Karydakis procedure, in which a wound infection rate of 26% was reported\(^26\) and 4% – 10.7% of patients required further surgery in the post-operative period\(^8, 13\).

The duration of hospital stay was in keeping with other authors, who state a median hospital stay of 4 days using the Karydakis technique\(^6, 8, 10, 13\), but is superior to other reports of asymmetrical excision and closure techniques, in which the mean hospital stay ranged from 7.3\(^22\) to 16 days\(^22\).

Removal of sutures occurred at a later stage than in other studies\(^6, 10, 13\), but did not appear to have a deleterious effect on outcome.

The median time off work was 3 weeks [range 1–13 weeks], with regular analgesia required most frequently for a 7 day period [mean 16 days, range 1–70 days]. This is shorter than that reported in comparative studies of procedures such as marsupialisation and primary midline closure, in which the average time off work after primary closure was 6 weeks compared with 7 weeks after laying open\(^4, 22\). The most frequent period during which regular analgesia was required [7 days] compared favourably with other studies of surgical treatment for pilonidal disease\(^4, 8, 19, 25\), but the range of 1–70 days was unusually variable, as data was skewed by individuals with concurrent conditions who required analgesia for lengthy periods of time.
The most frequent duration of out-patient follow-up was 1.5 months [range 1–60 months]. At the discharge appointment, 68 patients (94.4%) were asymptomatic with no problems. In two patients, pilonidal symptoms had resolved, but other problems were encountered; one patient experienced neuralgic pain due to repeated operations for pilonidal disease, and another patient continued to complain of swelling and pruritus 38 months post-operatively, but no treatment was required. Only one patient (1.38%) experienced recurrence of pilonidal disease; hence it is possible that mature scar tissue may have been responsible for their discomfort.

Overall, 66 patients (91.7%) reported complete satisfaction with the procedure and outcome during telephone interview, which is superior to a satisfaction rate of 70.8% in a study conducted in 2009.

**Conclusion**

In this study, the low incidence of post-operative problems (5.56%) and recurrence (1.38%), combined with the relatively short period before return to work (median 21 days) and high patient satisfaction rate (91.7%), emphasize the benefits of the modified Karydakis excision and repair technique in the surgical treatment of pilonidal disease. Our results demonstrate that the procedure can be effectively performed as a day-case procedure, or overnight stay if in-patient treatment is truly necessary. The technique is not technically demanding, and can readily be performed by Consultant Surgeons and Specialist Registrars alike.

**Acknowledgements**

The authors would like to thank Pam Roach for sourcing medical notes and staff at The Library, Education Centre, Southend University Hospital NHS Foundation Trust, for prompt provision of the references cited in this report and Roger Haworth, for his editorial input.

**References**


