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LIMBERG FLAP VS PRIMARY CLOSURE OR HEALING BY SECONDARY INTENTION AS MANAGEMENT FOR SACCRO-COCCYGEAL PILONIDAL SINUS (SCPS): A REVIEW

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ABSTRACT

Saccro-Coccygeal Pilonidal Sinus is a common affliction seen mostly in young slightly obese hirsute males. There are many ways to manage this, most commonly being excision and leaving a raw area to heal by secondary intention. This procedure necessitates long periods of dressing which causes much distress and inconvenience to patients. Also this method does not address to one of the basic causes of Sacro-coccygeal pilonidal sinus which is suction effect of a deep natal cleft. The other procedures are difficult to master and have their own set of issues for successful management. This study focuses on management of Saccro-coccygeal pilonidal sinus by complete excision of infected tissue and on table primary coverage of defect using a Limberg flap which is a rotational local flap hence has a good survivability, is easy to master and address very well to management of deep natal cleft too. This study compares the commonest three methods of management of SCPS which are excision and healing by secondary intention or closing the wound primarily and use of Limberg flap for primary closure of the defect.

INTRODUCTION

The term pilonidal sinus, 'pilus' meaning hair and 'nidal' meaning nest, was first used by Hodges in 1880 to describe an abnormal chronic tract between the buttocks.[1] Pilonidal disease consists of Pilonidal abscess and Pilonidal sinus. It was called 'Jeep drivers disease' as it was commonly seen in American jeep drivers during World War 2. (Fishbien, W 1950[2]).

Saccro – coccygeal Pilonidal sinus (SCPS) disease is a common condition usually seen in young adults. The mean age of presentation is 21 and 19 years in men and women respectively (Notaro 2003[3]). The estimated incidence is 26 per 100 000 people affecting men more often than women (2.2 to 1.0) (Sondenaa 1995[4]). Many, but not all patients are hirsute and an excess incidence has been reported in those who are moderately obese (Notaro 2003[3]). The exact incidence in Indian conditions is not known.

There has been a debate regarding the best treatment for Pilonidal diseases (SCPS) for many years. An ideal operation should be simple, should not need prolonged hospital stay, should have low recurrence rate and should be associated with minimal pain, wound care and decrease the patient's time off-work.[2] Most importantly it should address the basic requirement of making the natal cleft shallow so as to prevent the suction action of the buttocks and hence prevent recurrence.

It was decided to carry out a study to evaluate the advantages and disadvantages and final outcome of Limberg flap reconstruction after rhomboid excision of Saccro-Coccygeal Pilonidal Sinus (SCPS) as compared to the excision and wound either stitched primarily or left to heal by secondary intention.

MATERIALS AND METHODS

This study was carried out in the Department of Surgery of a secondary care government hospital for a period of 186 months (January 2002 – June 2016). The total number of cases of SCPS surgery was 77; 20 by excision and healing by secondary intention while 7 by primary closure of the wound. 50 cases were managed by excision with Limberg flap.

It was only after 2007 that Limberg flap was used to manage all cases of SCPS by us.

The three methods i.e excision and healing by secondary intention, excision and primary closure of the wound and excision and closure by Limberg flap were compared for:

Primary outcomes which included

- Operative time
- Post-op pain severity by Wong Baker Faces pain rating scale
- Rate of surgical site infection (SSI)
- Wound dehiscence

- Time to wound healing (Full epithelialisation (healing) of the wound was considered as the definition of wound healing).
- Length of hospital stay

And Secondary outcomes which included

- Time to return to work (RTW)
- Rate of recurrence
- Quality of life
- Participant (patient) satisfaction

Participants were anyone over 14 years of age undergoing surgery to treat pilonidal sinus disease. No distinction was made between new (initial presentation of the disease) and recurrent presentation of pilonidal sinus disease.

All patients were offered this surgery after counselling and obtaining a full informed consent.

The preoperative patient characteristics like sex, weight, hirsute were collected and summarized. Sinuses characteristics were also documented including, the number, site, size, duration of the sinus disease and either primary or recurrent and a scoring was done. This was done to achieve secondary objective of studying the profile of the patients and the disease.

