"COMPARATIVE STUDY BETWEEN EXCISION WITH PRIMARY CLOSURE VERSUS LIMBERG FLAP IN THE MANAGEMENT OF SACROCOCCYGEAL PILONIDAL SINUS "

A DISSERTATION SUBMITTED TO

THE TAMILNADU DR.M.G.R MEDICAL UNIVERSITY

In partial fulfilment of the regulations for the award of the degree of

M.S. GENERAL SURGERY – BRANCH I

DEPARTMENT OF GENERAL SURGERY

COIMBATORE MEDICAL COLLEGE AND HOSPITAL

THE TAMILNADU DR.M.G.R MEDICAL UNIVERSITY

CHENNAI

MAY 2020

REGISTER NUMBER : 221711311

CERTIFICATE

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CERTIFICATE OF APPROVAL

To
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Dear **Dr.Navarethina Rajan A**

The Institutional Ethics Committee of Coimbatore Medical College, reviewed and discussed your application for approval of the proposal entitled **"Comparative Study between excision with primary closure versus limberg flap in the management of sacrococcygeal pilonidal sinus."**No.0113/2017.

The following members of Ethics Committee were present in the meeting held on 30.11.2017.conducted at MM - II Seminar Hall, Coimbatore Medical College Hospital Coimbatore-18

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15	Mr.V.A.Shahul Hameed, +2	Lay-Person

We approve the Proposal to be conducted in its presented form.

Sd/Chairman & Other Members

The Institutional Ethics Committee expects to be informed about the progress of the study, and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary, Ethics Committee

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DECLARATION

I solemnly declare that the dissertation titled **"COMPARATIVE STUDY BETWEEN EXCISION WITH PRIMARY CLOSURE VERSUS LIMBERG FLAP IN THE MANAGEMENT OF SACROCOCCYGEAL PILONIDAL SINUS"** was done by me from 2018 onwards under the guidance and supervision of **Prof. DR. A.NIRMALA M.S., D.G.O.,**

This dissertation is submitted to the Tamilnadu Dr. M.G.R Medical University towards the partial fulfilment of the requirement for the award of M.S Degree in General Surgery (Branch I).

PLACE: **DR.NAVARETHINA RAJAN.A**

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Lastly I am grateful to all the patients whose cooperation made this work possible.

DATE: **SIGNATURE OF THE CANDIDATE**

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ABSTRACT

Background

Pilonidal sinus is a disease of young adult males. Although there are various hypothesis introduced for the disease, acquired theory is the most widely accepted. Management of the disease is complex because of higher incidence of post op infection, recurrence and poor wound healing.

Aim and Objectives

Our aim of this study is to compare the Rhomboid excision with Limberg flap versus Excision with primary closure in the treatment of uncomplicated sacrococcygeal pilonidal sinus disease in terms of morbidity, hospital stay, complications and recurrence rate.

Methods

This is a prospective study conducted on a 30 patients of pilonidal sinus who were admitted in Department of General surgery, Coimbatore medical college hospital for a period of 1 year from December 2017 to December 2018 after met with inclusion and exclusion criteria. They were subjected to surgical treatment, either by rhomboid excision and Limberg flap procedure (Group-A) or by excision and primary closure (Group-B). Operation time, early complications, postoperative day were recorded for both groups. Complete recovery time and late complications like delayed wound healing, hypertrophic

scar and keloid after one month of surgery were recorded and long term follow up after 6 months were performed. Patients were also reviewed for recurrence and patient satisfaction with the operation and scar formation. Then the two groups were compared. Data were analysed with SPSS software and chisquare and student t tests were applied. $P<0.05$ was considered as statistically significant.

Results

In our study, there was a male preponderance in a ratio of 3:1. Mean age at presentation is noted to be in the range of 28.47 ± 8.068 years. The disease was more common in persons having occupation of prolonged duration of sitting. Clinical presentations varied from pain, discharge to swelling in the midline sacrococcygeal region. The early post op complications, pain scores on pod-1 and pod-4, day of pain free sitting and toileting were noted. All these patients were followed at one month and six months post surgery. There was a significant difference found between 2 groups in terms of pain free sitting and toileting, pain scores on pod-1 and pod-4, recurrence and patient satisfaction.

Conclusion

Although limberg flap procedure has similar complications as excision with primary closure, it has a advantages of earlier return to physical activity, faster wound healing,lesser hospital stay, lower pain scores, less recurrence and

good patient satisfaction. Therefore limberg flap procedure is best recommended for the management of uncomplicated sacro-coccygeal pilonidal sinus disease.

Key words

Pilonidal Disease, Natal Cleft, Pain, Sinus, Discharge, Limberg Flap, excision with primary closure, Recurrence.

INTRODUCTION[1,2]

Pilonidal disease is derived from Greek word 'pilus' meaning hair and 'nidus' meaning nest. It is characterized by chronic inflammation in one or more sinuses in the midline of the natal cleft which contains hair and debris. So it is the sinus containing a free tuft of hairs. Pilonidal disease includes pilonidal sinus, cyst and pilonidal abscess. It mostly affects sacro-coccygeal area but can also affect the digital clefts in hair dressers and at the umbilicus.

Sacrococcygeal pilonidal sinus is a common condition and usually affects adult males under 45 years. The pathogenesis has always been controversy ranging from congenital to acquired theory. Nowadays trend has changed towards the acquired theory. Patients usually presents with chronic infective discharge or acute attack of abscess.

The main symptoms includes localized pain, swelling and seropurulent discharge. Due to the recurrent nature of the disease, it has got high morbidity because of interference with education or employment for long periods.

The diagnosis is mainly by clinical examination.

Management of pilonidal disease is complex due to higher incidence of poor wound healing, post operative infection and recurrence. Though there were large number of non-operative and operative methods of treatment, no single procedure has been widely accepted as the gold

standard. The various procedures includes excision and healing by secondary intention, marsupialization, excision and primary closure and various types of excision followed by flap repair.

Various flap techniques have revolutionized the management of pilonidal disease because of least recurrence, less morbidity and duration of hospital stay, good technique, cosmetically better with good patient compatibility.

It includes Rhomboid, V-Y advancement, Z-plasty and myocutaneous flaps. Among various flap techniques, the Limberg flap technique is found to have efficient in the management of sacrococcygeal pilonidal disease.

Our aim in this study is to evaluate the role of rhomboid excision of the pilonidal sinus with limberg flap versus traditional excision and primary closure.

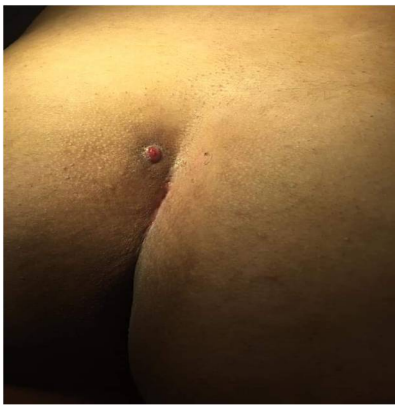


Fig.-1 Pilonidal Sinus

AIM AND OBJECTIVE

The aim of this study is to compare the Rhomboid excision with Limberg flap versus Excision with primary closure in the treatment of uncomplicated sacrococcygeal pilonidal sinus disease in terms of morbidity, hospital stay, complications and recurrence rate.

REVIEW OF LITERATURE

HISTORY[1]:

1833- Mayo initially described pilonidal sinus disease as a hair containing cyst located just below the coccyx.

1854- Anderson also described pilonidal sinus

1854- Warren described this as a abscess in the natal cleft containing hair.

1880- The word 'pilonidal' was first coined by Hodges, derived from the Latin "pilus" meaning hair and "nidus" meaning nest. The pilonidal sinus literally means a sinus lined by epithelium containing nest of hair.

Today pilonidal disease entitles spectrum of various clinical presentations ranging from asymptomatic hair containing cysts and sinuses to large symptomatic abscess of the sacrococcygeal region which has tendency to recur.

During world war II, pilonidal sinus was commonly seen in jeep drivers and hence also called as 'Jeepers bottom'.

ANATOMY[3,4,5,6]

SITE: Sacrococcygeal region is the most commonest area affected by pilonidal sinus, however it can also affects any areas of the body.

In sacrococcygeal region, natal cleft located probably 4-5cm above the anal verge is the most specific site. Extra natal sites affected by pilonidal sinus disease are finger webs in (barbers, milkers, hair dressers, sheep or cow shearers, dog groomers and people working in slaughter house), perineum, suprapubic area, ear, amputation stump, axilla, chest wall and umbilicus.

PRESENTATION:

Patients with pilonidal sinus disease most commonly presents with discharging sinus in the midline natal cleft. However patients may also presents with multiple openings in the midline or lateral openings. Dimpling of the skin in the post anal region was also frequently seen.

PATHOLOGY:

The squamous epithelium lines the sinus tract which is smooth and when it extends to subcutaneous cavity lined by granulation tissue containing the nests of hair. The deep cavity when it opens to the outside forms the sinus tract openings.

So once abscess is formed, it will present either in the midline or laterally.

Fig.-2 Pilonidal Sinus in web space of the hand

INCIDENCE[7,8,9]:

During the 2nd world war, around 79000 warriors were affected by pilonidal sinus disease and managed by General Surgeons in Military hospital with an average hospital stay of 55 days.

In 1980s, Bascom found that more than 40,000 US soldiers required in patient care for pilonidal sinus disease for more than 5 days.

In 1985, from a census and survey of inpatient admission to British hospitals, 7000 patients required inpatient care for pilonidal sinus disease with an average of 5 days. It ultimately leads to loss of earnings and productivity, and disruption of education in school going young childrens who were affected by this disease.

In India, the disease is common ,but its incidence statistics are not available.

The incidence rate of pilonidal sinus disease is approximately 1.1%.

SEX:

Pilonidal sinus disease affects twice in males compared to females. This male preponderance is due to their hirsute nature.

AGE GROUP:

It mainly affects young adults of working age group. Pilonidal disease often affects men between the ages of 16-25 years. American Indians and Negroes are mostly immune due to their hair distribution. White persons were involved more often than black African or Asian peoples.

