# Sacrococcygeal pilonidal sinus: modified sinotomy versus lay-open, limited excision, and primary closure

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**Context**
Pilonidal sinus PNS is a common condition. Although many methods for treatment are available, there is no consensus on the optimal treatment.
**Aim**
The aim of this study was to compare the results of a modified sinotomy method with those of lay-open, limited excision, and primary closure with and without a drain in the management of a PNS.
**Settings and design**
This is a prospective randomized comparative study.
**Patients and material**
Fifty-eight patients undergoing surgery for primary PNS were enrolled. The patients were randomized into three groups: group A (17 patients) underwent modified sinotomy; group B (22 patients) underwent lay-open, limited excision, and primary closure with a drain; and group C (19 patients) underwent the same procedure as group B but without a drain. Each patient was followed up for 24 months.
**Statistical analysis**
Continuous variables were expressed as mean±SD. Categorical variables were expressed as frequencies and percentage.
**Results**
Significantly short operative time was recorded in the modified sinotomy group. Postoperative wound complications occurred in 5.9% of patients in group A, in 31.8% of patients in B, and in 21.1% of patients in group C. Significantly short time was recorded between the completion of the procedure and the patient being able to walk, sit, and sit on a toilet comfortably, as well as be able to return to work, in group A; however, the healing duration was significantly longer. Visual analogue scale score showed significantly less pain in group A. Complete wound healing occurred in all patients in groups B and C, but one patient in group A developed failure of healing. Recurrence rate was a slightly higher in group B but with no statistical significance.
**Conclusion**
The modified sinotomy technique for treatment of PNS is superior to excision with primary closure either with or without a drain with respect to operative time, hospital stay, comfort in walking, sitting, and sitting on the toilet, return to work, and visual analogue scale scores for pain, although the healing time is longer.

**Keywords:**
lay-open, pilonidal sinus, primary closure, sacrococcygeal, sinotomy

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## Introduction

Sacrococcygeal pilonidal sinus (PNS) is a common condition usually affecting young-to-middle-aged men. Its pathophysiology is uncertain as it has been commonly thought to be embryonic; however, nowadays it is commonly thought to be acquired [1]. PNS is due to hair penetration into the skin of the gluteal cleft that causes a cyst and sinus formation because of reaction to a foreign object, resulting in secondary infections and abscess formation [2]. Risk factors include adiposity, sedentary lifestyle, local irritation-trauma, insufficient body hygiene, excessive hair, and perspiration [3].

Many methods are available for surgical and non-surgical treatment of PNS [4]. PNS is usually treated by wide excision. After excision, the wound may be left open to heal with granulation tissue [5], or may be immediately closed with a midline closure [6] or by using a flap (Z-plasty [7], Karydakis [8], Bascom [9], or Limberg [10] flaps). However, there is not yet a consensus on the optimal treatment. Recurrence after



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any surgical procedure is not uncommon, reaching up to 20% or more [11].

The ideal management for PNS should be simple, cause minimal pain, have the best chance for success and the least recurrence rate with a low risk for complications and rapid return to work [12]. The aim of this study was to compare the results of modified sinotomy against those of lay-open, limited excision and primary closure with and without a drain in the management of a PNS.

## Patients and methods

This prospective randomized trial was conducted over a period of 48 months from May 2012 to March 2016. Fifty-eight patients undergoing management of their primary PNS were enrolled. They were selected on the basis of age (17–40 years old), BMI (20–29.9 kg/m$^2$), and number of sinuses (≤5 midline sinuses). If the sinus was not located midline, it was ensured that there was only one sinus and that the sinus was not more than 2 cm away from the midline. Obese patients and those with infected and recurrent PNS were excluded from the study, as well as patients with chronic medical conditions affecting the healing process. The first 24 months of the study was divided into three equal periods (8 months each) at which patients were randomized into three groups: group A (17 patients) underwent modified sinotomy; group B (22 patients) underwent lay-open, limited excision and primary closure with a drain; and group C (19 patients) underwent the same procedure as group B but without a drain. Each patient was followed up for 24 months.