Preoperative patient characteristics and scoring number[3] **Patient Characteristics**	**Score No – 2**	**Score No – 1**
Hirsute	Hairy (coarse with hard texture) – 2	Less (faint hair with fine texture) – 1
Weight	Overweight – 2	Average or underweight weight – 1
Sex	Male – 2	Female – 1
Sinus Characteristics		
Number of Sinuses	Multiple – 2	Single – 1
Site	At the convex side – 2	At the midline – 1
Size	>0.5 – 2	<0.5 – 1
Recurrence	Recurrent – 2	Primary – 1
Duration	More than 6 months – 2	Less than 6 months – 1
Site	At the convex side – 2	At the midline – 1
Total score	16	8

Scoring was done only to categorise the case as difficult (60 had a scores between 12 and 16) or easy (17 had a scores between of 8 and 11).

Surgery was performed under Spinal anaesthesia. Patients were placed in prone position with buttocks strapped after applying tincture benzoin to open up the natal cleft. After standard preparation of skin and draping, the area to be excised marked. The incision (which includes the sinus) was made till the presacral / gluteal fascia. Hemostasis was secured and the wound was closed primarily after putting a corrugated drain in two layers using polyglactin undyed 3/0 and Nylon 2/0. The drain was removed after 48 to 72 hours and sutures were removed on 12 to 14th day.

When left open to heal by secondary intention, a betadine soaked pack was placed in the empty sinus cavity and dressing done initially every alternate day and after 3 dressings twice a week or daily after sitz bath depending on the wound characteristics.

In cases where closure by Limberg flap was planned, a flap was constructed by first drawing a line A–C and its length measured. C should be adjacent to the perianal skin and A is placed so that all diseased tissue can be included in the excision. The line B–D transects the midpoint of A–C at right-angles and is 60 per cent of its length. It is this ratio of lengths which determines the correct shape to the rhomboid. The flap is planned so that D–E is a direct continuation of the line B–D and is of equal length to the incision B–A to which it will be sutured after rotation. E–F is parallel to D–C and of equal length. After rotation, it will be sutured to A–D.[6]

The incision laterally was down to the fascia of the gluteus maximus muscle (making sure that side AB = DE, AD = EF and BC = DC) (Figure 2). Haemostasis is secured. The flap is transposed bringing DE to AB / CD to BC / EF to AD to cover the rhomboid defect created by excision of the sinus. A suction drain 20 F is placed in the wound cavity through a separate stab incision. Subcutaneous tissue is approximated with interrupted polyglactin 3-0 suture. The skin is closed with interrupted nylon 2-0 suture (Figure 3). Drain is removed after 24–48 hours. The patient is encouraged to sleep in supine position to put pressure on the flap and negate any dead space and seroma formation Sutures are removed on the 12th–14th POD.

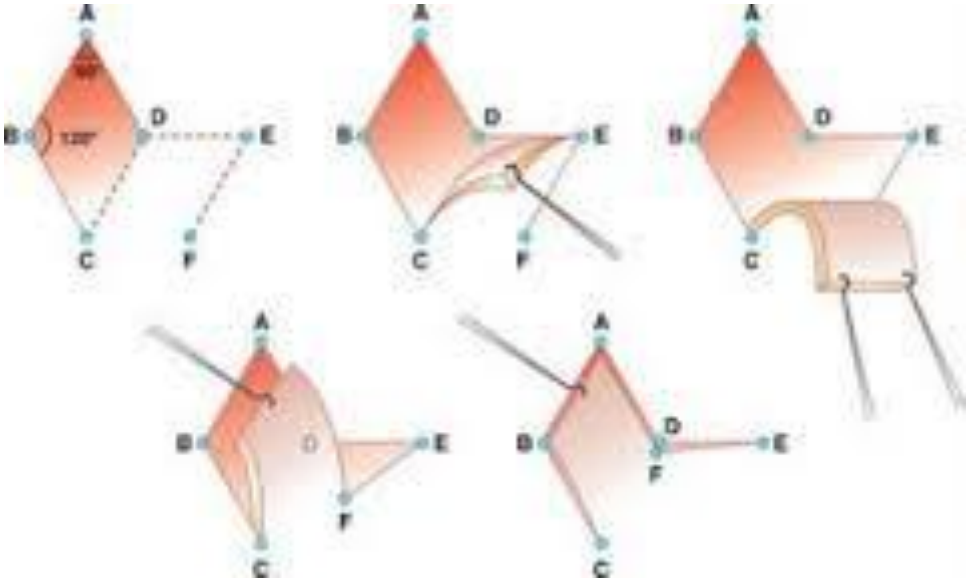


Figure 1: Marking of rhomboid incision and Limberg flap.

