

## Original Research Article

# A comparative study of excision with primary closure versus Limberg flap in pilonidal sinus

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## ABSTRACT

**Background:** The term 'pilonidal sinus' describes a condition found in the natal cleft overlying the coccyx which is treated by excision.

**Methods:** This study is a prospective study held in Department of general surgery, Safdarjung Hospital, New Delhi from October 2014 to April 2016 on 60 patients out of which 30 were controls (excision with primary closure) and 30 were taken as case (Limberg flap). Post-operative follow up was done till 6 months and complications were noted. The data was tabulated and SPSS version 17 was used for statistics.

**Results:** Pilonidal sinus disease is common in age group 20 years and above and twice more common in males than females. Although operating time in Limberg flap is little more as compared to primary closure but insignificant. The post-operative pain in the long term follow up is less in the Limberg flap procedure, although in the initial post-operative period it is slightly higher as compared to primary closure. In Limberg flap procedure, post-operative complications like stitch line infection, seroma formation, wound dehiscence are low as compared to primary closure. Limberg flap require  $2.27 \pm 0.52$  days hospital stay as compared to  $3.57 \pm 1.43$  days in primary closure due to less post-operative complications. Recurrence rate is 3.33% in Limberg flap as compared to 26.67% in primary closure group.

**Conclusions:** We recommend the Limberg flap method for primary pilonidal disease with low morbidity rates over primary closure.

**Keywords:** Limberg flap, Pilonidal sinus, Visual analog scale

## INTRODUCTION

The term 'pilonidal sinus' describes a condition found in the natal cleft overlying the coccyx, consisting of one or more, usually non-infected, midline openings, which communicate with a fibrous track lined by granulation tissue and containing hair lying loosely within the lumen. It has been referred to as 'jeep disease'. Although the disease was defined by Herbert Mayo in 1883 for the first time, the name "pilonidal" derived from Latin for hair

(pilus) and nest (nidus), was used by Hodge in 1880 for the first time.<sup>1</sup> A deep natal cleft is a favourable environment for sweating, maceration, bacterial contamination and penetration of hairs. Thus, for treatment and prevention, these causative factors must be eliminated.<sup>2</sup> The estimated incidence is 26 per 100000 people affecting men twice as often as women.<sup>3</sup> It is more common in people aged 15-30 years after puberty due to the effect of sex hormones on pilosebaceous glands and change in healthy body hair growth.<sup>4</sup>

The surgical wound after primary excision may be left to heal by open healing (secondary intention) or may be closed to heal by primary closure(primary intention).<sup>6,7</sup> But since the incision tends to be situated in a deep midline cleft where there is tension and also the propensity to accumulate hair.<sup>6</sup>

Skin flaps techniques available include the advancement flap (Karydakis procedure), local advancement flap (V-Y advancement flap) and rotational flap (Limberg flap, modified Limberg flap, gluteus maximus myocutaneous flap).<sup>7,8</sup>

However, there have been few clinical studies proving that the recurrence rate in the Limberg flap group was lower than the recurrence rate in the other flap techniques and provides a more efficient flattening of the natal cleft, including the most inferior part that is inclined to invert towards the anal region, lateralization of the inferior apex of the classic Limberg flap decrease recurrence which could occur in the inferior midline<sup>8,9</sup>. This prospective study of ours is to differentiate and hence, choose the better method for pilonidal sinus surgery.

## METHODS

The study has been conducted in the Department of surgery, Safdarjung Hospital, New Delhi over a period of 1 year and 6 months (October 2014 to April 2016). A group of 30 patients in study group underwent pilonidal surgery by primary closure using Limberg flap technique and 30 patients in control group underwent pilonidal sinus surgery by excision with primary closure only. They were evaluated for the study period of one and half

year and all the data was collected and results were tabulated using SPSS Version 17.0.

## Inclusion criteria

All patients presenting to surgical outpatient department with pilonidal sinus disease requiring surgical management.

