

A New Oval Advancement Flap Design for Reconstruction of Pilonidal Sinus Defect

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Published online: 30 April 2018
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Abstract

Backgrounds Pilonidal sinus is a common chronic disease of the sacrococcygeal region. Although many surgical methods have been described for treating pilonidal sinus disease, controversy still exists as to the best surgical technique. The aim of this study is to present a new modified advancement flap technique named “omega flap” for the treatment of pilonidal sinus disease.

Materials and methods This study included 18 patients with pilonidal sinus who were treated between March 2012 and August 2014. All cases underwent oval excision and omega advancement flap reconstruction. Defect size, postoperative complications, postoperative pain, painless sitting time, patient satisfaction and recurrence were evaluated retrospectively.

Results All patients were discharged on the first postoperative day. There was no flap necrosis. No recurrence and no major complication were observed during follow-up period. The outcomes were also satisfactory regarding functionally and aesthetically, and the patients were satisfied with the results.

Conclusions Presented method has a different geometry than classical advancement flap methods. Our technique provides two-layered repair with minimal tension and off-midline closure for the reconstruction of pilonidal sinus defect. It is easily performed, reliable, associated with no recurrences and good aesthetic results.

Introduction

Pilonidal sinus is a chronic intermittent disease that mostly appears in the sacrococcygeal region. The goals of the treatment of the pilonidal sinus are to minimize the amount of postoperative pain and wound-related complications, to ensure that the patient returns to daily life in as soon as possible and to reduce recurrence rates. Flattening of the natal cleft and lateralizing the scar formation from the midline are the effective factors to achieve these goals. Although surgical flap procedures have superiority over other methods in terms of these purposes [1–7], various complications and recurrence rates have been reported in presented studies [8–15].

The excision of the sinuses usually results in an oval skin defect in pilonidal sinus surgery. The oval-shaped

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defect needs to be adjusted according to the flap geometry in various transposition and advancement flap techniques used. We designed an oval advancement flap method named “omega flap” which has similar size and shape to the defect and provides two-layered closure.

The aim of this study was to present technical details of omega flap and the results of clinical cases in which surgery performed.

Patients and methods

The study was conducted between March 2012 and August 2014; we have used this technique in 18 patients to close skin defect due to excision of pilonidal sinus; 13 (72.2%) patients were men and 5 patients were women (28.8%).

All operations were performed by same surgeon. All patients were evaluated in terms of age, gender, operation time, postoperative complications (infection, hematoma, seroma and dehiscence), postoperative pain, painless sitting time, patient satisfaction and recurrence. All cases were examined early postoperative period at 1, 3, 10 and 15th days. Pain was measured using a visual analog scale (VAS). The patients were asked to choose on a chart a number from 0 (no pain) to 10 (worst pain). To assess the painless sitting time, patients were asked “when did you sit to couch or chair without pain?” Patients’ satisfaction rates were evaluated after 6-month follow-up period on the basis of questioning the patient to give a grade to their buttock shapes and scar formations (dissatisfied: 1; somewhat satisfied: 2; good: 3; excellent: 4). Values are reported as the mean \pm standard deviation for numbers and percentages. All patients were administered a single dose of cefazolin 1 gm before operation.

Surgical procedure

All surgical procedures were performed under spinal anesthesia. The patients were placed in the prone, jackknife position with the buttocks strapped apart using wide adhesive tape, and methylene blue was injected into the sinuses. Excision of sinuses was made in a vertical and oval fashion to the level of the presacral fascia. An oval flap with similar size and shape to the defect was planned adjacent to the defect. An imaginary tangential line was drawn parallel to the vertical axis of the defect and flap (Fig. 1). The length of tangential line was planned equal to two times the length of the diameter of the defect. Beginning from the free ends of the first tangent line toward the lateral borders of the flap, second and third tangent lines were drawn with an angle of 60°. This planning provides equilateral triangles on both sides of the main oval flap. The triangular areas were deepithelialized. The oval flap

was elevated in the suprafascial plane, but triangular flaps were elevated in a thinner thickness. After undermining the lateral margins of the defect, the deepithelialized triangular flaps were placed in these undermined areas and anchored by absorbable sutures. The corner of the lateral margins of the defect was sutured in place to the corners between oval and triangular flaps. Oval flap was placed to the defect with minimal tension (Fig. 2). A suction drain is placed under the flaps, and the operation is completed by the layered wound closure.