Fig 2: Marking of Incision.

Fig 3: Excision of Rhombhoid.

Fig 4: Making a Limberg Flap.

Figure 5: Final Repair by Limberg Flap.

Figs 6 and 6a: Result after 6 weeks.

Postoperatively patients' are advised to maintain local hygiene and to rub coconut oil after stitch removal to keep the stitch line supple. Patients were followed up in OPD monthly for 6 months (28 patients) to 1 year (2 patients). 47 patients were lost to follow up after 2 to 6 weeks.

Abstinence from intercourse was advised for 2 weeks.

Intra and post op features as noted in primary outcome while features of secondary outcome were noted on follow up.

RESULTS

77 patients of SCPS were operated in 14 years. 7 by excision and primary suturing, 20 by excision and left to heal by secondary intention and 42 by rhomboid excision and Limberg flap reconstruction. Among them there were 66 males (85%) and 11 females (15%). The mean age of presentation was 24 years (range 16–37 years). The mean age of presentation is 21 and 19 years in men and women respectively in a study by Notaro 2003.

19 patients presented with recurrent sinus (25%). 49 patients (64%) presented with discharge, 27(35%) presented with pain, 16 (21%) with infection, in 10 (13%) patients hair could be seen protruding from the sinus and 4 (5%) with pilonidal abscess and fever.

Presenting Symptoms	**No of Patients**
Pain when sitting or standing	46 (60%)
Pilonidal abscess	4 (5%)
Reddened, sore skin around the area	43 (56%)
Pus or blood draining from the abscess, causing a foul smell	33 (58%)
Hair protruding from the lesion	10 (13%)
Recurrent Sinus	19 (25%)
Fever	4 (5%)

Early operative Data	**Excision with Primary Suturing (5 patients)**	**Excision with healing by secondary intention (30 patients)**	**Excision and repair using Limberg flaps (42 patients)**
Operative time (incision to closure)	30 - 45 minutes (Avg. 40 mins)	30 - 45 minutes (Avg.32 mins)	60–90 minutes (Avg. 72 mins)
Drain removal	24–48 hours (Avg. 28 hrs)		48–72 hours (Avg. 50 hrs)
Post op Pain as per Wong Baker Faces pain rating scale	4 to 6 (Avg. 5.5)	6 to 8 (Avg. 7)	4 to 6 (Avg. 5.5)
Pain and discomfort while sitting	5 (100%)	15 (Avg. 50%)	16 (Avg. 38 %)
Time to walk without pain	2 to 5 days (Avg.4 days)	4 to 7 days (Avg. 6 days)	2 to 4 days (Avg. 3 days)
Hospital stay	48–72 hours (Avg. 52 hrs)	48–96 hours (Avg. 80 hrs)	24 to 48 hrs (Avg. 30 hrs)
Surgical site infection	2 (40%)	10 (33%)	2 (5%)
Wound Dehiscence	2 (40%)		**1 (3%)**
Healing (removal of stitches)	12–14 days	4 to 6 weeks	**12 – 14 days**
Late complications			
Time to return to work	14 to 28 days (Avg. 16 days)	18 to 36 days (Avg. 24 days)	**7 to 24 days (Avg. 10 days)**
Recurrence	1 (20%)	2 (7%)	**0**
Patient satisfaction	Satisfied -3 (60%) Not satisfied – 2 (40%)	Satisfied 10 (33%) Not satisfied 25 (77%)	**Satisfied 42 (100%) Not Satisfied 0 (0%)**

Postoperative complications

All patients tolerated the procedure well with minimal postoperative discomfort and were discharged in 24 – 72 hours depending on when the drain was removed.

Out of 7 cases which were excised and stitched primarily, stitches gave way in 3 cases and these were due to wound infection. The stitches were removed and wound left to heal by secondary intention in 3 to 4 weeks while 1 patient had recurrence and 3 healed well primarily.