AETIOLOGY[3,4,5,7,8,10]:

The aetiology of pilonidal disease were always been debate of controversy whether it is congenital or acquired. In 1950s, aetiology was thought to have congenital origin. But nowadays, current theories focussed on predisposing factors and acquired conditions. According to congenital theory it is due to secondary infection of a congenital remnant of epithelium resulting in pilonidal sinus. The other theory denotes that it is due to epithelial and hair follicle entrapment in the natal cleft.

The occurrence of pilonidal sinus disease is affected by characteristics of hair like kinking, medullation, coarseness and rate of growth.

Various predisposing factors includes:

- Friction in buttocks as it was reason for most occurrence in Jeep drivers, causing local irritation
- Overweight
- Deep natal cleft
- Local irritation or trauma
- family h/o pilonidal disease
- sedentary life style
- Use of tissue papers for cleaning the perineum
- patients with profuse sweating

Personal hygiene does not implicates in pilonidal disease occurrence.

Other correlation factors are

- significant family history
- obesity
- Vehicle driver
- presence of folliculitis or furuncle in another site

This disease occurs earlier in females due to early onset of puberty.

PATHOPHYSIOLOGY

For many years, various debates occurs in the pathogenesis of sacrococcygeal pilonidal sinus disease. Now a days, acquired theory are widely accepted.

CONGENITAL THEORY[4,11]

In 19th century, most authors proposed a theory based on their studies in the human embryo since they thought to have congenital origin and postulates as follows:

1. In caudal region, neural canal remnants were found attached to the skin Surface → recurrent cyst formation → rupture → sinus tract.
2. Dermal inclusions were formed by sequestration of degenerated epithelial nests.
3. Due to failure of development of caudal appendix during involution of human tail bud → tractions will be exerted which pulls the skin into the subcutaneous tissue → formation of an epithelium lined sinus tract.

ACQUIRED THEORY[12]

The congenital theory was challenged by Patey and Scarffl which was supported by Hueston, Currie and Davage.

They demonstrated the following from their research work that:

1. Though the word "pilonidal" derived from nests of hair, it is not possible to demonstrate this fact by microscopic sections that the hairs grows out of the follicles of suppurating tract. Those follicles visualized on microscopy were found to be growing out of skin surface.

2. Sinus tract or suppurated zones containing hairs were found to be loose which are nothing but unattached dead hairs.
3. These loose hairs which are projecting out of the sinus opening were found to have the pointed end pointing towards the lumen of the tract. The pointed end is the one which is farthest from the follicle.
4. Various lesions which are pathologically similar to the pilonidal sinus have been demonstrated by Hueston, and Patey and Scarfft, occurring in the inter digital clefts of barbers as an occupational disease. These inter digital sinuses are beyond of thinking on an embryological basis which contains customer's hair. Since these sinuses are formed from skin surface, they are lined by epidermal cells.

The following points favours against the congenital theory of pilonidal sinus disease:

1. There is no association of pilonidal sinus in congenital abnormalities of cervical and dorsal areas of vertebral column unlike the sacrococcygeal region.
2. Most of the patients with pilonidal sinus presents during adolescent period which does not correlate with developmental theory.
3. According to congenital aspects in pilonidal sinus, males and females are equally affected. But in practical, males are affected more than females which favours acquired theory.

4. Since pilonidal sinus disease has occupational predilection for soldiers, barbers and jeep drivers which favours against the congenital theory.
5. Congenital theory states that there is a suction of hair and its appendages during tractions. But we cannot demonstrate appendages of the skin or hair follicles in its wall , and absence of epithelium inspite of abundant hair shafts.

Hair has mainly three roles since 50-75% of sinuses contains hair shafts at exploration.

1. Hair remains in the dilated hair follicle unshed which can precipitate micro abscess formation.
2. There will be foreign body reaction created by free hairs from any parts of the body after invading the follicles.
3. The skin hair surrounding the pilonidal wound will irritate it and precipitates the disease.

Karydaki's demonstrated the 3 factors responsible for insertion of the hair are

1. The invader is the loose hair
2. The invading force causing hair invasion
3. The skin in the natal cleft is at risk for the invasion of hair[13,14].

MICROSCOPY[3,15]

From the microscopic study of pits in natal cleft by bascom, it was found that they are enlarged and altered hair follicles and the cause for this is not known clearly. It could be due to the vacuum created by gravity and motion of the gluteal folds which pulls on the follicles.

Occlusion of the mouth of hair follicles by local inflammation, debris, bacteria and oedema → expansion of the cavity → rupture → foreign body reaction → micro abscess formation. Later on resulting in chronic pilonidal abscesses and epithelialization occurs.

Microscopic examination of the pits revealed distorted hair follicles.

1) The dilated hair follicle will cause pit in the midline and are of varying sizes ranging from normal to moderate and gross distension. They all have pits in near to each other.
2) In large pits with distorted hair follicles, hair is surrounded by concentric keratin sleeves.
3) In 90% of Pilonidal disease, pits were seen in the midline and its distribution pattern was allotted by nearby hairs.
4) Pit wall contains germinal hair buds .
5) There is a enough evidence to prove that distorted hair follicles contains pits in the midline.

MECHANISM:

There are two kinds of forces leading to enlargement of normal follicles.

1.Outward force→due to accumulated keratin

2. Inward force→created by vaccum.

STAGES OF PILONIDAL DISEASE:

MICROSCOPIC EVIDENCE :

The mouth of the hair follicle is closed by oedema following infection incited by bacteria laden keratin and hairs. The infection arises from follicular base from which keratin and hair emerges out. Since the follicular mouth is closed, these contents don't come out. The hair shafts will lie on its wall and heals together. But the hair makes a hole in the layer of skin by which it breaks and tends to lie both the sides of the body. The accumulated keratin drives the outward force and vacuum creates the inward pulling force which ultimately results in pushing the pus in follicular content towards the fat. Therefore the accumulated pus will comes out of the follicle's bottom and resulted in acute pilonidal abscess which ruptures to the outside.

Once abscess gets drained out, the mouth of the follicle will open again due to reduction of oedema. Thus the follicle remnants where both ends are reopened now , will create a cavity outside resulting in the formation of chronic pilonidal abscess. Since there will be persisting

outward and inward forces, the cavity will persist. These evidence ultimately proves that distorted hair follicles will form midline pits.

The theories given by Bascom and karyadakis explained well about the pathogenesis of pilonidal disease and its main predisposing factors includes Hair and its follicles.

MIDLINE IS MOST AFFECTED BECAUSE:

Skin cells and the hairs admixed together in the midline areas. The vertical walls on either side of the midline with scales and barbs in hair creates a cleft wall on walking in combined with barbs on hair→imparts motion to hairs→hair pushed against midline cells→puncturing of skin→accumulation of follicles. Hence midline pits are common in pilonidal sinus.

The plan of management depends on the stage of pilonidal sinus and its presentation. While exploring the pilonidal sinus through lateral approach, the instrument will explore the cavity to the underside of the pit which has blown either out or pit in to fat , ultimately expressing paste like white material from the abscess cavity. These are the findings of midline pits and their contents acts as a source of the disease.

MECHANISM

In standing position, due to gravity the gluteal tissue is separated away from the sacrum and hence the vacuum is created sucking air along with hairs into the cavity. These hairs passes through the follicular remnant to join with accumulated pus. This vacuum was measured by Brearly[9].

Brearly also demonstrated that when the patient sits, the gluteal tissues will be pushed against the sacrum together with squeeze of the buttocks, the exit of the sinus will be sealed.

The minimum pressure needed to drain the fluid from inside to outside of the sinus to the chair must be more than 125 mm Hg which is not obtained inside during sitting, hence the pus ultimately drives through fat creating tunnels leading to abscess collection at the site distant to site of origin of hair follicle.

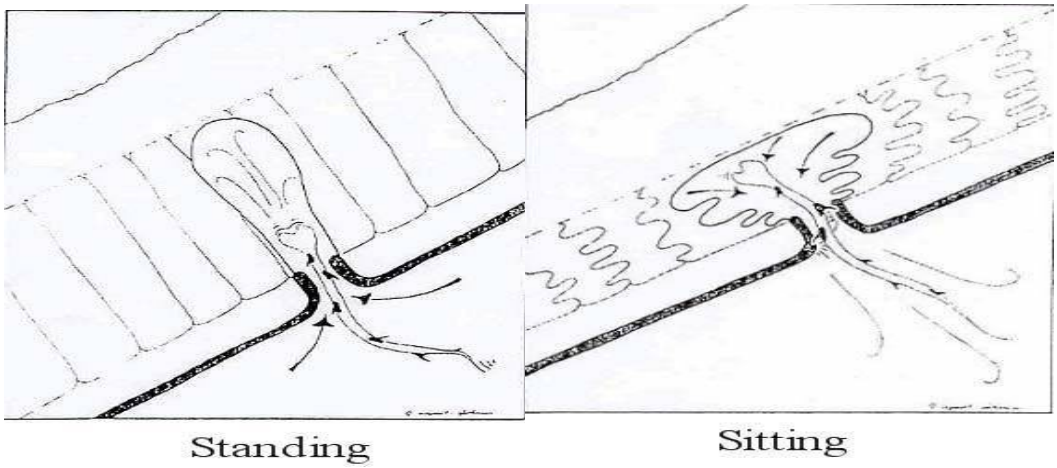


Fig.-3 Chronic pilonidal abscess cavity showing ingestion of hair

HORMONAL ORIGIN[7,8,10,16]

- During Pubertal growth, there will be sex hormonal surge which has great influence on the growth of pilosebaceous glands resulting in hair follicle formation with keratin.
- This results in folliculitis→ oedema→ follicle occlusion. The infected follicle penetrates the subcutaneous tissue which ruptures on its own to form the abscess, thus creating a sinus tract extending up to subcutaneous cavity.
- Sinus tract will be in the cephalad direction in 90% of cases since the hair follicles usually grows cephalad. These sinus tract will be situated approximately 5 – 8 cm from the anal verge.
- The loose hairs are drilled and sucked into the pilonidal sinus upon friction and movement of the buttocks when patient stands or sits. This stimulates foreign body reaction to the hairs and infection.
- When these tip of the hairs enters into the cavity, they becomes entrapped as the barbs on the hair preventing it from being expelled.
- Thus ultimately the trapped hairs stimulates a foreign body reaction leading to pain, infection and abscess formation & finally ending in chronic discharging sinus from the opening.

