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Original Research Article

Comparative study between 'Limberg flap' and 'excision with secondary wound healing' in the management of sacrococcygeal pilonidalsinus

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ABSTRACT

Background: We conducted this comparative study between 'Limberg flap' and 'excision with secondary wound healing' to have a more informative data as far as surgical outcome is concerned for patients of sacro-coccygeal pilonidal sinus.
Methods: This study was conducted as prospective observational study on patients of sacrococcygeal pilonidal sinus admitted in the Department of General Surgery, People's Hospital, who have been selected for operative intervention by either of two procedures during the study period of 18 months. Depending upon surgical procedure, patients were divided into two groups, group A- Limberg flap (study group) and group B- excision with secondary wound healing (control group).
Results: Mean duration of surgery was significantly higher in cases managed using Limberg flap technique as compared to excision and secondary healing. Mean pain scores, wound infection, time to wound healing, duration of hospital stay and time to return to normal activity were significantly lower in cases managed using Limberg flap as compared to excision at all the follow up ($p<0.05$). Mean patient satisfaction was found to be significantly higher in cases following Limberg flap group ($p<0.05$).
Conclusions: Rhomboid excision with Limberg's flap technique is better technique as compared to open excision with secondary healing technique in terms of less post-operative pain, less complications, early recovery, early wound healing, short duration of hospital stay, early return to normal activity and higher patient satisfaction. The only disadvantage with Limberg flap technique is higher mean duration of surgery, attributed to additional time required for raising and suturing of flap following excision.

Keywords: Pilonidal sinus, Excision, Secondary healing, Limberg flap, Wound healing

INTRODUCTION

The pilonidal sinus is a small tract beneath the skin, which is commonly present in sacrococcygeal area.[1,2] The incidence of pilonidal sinus is estimated to be 26 per 1 lakh people and it is reported to be approximately twice more common in males as compared to females.[1] However, the prevalence of pilonidal sinus in Asia was reported to be 6.6%.[3] The disease is reported to be more common in Caucasians as compared to Asians or Africans due to difference in hair growth pattern and features of hairs.[4]

The management of sacrococcygeal pilonidal sinus may be non-operative or operative. Though non-operative management options are available (such as epilation or hair removal, laser epilation, phenol application, treatment with fibrin and thrombin products, hyperbaric oxygen, and platelet rich plasma) pilonidal sinus is largely managed surgically.[1] The most common approach is incision and

drainage of abscess (I & D). I & D before the definitive procedure has been associated with low recurrence rate and better outcome as compared to primary surgical treatment.[5] Various surgical modalities are available for management of pilonidal sinus e.g. pit picking, unroofing, aspiration, curettage or surgical excision. The defects as a result of surgically treated pilonidal sinus may be closed with flaps or graft (primary closure), negative pressure wound therapy or are allowed to heal by secondary intention. However, healing by secondary intention require keeping the wound open and allowing the granulation tissue to contract the wound edges and epithelialization. The major drawback of secondary healing is high risk of infection as epidermal barrier is lacking in such patients.[1]

Various flap techniques have been used for the management of wound following pilonidal sinus excision. The advantages associated with flap techniques include less recurrence, low risk of complications, short duration of hospital stay, less postoperative morbidity and pain, better cosmesis and better patient compatibility.[1,6] Among various flap techniques, the Limberg flap technique is the easiest to perform for General Surgeons with shorter learning curve, good local acceptance rate in terms of flap viability/complications, and most importantly low recurrence rate as reported in previous studies. In our hospital, on data search we found that mainly excision with or without primary closure was being done. Recently, there has been a preference for Limberg flap procedure in our department with early encouraging results. Hence, we conducted this comparative study between 'Limberg flap' and a more conventional 'excision with secondary wound healing' to have a more informative data as far as surgical outcome is concerned, that may help us in choosing an appropriate surgical procedure for patients of sacro-coccygeal pilonidal sinus.