Of the 20 cases where the sinus was excised and left to heal by secondary intention, most 10 (50%) complained of pain, 10 (50%) of discharge and discomfort while sitting for 3 weeks. 6 (33%) had wound infection which was managed by local wound management and antibiotics. There was hypergranulation in 2 (10%) patients which was managed by vigorous scraping and dressings. There was recurrence in 2 (10%) cases. Both the cases came after 6 months of surgery and were not followed up for wound management in the hospital.

Of 50 cases of Limberg flap repair in 1 (2%) case the drain was removed 24 hours after surgery and patient subsequently developed a serous collection after 24 hours after removal of the drain. This seroma drained spontaneously from a suture site without compromising the flap. This resulted in gaping of the wound in a small area which healed spontaneously. The other patient developed seroma 3 days after discharge from hospital which was aspirated without any consequences.

There was infection in 5 (10%) patients. Of this 3 patients were managed by local hygiene and antibiotic ointment application locally while in 2 patients infection resulted in partial (about 50%) necrosis of the flap. This was managed by vigorous dressing and wound left to heal by secondary intention.

Blackening of tip was seen in 1 patient where it was excised and re-sutured.

There were two cases of hypertrophied scar with itching but this improved with local steroid ointment and coconut oil application.

In this study there were no recurrences seen in case of excision and repair by Limberg flap.

Clinical outcomes	Range (days)		
	Primary Closure	Secondary Intention	Limberg Flap
Time off-work	3 weeks	5 - 6 weeks	12 – 22 days
Time to walk without pain	2 to 5 days (Avg.4 days)	4 to 7 days (Avg. 6 days)	2 to 4 days (Avg. 3 days)

Comparison between other studies and this study when SCPS managed by Limberg flap.

Author/s	Patients (no.)	Hospital stay (days)	Complication (%)	Recurrence (%)
Katsoulis et al.[10]	**25**	**4.0**	**16**	**-**
Akin et al.[3]	411	3.2	15.75	2.91
Akin et al.[3]	411	3.2	15.75	2.91
Urhan et al.[11]	102	3.7	7	4.9
Mentes et al.[12]	238	2–3	2	1.26
Aslam et al.[4]	110	3.0	5	1
El-khadrawy[8]	40	5–11	40	10
Jethwani et al	67	2–3	11.94	1.49
This study	50	2.3	18 (9 of 50)	0

DISCUSSION

Theories regarding beginning of Sacro coccygeal Pilonidal sinus is debatable. It may begin as a congenital pilonidal dimple or pits which are present in some individuals at the top of the crease between the buttocks, about 5-9 cm from the anal orifice or may be an acquired condition beginning with rupture of a hair follicle in the dermis of sacrococcygeal region (Al-Naami 2005). These people are potential candidates for pilonidal sinus disease. Why this happens at that location more than other locations and what predisposes certain people (male sex, second or third decade of life, hirsute habitus, Mediterranean skin type) to develop pilonidal sinus is unclear (Notaro 2003).

At adolescence the pits or dimples enlarge and became wide enough to create a portal of entry for cellular debris or free hairs. Loose hairs are drilled and sucked into these pilonidal pits by friction and movement of the buttocks which create a suction whenever a patient stands or sits.

Hair enters tip first and the barbs on the hair prevent it from being expelled so that the hair becomes entrapped. This trapped hair stimulates a foreign body reaction, infection and abscess formation later leading to discharging sinus.

As believed by Karydakis three factors have to present to initiate this condition

1. Presence of Pilonidal dimples or pits making the skin vulnerable to insertion of skin
2. Deep natal cleft which causes a suction force
3. Presence of an 'invader' (hair / cellular debris)

Any treatment which addresses the above three factors will be successful. As amount of hair cannot be dealt with easily by the surgeon the only options left are to remove the Pilonidal dimples meticulously and close the wound in such a manner so as to make the cleft shallow. (Basscomm).