In rare cases, the birds feather which was used to stuff feather bedding will elicit a foreign body reaction other than human hair resulting in pilonidal disease.

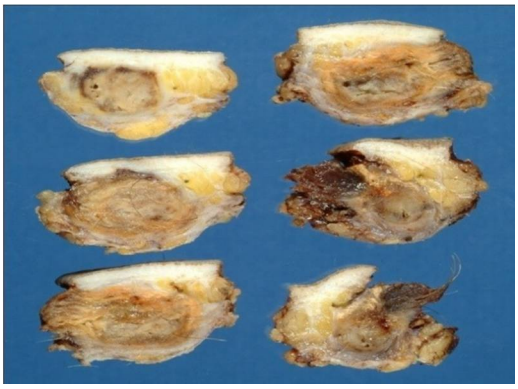


Fig.-4 Cut sections of pilonidal sinus disease

PATHOANATOMY[4,5]

In post anal region the dimpling of the skin is more often seen. While examining the recruits of world war 2, few authors recorded minor anatomical variations in perianal area. Post anal dimple was seen in 287 individuals out of 3136 male recruits which accounts for an incidence of approximately 9% . A dimple in the post anal region will have the same significance as at other sites like cheeks, chin, sacral region or knees. Anatomically these denotes a local fixation of skin by dense collagenous fibers to underlying bone or fascia. Hence these dimple formation together with other factors will be important in the development of pilonidal suppuration.

Fig.-5 Post anal dimple in an infant

In Deep post anal dimple→ use of toilet paper in an antero-posterior direction→ makes a paste composed of broken hair bits and faecal material deeply into the dimple with each successive wipe.

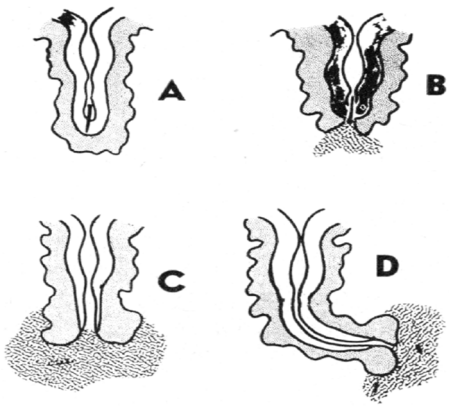


Fig.-6 Pilonidal sinus in post anal dimple

A	Trapping of loose hair in the bottom of post anal dimple and penetrates the epidermis by its sharp pointed end.
B & C	Stages of foreign body inflammatory reaction
D	Epithelisation of the tract

The triad of post anal dimple, loose bits of hair and faecal residue is very important for the prophylaxis of individuals who are prone to pilonidal suppuration. Additional factors like prolonged sitting as in jeep

drivers may perpetuate in the chain of events leading to pilonidal suppuration.

For the spread and persistence of an inflammatory process, local anatomy of the internatal cleft in the post anal dimple is very important. The dense collagen attaching the deep surface of the skin to the subjacent coccygeal and sacral periosteum is noted to prevent spread of the disease. The fatty tissue in this portion has a series of minute cushions which lies between the strands of fibrous tissue. However in lateral areas, since the proportion of fat to collagen becomes reversed, and hence large areas of fatty tissue becomes interlaced with fibrous strands.

The chronicity of the disease is due to complexity and irregularity of this spread into lateral fatty zones, which prevents it from complete excision by defeating its primary structure. Hence it will promote recurrence of the disease.

For a length of formed tract, in growth of surface cells gives skin lined tract like appearance. The active inflammatory zone which contains the debris of loose hairs and granulation tissue or pus is a simple tissue space infection and very irregular in outline without lining.

STAGES OF PILONIDAL DISEASE[3,15]:

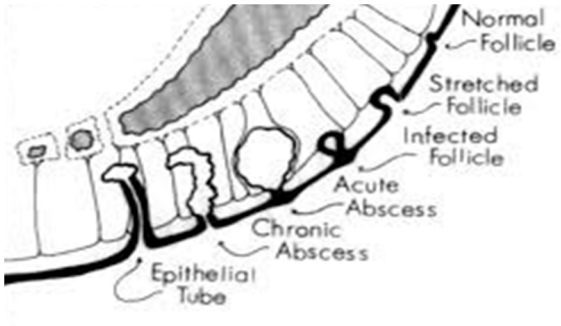


Fig.-7 Stages of pilonidal disease

STAGE-I	is a stage of normal follicle
STAGE-II	is a stage of distended follicle filled with keratin. The fibrous strands will suspend follicle and skin from sacrum.
STAGE-III	Once the distended follicle gets infected and oedematous, the mouth of the follicle will be closed. This will cause the rise in pressure inside the infected follicle leading to rupture into fat and acute collection of pus. This stage is called stageIII or stage of acute abscess.
STAGE-IV	is a stage of chronic pilonidal abscess. Once the ruptured follicle forms the mouth of the abscess, it will have opening at both ends.
STAGE-V	is a stage of Epithelialization. In this stage the sinus tract will be lined by normal epithelium forming epithelial tube.

CLINICAL FEATURES[5,6,7,17]

Pilonidal sinus disease has a variety of clinical presentations from asymptomatic pits to discharging sinus that are predominantly located in midline natal cleft of sacro-coccygeal region. These sinus tracts are more commonly seen in persons having excessive hairs in that region and those who spends most of their life time in chair. But these pilonidal sinus can also occurs in interdigital space in barbers, sheep shearers and dog groomers[5,18,19,20]. Rarely it has been found to have occurred in penis and pulp of finger tips[21].

Though the pilonidal sinus disease occurs predominantly in males compared to females, it has tendency to occurs earlier in females due to their prematurity.

Patients with pilonidal sinus disease commonly presents with either the pits or holes in the gluteal cleft. In a study on the turkish soldiers of 1000 members, 88 members had pilonidal sinus and among which 48 were asymptomatic and 40 were presented with symptoms[22]. Patients may also presents with either chronic or recurrent discharging sinus.

Fig.-8 Asymptomatic Pilonidal Sinus **Fig.-9 Recurrent pilonidal sinus showing bridging and fibrosis**

From the studies on Sondenaa et al the various percentages of presentations includes: discharge- 66%, swelling-50%, pain-35% and abscess-50%. Half of all these patients present with an abscess and can present with discomfort on prolonged sitting or obvious acute purulent discharge with surrounding inflammatory changes[23].

Fig.-10 Pilonidal abscess-note the signs of inflammation

Waxing and waning phase: This is due to spontaneous drainage from the secondary sinus and when it gets reinfected leading to spontaneous rupture.

From the pus culture and senstitivity report of collections from the abscess, bacteroides and anaerobic cocci were most commonly reported accounting for 77% , aerobic organisms in 4% and both were cultured in about 17%. Most commonly pilonidal sinus will track towards cephalic direction. But in some cases, it can track towards the anus, presenting as sepsis in the perianal region.

In long standing pilonidal sinus, one of the most dreadful and rare complication is the malignant transformation of sinus tract (squamous cell or spinocellular variety) which have also been reported. These cases will usually have a poor prognosis with high recurrence rate.[24].

Although the pilonidal sinus can manifest as chronic/recurrent pilonidal sinus or an abscess, the most common manifestation is tender and fluctuant mass in the sacrococcygeal region. These are seen in symptomatic cases of young adults.

PRESENTATION:

Pain and foul smelling purulent discharge from the sinus opening were the most common presentation in about 70 – 80%.

In another 50% of the patients, presents with abscess or infected sinus.

In the initial stage of folliculits, it expands into subcutaneous tissue and forms an abscess or when a pre-existing foreign body granuloma gets infected. Only the midline sinus pits are lined by epithelium whereas the

laterally oriented sinus tracts are usually lined with granulation tissue[17,25].

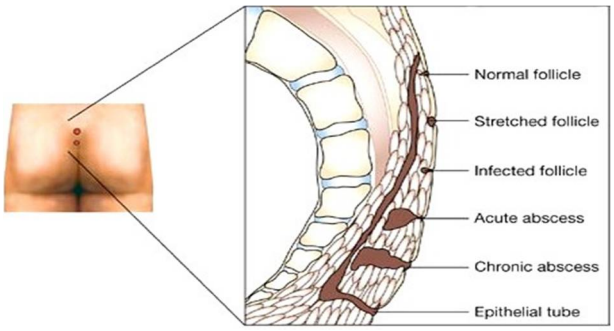


Fig.-11 Diagrammatic representation of Pilonidal Disease

DIAGNOSIS :

Diagnosis is made by palpating the indurated region beneath the skin and epithelialized follicular opening in the sacrococcygal region. These sinus tracts usually track in the cephalad direction but it can also run in the caudal direction in case of perianal sepsis.

Though the disease carries benign course, patients usually presents with chronic discharging sinus with exacerbations and remissions after I & D.

Fig.-12 Multiple sinus pits running cephalad with hair seen protruding out of the pit

CHRONIC / RECURRENT PILONIDAL DISEASE[6,26,27]

DEFINITION:

When the patients presents with chronic discharging sinus without any acute exacerbation is termed as chronic or recurrent pilonidal disease.

PATHOGENESIS FOR CHRONIC/RECURRENT PILONIDAL DISEASE:

- In chronic disease, patients presents with chronic purulent discharge without an acute abscess and usually seen after I&D for pilonidal abscess.
- Hair follicle is not the precipitating factor in chronic pilonidal disease.
- Non healed sinus tract → lined with granulation tissue which contains hair, skin debris → foreign body reaction and chronic inflammation. This together with midline cleft hairs is responsible for pathogenesis of chronicity or recurrent course of the disease.