## Exclusion criteria

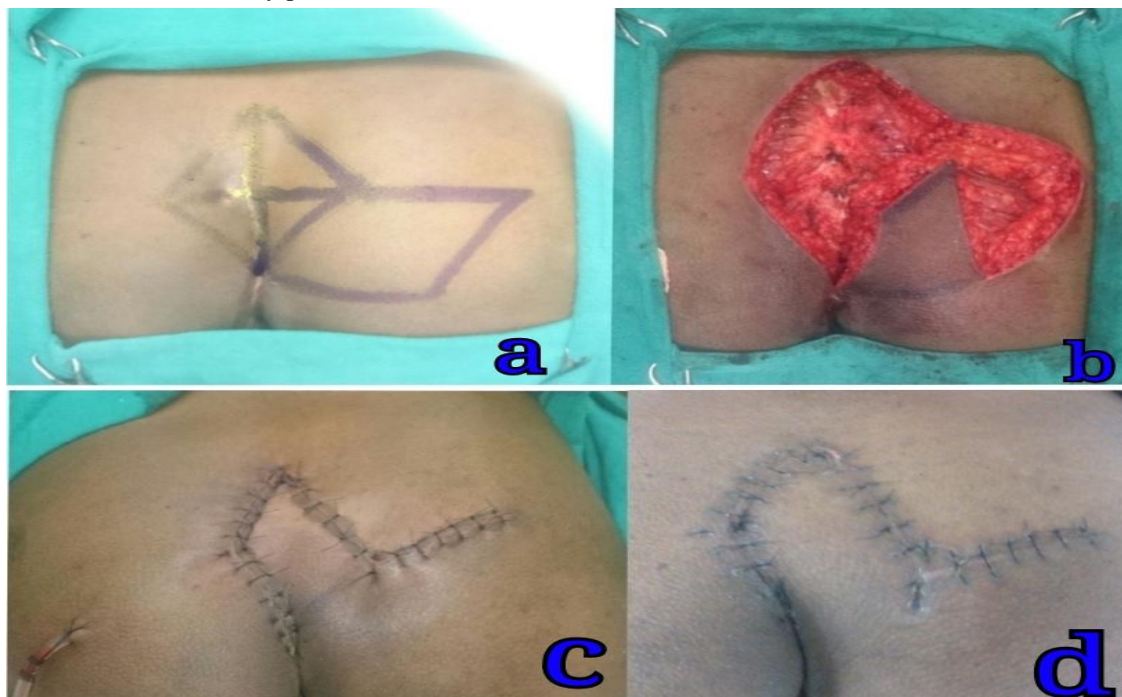
Patients with abscess formation, who are having immunodeficiency, diabetes mellitus, hypertension, patients younger than 12 years, those with existing recurrent disease or previous surgery in the sacrococcygeal region, who have severe hirsutism in female patients, patients with psychiatric disease or poor hygiene and patients with contraindication to spinal anaesthesia or prone position.

## Method

The inclusion and exclusion criteria were followed and all the patients underwent routine investigations and then preanaesthetic fitness.

## Randomization

Patients were allocated in the two different groups by means of sealed, numbered envelopes opened in sequence and consent was taken. Each patient is then subjected to undergo pilonidal sinus surgery by excision with primary closure or Limberg flap technique.



**Figure 1: (a) Marking of excision of pilonidal sinus using Limberg flap, (b) rotational flap (Limberg's), (c) post excision and completion of surgery and (d) post-operative 1 week status.**

### Operative procedure

All surgeries were performed under spinal anaesthesia. Control group underwent excision with primary closure only and study group underwent primary closure by Limberg flap technique.

### Excision and primary closure

The excision site was marked 1 cm away from the sinus. Then an elliptical incision was made that extended to the post sacral fascia. The tissue was resected and hemostasis was completed applying electrocautery. Then the wound was closed in layers after hemo- vacuum drain was placed in subcutaneous plane, deep tissue was closed with interrupted 2-0 Vicryl string, superficial soft tissue was closed with 3-0 Vicryl string and the skin was closed with 2-0 nylon string. Routine dressing was performed and removed the day after operation.

### Limberg flap technique

The excision and flap site was mapped. The ratio of length to width was 60%. This rhomboid shape incision was made and continued to the post sacral fascia and the tissue was excised. Then the fascio-cutaneous flap was divided from the underlying gluteus muscle and rotated to the defect. The wound was closed with 2-0 nylon string after hemo-vacuum drain placement. Routine dressing was performed and removed the day after operation (Figure 1).

The data was collected in the form of intraoperative time, post-operative complications, hospital stay and recurrence after follow up of 6 months. Whole data was tabulated and results were calculated using SPSS version 17.0 software.

### Postoperative complications

- Postoperative pain was measured by visual analog scale (VAS).
- Infection at stitch line.
- Seroma formation.
- Wound dehiscence.

## RESULTS

This study was conducted in the Department of General Surgery, Safdarjung Hospital, New Delhi. 60 patients were included in this study, 30 patients were study group who underwent excision with Limberg flap and 30 patients were control group who underwent excision with primary closure on a randomized basis. Patients were followed up for a period of six months.