Data extracted for analysis included demographic details, duration of symptoms, operative time, duration of hospital stay, postoperative comfort in walking, sitting and sitting on the toilet, visual analogue scale (VAS) for pain at days 1 and 5, healing time, healing failure, return to work, and recurrence rate.

### Surgical techniques

*General consideration*

After obtaining informed consent from the participating patients, they were prepared preoperatively with intravenous 500 mg metronidazole and 1 g ceftriaxone 20 min before the procedure. Shaving of the operation area and evacuation enema were done a few hours before the procedure. Spinal anesthesia was adopted in most of the cases, according to patient preference, but general or local anesthesia with sedation was also used in some cases. During the operation, the patient was placed in the prone position with the pelvis elevated with a pillow. An adhesive tape was used to strap the buttocks apart for proper exposure of the sinus area, which was disinfected with 10% povidone–iodine.

*Group A (modified sinotomy)*

After identification of the main sinus orifice, it was probed (Fig. 1) and the main track was laid open (Fig. 2). Any cysts or hair tufts were removed, followed by curettage of the infected granulation tissue and debris. The modification adopted here is that the skin carrying the sinus openings was excised with partial excision of the lateral wall of the main sinus track (Fig. 3a and b).

Using a magnifying surgical loop and suction instrument, any side track was identified, laid open, and curetted. The whole cavity was then washed with $H_2O_2$ and 10% povidone–iodine and irrigated with saline (Fig. 4). Meticulous hemostasis and packing with good compression was achieved. The wound was dressed every day for 3 days. Thereafter, healing-promoting local applicants (sitosterol 0.25% as the main active ingredient) were used until complete healing was achieved.

*Group B (primary closure with drain)*

Group B patients underwent the same procedure as those of group A, but after laying open (Fig. 5) the

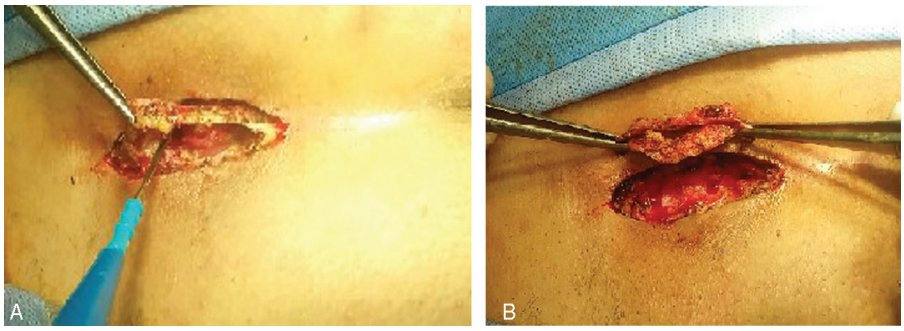
**Figure 1**

Probing of pilonidal sinus.

**Figure 2**

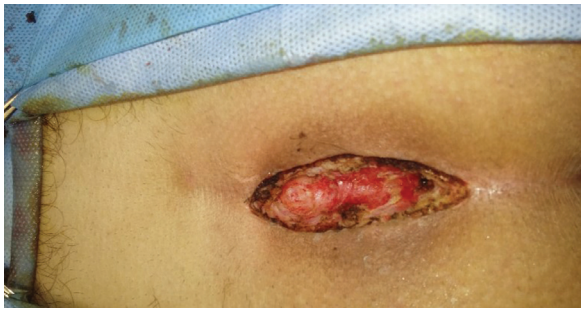
Lay-open and curettage.

**Figure 3**




(a, b) Excision of the edge of the wound together with the upper part of the sinus wall.

**Figure 4**



Sinotomy is completed.

**Figure 5**

Lay-open.

main and side tracks were excised (Fig. 6a and b) with minimal tissue removal (sinectomy) to achieve a tension-free closure. Thus, there was no need to reach the postsacral fascia.

Closure in layers was achieved starting from the deepest part of the wound using a polyglactin 910 2/0 rounded needle. Then a suction drain 12 was put at the subcutaneous area to be removed within 48–72 h (Fig. 7). Subcutaneous closure with polyglactin 910 2/0 and skin closure was done (Fig. 8) using polypropylene 3/0 followed by compression dressing, which was changed after 48–72 h and then every other day.