Results

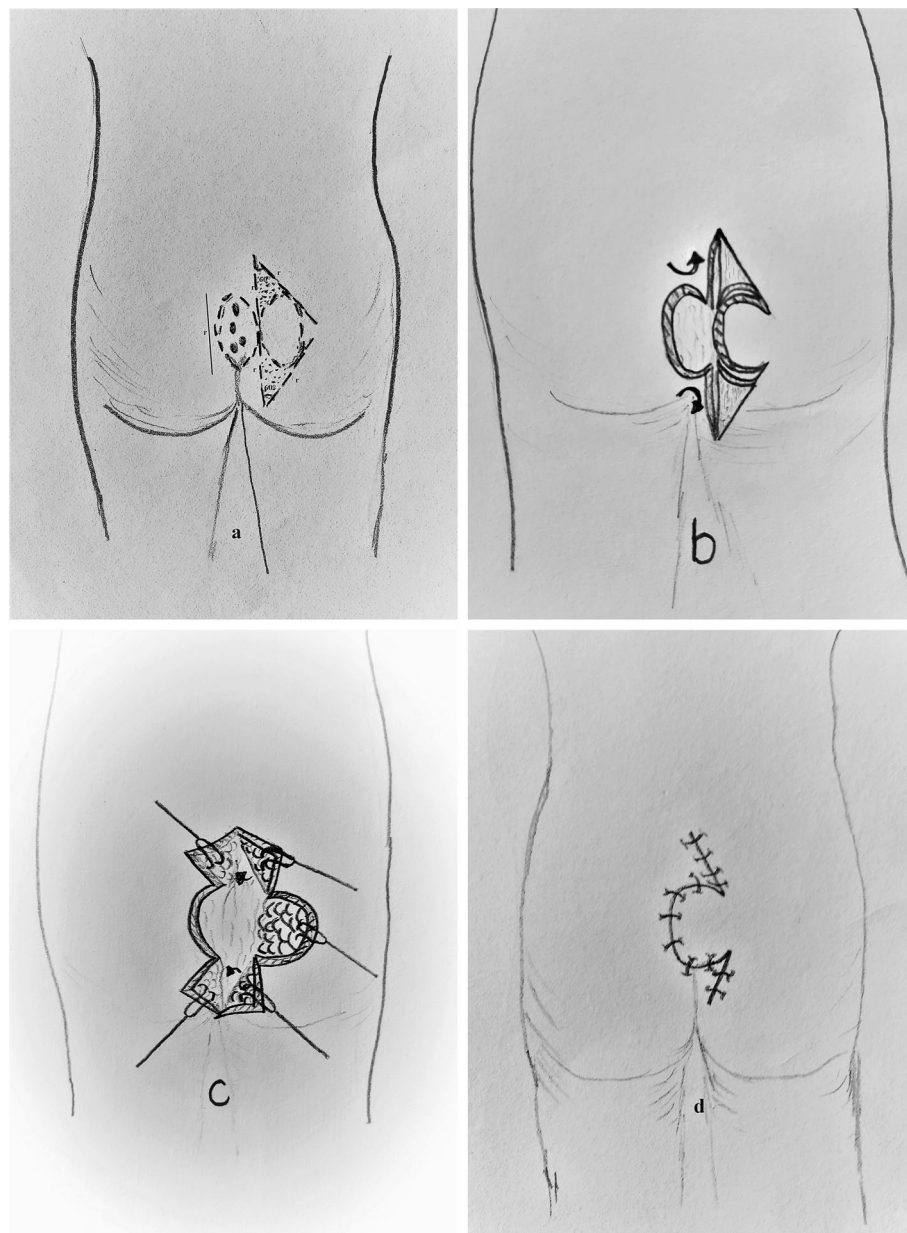
All the patients treated with omega advancement flap in this study. Four patients had recurrent disease after excision and reconstruction with Limberg flap. The mean age of all patients was 23.2 years (range, 17–30 years). The mean defect size of the sinuses after excision was 7.4 \times 5.0 cm. The duration of the sinuses was 1–8 years (average 3.8 years). The mean operation time was 45.8 \pm 5.4 min (Table 1). All patients were mobilized and discharged on the first postoperative day. The suction drain was left in place for 3 days or until drainage was less than 25 mL per 24 h. The mean VAS score for postoperative pain at the operation site on the first day was 2.9 \pm 0.8 and on 3rd day was 1.6 \pm 0.6. Sutures were removed on the 10th postoperative days. The mean time to painless sitting was 9.7 \pm 1.1 days. The mean follow-up period was 18.11 \pm 3.3 months (Table 2). There was no recurrence, and there was no need of additional surgery during the follow-up period.