METHODS

This study was conducted as a prospective observational study on patients of sacrococcygeal pilonidal sinus admitted in the Department of General Surgery of People's Hospital, who have been selected for operative intervention by either of the two procedure during the study period of 18 months i.e. from November 2022 to April 2024. All cases of sacrococcygeal pilonidal sinus belonging to more than 18 years of age were included whereas patients with acute pilonidal disease with abscess formation, recurrent pilonidal disease or previous surgery in the sacrococcygeal region, Sinus opening >5 cm from the midline, osteomyelitis of sacrum and co-morbidities like diabetes mellitus, collagen diseases, immuno-suppressive therapy were excluding from the study.

The ethical clearance was obtained from the Institute ethical committee and then all the patients fulfilling the inclusion criteria were enrolled. All the patients of sacrococcygeal pilonidal sinus who were planned to be operated by either Limberg flap or excision with secondary wound healing, and meeting the inclusion/exclusion criteria were enrolled in the study. Detailed history regarding sociodemographic variables, along with clinical data was obtained. All the patients were then subjected to local and systemic examination and findings were documented. Patients were then subjected to sinogram and ultrasonography (USG).

Selection of the procedure was done by the operating surgeon in consultation with the patient after usual counselling and consent as part of routine treatment, and investigator was not allowed to choose the procedure. Depending upon the surgical procedure, patients were divided into two groups-group A- Limberg flap (study group), and group B- excision with secondary wound healing (control group).

Intra-operative data regarding type of anesthesia, type of surgical procedure, duration of surgery etc. was noted. In the post-operative period, patient was regularly followed up till the time of discharge and total duration of hospital stay was noted in days. Postoperative outcome was noted in terms of pain (using VAS score) on day 1, day 5 and day 14; and postoperative complications.[7]

All the patients were followed up at 14 days, 1 month, 3 months and 6 months interval and following parameters were assessed: time of wound healing, return to normal activity, patient satisfaction (using VAS), and recurrence.[8]

Statistical analysis

Data was compiled using Microsoft excel and analyzed by IBM statistical package for the social sciences (SPSS) trial version 25.0. Comparison between two groups was done using chi square test (for categorical variables) or independent t test (for continuous variables). P value of less than 0.05 was considered statistically significant.

RESULTS

This study was conducted on a total of 63 cases with sacrococcygeal pilonidal sinus and of them 32 cases were managed with Limberg flap (50.8%) whereas 31 (49.2%) cases were managed with excision with secondary healing.

Mean age of patients enrolled in Limberg flap group was 38.94±11.49 years whereas that of patients enrolled in Excision with secondary healing group was 35.10±11.08 years. About 71.9% cases in Limberg flap group and 74.2% cases in excision with secondary healing group were males whereas only 28.1% and 25.8% cases in respective groups were females. All the cases presented with pain and discharge in both the groups. We found no significant difference in age, gender, clinical features and length of tract between the groups ($p>0.05$). About 61.3% cases belonging to excision group had 2 opening whereas 50% cases belonging to Limberg flap group had 3 openings and the observed difference in number of openings between the groups was statistically significant ($p<0.05$) (Table 1).

Mean duration of surgery was significantly higher in cases managed using Limberg flap technique as compared to patients managed with excision and secondary healing (66.72±6.67 versus 47.74±6.033 minutes; p<0.05) (Figure 1).

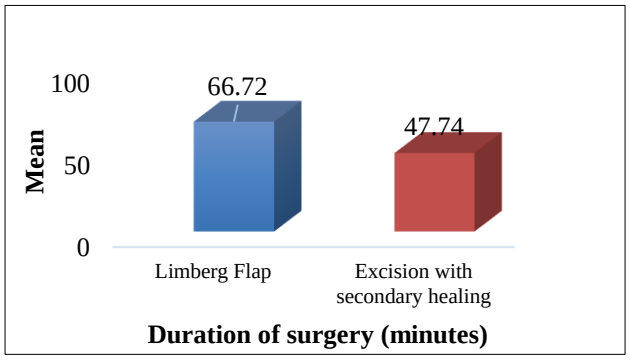

Figure 1: Comparison of duration of surgery between the groups.

Mean pain scores were significantly lower in cases managed using Limberg flap as compared to excision at all the follow up (p<0.05). We reported wound infection in significantly higher proportions of cases managed with excision and secondary healing (19.4%), whereas 3.1% of the cases in Limberg flap group had wound infection (p<0.05). Mean time of wound healing was found to be significantly less in Limberg flap group (13.47±1.722 days) as compared to excision with secondary healing (34.71±14.48 days; p<0.05). Mean duration of hospital stay was significantly lower in limber flap group as compared to excision group (6.13±1.008 versus 10.39±1.978 days; p<0.05). Mean duration to return to normal activity was found to be significantly higher in excision group as compared to Limberg flap group (39.97 versus 14.38 days; p<0.05) (Table 2).