Fig.-13 Recurrent pilonidal disease

INFECTION[28]

Post operatively anaerobes predominates over aerobes in causing the wound infection and wound gaping. Most common organisms responsible are:

Anaerobic bacteria- Bacteroides and Enterococci.

Aerobic bacteria- Staphylococci and haemolytic streptococci.

COMPLICATIONS[5,6]

Most common complications of pilonidal disease includes:

- Recurrence of the abscess is the most common complication, as many literature quotes a rate of about 50%.
- Another complication is the recurrence of pilonidal sinus disease.

Recurrence of the disease can be either early or late.

- Early recurrence → due to missed sinus tracts during surgery. i.e failure to identify one or more sinuses during surgery.
- Late recurrence→ due to incomplete removal of residual debris at operation causing secondary bacterial infection or improper wound care.
- Wound infection following primary Incision & Drainage is rare but described.
- In long standing cases, Squamous cell carcinoma of the sinus tracts have been described. Although its incidence is rare and when it

occurs management includes wide local surgical resection and post-operative chemoradiation[29].

PROGNOSIS

Pilonidal sinus disease carries a excellent prognosis with nil mortality unless squamous cell carcinoma develops, although abscess recurrence is common.

DIFFERENTIAL DIAGNOSIS[1]

It includes: Anal fistula, Hidradenitis suppurativa, congenital abnormalities and perirectal abscess.

ANAL FISTULA

Sometimes sinuses from pilonidal disease will reach perianal region and simulates anal fistula formation.

In anal fistula, on palpation of the tract will lead to secondary opening in the anus. When there is no tract or secondary opening, extra-anal source of the infection must be ruled out.

HIDRADENITIS SUPPURATIVA

Patients with more than 30 years of age together with co-morbidities like diabetes and obesity will have a chronic inflammatory disease of the apocrine sweat glands. This results in folliculitis and local friction.

CONGENITAL ABNORMALITIES

In congenital abnormalities like meningocoele, there will be continuous tract communicating with the central part of the spinal cord and hence CSF discharge will be present.

PERIRECTAL ABSCESS

It will be wise to differentiate pilonidal disease from perirectal abscess by locating the site of the lesion.

Perirectal abscess frequently presents as surgical emergency which may require drainage procedures.

Other Differential Diagnosis includes:

1.Sebaceous and dermoid cysts 2.Syphilitic & tuburculous granuloma 3.Sacral osteomyelitis with discharging sinus	4. Furuncle or carbuncle 5. Pyoderma gangrenosun 6. Inclusion dermoid/teratoma 7. Primary presacral sacrococcygeal sinus

Inclusion dermoid/teratoma- Appropriate differentiation and post primary presentation are critical as the management of sacro-coccygeal teratoma is wide local excision and oncological care.

MANAGEMENT:

The management of pilonidal sinus disease varies on the basis of clinical presentation of disease.

For the purpose of management, clinical presentation of the disease can be categorized into 3 types. They are :

- Acute pilonidal abscess,
- Chronic pilonidal sinus disease,
- Complex or recurrent pilonidal disease.

The main aim of ideal procedure for the pilonidal sinus disease should be:

1. Lesser hospital stay
2. Better wound healing with low recurrence rate
3. Less complications with fewer morbidity
4. Patient convenience
5. Return to normal activities as early as possible [5]

The management of pilonidal sinus disease can be divided into surgical and non-surgical methods:

NON-SURGICAL METHODS:

i. Fibrin glue

ii. Cryo-surgery

iii. Electro cauterization

iv. Injection of sclerosing agent

v. Application of depilation creams or regular shaving

SURGICAL METHODS:

i. Excision with primary closure

ii. Excision with healing by secondary intention

iii. Drainage of abscess with/without excision of the sinus tract

iv. Marsupialization

In order to prevent the chronic course and recurrence rate of the disease, various techniques were followed which includes:

i. Bascom procedure

ii. Karydaki's flap

iii. Modified Bascom procedure

Various techniques by use of transposition flaps have been followed by which recurrence rate may be brought very low and these includes :

i. Limberg Rhomboid flap

ii. 'Z' plasty

iii. Crossed triangular flaps

iv. V-Y fascio-cutaneous advancement flap

v. Gluteus maximus myocutaneous flap

In all above transposition flaps , the recurrence rate was low because the depth of the natal cleft was reduced and tension free sutures were placed away from the midline cleft[1,5,6].

CONSERVATIVE TREATMENT[6,30]:

Conservative management takes longer period of time to get better results and following this there will be only less no of patients who may need excision later on. It includes

i. Control of hair growth by regular shaving of natal cleft area

ii. Removal & scraping of granulation tissue

iii. Laser depilation of midline natal cleft hair[31,32]

iv. Maintain hygiene by use of solution containing equal parts of witch hazel (liquid hamamelis) and alcohol, which can be used for frequent washing of the parts

v. Avoiding sitting for a long time

INDICATIONS FOR CONSERVATIVE LINE OF MANAGEMENT:

Mild symptoms at first time presentation

Armstrong and Barcia studied the role of conservative line of management in army hospital for 17 years and in this study very few required excision later on[30].

A-Natal cleft with pilonidal sinus B- after 3 treatments C-after 7 treatments

Fig-14 Laser depilation of pilonidal sinus

TREATMENT OF PILONIDAL ABSCESS[5,6,14,33,34,35]:

Pilonidal abscess is managed in emergency theatre by incision and drainage under local anaesthesia. Always get informed consent for I&D and anaesthesia by making them understand that drainage of abscess is not curative procedure. The incision is made laterally away from the midline and abscess cavity is drained with removal of all hairs and granulation tissues. By careful instillation of phenol solution, sinus track can be destroyed.

Since there will be frictional movement of one buttock with the other, the wound heals very poorly in the midline natal cleft. Hence the wound should be thoroughly cleaned with sitz bath daily.

To prevent hair entering into the healing wound, one should always maintain hygiene of the area and regular hair shaving of the surrounding area done. This treatment should be continued for approximately next three months , even after the wound has healed completely.

Wound heals completely in more than 90% of patients in 1 month. In approximately 60 % of patients, incision and drainage results in wound healing within 10 weeks. Remaining 40% of patients develops into recurrent pilonidal sinus requiring further treatment.

85% of patients may require further surgical treatment as shown in some studies. While draining abscess, if pilonidal pit is excised along with it, may reduce the recurrence rate to 15%. But this is difficult during

the first drainage of abscess because identification of the pilonidal pit itself seems difficult. Only after the 5 days, once the oedema gets reduced, pilonidal pit can be identified clearly. Hence it is necessary for the patient to return 5-7 days after drainage of abscess to identify the pit and if possible it can be easily excised off with a small incision.

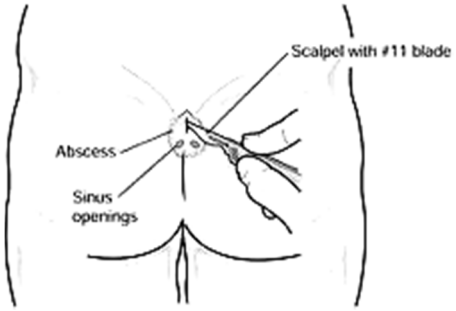
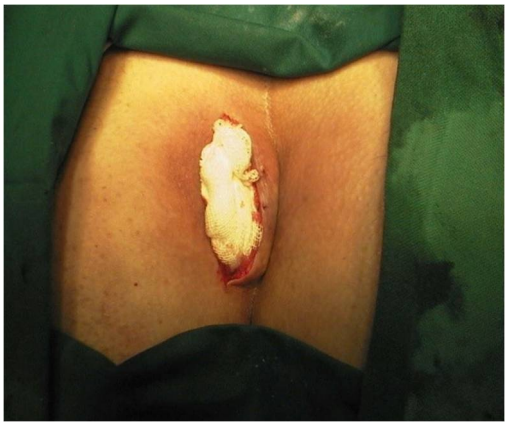


Fig-15 Diagrammatic representation of incision and drainage

A-PILONIDAL ABSCESS **B-PUS ASPIRATION**



C-Incision and Drainage **D-Packing of wound**

Fig-16 Pilonidal abscess incision and drainage

MEDICAL MANAGEMENT

1. **INJECTION OF SCLEROSANTS**[36,37,38]**:**

In Europe, phenol injections are more often used as sclerosants in the treatment of pilonidal sinus compared to united states. It can be used in acute pilonidal abscess (after I & D) and chronic pilonidal disease. The phenol acts by denaturation of carotene in polypeptide structure of hair.

In this method, 80% phenol is injected into the sinus, allowed to remain in sinus for 1minute, which is then expressed out of the cavity.

Then curettage of pilonidal sinus is done. It can be repeated for 3 times for a total of 3 minutes of phenol exposure at one treatment. If the wound heals well, this process can be repeated every 4-6weeks. Liquid paraffin can be applied to the skin to protect it from phenol since it destroys the epithelium.

Advantages of phenol injection as sclerosants:

i. Phenol removes the embedded hair and sterilizes the sinus tract.

ii. It can be combined with local excision of the sinus.

iii. Wound usually heals in 4-8weeks.

Disadvantages:

i. Recurrence rate is 9-27% which is similar to that following simple excision and packing the wound.

