

A Study to Evaluate Outcome of Pilonidal Sinus Treatment after Various Surgical Techniques

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Abstract: Background: Pilonidal disease is a type of skin infection which typically occurs as a cyst between the cheeks of the buttocks and often at the upper end. Symptoms may include pain swelling and redness Risk factors include obesity family history prolonged sitting greater amounts of hair and not enough exercise . Shaving the area and laser hair removal may prevent recurrence .About 3 per 10,000 people per year are affected and it occurs more often in males than females . Young adults are most commonly affected The term pilonidal means nest of hair Good technique less incidence of recurrence less morbidity less duration of hospital stay and good patient compatibility have made these procedures popular and acceptable with minimal cosmetic disfigurement. Though many techniques are practiced, the LIMBERG'S RHOMBOID FLAP is one of the flap technique that was found to be efficient in the management of this condition. Aims and objectives: 1 To determine effects of Limberg flap rotation surgery their outcomes such as wound infection seroma formation flap necrosis 2 To compare the result of excision of sinus followed by dressing of wound versus closure of wound by Limberg flap closure Z-plasty 3 To assess the recurrence rate of pilonidal sinus disease in patients with effective removal of pilonidal sinus. Materials and Methods: The study has been conducted in department of general surgery Associate LLR hospital GSVM medical college Kanpur from January 2019 to October 2021 on patients who were admitted from casualty and Outpatient departments of general surgery. Total 100 patients were taken. A Proforma has been designed which included demographic data signs symptoms predisposing risk factors investigations diagnosis type of operative technique operative time and complications BMI >35 kg/m² will be considered to be overweight and obese. Results: A total 100 patients were included in the study findings noted appropriate treatment instituted and followed up for a period of 6 months. Pilonidal disease have been reported, due to various predisposing factors, more common in males (84%) compared to the females (16%). It affects young adults (20-24 yrs-42%) Presentation may vary from asymptomatic pits to chronic pain (88%) and discharging sinuses (38%) and acute presentations of abscess. Patients with an increased body mass index and those with a deep natal cleft are more prone for it. Patients who work for prolonged sitting are more prone to develop this disease. There are a wide variety of treatments both surgical and non-surgical that are advocated in the management of pilonidal disease. Among all, it is the flap procedures which have a low recurrence, less duration of hospital stay and early return to work. Limberg flap is the most effective surgery. Conclusions: A disease of the natal cleft affecting young adults with a male preponderance and occupation involving prolonged sitting with presentation vary from painful discharging sinus to acute abscess. The current published literature supports the use of the rhomboid flap excision and the limberg flap-repair procedures over primary midline suture techniques for the effective management of primary pilonidal disease. Flap procedures are the most effective way to treat the disease.

Keywords: Pilonidal Sinus, Limberg flap, Z-plasty

1. Introduction

Pilonidal Disease includes Pilonidal Sinus, Pilonidal Cyst and Pilonidal Abscesses, mostly occur in the sacro-coccygeal area, posing problems that include pain, acute abscess and chronic discharging sinus . It causes discomfort that may interfere with education or employment sometimes for prolonged periods. Flap techniques have revolutionized the management of pilonidal disease. Good technique, less incidence of recurrence, less morbidity, less duration of hospital stay and good patient compatibility have made these procedures popular and acceptable with minimal cosmetic disfigurement.

Though many techniques are practiced, the LIMBERG'S RHOMBOID FLAP is one of the flap technique that was found to be efficient in the management

of this condition. Hodges in 1880 was the first to use the name "pilonidal" derived from Latin "pilus" meaning hair and "nidus" meaning nest. The term literally means nest of hair, the epithelium lined sinus mostly contains hair. It is called as "Jeepers bottom" as it was common in jeep drivers during World War II . In the year 1973, more than 70,000 patients were admitted to non-government hospital in the US with a primary diagnosis of pilonidal disease. In 1980, more than 40,000 patients with pilonidal disease were hospitalized in the United States averaging over 5 days in hospital care. In India, the disease is not uncommon as might be thought even though incidence statistics are not available. The incidence rate of pilonidal disease is approximately 0.7%.