*Group C (primary closure with no drain)*

Group C patients underwent the same procedure as group B patients but subcutaneous and skin closure was accomplished without a drain.

*Postoperative*

Antibiotics and analgesics were needed for groups B and C postoperatively for 5 days, followed by administration of analgesics on demand, whereas analgesics were used on demand in patients in group A with no need for antibiotics.

All patients were followed up for 24 months postoperatively (at 3, 6, 12, 18, and 24 months) by attendance or by phone. Patients in group A were seen weekly until complete healing of the wound, whereas patients in groups B and C were seen weekly at the first postoperative month. The drain was removed from group B patients within 48–72 h postoperatively to make sure that there were no wound complications. Removal of sutures was done at 2–3 weeks. If there were any wound complications, sutures were removed and the wound was dealt with as the open method until complete healing. If no healing occurred despite careful wound dressing, this was considered as healing failure. Disease recurrence was considered after the disease-free interval following complete healing.

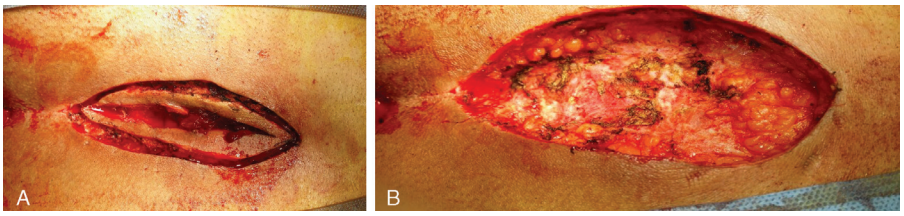
### Statistical analysis

Statistical analysis was carried out using SPSS 20 (SPSS Inc., Chicago, Illinois, USA). Mean±SD was used for presenting numerical data. The Fisher exact test, $\chi^2$-test, ANOVA test, and post-hoc test were selectively used according to the data. Statistical significance was considered at $P$ value less than 0.05.

## Results

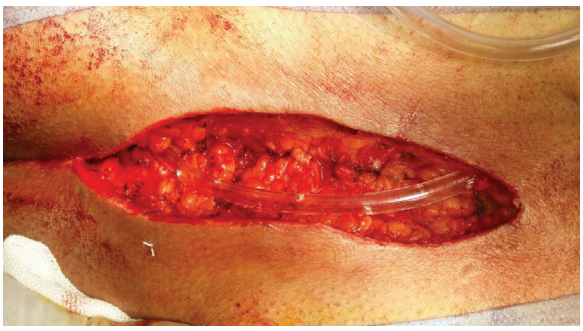
This study included 58 patients who underwent surgical management for their primary PNS at the Department

**Figure 6**




(a, b) Excision of the sinus.

**Figure 7**



Primary closure with suction drain.

**Figure 8**

Skin closure.

of General Surgery at Ain Shams University Hospitals over a period of 48 months from May 2012 to March 2016. Thirty-nine (67.2%) patients were male and 19 (32.8%) were female. Their ages ranged from 17 to 40 years with a mean±SD of 25.43±7.02 years. All patients complained of symptoms of PNS (pain and discharge) for 10–30 months, with a mean±SD of 17.66±4.71 months (Table 1).

The mean operative time was 23.12±4.12 min in group A, 34.68±4.12 min in group B, and 35.58±4.69 min in group C, with significantly short operative time in the sinotomy operation group in comparison with the other two groups.

As regards the postoperative complications, one (5.9%) patient in group A developed postoperative bleeding, which needed hemostasis in the operating room with compression, and seven (31.8%) patients in group B developed wound complications in the form of infection in four patients, hematoma in one patient, and discharge in the other two. In group C, four (21.1%) patients showed wound complications in the form of discharge in three patients and infection in one patient. In wound infection, the sutures were removed to open the wound. The wound hematoma that developed in one patient was evacuated in the operating room with hemostasis to be closed again while discharge from the wound was managed conservatively. The hospital stay was significantly shorter among patients in group A in comparison with groups B and C, as shown in Table 2.