Patient satisfaction was assessed using VAS score at 1 month, 3 months and 6 months following surgery and mean patient satisfaction was found to be significantly higher in cases following Limberg flap group as compared to excision with secondary healing group (p<0.05). In our study, recurrence was assessed at each follow up till 6 months, however, none of the patients in both the groups had recurrence during the period of follow up i.e. at 1 month, 3 months and 6 months follow up (Figure 2).

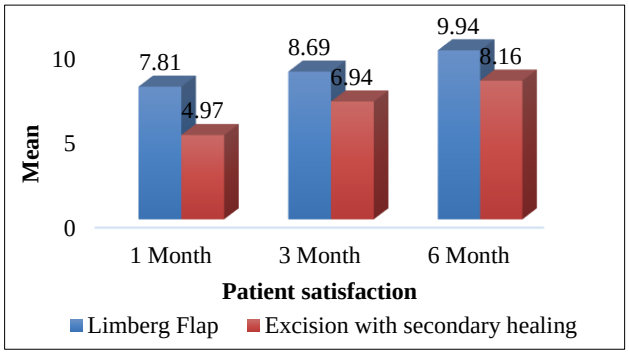

Figure 2: Comparison of patient satisfaction using VAS score at follow up.

Table 1: Comparison of baseline variables between the groups.

Baseline variables	Surgery				P value
	Limberg flap (n=32)		Excision with secondary healing (n=31)		
	N	%	N	%	
Age (years)					
<30	9	28.1	10	32.3	0.25
31-40	6	18.8	11	35.5	
41-50	13	40.6	6	19.4	
>50	4	12.5	4	12.9	
Mean±SD	38.94±11.49		35.10±11.08		
Gender					
Male	23	71.9	23	74.2	0.84
Female	9	28.1	8	25.8	
Clinical features					
Pain	32	100.0	31	100.0	NA
Discharge	32	100.0	31	100.0	NA
Signs					
No. of openings					
1	0	0.0	10	32.3	0.001
2	13	40.6	19	61.3	
3	16	50.0	2	6.5	
4	2	6.2	0	0.0	
5	1	3.1	0	0.0	
Mean±SD	2.72±0.73		1.74±0.575		

Continued.

Baseline variables	Surgery				P value
	Limberg flap (n=32)		Excision with secondary healing (n=31)		
	N	%	N	%	
Length of tract (cm)					
2	5	15.6	3	9.7	0.92
3	14	43.8	15	48.4	
4	9	28.1	9	29.0	
5	4	12.5	4	12.9	
Mean±SD	3.38±0.907		3.45±0.850		

Table 2: Comparison of outcome between the groups.

Outcome	Surgery				P value
	Limberg flap (n=32)		Excision with secondary healing (n=31)		
	Mean	SD	Mean	SD	
VAS score					
Day 1	4.56	1.045	6.32	1.40	0.001
Day 5	2.94	0.840	4.94	1.28	
Day 14	1.75	0.803	3.35	1.473	0.001
Complications					
Seroma	2	6.2	0	0.0	0.157
Wound infection	1	3.1	6	19.4	0.04
Flap necrosis	0	0.0	0	0.0	NA
Time of wound healing (days)	13.47	1.722	34.71	14.48	0.001
Length of hospital stay (days)	6.13	1.008	10.39	1.978	0.001
Return to normal activity (days)	14.38	2.19	39.97	16.04	0.001

DISCUSSION

Pilonidal sinus is mainly a surgical disease and most common surgical approach is incision and drainage of the associated abscess followed by definitive surgical procedure.[8] Amongst various surgical approaches, excision is the most common method for management of pilonidal sinus and the defect so formed may be allowed to heal by secondary intention or may be closed with flap technique.[1] We compared the early and intermediate clinical outcome of 'Limberg flap' with 'excision and secondary wound healing' in the management of sacrococcygeal pilonidal sinus. We enrolled a total of 63 patients in our study and excision of pilonidal sinus was done in all the cases, of them, 32 (50.8%) were managed with Limberg flap technique whereas remaining 31 (49.2%) were allowed to heal by secondary intention.