One proposed cause of pilonidal cysts is ingrown hair,^[1] although hairs found in pilonidal sinus tracts may

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originate from the head. Excessive sitting is thought to predispose people to the condition, as sitting increases pressure on the coccygeal region.

Congenital theory; Most of the authors in nineteenth century believe that the pilonidal sinus disease was congenital in origin and they proposed a congenital theory based on their studies on the human embryo: 1. Neural canal remnants 2. The degenerated epithelial nests 3. As the human tail bud involutes because of the lack of development of the caudal appendix, tractions will be exerted which attracts the skin into the subcutaneous tissue region thereby resulting in the formation of an epithelium lined sinus tract.

Acquired theory; Patey and Scarffl challenged the opinion that the lesion is congenital, and their view has since been supported by Hueston, Currie, Gibson and Goodall and by Davage. These writers have emphasized the following observations. **Karyadakis postulated** the pathogenesis of the pilonidal sinus disease. He attributed three main factors responsible for the hair insertion process: 1. The loose hair being the invader 2. And the force causing the insertion 3. The skin in the natal cleft vulnerable to the insertion of hair.

Studies on the routine physical examination of **Minnesota college students** showed 364 out of 31597 males (1.1%) and 22 of 21467 females (0.11%) had pilonidal sinus. The most common presentation in patients with pilonidal disease being the pits or holes in the gluteal cleft. And studies on the Iraq soldiers of 1000 members showed, Out of 88 members who had pilonidal sinus, 48 were asymptomatic and 40 presented with symptoms.

Sondenaa et al. noted discharge in 66%, swelling in 50% and pain in 35% of chronic pilonidal disease presentations. 50% of patients present with abscess and with discomfort or pain following physical activity or after a long drive due to prolonged sitting.^[16] The most commonly performed surgery is for the pilonidal sinus complex to be surgically excised with the wound often left open to heal. Post-surgical wound packing may be necessary, and packing typically must be replaced daily for 4 to 8 weeks. In some cases, two years may be required for complete granulation to occur. Sometimes the cyst is resolved via surgical marsupialization.^[17]

Surgeons can also excise the sinus and repair with a reconstructive flap technique, such as a "cleft lift" procedure or Z-plasty, usually done under general anesthetic. This approach is especially useful for complicated or recurring pilonidal disease, leaves little scar tissue and flattens the region between the buttocks, reducing the risk of recurrence.^[13] This approach typically results in a more rapid recovery than the traditional surgery, however there are fewer surgeons trained in the cleft lift procedure and it consequently may not be as accessible to patients, depending on their location. Meta-analysis shows recurrence rates were lower in open healing than with primary closure (RR 0.60, 95% CI 0.42 to 0.87), at the expense of healing time.

2. Aims and Objectives

- Clinical and demographic profile of pilonidal sinus.
- To determine effects of Limberg flap rotation surgery, their outcomes such as wound infection, seroma formation, flap necrosis.
- To compare the result of excision of sinus followed by dressing of wound versus closure of wound by Limberg flap closure, Z-plasty.
- To assess the recurrence rate of pilonidal sinus disease in patients with effective removal of pilonidal sinus.

3. Material and methods

The prospective comparative study was carried out on patients of pilonidal sinus conducted in department of general surgery, Associate LLR hospital GSVM medical college, Kanpur from January 2019 to October 2021.A

Inclusion criteria

- Pilonidal sinus in the natal cleft of the sacro-coccygeal region.
- Patients aged between 12 to 60 years

Exclusion criteria

- Perianal abscess
- Pregnant women
- Osteomyelitis of underlying bone
- Fistula in ano
- Tubercular and syphilitic granuloma
- Patients having diabetes mellitus
- Human immunodeficiency virus positive patients
- Patients on cancer chemotherapeutic drugs
- Patients on immunosuppressive therapy

Techniques

The various types of Local advancement flaps are

- Z-plasty
- Rhomboid flap
- V-Y advancement flap

Z- PLASTY

Mansoor and Dickson used this technique on 120 patients and reported a complication rate of 4 % and a recurrence rate of 1.65% after a follow up of 9 years. The patients were discharged on post-operative day 1 and they returned to work 2 weeks later.