Azab[11] first adopted this transpositional flap for the treatment of pilonidal sinus disease.[2] (Hence surgical approach to SCPS is removal of all infected tissue and Open healing or Primary wound closure by various techniques which include simple primary suturing (but this is reserved for small cysts or sinuses) or primary closure using some sort of flap (Limberg flap, Karydakis flap, Bascom procedure, Z- plasty, V-Y Plasty and lateral advancement flaps), Advocates of open healing by secondary intention argue that this method reduces both wound tension and wound infection because free drainage can occur. But here the major factor of deep natal cleft causing suction is not addressed to as is done by Limberg flap.

The various techniques of wound management after removal of infected tissue include simple cystectomy, cystectomy with primary closure, the Karydakis flap, the Bascom procedure, Z-plasty, Y-V plasty, or myofascial flap closure. Other techniques have been used and are variations of these techniques, including an elliptical flap and an oblique excision.[9,10] Simple cystectomy and primary closure is reserved for small cysts.

17 studies compared open wound healing with surgical closure. Healing times were faster after surgical closure compared with open healing. Surgical site infection (SSI) rates did not differ between treatments; recurrence rates were lower in open healing than with primary closure (RR 0.60, 95% CI 0.42 to 0.87).

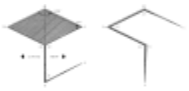
Six studies compared surgical midline with off-midline closure. Healing times were faster after off-midline closure (MD 5.4 days, 95% CI 2.3 to 8.5). SSI rates were higher after

midline closure (RR 3.72, 95% CI 1.86 to 7.42) and recurrence rates were higher after midline closure (Peto OR 4.54, 95% CI 2.30 to 8.96).

Karydakis attributed the extremely low recurrence rate of 1% of his surgery to two facts. These are:

- The whole wound is placed away from the midline (recurrences always occur in the midline)
- The resulting new natal cleft is shallower (so hairs do not collect so readily and suction pressure of buttocks is absent)

Professor A Limberg of Leningrad devoted his entire career to flap design, publishing first on the subject in 1928. His first treatise in English was a chapter in *Modern Trends in Plastic Surgery*, in 1963.[1] In that chapter, he outlined his rhomboid flap. It is basically a parallelogram with two angles of 120° and two of 60° (Figure 1).



Recurrence is the main problem associated with all surgeries described which ranged from 21.4% to 100% for incision and drainage, 5.5%–33% for excision and open packing, 8% for marsupilisation, 3.3%–11% for Z plasty.[6,7] Flap techniques have been associated with lower complication and recurrence rates. With the Limberg flap technique the natal cleft can be flattened and this eliminates the 'suction' capability of buttocks preventing hairs form being sucked into the natal cleft.

In this study, 77 patients with sacrococcygeal pilonidal disease were managed with rhomboid excision and Limberg flap reconstruction. Recurrence was nil (0%). Akin et al.[3] operated on 411 patients and reported recurrence rates of 2.91%, so our results were better than theirs. Superficial necrosis was seen in one patient (1.49%), which may be due to the design of the long flap or faulty technique. El-khadrawy[8] operated on 40 patients and had superficial necrosis at the tip of the flap in four patients (10%). Time off-work in our study patients was 12–22 days. This was similar to that reported by Abu Galala et al.[9]

CONCLUSION

A Limberg flap meets the entire requirement for being the ideal procedure for sacrococcygeal pilonidal sinus.

The advantages of Limberg flap reconstruction are:

• Flattens the natal cleft with a large well-vascularised pedicle that can be sutured without tension.

• Midline dead space and scar is avoided.

• Useful in complex sinuses with multiple pits where radical excision leaves large defect.

• Easy to perform, learn and design.

• Useful in recurrent pilonidal disease.

• Reduces hospital stay and time to resume normal activities.

Healing time is 2 weeks compared to 3 to 8 weeks for other methods.

Early recurrence is usually due to failure to identify one or more sinuses during surgery. Late recurrence is usually due to secondary infection caused by residual hair or debris in the pilonidal dimple that was not removed at operation, as well as inadequate wound care or insufficient attention to depilation.[19]

Excision and primary closure was associated with a short healing time and shorter hospital stay but the stitch line was under tension and this did not eliminate the suction effect of buttocks into the natal cleft hence higher incidence of recurrence approximately 5 to 7%.

The results of this study favour rhomboid excision and Limberg flap reconstruction for pilonidal disease.

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