As given in Table 1, since the p value is  $>0.05$  (0.809), it age is non-significant with occurrence of pilonidal sinus.

**Table 1: Age group involved in pilonidal sinus disease.**

Age group (year)	Study (n=30) N (%)	Control (n=30) N (%)	Total (n=60) N (%)
≤20	4 (13.33)	5 (16.67)	9 (15.00)
21-30	17 (56.67)	15 (50.00)	32 (53.33)
>30	9 (30.00)	10 (33.33)	19 (31.76)
Mean age	28.33±7.55	28.8±7.3	

P=0.809.

Pilonidal sinus disease is more common in males than in females (2:1).

Operating time in both the groups was noted from skin incision to the closure of wound.

**Table 2: Distribution of patients according to duration of surgery in study and control group.**

Duration of surgery (min)	Study group (n=30) N (%)	Control group (n=30) N (%)	Total N (%)
≤25	0 (00)	18 (60)	18 (30)
26-35	13 (43.33)	12 (40)	25 (41.67)
>35	17 (56.67)	0 (00)	17 (28.33)
Mean time	36.3±3.4	24.93±3.06	

p<0.0001.

Operative time period for two procedures; a mean of 36.3±3.24 (range 30-42) minute for Limberg flap procedure against a mean of 24.93±3.06 (range 20-30) minutes for primary midline closure. Although near similar value of these parameters for two procedures should render them a less important factor in determining the superiority of one procedure over the other.

### Post-operative pain

Measurement of the post-operative pain as per VAS for patients of both groups on post-operative day 1, day 2, 1 week, 1 month, 3 month, 6 month and comparison and statistical analysis is done using student-t test.

### Post-operative pain on post-operative day 1 (POD-1)

On VAS, maximum number of patient recorded a score of 7 i.e., 19 in which 13 patients (43.33%) in study group and 6 patients (20.00%) in control group out of 30 patients in each group. Mean VAS score in study=6.57±0.9 and control=5.63±1.33. P value of post-operative pain on POD-1 is 0.004 (<0.05). Means the comparison of pain in study and control group was statistically significant on POD-1.

**Post-operative pain on POD-2**

Most number of patients recorded a score of 3 on VAS scale i.e., totally 20 patients out of which 6 (20.00%) patients are from study group and 14 (46.67%) patients are from control group. Mean VAS score in study group is  $4.4 \pm 1.1$  and control group is  $7 \pm 0.95$ . P value of post-operative pain on POD-2 is 0.01 ( $<0.05$ ). Means the comparison of pain in study and control group was statistically significant on POD-2.

**Post-operative pain on PO- 1 week**

Most number of patients recorded a score of 3 on VAS i.e., totally 25 patients out of which 12 patients (40.00%) are from study group and 13 (43.33%) patients from control group. Mean VAS score in study group =  $3.13 \pm 1.01$  and control group =  $2.97 \pm 0.89$ . P value for post-operative pain on PO WEEK 1 is 0.449 ( $>0.05$ ). Means post-operative pain comparison was not statistically significant on post-operative week 1.

**Post-operative pain on PO 1 month**

Most number of patients recorded a score of 2 on VAS i.e., 31 patients out of which 15 (50%) patients are from study group and 16 (53.33%) patients are from control group. Mean VAS score of Study group is  $1.9 \pm 0.71$  and Control Group is  $2.1 \pm 0.76$ . P-value for post-operative pain on post-operative 1 month is 0.332 ( $>0.05$ ). Means post-operative pain comparison was not statistically significant at post operatively 1 month.

**Post-operative pain on PO 3 month**

Most number of patients recorded a score of 1 on VAS i.e., totally 35 patients out of which 20 (66.67%) patients are from study group and 15 (50%) patients are from control group. Mean VAS score of study group is

$0.87 \pm 0.57$  and control group is  $1.23 \pm 0.68$ . P value for post-operative pain on post-operative 3 month is 0.027 ( $<0.05$ ). Means post-operative pain comparison was statistically significant post operatively at 3 month.

**Post-operative pain on PO 6 month**

Most number of patients recorded a score of 0 on VAS i.e., totally 41 patients out of which 28 (93.33%) patients are from study group and 1 (43.33%) patients are from control group. Mean VAS score in study group is  $0.07 \pm 0.25$  and control group is  $0.77 \pm 0.77$ . P value for post-operative pain on post-operative 6 month is  $<0.0001$  ( $<0.05$ ). Means postoperative pain comparison was statistically significant post-operatively at 6 month.