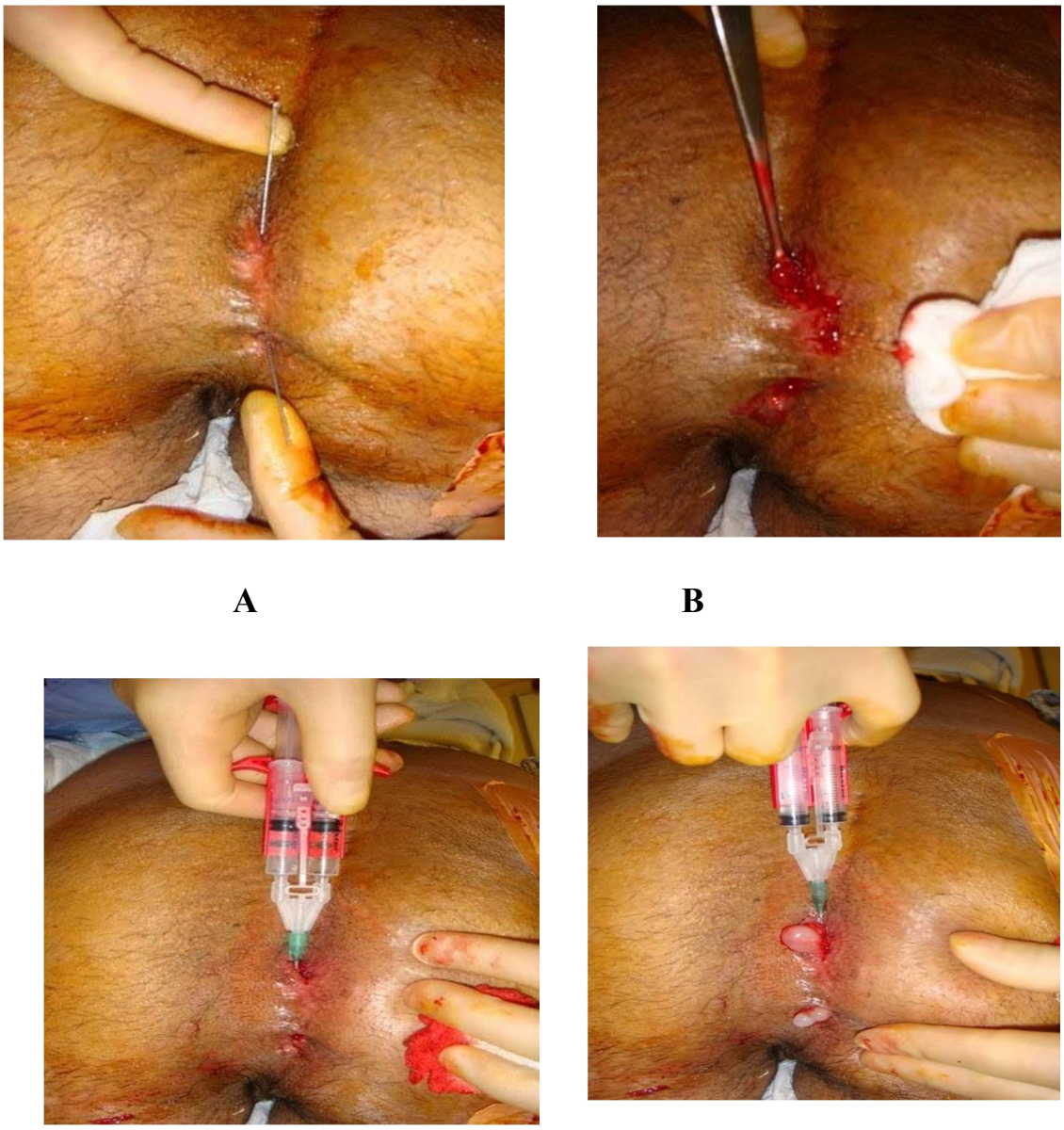
ii. There will be severe local inflammatory response following phenol injection which may compel the patient for inpatient care overnight.

While discharging the patient, advise to take bath daily and keep the area shaved. Dressings can be done for comfort.

2. **FIBRIN GLUE**[39]

In this method, the fibrin glue is injected into the fistula to seal the tract.

It acts as a tissue sealant by the activation of fibrinogen to form a fibrin clot, thereby seals the tract after thorough curettage.



A **B**

C **D**

A-Delineating sinus tracts
B-curretage of sinus
C-fibrin glue injection into sinus
D-fibrin glue coming out of tracts

Fig.17 Procedure of injection of fibrin glue

Injection of fibrin glue after curettage of pilonidal sinus gives better results and earlier return to work or physical activity.

3. CRYOSURGERY[1,40]

- ♣ It can be done as an out patient procedure.
- ♣ In this method, once the sinus tracts were laid open and completion of curettage, it is sprayed with liquid nitrogen for 5minutes.
- ♣ But recurrence rates are high as 20%
- ♣ And there will be delayed wound healing at the skin level.

4. ELECTROCAUTERISATION[1,41]

Fig-18 Electrocauterisation

- ♣ It can be done under local anesthesia.
- ♣ Diathermy knife is used to open up the sinus tracts. Once the hair removal and curettage of sinus tract is done, tract is cauterized.
- ♣ As an out patient procedure, patient can be sent home with mild analgesics.
- ♣ Recurrence rate is 11%.
- ♣ This procedure can be repeated depending on the healing.

SURGICAL MANAGEMENT OF UNCOMPLICATED CHRONIC PILONIDAL SINUS:

Various options includes:

1. Excision of the sinus with primary closure.
2. Excision with lay open of the sinus tract.
3. wide excision deep to the sacrum.
4. Marsupialization.

All these procedures are carried out under regional anaesthesia with the patient in jackknife or prone position. Once parts have been prepared by shaving, methylene blue dye is injected into openings of the sinus which acts as a guide to the tract and its branching.

1. EXCISION WITH PRIMARY CLOSURE[42,43]

In this method, excision of the midline pits together with lateral openings was done deep up to the presacral fascia. But removing more than 0.5 cm of normal surrounding skin is not needed.

This is followed by curetting the wound in order to remove the skin debris, hair and granulation tissue which stimulates adequate wound healing. It can be done under local anaesthesia but mild sedation may be necessary.

In 1965 , Lord and Millar is very popular in the technique of coring out the midline pits under local anaesthesia, but they also used a brush to

clean the cored cavity of hair and to remove the left over hair in the remnants of granulation lined tract[44].

This brushing technique can be performed as an out patient procedure in postop period until the tract heals completely and closes. After curettage 50% phenol was applied to destroy the epithelial remnant of the track.

In 1994, Schneider et al. reported that phenol injection gave results similar to the above surgery with limited hospital stay for 1-2 days and early return to activity within 2 weeks.

In 2 weeks time, 60% of sinuses showed complete healing[36] after which wound may be closed either primarily or may be packed to heal by secondary intention.

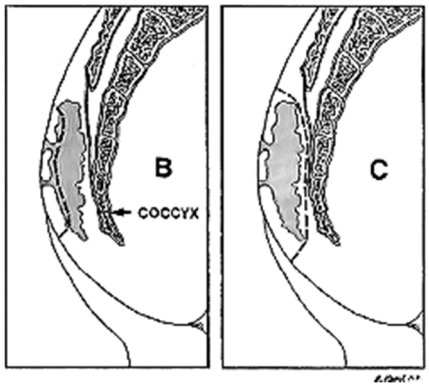


Fig.-19 Level of Excision needed

A **B**

C **D**

A-Excision of pilonidal sinus
B-Primary closure
C-Post excision of pilonidal sinus
D-wound closed primarily after keeping drain

Fig.-20 Excision with primary closure

MODIFIED BASCOM TECHNIQUE[3,6,15,45,46]

Recently, Bascom used lateral approach for entering into the cavity. Through this lateral approach curettage of the cavity is done which is not excised. But the midline pits were excised separately

including the epithelialized tube. While the midline incisions are closed primarily, the lateral wound may be either left open to heal by secondary intention or closed primarily.

The advantages of this primary closure is small wounds, faster healing rate, usually in 3weeks with minimal wound care. This favours earlier return to work with no need of regular change of dressing.

The disadvantages are wound infection leading to wound dehiscence.

To improve the wound healing and preventing unnecessary tension sutures in the natal cleft, it is better to use asymmetrical or oblique elliptical incisions where the incision is out of the natal cleft.

The aim of this asymmetric incision is to reduce the depth of the gluteal fold, thereby removing the frictional forces between the two opposing skin edges.

After wide excision, skin flaps have been raised to cover a sacral defect. This will flatten the natal cleft by keeping the scar away from the midline.

The common complications includes loss of skin sensation in the flap seen in more than 50% of patients with necrosis of the flap edges. In about 90% of cases, primary healing is well achieved.

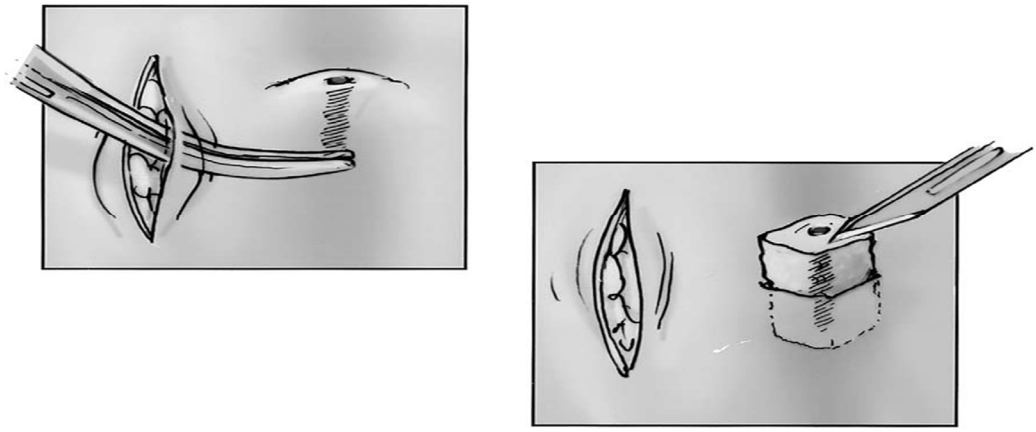


Fig.-21 In the Bascom procedure, midline pilonidal pits are excised. 1 to 10 follicles can be removed, leaving wounds 2–4 mm in diameter. The sinuses or cavity are opened through an incision 2 cm lateral and parallel to the midline natal cleft. The lateral incision undermines the midline and where gauze is pushed through the cavity to ‘‘scrub out’’ hair and granulation tissue