There was a significantly short time to comfortable walking, sitting, sitting on the toilet, healing, and time to return to work postoperatively in group A. However, the healing duration was significantly longer in group A when compared with the other two groups. VAS scores for pain on the first and fifth postoperative days showed significantly less pain in group A.

Complete wound healing occurred in all patients in groups B and C, including complicated wounds, whereas one patient in group A developed failure of healing of his wound. The recurrence rate was higher in group B [5.9% ($n$=1), 18.2% ($n$=4), and 5.3% ($n$=1) in groups A, B, and C, respectively].

## Discussion

Many techniques have been advocated for the surgical management of PNS. They are classified basically into two groups: total excision of the sinus followed by either leaving the wound open for secondary healing or its primary closure with techniques ranging from simple suturing to the numerous complex methods for coverage. However, recurrence is still an important problem and its optimal management remains controversial [13].

In the present study, there was a remarkable male predominance in the three groups; however, the

**Table 1 Demographic data and duration of symptoms of patients in the three groups**

| | Group A (*N*=17) | Group B (*N*=22) | Group C (*N*=19) | ANOVA test | |
|---|---|---|---|---|---|
| | | | | *P* value | Significance |
| Age (mean±SD) (years) | 26.18±7.03 | 25.36±7.23 | 24.84±7.10 | 0.854 | NS |
| Sex [*n* (%)] | | | | | |
| Male | 12 (70.6) | 15 (68.2) | 12 (63.2) | 0.877* | NS |
| Female | 5 (29.4) | 7 (31.8) | 7 (36.8) | | |
| Symptom duration (mean±SD) (months) | 16.74±3.59 | 17.14±4.94 | 19.32±5.09 | 0.158 | NS |

*$\chi^2$-Test.

**Table 2 Postoperative clinical outcomes in the three groups**

| | Group A (N=17) | Group B (N=22) | Group C (N=19) | Post-hoc test[a] | |
|---|---|---|---|---|---|
| | | | | P value | Significance |
| Operative time (min) | 23.12±4.12 | 34.68±4.12 | 35.58±4.69 | <0.001 | S |
| Hospital stay (days) | 0.23±0.08 | 2.09±1.09 | 1.50±0.53 | <0.001 | S |
| Walking (days) | 2.24±0.36 | 15.23±1.63 | 15.32±1.60 | <0.001 | S |
| Sitting (days) | 0.73±0.31 | 7.82±1.05 | 7.89±1.10 | <0.001 | S |
| Toilet sitting (days) | 1.71±0.40 | 5.82±0.85 | 5.74±0.93 | <0.001 | S |
| Wound healing (days) | 30.81±3.12 | 17.27±4.81 | 17.74±5.16 | <0.001 | S |
| Return to work (days) | 4.12±0.52 | 19.82±3.69 | 19.68±3.15 | <0.001 | S |
| VAS score first day | 4.71±1.16 | 6.86±1.49 | 6.21±1.18 | <0.001 | S |
| VAS score fifth day | 2.71±1.16 | 3.82±1.50 | 3.79±1.44 | <0.001 | S |

S, significant; VAS, visual analogue scale. [a]Post-hoc test: A versus B (S), A versus C (S) and B versus C (NS).

distribution of sex did not differ significantly between the three groups (70.6, 68.2, and 63.2%, respectively). The duration of symptoms varies between 24 and 50 months in the literature [14,15]. In the present study, the mean duration of symptoms did not differ between the three groups (16.74, 17.14, and 19.32 months for groups A, B, and C, respectively).

Prophylactic antibiotic use in the surgical treatment of PNS is still controversial. Some authors do not recommend antibiotics in view of the fact that preoperative bacterial isolates, usually anaerobes, in chronic PNSs do not affect the complication rate, because bacterial isolates from infected wounds are mostly aerobes [16]. However, others advocate a single dose of metronidazole [17]. Other studies concluded that prophylactic antibiotics seem to be unnecessary in patients undergoing the lay-open technique, while prophylaxis may be helpful to prevent infectious complications during excision with primary closure [18]. In our study, single doses of ceftriaxone and metronidazole were used pre-operatively in all patients in the three groups to achieve standardization, whereas antibiotics were used only in groups B and C (wound closure). No wound infection was observed in patients who underwent modified sinotomy (group A), whereas five patients had wound infection following excision with primary closure (groups B and C), supporting the hypothesis that type of surgical intervention may affect the rate of wound infection more than the use of antibiotic prophylaxis.