All flaps survived completely, and there were no postoperative complications such as flap congestion, necrosis, hematoma and infection. Partial wound dehiscence was seen in 2 patients in the inferior triangular flap suture line. All the patients were mobilized on externalization and returned to their routine activities in 2 weeks. Aesthetic outcomes were quite satisfactory, and the mean patient satisfaction rate was 3.61 \pm 0.6 (range, 0–4) (Table 2, Fig. 3).

Discussion

Pilonidal sinus is an acquired, chronic inflammatory and intermittent disease. Although many techniques have been described, the ideal surgical method remains controversial because of the potential recurrence risk. The surgical flap methods have various advantages including low recurrence and complication rates, short hospital stay, quick return to daily activities and satisfactory aesthetic results.

Fig. 1 Diagram of surgical procedure. **a** The planning of the technique; a circular flap is designed adjacent to the defect. An imaginary tangent line is drawn between circular flap and the defect, and the second and third tangent lines that beginning from the free end of the first tangent line are drawn with an angle of 60° (dotted areas: triangles that have to be deepithelialized). **b** The view of incised circular and deepithelialized triangular flaps (arrows: the lateral sides of the defect where to be dissected for the placement of deepithelialized flaps). **c** complete elevation of the flaps and the lateral sides of the defect. **d** The postoperative view of the operation area



In this study, we present an oval advancement flap design for reconstruction of the excisional defect of the pilonidal sinus disease. Omega (Ω) is the last letter of the Greek alphabet. It refers to the end of something or the final. In our method, the view of the final suture line resembles the omega (Ω) sign at the end of the surgery. We can also insinuate by this omega that we hope this flap is the last procedure the patient will need for this problem. Therefore, our flap is named as omega advancement flap.

The V–Y fasciocutaneous flap is the most commonly used advancement flap technique to close the pilonidal sinus defect in the literature. This method is usually reserved for wide and recurrent disease, unilaterally [4, 5]

or bilaterally [6]. The length of the flap is planned to be three times the width of the defect. This planning is resulted in a long scar formation and patient satisfaction. In addition, the medial closure line of the classic V–Y flap is placed in the region of gluteal sulcus, which is accused as the main cause of recurrence. The V–Y flap is an advancement flap and is moved by sliding toward the defect. This movement involves stretching the flap tissue. Although it is emphasized that the V–Y flap provides tension-free closure [7], the greatest wound closure tension is perpendicular to the distal border of the flap. This excessive tension may results in inadequate flap perfusion and necrosis at the distal margin of the flap in the early

Fig. 2 Application of the method on the right gluteal side; **a**, preoperative view of the pilonidal sinuses. **b** The view of the defect and planning of the technique. **c** The intraoperative view of the main flap and deepithelialized triangular flaps (white arrows). The elevation of the lateral sides of the defect. **d** The early postoperative view. **e** The postoperative view after 6 months



postoperative period and hypertrophic scar formation after healing process. Some comparative studies are reported that V–Y flap has longer hospital stay period and time to return to the work [8]. The V–Y flap is usually preferred in large defects that occurred after recurrent sinuses excision with the presence of paramedian sinus localization. Recurrence rates of V–Y flap are reported 0–11.1% in the literature [8–10].

In our technique, we have used the basic advancement flap principles with some exceptions.

- (1) We planned an oval-shaped flap unlike other advancement flap techniques. Oval-shaped flap design has been used in pilonidal sinus surgery [11]. According to Polat et al. [12], oval head transposition flap has such advantages as low risk of flap necrosis at the distal flap margin with decreased rate of recurrence and acceptable aesthetic results.
- (2) Our technique can be applied in all sinus localizations, because omega flap design provides an off-midline closure for both median and paramedian pilonidal sinuses.

- (3) One of the most important advantages of our technique is to provide two-layered repair. The excisional sinus defect is repaired with the main oval-shaped advancement flap. Deepithelialized triangular flaps located on both lateral sides of main oval flap are provided to facilitate advancement of main flap with minimal tension. The width and length of flap are equal to the size of the defect unlike V–Y flap. This means that the defect-to-flap ratio is 1/1.