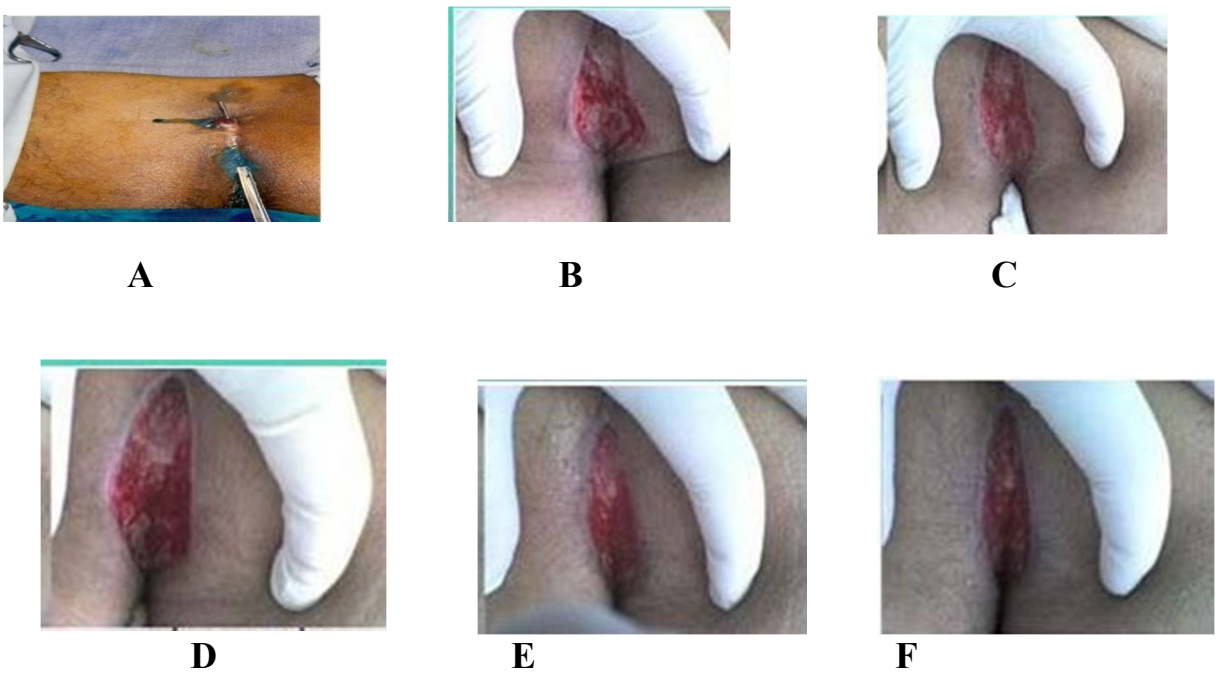
2. EXCISION WITH LAY OPEN OF THE TRACT[5,6,47,48]

In this method once the pilonidal sinus is excised, the tract may be laid open to heal by secondary intention. Hence the tract will have better drainage and can prevent wound infection that occurs following primary closure. This technique can be considered when there is surrounding cellulitis and primary closure is not free of tension. In 50-70% of wounds, aerobic and anaerobic organisms were cultured positive even though excision of the sinus was done up to healthy presacral fascia.

The disadvantages of this technique includes regular change of dressing, discomfort to the patient, close monitoring of the patient to ensure proper wound healing and avoiding premature closure of wound

edges. It takes average of 6 weeks for adequate wound healing. The main principal surgical options for chronic pilonidal sinus includes wound healing either by primary or secondary intention since it is associated with a low recurrence rate.

Isbister and Prasad studied from a group of 146 patients and mentioned that this procedure can be done very safely in an outpatient procedure. There exists a difference between these two methods in view of recurrence & wound healing. If infection does not occurs, wound healing by primary closure is best although it requires patient coordination in restricting daily activities until healing gets completed. Patient coordination is necessary because wound healing by primary closure is rarely free of tension and is considered contaminated. It has got high recurrence rate as 38%. Wound requires 4-6 months to heal with an average healing time of 2 months. But recurrence rate can be reduced due to flattened, broad based & hairless scar as produced by secondary intention since it prevents friction between buttocks, follicle infection and hair penetration. Hence wound healing by secondary intention has got advantages, it requires frequent change of dressing and close monitoring by both surgeon and patient.



A-lay open of tracts
B-9 days post excision
C-12 days post excision
D-16 days post excision
E-20 days post excision
F-22 days post excision

Fig-22 Excision with laying open of tracts

3. EXCISION WITH MARSUPIALIZATION[5,6,49]

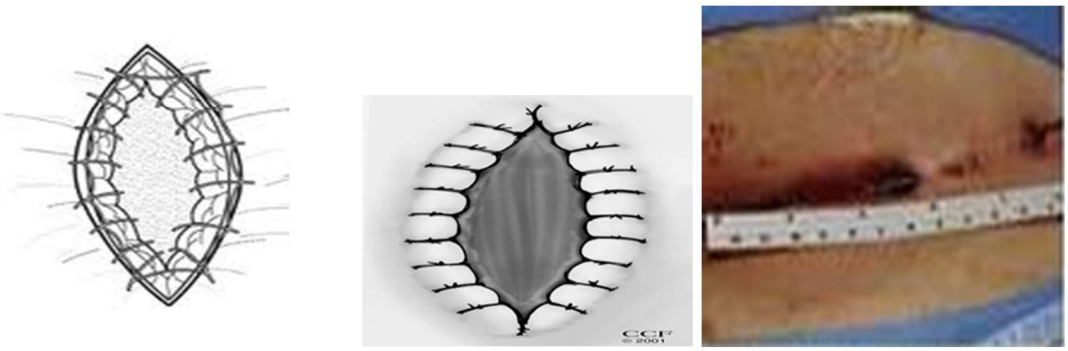
This was first introduced in 1937. Marsupialization is a technique of choice between primary wound closure and wound healing by secondary intention. This procedure avoids wound infection and wound dehiscence after primary closure. In this method, the wound is sutured open.

Once excision of the pilonidal sinus is done, the cavity is curetted to remove hair and granulation tissue, which is followed by suturing the

skin edges to the presacral fascia. The wound then requires loose packing and regular dressing.

Marsupialization makes the wound smaller compared to the wounds that are left open to granulate. Since the wound edges are sutured to presacral fascia, the subcutaneous tissue is covered, thereby wound infection can be prevented and enhances faster rate of wound healing in 6 weeks. It has got 4-8% of recurrence rate.

Since marsupialization avoids closure of contaminated wound together with low recurrence rate & faster wound healing, it has been considered as the preferred method in the management of chronic pilonidal disease as suggested by many authors. In this method also, the patient needs daily wound cleaning and regular wound shaving.



A Technique of marsupialization B Technique of marsupialization C-Multiple sinus tracts

Fig.-23 Excision with marsupialization

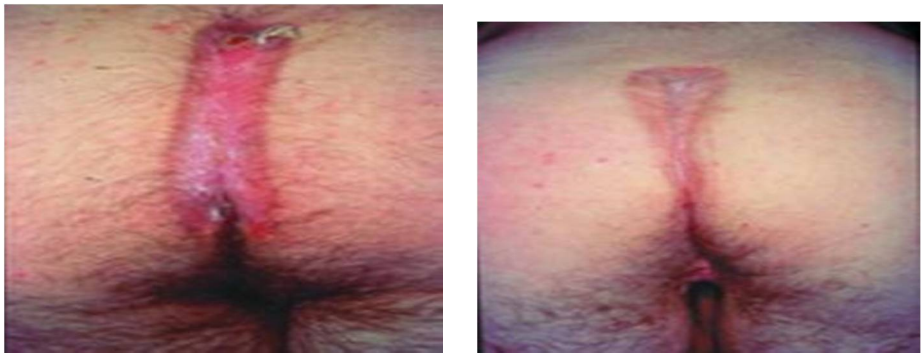
4. WIDE EXCISION AND PRIMARY DRAINAGE[5,6,50]

In this method, wide local excision of the pilonidal sinus is done and wound is allowed to heal by secondary intention. Although it takes a longer time to heal, recurrence rate is low. The mean hospital stay is 4 weeks which is very longer for the manual workers than self employed. But the wound healing gets delayed if it gets secondary infected by anaerobic bacteria.

Recurrent pilonidal disease or complex unhealed pilonidal wounds always presents as a challenging task to the surgeon. Initial attempts at excision resulting in tissue loss which further complicates the situation and limiting the surgical options.

A

B



C D

A-Marking for wide excision
B-2 weeks post wide excision
C-6 weeks after wide excision
D-10 weeks post excision

Fig.-24 Wide excision

Recurrence could be due to:

i. Recurrent infections leading to abscess

ii. Failed to remove the sinus while doing initial excisional surgery

iii. Hair growing into the scar because of well known midline cleft promoting inward and outward forces causing recurrence.

iv. Midline cleft with scar is the most susceptible site for recurrent pilonidal sinus disease because of poor wound healing.

Hence generally flap technique is the best procedure for recurrent disease where wide excision is followed by covering the defect with flap. This avoids the sutures in midline and dead space is obliterated completely. Therefore flap techniques prevents the frictional forces in causing the pilonidal sinus disease.

In cases of failure of conservative management for complex or recurrent pilonidal disease, it is best to reserve the flap closure to treat chronic pilonidal disease.

CLOSURE OF THE DEFECTS

Various techniques of closure of the wound defects following wide excision includes:

1. PRIMARY CLOSURE OF THE DEFECT
2. KARYDAKIS ADVANCEMENT FLAP PROCEDURE
3. LOCAL ADVANCEMENT FLAP
    a. Z–PLASTY
    b. LIMBERG'S RHOMBOID FLAP
    c. V–Y ADVANCEMENT FLAP
    d. CROSSED TRIANGULAR FLAPS
4. GLUTEUS MAXIMUS MYOCUTANEOUS ROTATIONAL FLAP

1. CLEFT CLOSURE[5,33,51]

It was first described by Bascom where mobilization and excision of the fat is not necessary.

- In this procedure excision of the wound was done by triangular incision with its apex lateral to apex of the natal cleft.
- Raising of full thickness flaps.
- The skin debris were removed making the cavity of the sinus free.

- The crescent shape is formed by inferior margin with its pointing towards the anus.
- On the convex side of lower wound margin, a dermis containing skin flap is raised. Then wound is closed after trimming of skin on one side.