In present study, mean duration of surgery in patients managed with excision alone was 47.74±6.033 minutes, this was significantly lower as compared to duration of surgery in patients managed with Limberg flap technique (66.72±6.67; p<0.05). The prolonged duration could be attributed to time required in raising and suturing of the flap in cases of Limberg flap group. The findings of our study were supported by the findings of Kumar et al, in which the mean operative time in patients who underwent Limberg flap reconstruction was higher as compared to excision alone, but the difference was statistically insignificant (52.8±19.4 minutes versus 45.3±14.7 minutes; p>0.05).[9] The mean operative time for excision with Limberg flap was 55 minutes, ranging from 45 to 65 minutes in a study of Akhtar et al, which was similar to present study.[10] The findings of present study were also in line with the study of Meena et al, where mean operating time in patients of Limberg flap group was higher as compared to patients of primary midline closure group (36.3±3.24 minutes versus 24.93±3.06 minutes; p<0.05).[11]

We assessed pain using visual analogue scale at day 1, day 5 and day 14 during the post-operative period in all the patients of both the groups. In our study population mean VAS scores at day 1, day 5 and day 14 in patients managed with Limberg flap technique following excision was significantly lower as compared to patients managed with excision alone (4.56 versus 6.32 at day 1, 2.94 versus 4.94 at day 5 and 1.75 versus 3.35 at day 14; p<0.05). The higher pain in the excision group with secondary healing could be due to open wound, scar contraction and in some cases associated infection.[12]

The findings of present study were concordant with the findings of Kumar et al, in which the authors found mean VAS score to be significantly lower in patients of Limberg flap group as compared to patients of excision group at post-operative day 1 (4.8±2.6 versus 6.5±2.1; p<0.05), day 2 (3.3±1.3 versus 5.2±1.7) and day 3 (2.6±0.5 versus 4.2±0.8; p<0.05).[9] Similar findings were reported by Aziz et al in which mean pain scores were significantly lower in patients of Limberg flap group as compared to excision group (p<0.05).[13] Our study findings were contrasting to the findings of Chopade et al, where the authors reported

significantly higher pain during immediate postoperative period in Limberg flap group as compared to excision group at day 1, 3 and 7. However, at 1 month, and 2 month post-operative follow up period, the authors found no pain in patients of Limberg flap group but pain in excision group persisted with mean VAS score of 3 and 1 respectively.[14] The higher pain in reference study were attributed to use of non-absorbable nylon sutures and fixation of drain on skin, after removal of which the pain scores reduced significantly.[14]

We observed no incidence of flap necrosis in patients managed with flap technique. About 6.2% cases in Limberg flap group developed seroma postoperatively whereas none of the patients in excision alone group developed seroma. Though we found no significant difference in seroma between two groups ($p>0.05$), we reported wound infection in significantly higher proportions of cases in excision with secondary healing group as compared to Limberg flap group (19.4% versus 3.1%; $p<0.05$). The high risk of infection in patients managed with primary excision and secondary healing could be due to presence of open wound.[1] The findings of our study were supported by the findings of Chopade et al, in which the authors reported wound infection in 20% cases of excision group and none in patients of Limberg flap reconstruction surgery group.[14] However, in a study of Jabbar et al reported wound infection in 20% and 16.67% cases following excision and Limberg flap procedure respectively.[15] In a study of Kumar et al, the authors documented seroma in 12.5%, hematoma in 7.5% and infections in 10% cases of wide excision group and that in Limberg flap group was 5%, 2.5% and 2.5% respectively, with no significant difference between the groups ($p>0.05$).[9]

Thus, wound infection is a major complication associated with wide excision with healing by secondary intention. Based on the immediate postoperative complication spectrum of the two techniques, it can be concluded that whereas suppurative wound infections and wound disruptions are more common with simple excision, wound collections (hematoma/seroma) are more likely to develop with Limberg flaps.