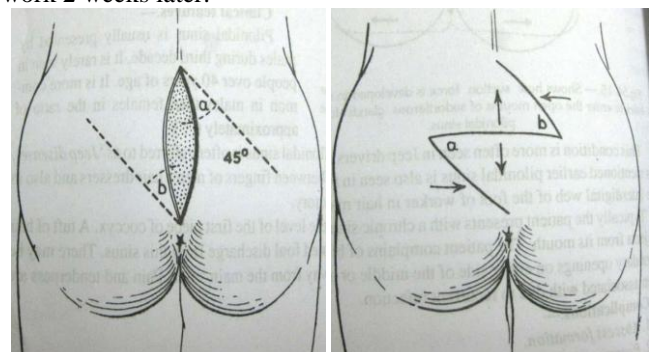


Figure 1: Z-plasty. marking of Z limbs A and C
b. Flaps created and transposition done and skin closed B and D



Figure 2: Marking of incision.



Figure 3: Excision of pilonidal sinus and Creating the flaps for Z-plasty



Figure 4: Closure of Z-plasty

LIMBERG'S RHOMBOID FLAP.

Stauffer VK et al (2018) they systematically searched available databases and reviewed 6,143 studies published from 1833 to 2017. They assessed data in the manner of a meta-analysis of RCTs; further we assessed non-RCTs in the manner of a merged data analysis. In the RCT analysis including 11,730 patients, Limberg&Dufourmental operations were associated with low recurrence of 0.6% (95%CI 0.3-0.9%) 12 months and 1.8% (95%CI 1.1-2.4%) respectively 24 months postoperatively. Analysing 89,583 patients from RCTs and non-RCTs, the Karydakis& Bascom approaches were associated with recurrence of only 0.2% (95%CI 0.1-0.3%) 12 months and 0.6% (95%CI 0.5-0.8%) 24 months postoperatively. Primary midline closure exhibited long-term recurrence up to 67.9% (95%CI 53.3-82.4%) 240 months post-surgery. For most procedures, only a few RCTs without long term follow up data exist, but substitute data from numerous non-RCTs are available.

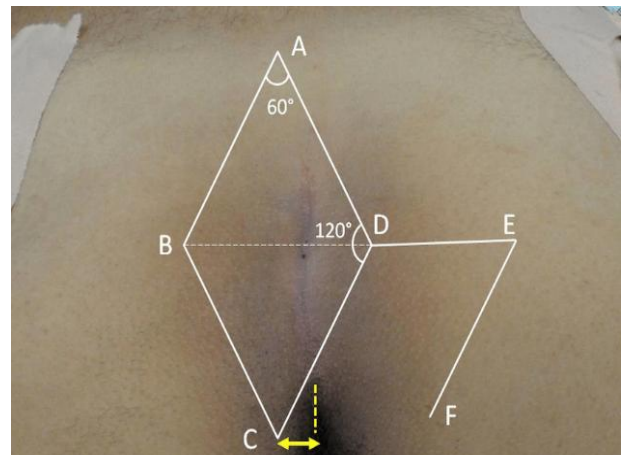


Figure 5, 6: Marking for Limberg flap



Figure 7: Excised pilonidal sinus with flap construction



Figure 8: Repositioning of flap



Figure 9: On first dressing (Post-op)

4. Observation

Pilonidal sinus is one of the least reported of diseases prevalent. Patients tend to seek advice mostly only when they are ridden with the complications of the disease and/or have a persisting disturbing discharging sinus. The patients presented to the doctor with complaints were only tip of the

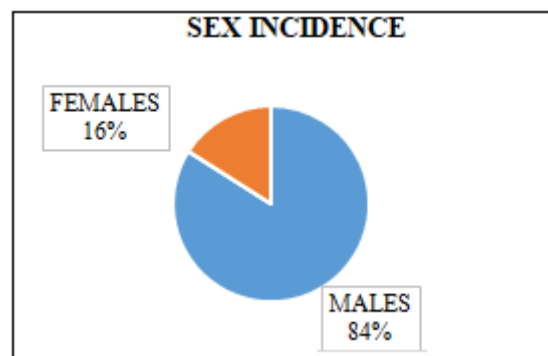
ice berg .Not many studies have been conducted in India to know the prevalence and incidence of the disease. Many go unreported and under diagnosed or even misdiagnosed.