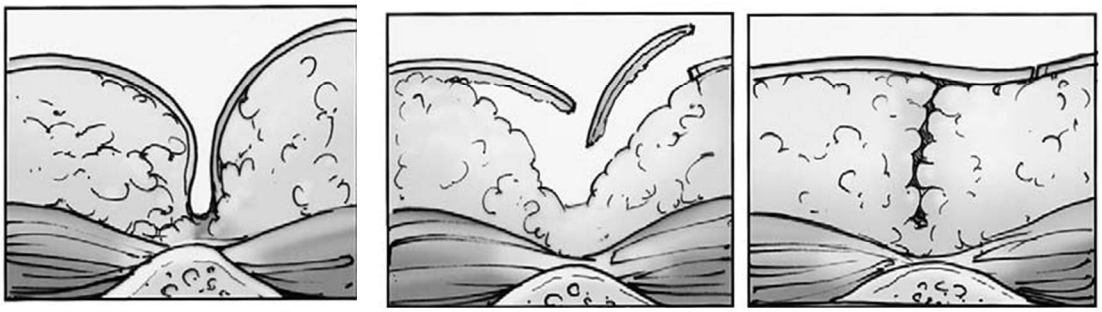


Fig.-25 Cleft closure procedure

- This alters the shape of the cleft allowing the suture line to be placed away from the cleft.
- The lateral edge of the raised skin flap should be marked preoperatively at the line of contact of buttocks. Then the edges are overlapped and its excess skin trimmed.
- This ultimately ending in closing the defect that is well away from the midline and obliterating the midline cleft.
- Suction drain kept and the wound closed in layers.
- It has got low recurrence rate of 3.3%.

2. KARYDAKI'S LOCAL ADVANCEMENT FLAP[5,6,14,33,52]

Initially elliptical incision covering the sinus is put away from midline and enbloc removal of the skin specimen containing sinus is done. Once excision is done, full thickness controlateral flap of semilateral incision is raised which crosses the midline for primary closure avoiding midline closure.

ADVANTAGE :

- Midline natal cleft will be flattened
- Suture line will lie in lateral position well away from the midline.

DISADVANTAGE:

- It has got a 1.3% recurrence rate,
- It cannot be done as OP procedure since it needs extensive dissection.

PROCEDURE :

After excision thick flap will be raised which crosses the midline and primary closure of the defect done. Suction drain kept and wound closed in layers. Hence this procedure is best suited for the management of pilonidal sinus.

Fig-26 Karydaki's flap

ADVANCEMENT FLAPS:

Local advancement flaps includes:

i. Rhomboid excision with limberg flap

ii. V-Y advancement flap

iii. Z–plasty

These advancement flaps are used to cover the defects created from recurrent pilonidal disease.

ADVANTAGES:

- Myocutaneous flap should be used whenever an advancement flap is needed. Because it helps to reconstruct complex wounds as flap heals well and covers large area of skin loss.
- Infection rate is less
- Wound healing is better since it has got good vascular supply.

DISADVANTAGES:

- It needs prolonged hospitalization
- These methods are technically demanding
- It has got long operation time
- It has 6-20% recurrence rate
- Flap necrosis is another problem which is difficult to manage since it creates additional skin loss.

Hence these methods are reserved for the management of complex or recurrent pilonidal sinus only when other procedures fails.

3. Z–PLASTY[6,33,53]

PRINCIPLE : The main principle behind Z-plasty is to obliterate the natal cleft and to increase the transverse length by utilising the lateral tissue.

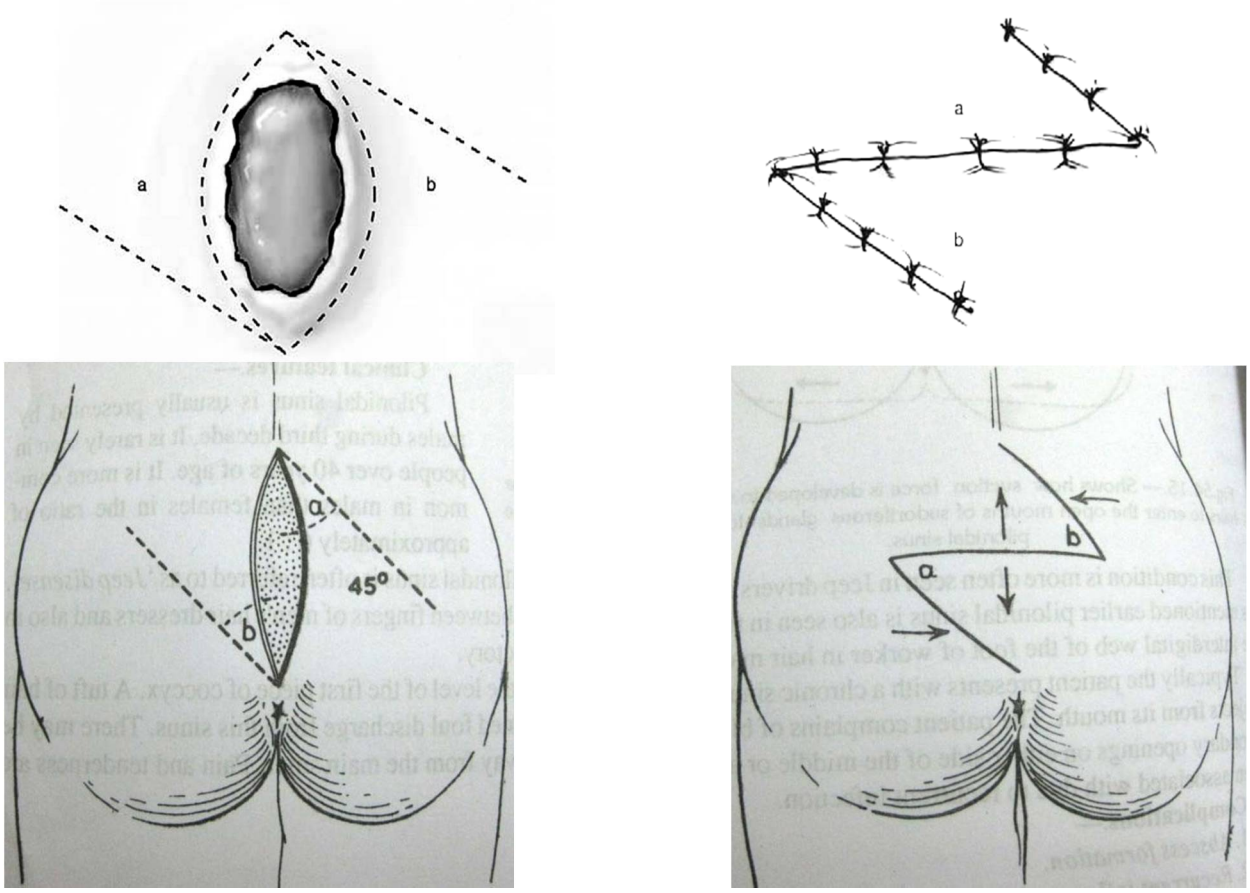


Fig-27 Z-plasty

a. Limbs of the Z are cut at the ends of the midline wound.

b. Flaps created and transposition done and skin closed.

PROCEDURE :

- Excise the midline pilonidal sinus.
- The limbs of the 'Z' are cut at the ends of midline wound.
- The flaps are raised subcutaneously upto the presacral fascia.
- Flaps have been transpositioned and wound is closed.

Z plasty have been studied on 120 patients by mansoory and dickson who concluded that it has got a recurrence rate of 1.65% and complication rate of 4% after follow up for 9 years. All these patients were discharged on POD-1 and returned to work after 2 weeks.

4. V-Y ADVANCEMENT FLAP[6,14,54]

It can be raised either unilaterally or bilaterally.

- Unilateral flap can cover a defect of 8-10 cm in diameter
- Bilateral flap can cover a defect larger than 10 cm
- Here the flaps were raised upto the level of fascia which contains skin, fat and gluteal fascia.
- In this method, flap is raised in a V fashion as marked by 'a' which is then extended into the wound and secured. The resulting suture lines resemble a Y on its side because the area of harvest is re-approximated to simulate the stem of the Y.

ADVANTAGES:

- It has a mean hospital stay of 10 days.
- Very easily dead space can be obliterated.
- Primary defect can be closed without tension.
- Here all midline pits and necrotic tissue can be removed completely.
- For unilateral flaps it has got a wound complication rate of 8% and for bilateral flaps 17% complication rate.
- After follow up for 5 years it has got a recurrence rate of 5%.

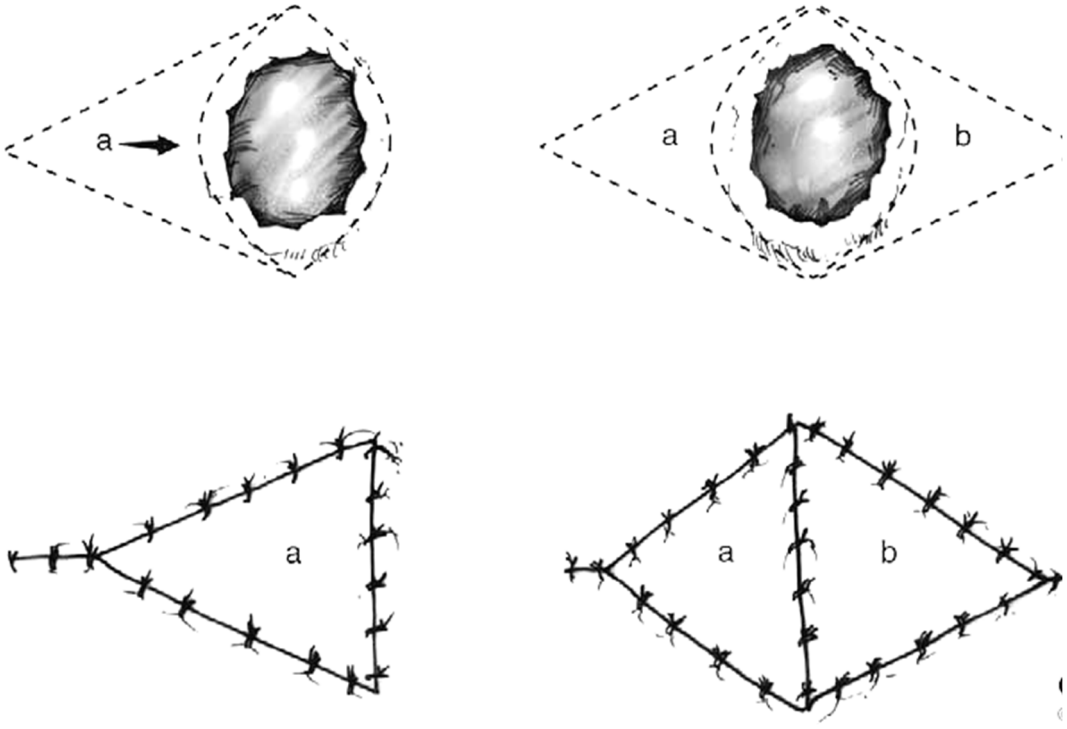


Fig.-28 V-Y advancement flap.