**Infection at stitch line**

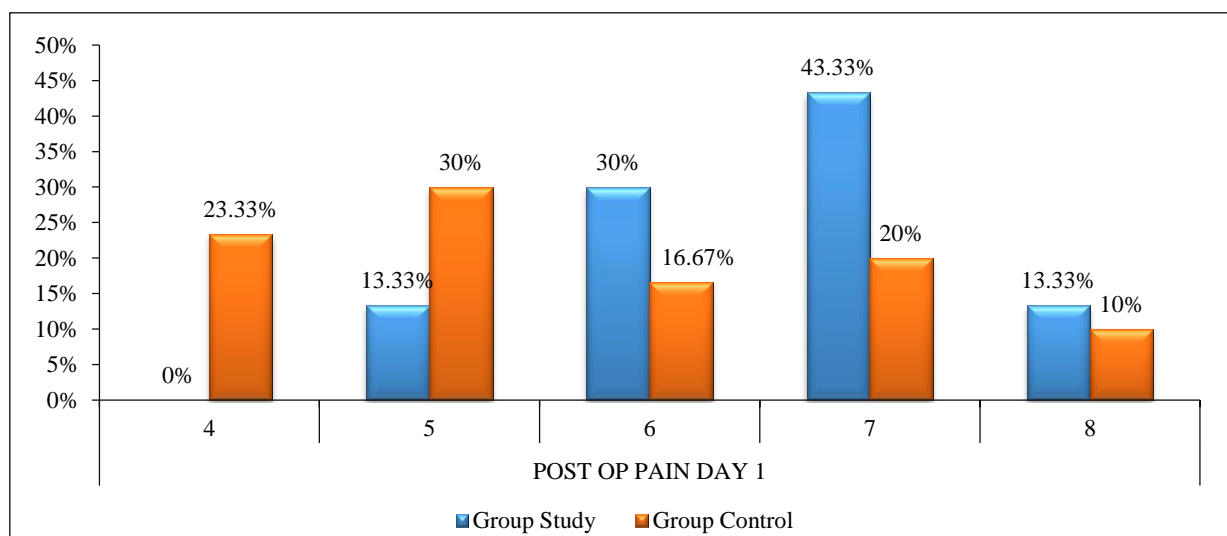
Infection at stitch line occur in totally 11 patient out of which 1 (3.33%) patient is from study group and 10 (33.33%) patients are from control group. P value for infection at stitch line is 0.006 ( $<0.05$ ). Means infection at stitch line comparison was statistically significant.

**Seroma formation**

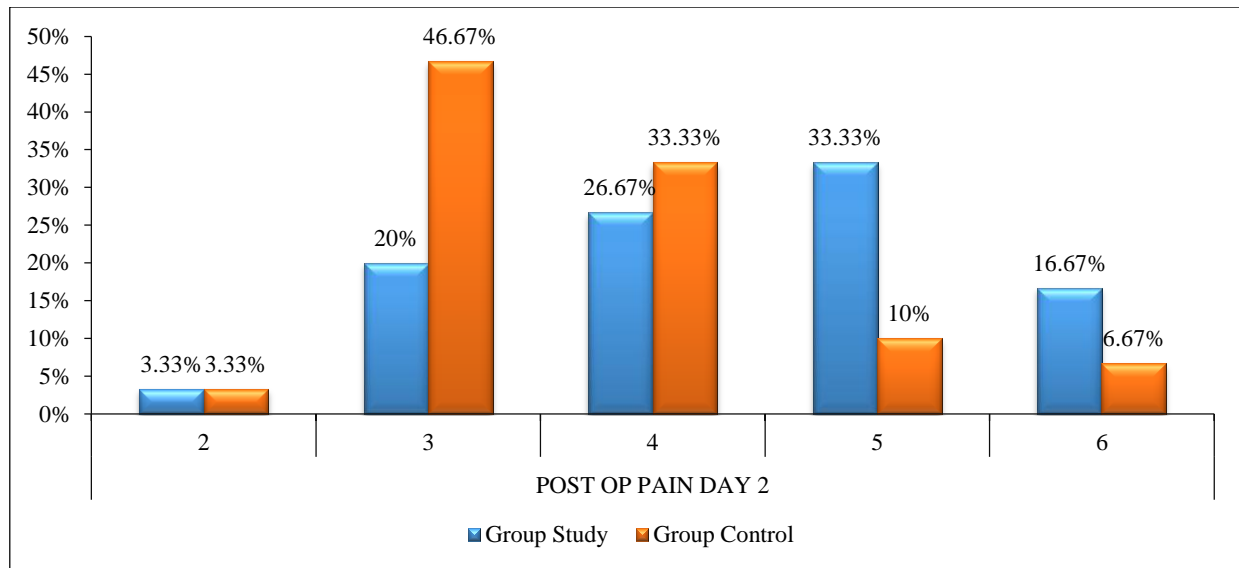
Seroma formations occur in total 9 patients out of which 1 (3.33%) patient is from study group and 8 (26.67%) patients are from control group. P value for seroma formation is 0.026 ( $<0.05$ ). Means seroma formation comparison was statistically significant.