A total of 100 patients were admitted with complaints relating to pilonidal disease and its complications. The above patients were included in the study; findings noted, appropriate treatment instituted and followed up for a period of 6months.

Sex Incidence: The Indian male for obvious reasons like more hair distribution and occupation were noted to be more prone for disease than female counterpart

Table 1

Study	Present study	Varnalidis, I et al.	HemmatMaghsoud el al..
Men	84 (84%)	92 (82.8%)	131 (87.3%)
Female	16 (16%)	19 (17.2%)	19 (12.7%)



After comparison with previous studies, it can be concluded that the incidence of pilonidal disease is more common in men (5:1).

Age Incidence

Pilonidal disease commonly affects the male young people. It is not seen in older age groups unless the cause has been because of poor previous treatment.

Table 2

Age group	No of patients	Percentage
20-24	42	42%
25-29	24	24%
30-34	18	18%
35-40	16	16%
Total	100	100%

Age incidence comparison:

Age	Present study	Hemmat Maghsoudi, et al	OnerMentes el al
Mean +/- SD	25 +/- 5.73	22.1 +/- 11.3	22.49 ± 2.97

Table 3: Occupation incidence

Occupation	No of patients	Percentage
Agriculturist	26	26%
Clerk	6	6%
Driver	8	8%
Housewife	8	8%
Shopkeeper	18	18%
Student	34	34%

Though called “Jeep bottom” as it was noted to be more common in the jeep drivers of the world war-2, there have been no definitive studies done to note that the disease is more common in patients who have history of prolonged sitting and those who are close to vibrating structures.

Body Mass Index: There have been many studies that have proved the incidence of increased body mass index with the incidence and even recurrence of pilonidal sinus.

Table 4: Body mass index comparison:

B.M.I.	Present study	Oner Menten et al.
18.5 – 24.9	64%	70.5%
25 – 29.9	32%	27.4%
30.1 – 34.9	4%	2%
Mean +/- SD	24.39 +/- 3.07	23.8 +/- 2.7
Range	19.5 – 32.9	16.1 – 36.8

Procedure: The patients who had presented with complaints of abscess were drained on an emergency basis. The other patients who presented with complaints of recurrent or chronic disease were subjected to the operative procedure.

Table 5

Treatment	Number of Patients	Percentage
Incision and drainage	28	28%
Wide local excision	16	16%
Limberg flap	42	42%
Z-plasty	42	42%

Table 6: Complications

Post-operative outcome between Limberg flap and Z plasty:

Parameter	Limber flap group	Z plasty group
Total patients	42	42
Wound infection	2	4
Seroma	0	6
Partial flap ischemia	1	6
Flap necrosis	0	0
Partial wound dehiscence	2	4
Complete wound dehiscence	0	0
Recurrence	2	2

Among wide local excision group, recurrence was seen in 2patient at 6 months of follow up.

Table 7: Complications comparison of Z plasty

Complications	Wound infection	Seroma	Flap ischemia/necrosis	Recurrence
Current study	9.5%	14.28%	14.28%	4.76%
Rao et al	7.5%	12.5%	7.5%	-
Behdal& Hosseinpor	3.3%	12.5%	25.5%	3.3%
Fazeli et al	9.7%	5.6%	-	-
Parveen et al	-	-	-	5%

Table 8: Complications comparison of Limberg flap:

Authors	Complications	Recurrence
Katsoulis et al.	16%	-
Akin et al.	15.75%	2.91%
Urhan et al.	7%	4.9%
Mentes et al.	2%	1.26%
Aslam et al.	5%	1%
El-khadrawy	40%	10%
Current study	19.04%	4.76%

Table 9: Duration of hospital stay comparison

Procedure	Current study	Akmaljamal et al.	Gaber R. Asmaa et al
Wide Local Excision	5.33 +/- 2.45	5.68 +/- 1.25	-
Limberg flap	5.43 +/- 2.38	4.04 +/- 1.12	1.6
Z-plasty	5.44 +/- 2.42	-	3.4

Duration of hospital stay, time taken for healing and time taken to return to work are important variables which decide the success of treatment. As already mentioned, this disease causes morbidity amounting to loss of work and discomfort hence these determinants help choose the appropriate line of management.