In present study, time to wound healing was significantly lower in patients of Limberg flap group (13.47±1.722 days) as compared to excision with secondary healing group (34.71±14.48 days; $p<0.05$). Similarly, mean healing time in patients of Chopade et al was significantly lower following Limberg flap procedure (20±2 days) as compared to excision (57±11 days; $p<0.05$).[14] Our study findings were also supported by the findings of Kumar et al in which mean healing time in patients of rhomboid excision with Limberg flap reconstruction group was 17 days and that of open excision with secondary healing was 60 days, which was much higher in excision group ($p<0.05$).[9] These findings were confirmed by meta-analysis conducted by Berthier et al, in which, the authors documented Limberg flap to be associated with significantly shorter time to complete wound healing as compared to open laying technique.[16]

Mean duration of hospital stay for patients managed with Limberg flap group was 6.13±1.008 days and it was much less as compared to patients of excision alone group (10.39±1.978 days; $p<0.05$). Prolonged hospital stay in excision group could be due to delayed wound healing and presence of complications (wound infection) in higher proportions of patients in excision group. Our study findings were in line with the findings of Kumar et al, in which mean length of hospital stay in patients of Limberg flap group was significantly shorter as compared to patients of excision group (4.6 days versus 6.9 days; $p<0.05$).[9] Berthier et al in their meta-analysis also documented significantly early recovery and shorter duration of hospital stay in cases managed by flap repair as compared to open laying techniques.[16]

As the recovery in the form of low pain score and short length of hospital stay was rapid in patients with Limberg flap group, the time to return to normal activity was significantly early among them as compared to excision with secondary healing group (14.38 days versus 39.97 days ($p<0.05$). These findings were concordant with the findings of Kumar et al, in which time taken to return to their profession was 10.8±4.2 days in excision group, which was much higher as compared to Limber flap group (8.3±3.0 days; $p<0.05$).[9] Our study findings were also supported by the findings of Chopade et al, where, the patients of Limberg flap group resumed their work after removal of sutures but the patients of excision group took time to resume their work due to presence of significant anxiety and need of daily dressing.[14]

We aimed to assess intermediate outcomes in our study between two groups of patients. Patient satisfaction was assessed in terms of VAS score at 1 month, 3 months and 6 months postoperatively and documented significantly better patient satisfaction rate in patients managed with flap technique as compared to patients managed with excision alone. Mean patient satisfaction score in Limberg flap group and excision with secondary healing group were 7.81 and 4.97 at 1 month, 8.69 and 6.94 at 3 months and 9.94 and 8.16 at 3 months respectively ($p<0.05$). This could be attributed to early recovery, low pain scores, short duration of hospital stay and early return to normal activity following Limberg flap procedure.

Kumar et al also showed higher patient satisfaction in Limberg flap group as compared to excision group (80% versus 95%; $p<0.05$).[9] However, Kaser et al found no significant difference in overall patient satisfaction scores in patients of two interventional groups ($p>0.05$).[17]

Our study had certain limitations, first, our sample size was small and being a unicentric study with small sample size, the findings of study could not be generalized. Second, all the surgeries were performed by a single experienced surgeon in our study and thus, variability in the outcomes

may be present when performed by the different surgeons. Third, patients were followed up till 6 months after the procedure and thus, long term complications and recurrence rates could not be assessed. The cost of both the procedures was not assessed and the cost effectiveness and cost benefit analysis could not be done.

CONCLUSION

Rhomboid excision with Limberg's flap technique is better technique as compared to open excision with secondary healing technique in terms of less post-operative pain, less complications, early recovery, early wound healing, short duration of hospital stay, early return to normal activity and higher patient satisfaction. The only disadvantage with Limberg flap technique is higher mean duration of surgery, which could be due to additional time required for raising and suturing of flap following excision. Another disadvantage of this technique is it is associated with seroma in some patients. These results are probably attributable to the benefit of the Limberg flap technique, which flattens the natal cleft, hence reducing the likelihood of hair accumulation, pain and recurrence. Thus, rhomboid excision with Limberg flap is an acceptable and a better surgical procedure for pilonidal sinus disease because of its low recurrence rates and few complications, even though it demands complex surgical skills. Thus, Limberg's flap technique is recommended over excision alone with secondary wound healing to improve the outcome of surgery for sacrococcygeal pilonidal sinus.

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