**Wound dehiscence**

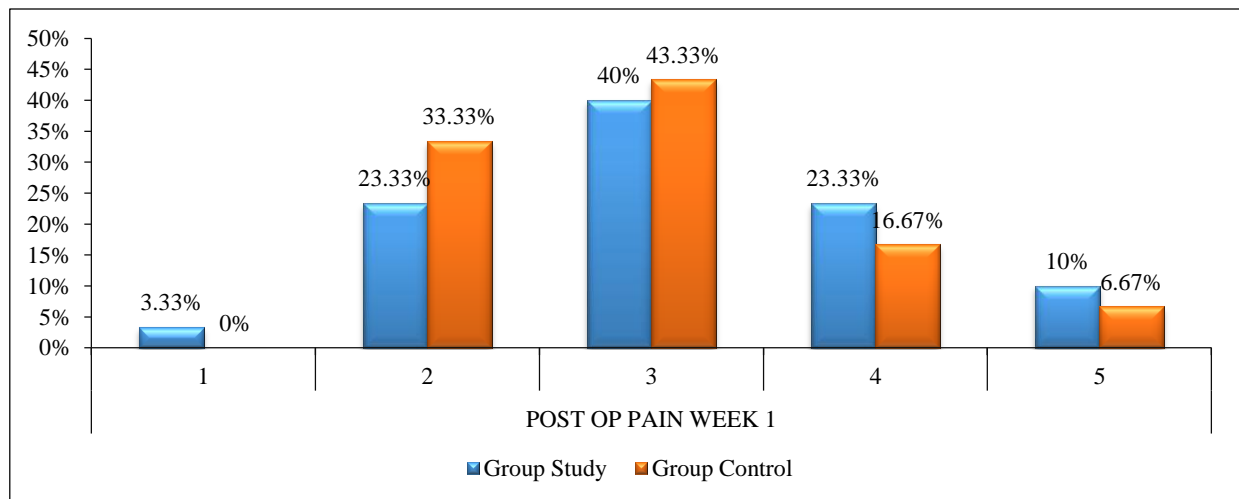
Wound dehiscence occurred in total 10 (16.67%) patients out of which 1 (3.33%) patient is from study group and 9 (30.00%) patients are from control group. P value of wound dehiscence is 0.012 ( $<0.05$ ). Means wound dehiscence comparison was statistically significant.



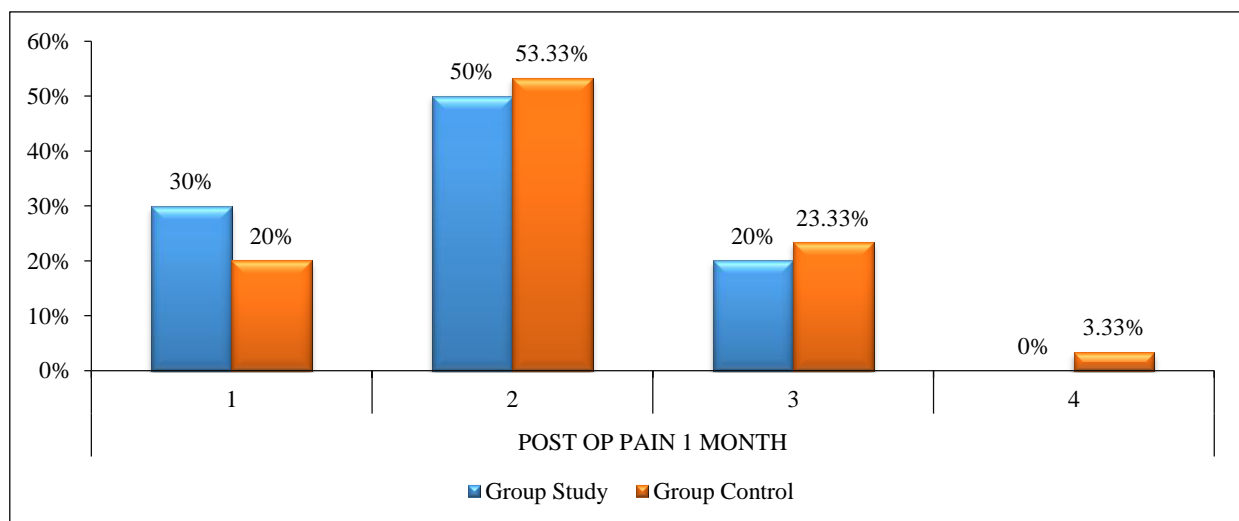
**Figure 2: Percentage of patients in study and control group with different VAS score on POD 1.**