Table 10: Time taken for complete healing of wound:

Procedure	Current study	Akmaljamal et al.	Gaber R. Asmaa et al
Wide local excision	61.25 +/- 18.49	120.08 +/- 31.59	-
Limberg flap	14.93	20.13 +/- 8.99	10
Z- plasty	22.17 +/- 7.42	-	18

5. Discussion

Pilonidal Sinus Disease is a disease affecting the young. It is under reported and yet it does significantly cause discomfort and morbidity to the patients that draws them to the surgeons mostly when complications of the disease arise. Definitive treatment is best provided when the patient initially presents to the surgeon to prevent loss of time from work and distress to the patient. The disease is more common in males for reasons like hirsutism, distribution of hair and occupation. The western literature also confirms that this disease is predominant in males.

The disease doesn't occur in subjects beyond 40years for reasons that have already been explained. It is more commonly seen in the late teens and early twenties as the hormone levels are high in this age.

Females tend to develop this disease at an earlier age than the male counterparts due to early onset of maturity. In a study done by **HemmatMaghsoudi, MD NarimanNezami, MD Ali Akbar Ghamari, MD** there were 131 (87.3%) male and 19 (12.7%) female patients included in our study; their mean age was 22.1. Most patients were between the ages of 15 and 25, and the incidence decreased thereafter

The mean age at presentation in our study is 25 years. This depicts better knowledge about the disease and early definitive treatment at an earlier stage in western world. Though called “Jeep bottom” as it was noted to be more common in the jeep drivers of the world war-2, there have been no definitive studies done to note that the disease is more common in patients who have history of prolonged sitting and those who are close to vibrating structures. The majority of the classical articles about SPD indicate a relation between the long sitting time and this disease; however, we could not find a clinical trial in the literature that was showing this relation. Current cars and trucks are comfortable and roads are flat. It is possible that improved vehicle and road conditions are the reason today's drivers

experience SPD less often than with their colleagues who rode in a jumping jeep on bumpy field roads during the Second World War. It is not easy to deny the relation between occupation and SPD according to study results; although occupation seems to be indirectly related to sitting time and body cleaning.

It is seen that the most common complaints that the patient may present with are pain, swelling and discharge. There may be persistent embarrassing discharge or vague dull aching pain that causes discomfort.

Patients often complain of intermittent swelling that reduces spontaneously after bursting open to discharge foul smelling thick paste like material associated with hairs. Patients who have presented with complaints of abscess had all the complaints of pain, swelling and discharge with exaggeration of all symptoms worsening over a short duration of time. Pilonidal sinus is a disease that has high rates of recurrence. And hence patients present with failure of previous treatment and recurrent trials of treatment in the past till proper definitive surgery has been advocated.

Our study and the other studies that have been taken for comparison prove this.

All the patients who presented had presence of sinus (single/multiple) in the natal cleft and they also had presence of a deep natal cleft. 82% of patients had local swelling and 94% of patients had active discharge seen coming out of the sinuses. About 28% of patients had complaints with abscess-pain, swelling, discharge, tachycardia, local raise of temperature and tenderness. In a clinical trial containing 419 patients and 213 controls, BMI was reported to be slightly higher in the patient group, but the difference was not statistically significant. [88] In another study, the authors declared that the **Karydakis procedure** for managing chronic pilonidal sinus in obese patients was easy to perform, had a fast healing time, required a short hospital stay, enabled a rapid return to work and resulted in a low recurrence rate. [89] In contrast, **Cubukcu et al.** Stated that obese patients with high BMI have a higher risk of recurrence of pilonidal sinus disease after surgical intervention. [90] A recent paper that included 125 patients and 125 controls revealed that sacrococcygeal subcutaneous fatty tissue is thicker in the patient group. [91] Study done by **Ali Harlak, OnerMentes** revealed that obesity is a relatively less important risk factor for SPD.