In practice, a rhomboid-shaped transposition flap has long been considered a workhorse in the armamentarium of the surgeons [8, 13–20], because of the simplicity of the flap design and reliability for repair of the excisional defect of the pilonidal sinus. The first rhomboid-shaped flap was described by Limberg [21]. He described the use of a rhomboid-shaped flap with internal angles of 60° and 120°. If the skin defect did not have the configuration of these angles, the extra healthy tissue excision was required in order to create the rhomboid shape. The lower pole of the Limberg flap is indicated as a weak point in terms of recurrence. The Limberg flap technique reported in the literature has recurrence rates that vary from 1.26 to 7%

Table 1 Patients data

Patient no.	Age/sex	Defect size	Complication	Operation time (min)	Follow-up (months)
1	22/M	7 × 4.5	–	50	20
2	28/M	10 × 5	–	55	18
3	23/F	8 × 6	–	45	18
4	25/M	6 × 4.5	Dehiscence	45	24
5	18/F	7 × 5	–	50	18
6	26/M	9 × 6	–	40	18
7	20/M	6 × 4	–	40	16
8	22/M	8 × 5	Dehiscence	35	24
9	19/F	8 × 5	–	45	16
10	17/M	8 × 5	–	45	18
11	23/M	9 × 5.5	–	50	16
12	30/M	8.5 × 5	–	50	18
13	21/M	6 × 5	–	40	12
14	26/F	7 × 5	–	55	12
15	22/M	7 × 6	–	45	24
16	28/F	11 × 7	–	45	18
17	22/M	7.5 × 5	–	50	18
18	26/M	8 × 5	–	40	18
Mean	23.2	7.4 × 5.0		45.8 ± 5.4	18.11 ± 3.3

Table 2 Patients VAS scores, painless sitting times and satisfaction rates

Patient no.	VAS 1 day	VAS 3 day	Painless sitting time (days)	Patient satisfaction
1	3	2	10	4
2	4	3	9	3
3	3	1	11	4
4	4	2	10	4
5	2	1	8	3
6	2	1	11	4
7	3	1	9	4
8	4	2	10	2
9	3	2	8	4
10	2	1	8	4
11	4	3	10	3
12	3	2	11	4
13	2	1	9	4
14	2	2	9	4
15	3	2	11	4
16	4	2	12	3
17	3	1	10	3
18	2	1	9	4
Mean	2.9 ± 0.8	1.6 ± 0.6	9.7 ± 1.1	3.61 ± 0.6

[8, 13–22]. This flap was modified by planning the rhomboid excision asymmetrically to place the lower pole of the

flap lateral to the intergluteal sulcus [17, 22–24] to decrease the recurrence rates.

Fig. 3 Application of the method on the left gluteal side; **a** preoperative view of the sinuses. **b** Intraoperative view of the defect after the excision. **c** The early postoperative view. **d** The postoperative view after 1 year



Omega flap technique provides the lateral placement of all suture lines to the intergluteal sulcus. In addition, we speculate that another important factor to prevent recurrence in our technique is insertion of deepithelialized triangular flaps into the lower and upper pole of the defect. These flaps provide to fill the dead space and to flatten the natal cleft in a similar way as with the adipofascial flaps [25, 26].

Primer closure, advancement flap and rotation flap result in movement of tissue directly forward into the defect. Therefore, the vector of greatest wound closure tension directly affects the distal margin of the flap. Conversely, in the transposition flaps, this vector affects primarily the donor closure site of the flap. Certain authors have

emphasized that the preferred flap technique and the tension vector are effective on the postoperative parameters such as postoperative pain, painless sitting time and return to work [27, 28]. Although the basic advancement flap principles are used in our technique, main flap tissue is less effected by tension because of triangular flaps placed in the subcutaneous region. These deepithelialized flaps provide to transfer the tension vector under the skin level. In addition, the triangular flaps are planned thinner thickness than the oval flap tissue. Therefore, there is no dead space under the oval flap and no bulge in the areas where triangular flaps are placed.

The main limitation of the present study was its retrospective nature. In addition, this study has the relatively

low number of patients and short follow-up period for the evaluation of recurrences.

Conclusion

We have used omega advancement flap for different parts of the body [29] which has become our workhorse for reconstruction of pilonidal sinus defect because of no recurrence rate, low complication rates, early return to the work, low VAS score and patient satisfaction with cosmetic results is high. In addition, our technique provides the off-midline closure and two-layered closure, no extra healthy tissue excision from the defect and acceptable cosmetic results. The disadvantage of our flap is that there should be enough area for planning of the triangular flaps in the region where the defect is located.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no competing interests.

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