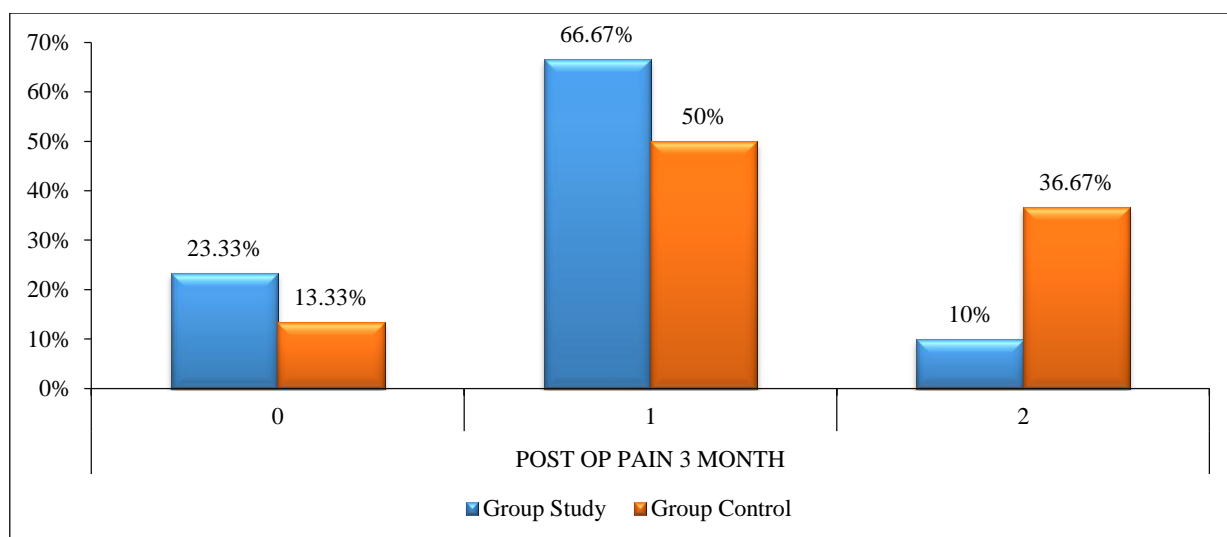
**Figure 3: Percentage of patients in study and control group with different VAS score on POD-2.**



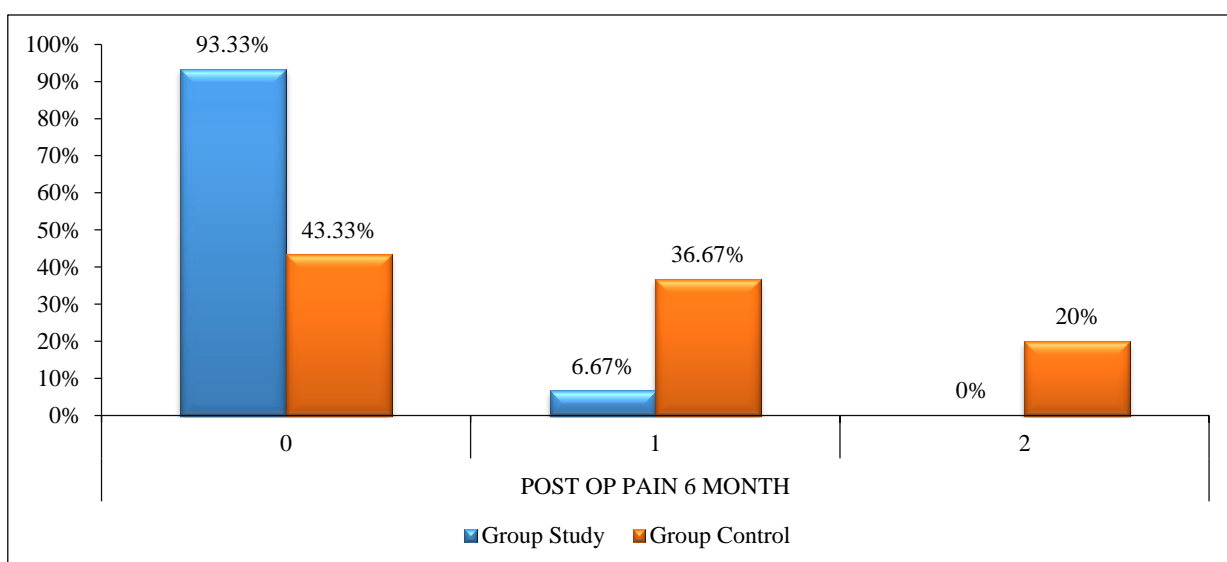
**Figure 4: Percentage of patients in study and control group with different VAS score on PO week 1.**