The modified sinotomy technique has an advantage of being simple, with short operative time as recorded in our study (23.12 min) compared with closure techniques (34.68 and 35.58 min in groups B and C, respectively).

The spectrum of postoperative wound complications varies according to the type of surgery. Leaving the wound open may result in early bridging or chronic nonhealing, whereas the primary closure technique increases the risks for hematoma, seroma, and infection. In the present study, complications developed in one (5.9%) patient who underwent modified sinotomy compared with 11 (26.8%) patients who underwent primary closure either with or without a drain. We experienced healing failure in one patient in group A. The reported complication rates following excision with primary closure vary markedly. In a randomized study comparing excision and primary suture with excision and open packing in 120 patients, Khaira and Brown [19] showed that the early complication rate was significantly lower in the former technique (27 vs. 38%). In contrast, Perruchoud *et al.* [20] compared excision and open granulation with excision and primary closure and found a primary healing failure rate of 9% following primary closure.

The mean duration of hospital stay in excision and primary closure techniques reported in previous studies was 4–5 days [21,22]. In our study the mean hospital

stay was significantly shorter in group A (0.23 day) compared with groups B and C (2.09 and 1.5 days).

Healing time is generally longer in techniques involving secondary healing than in techniques with primary closure in the absence of wound complications. In the present study, the mean healing time was longer in group A (30.81 days) than in groups B and C (17.27 and 17.74 days), similar to many previous reports [20,23]. The patients undergoing modified sinotomy were encouraged to return to work as early as possible. The mean time before return to work was significantly shorter in this group (4.12 days) compared with the other two groups (19.82 and 19.68 days). Although the healing time is longer following the modified sinotomy technique, the minimal wound care required after the first postoperative week did not undermine the quality of life of the patients [13]. On the other hand, our results seem to be in discordance with those of Perruchoud *et al.* [20], who reported an average healing time of 72 days and an average time before return to work of 38 days in patients who had undergone total excision and open granulation compared with 23 and 21 days, respectively, after excision and primary closure. Similarly, Fuzun *et al.* [24] reported that the time to return to work was significantly shorter following total excision with primary closure compared with that after total excision and secondary healing.

The use of suction drains following excision with primary closure is still controversial. Serour *et al.* [25] recommended routine use of suction drainage with primary closure, whereas Tritapepe and Di Padova [26] used the drain to flush the residual cavity with an antiseptic solution. On the other hand, Erdem *et al.* [27] found no additional benefit from the use of drains. In the present study, the use of suction drainage in patients in group B showed a recurrence rate that was higher (18.2%) compared with that in groups A and C (5.9 and 5.3%, respectively).

In our study, the quality of life of the patients who underwent modified sinotomy (group A) was much better than that of the other two groups in terms of time to comfortable walking, sitting, sitting on the toilet, healing, time to return to work, and VAS score for pain on the first and fifth day postoperatively. This was in accordance with many studies that showed that the sinotomy technique minimized the time away from work, deviation from normal activities, and costs [28,29].

The ideal approach for the management of PNS should be simple, cause minimal pain, have the best chance for success and least recurrence rate with low risk for complications, decrease hospital stay, avoid general anesthesia, require minimal wound care, and ensure minimal inconvenience for the patient with rapid return to normal activity [12].

## Conclusion

The modified sinotomy technique for treatment of PNS is superior to the excision with primary closure method either with or without a drain in terms of operative time, hospital stay, comfort in walking, sitting, and sitting on the toilet, return to work, and VAS scores for pain, although the healing time is longer. There was a higher recurrence rate when a drain was inserted in cases of primary closure.

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### Conflicts of interest

There are no conflicts of interest.

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