In this study, the average body mass index noted is 24.39 kg/m² implying that obesity is a relatively less important risk factor. Diagnosis of pilonidal disease is mostly clinical; there are no specific investigations that are needed for the confirmation of its diagnosis. However, in patients presenting with discharge, the discharge was sent for culture and sensitivity and appropriate antibiotic treatment was instituted. The most common organisms that were isolated were the anaerobic organisms and staphylococcus aureus, mixed growth was noted in a few (8%). These findings are similar to the western study that has a detailed evaluation organisms cultured in pilonidal disease. All the patients had undergone X-ray lateral view of the lumbo-sacral region, and there was no radiological abnormality noted. The

common treatment that was advised to all a patients was good personal hygiene and shaving of local area. All the patients who were admitted with complaints of pilonidal abscess, underwent an emergency incision and drainage procedure done under local anaesthesia and started on broad spectrum antibiotics. They are dressed on alternate day basis till the inflammation and oedema had reduced and then they were advised definitive surgery like wide local excision, Limberg flap closure and Z-plasty. 42% of patients had undergone Z-plasty, 42% of patients had undergone Limberg flap procedure and the rest wide local excision and healing by secondary intention.

The patients who had undergone Limberg flap procedure had drains placed to prevent collection underneath the flap. The drains were removed when the collection in the drain was noted to be below 20ml and 2 patients did not require drain placement. Out of 42 patients who had undergone Limberg flap closure, only 2 developed wound infection and this same patient had partial wound dehiscence. While in Z-plasty group, 4 patients developed wound infection and 6 patients had seroma formation probably due to absence of drain tubes and these 6 patients had partial flap ischemia, out of these 4 had partial wound dehiscence. The wound infection was controlled with use of wide spectrum antibiotics. The rate of wound infection, seroma formation and flap ischemia was found to be 9.5%, 14.28% and 14.28% respectively in current study in Z-plasty group. While according to the study done by Rao et al these rates are 7.5%, 12.5% and 7.5%. In the limberg flap group, the most common complication was wound infection and overall incidence of complication was 19.04%, while the other studies done by **Katsoulis et al, Akin et al and Urhan et al** mentions them as 16%, 15.75% and 7% respectively. Of the procedures performed, all the procedures had variable rates of recurrence. In comparison to the western literature, it is noted that the results are similar in patients undergoing wide local excision. While in the Z-plasty group the recurrence was noted in 4.76% cases. In the study done by **Behdal & Hosseinpor and Parveen et al** the recurrence rate is mentioned as 3.3% and 5% respectively. In the Limberg flap group, the recurrence rate seen in current study is 4.76%. In the study done by Urhan et al, Mentes et al and Akin et al it is mentioned as 4.9%, 1.26% and 2.91% respectively.

Our study shows the hospital stay duration found to be very less in patients treated with flap procedures than who underwent other procedures. Similar results were obtained from all studies done so far. The total time taken for the wound/flap to heal was noted to be significantly lower in patients undergoing Limberg flap procedure.

In patients undergoing the Z-plasty, the healing time was noted as 22.17+/- 7.42 days, while the western studies (Gaber R Asmaa et al) mentions it as 18 days. In patients undergoing Limberg flap procedure, the healing time noted in the present study is 14.93 days. While in western literature it noted to be 20.13±8.99 days.

6. Conclusion

Pilonidal disease is a disease of the natal cleft affecting young adults with a male preponderance and occupation involving prolonged sitting. The modes of presentation vary from painful discharging sinus to acute abscess. It is more common in patients with high body mass index and deep natal cleft. It's a diagnosis based on clinical findings. Anaerobic infection is more common in the sinus and among aerobic organism, Staphylococcus is the most common organism. Conservative management along with definitive surgical treatment of the disease form the goals of management of pilonidal disease. The current published literature supports the use of the rhomboid flap excision and the limberg flap-repaired procedures over primary midline suture techniques for the effective management of primary pilonidal disease. Flap procedures are the most effective way to treat the disease.

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