**Figure 5: Percentage of patients in study and control group with different VAS score on PO 1 month.**



**Figure 6: Percentage of patients in study and control group with different VAS score on PO 3 month.**



**Figure 7: Percentage of patients in study and control group with different VAS score on PO 6 month.**

### **Hospital stay**

Minimum number of days hospitalization required is 2 days in total 32 (53.33%) patients out of which 23 (76.67%) patients are from study group and 9 (30.00%) patients are from control group. P value for hospital stay is 0.0001 (<0.05). Means comparison of hospital stay was statistically significance.

### **Recurrence**

Pilonidal sinus recurrence occurred in total 9 (15%) patients out of which 1 (3.33%) patient is from study group and 8 (26.67%) patients are from control group. P value for recurrence is 0.026 (<0.05). Means recurrence comparison was statistically significant.

**Table 3: Post-operative complications and their significance.**

Post-operative complication	Total frequency	Study group frequency	Control group frequency	P value
<b>Infection at stitch line</b>	11	1	10	0.006
<b>Seroma formation</b>	9	1	8	0.026
<b>Wound dehiscence</b>	10	1	9	0.012
<b>Recurrence</b>	9	1	8	0.026

From Table 3 it is clear that since p value in all the complications is significant, the complications are more related with control group (primary closure) than study group (Limberg flap excision repair).

## DISCUSSION

When considered from this perspective, there was no statistical significance in the hospitalization period between the groups in the current study; on the other hand, time required to return to daily activities such as pain-free walking after the surgery, sitting on the toilet, and return to work, was significantly shorter in the Limberg flap method. However the results of a procedure on recurrence of the sinus probably depend mainly on the ability of the procedure to obliterate the depth of natal cleft. Considering this fact might expect the flap procedures to combat the disease recurrence better than excision with simple closure. Montes et al has documented a recurrence rate of 0-3% for Limberg flap whereas Sondenaa et al has documented high recurrence of 7-42% for primary closure.<sup>8,10</sup>

Outcome of our study in terms of recurrence of the pilonidal sinus is the same as reported by other studies, namely Sondenaa et al and Montes et al, 3.33% recurrence for Limberg flap group and 26.67% recurrence in primary closure group which was statistically significant with p value of 0.026 (<0.05).<sup>8,10</sup>

In our study mean age of Limberg flap group was  $28.33 \pm 7.55$  years and in primary closure group it was  $28.8 \pm 7.3$  years and the difference was statistically insignificant with p-value of 0.809 (>0.05).

Montes et al published a hospital stay of 2-3 days for the Limberg flap and 2-4 days for primary closure. In our study, we observed a total hospital stay of  $2.27 \pm 0.52$  days for Limberg flap group and  $3.57 \pm 1.43$  days for primary closure group and the difference was statistically significant with p value of <0.0001 (<0.05).<sup>8</sup>

Akca et al have published a median operative time 60 min for Limberg flap group against 45 min for the primary midline closure group and the difference has been found to have p value of 0.001. While Galala et al have found an insignificant difference in the operative time periods of the two techniques.<sup>11,14</sup> In our study mean time for Limberg flap group is  $36.3 \pm 3.24$  minutes as compared to  $24.93 \pm 3.06$  minutes for primary closure procedure. P value of this comparison is <0.0001 (<0.05) which is statistically significant.

Published studies namely Petersen et al documented a stitch line infection 12.4% for primary closure and 1.5-6.5% for Limberg flap procedure.<sup>10,11,15</sup> In our study stitch line infection 3.33% for Limberg flap group and 33.33% for primary closure group with p-value 0.006 (<0.05) which is statistically significant. Stitch line infection is

low for Limberg flap group as compared to primary closure group.

Daphan et al in 2004 reported 2% seroma formation with Limberg flap procedure. In our study post-operative seroma formation occur in 3.33% patients in Limberg flap group as compared to 26.67% in primary closure group which is statistically significantly high in primary closure as compared to Limberg flap procedure with the p value of 0.026 (<0.05).<sup>16</sup>

Lee et al reported post-operative wound dehiscence is 5-10% in primary closure as compared to 0.9-3.9% in Limberg flap procedure by Daphan et al and Bascom.<sup>4,16,17</sup> In our study we observed wound dehiscence in 3.33% of in Limberg flap group as compared to 30% in primary closure group with p value of 0.012 (<0.05) showing statistical significance i.e., wound dehiscence is very high in primary closure as compared to Limberg flap procedure.

From above data, it is evident that a less morbid immediate post-operative complications has been encountered in the Limberg flap group than with the primary closure group.

In immediate post-operative period on POD 1 and POD 2 patients from both group required injectable opioids for post-operative pain. On POD 1, all 30 patients (100%) in study group reflected pain on VAS with mean pain score of 6.57. In the control group, all 30 patients (100%) expressed pain on VAS with a mean pain score of 5.63. The p value is 0.004 (<0.05).

On POD 2, all patients (100%) in study group reflected pain on VAS with mean pain score of 4.4. In the control group, all 30 patients (100%) expressed pain on VAS with a mean pain score of 3.7. The p value is 0.01 (<0.05).

Post-operative pain on POD 1 and POD 2 is statistically significant. Post-operative pain on POD 1 and POD 2 is higher in Limberg flap as compared to primary closure.

Post-operative pain on 1 week, pain was recorded to be low in both study and control group. Most number of patients recorded a score of 3 on VAS i.e., totally 25 patients out of which 12 patients (40.00%) are from study group and 13 (43.33%) patients from control group. Mean pain VAS score in study group was 3.13 and in control group was 2.97 with the p value for post-operative pain on PO week 1 is 0.449 (>0.05) i.e., pain comparison was not of any statistical significance on post-operative week 1.

Post-operative pain on follow up of 1 month duration further decreased. Most number of patients recorded a score of 2 on VAS i.e., 31 patients out of which 15 (50%) patients are from study group and 16 (53.33%) patients are from control group. Mean pain VAS score in study

group was 1.9 and in control group mean VAS score was 2.1 with the p value of 0.332 ( $>0.05$ ) i.e., pain comparison was not of any statistical significance at post operatively 1 month. On 1 month pain was more in primary closure group as compared to Limberg flap group.

On post-operative follow up of 3 month duration total 11 (18.33%) patients were pain free, out of which 7 (23.33%) from study group and 4 (13.33%) from control group. Mean VAS score in study group was 0.87 and in control group was 1.23 with the p value of 0.027 ( $<0.05$ ) which is statistically significant. Pain was more in primary closure as compared to Limberg flap on PO 3 month.

On post-operative follow up of 6 month duration total 41 (68.33%) patients were pain free out of which 28 (93.33%) from study group and 13 (43.33%) from control group. Mean VAS score for study group was 0.07 and in control group 0.77 with the p-value of  $<0.0001$  ( $<0.05$ ) which is statistically significant. On post-operative 6 month maximum patients from Limberg flap were pain free as compared to primary closure who experienced pain.

Although limited data were available on post-operative pain with long term follow up. Similar results were achieved by Mahdy and Akca et al.<sup>11,12</sup>

Main technical problem of pilonidal surgery is not the removal of the cyst along with all of the sinuses, but rather reconstruction of the remaining defect area.<sup>13</sup> The reasons for the negative results of the primary closure method are the incision scar in the midline, the inability to flatten the natal cleft, and the tissue tension.

## CONCLUSION

The present study was designed to analyze the outcomes of the two different techniques of pilonidal sinus surgery- excision with primary closure and Limberg flap with special reference to operating time, post-operative complications, hospital stay and recurrence. We recommend the Limberg flap method for primary pilonidal disease with low morbidity rates as compared to primary closure, although further studies are necessary with a larger volume sample and longer follow up period.

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