Fig 1 and 3 – Unilateral advancement flaps

Fig 2 and 4 – bilateral advancement flap

5. CROSSED TRIANGULAR FLAPS[55]

ADVANTAGES :

- Technically good to perform
- Lesser hospital stay and early return to work
- Cosmetically it has got a better appearance in the postop period.
- It has got a wound complication rate of 5% and recurrence rate of 1.73%.

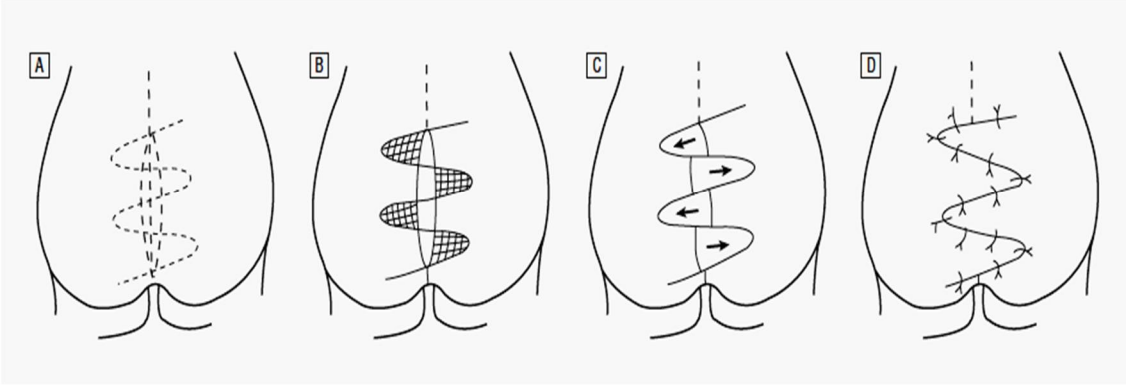


Fig-29 Diagram of crossed triangular flaps technique.

A shows the vertical and zig zag incision

B shows formation of triangular flaps resulting from zig zag incision

C Apical parts excised and basal parts undermined to replace the excised apical part . D wound closure

PROCEDURE :

- A midline incision is made covering all sinus openings in a semicircular fashion and excision of tract done
- Then multiple triangles are formed by zig zag incision across the wound with apex on one side and base on other side of the wound.

- This is followed by excision of all apical parts of each triangle, whereas undermining the basal parts is done.
- Haemostasis attained.
- Wound closure is done by replacing the apical parts with basal flaps in a zigzag line which crosses the midline.

A- Marking for vertical and zig zag incision & the black areas will be excised with sinus tracts

B-Excision of pilonidal sinus tissues

C Zigzag incision done to produce triangular flaps

D Excision of all apical parts

E-Basal parts are undermined with closure of the wound

F-Wound and natal cleft 1.5 years postoperatively.

Fig-30 Crossed triangular flaps

6. LIMBERG'S RHOMBOID FLAP[4,56,57,58]

ADVANTAGES:

- This flap flattens the gluteal cleft
- Large defects can be covered easily
- Since it has good vascular supply, flap necrosis is unlikely.
- Wound closure is done without tension
- It has got a 6 days of mean hospital stay
- After follow up for 74 months, it has got least recurrence rate of 4%.

PROCEDURE:

- Here excision of the pilonidal sinus is done in a rhomboid fashion deep upto the presacral fascia.
- Therefore incision will comprise of rhombic area of skin, subcutaneous fat and excised sinuses with lateral extensions.

- Long axis of the rhomboid is made in the midline whereas short axis is placed transversely.

MEASUREMENTS:

Rhomboid is marked as described below:-

- The line A-C is drawn with the point C is marked adjacent to perianal skin and point A is marked proximally covering all openings of the sinus for excision.
- The line B-D will transect the midpoint of line A-C at right angles which has 60% of its length.
- The line D-E is drawn as a direct continuation of line B-D which is of equal length to B-A and hence it will be sutured after rotation.
- Similarly the line E-F is drawn parallel to D-C with equal length and hence it will be sutured to A-D after rotation.
- Then the flaps are raised up to gluteal muscle fascia which contains skin and fat. Suction drain kept and wound is closed.

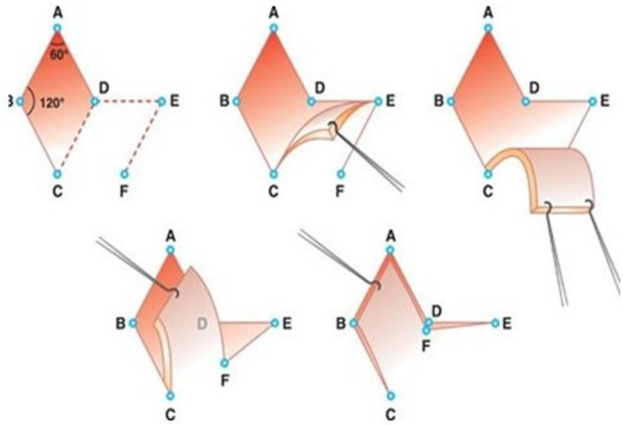
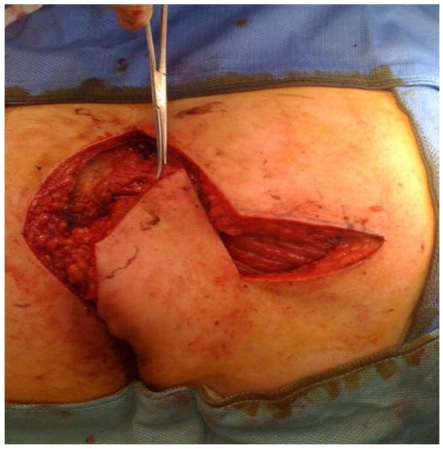


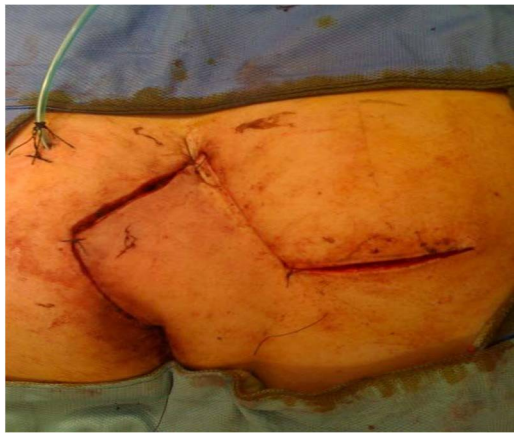
Fig.-31 Diagrammatic representation of the Limberg flap

A-Plan for Rhomboid excision with limberg flap

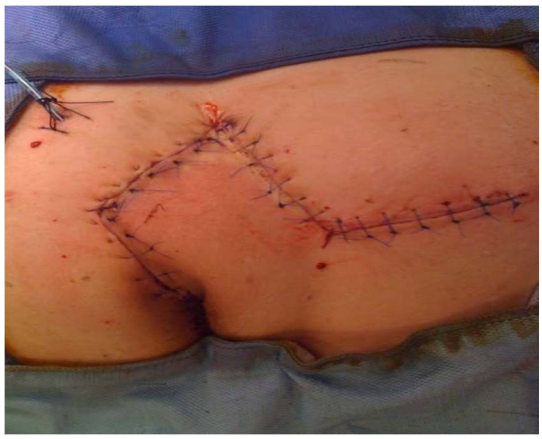
B-Excised specimen with incision over the flap



C-Rotation of flap to cover the defect



D-Flap in place with drain in situ



E-Post op picture of limberg flap

F- scar at 6months

Fig-32 Rhomboid excision with Limberg Flap

7. GLUTEUS MAXIMUS MYOCUTANEOUS FLAP[6,59]

It is an example of a Rotational flap.

ADVANTAGES:

- Once the radical excision of all diseased sinus done, the dead space is obliterated by well vascularised and bulky gluteus maximus myocutaneous flaps.
- Hence very large defects can be covered easily.
- There is no tension suture line.
- Since it obliterates the midline natal cleft, the local factors responsible for pilonidal sinus can be eliminated.

Fig.-33 The gluteus maximus myocutaneous flap

DISADVANTAGES :

- It takes long duration for surgery with high morbidity.
- Wound dehiscence is common. It has hospital stay of average 2 weeks and total time off work is 2 months & hence this method is not at all recommended unless other measures fails.

MATERIALS AND METHODS

The prospective study on pilonidal sinus was conducted in the department of general surgery, Coimbatore medical college hospital from December 2017 to December 2018 after getting approval from ethical committee of Coimbatore medical college hospital. The nature of disease, methodology of the study, categorization of groups on the basis of type of surgery and the risks involved were clearly explained to the patient while getting informed consent. This study follows the provisions of declaration of Helsinki. All the information which was collected from the patients and their case records were sequentially kept confidential .

STUDY DESIGN

Prospective study

STUDY POPULATION

30 patients of sacrococcygeal pilonidal sinus fulfilling the inclusion criteria from Coimbatore medical college hospital during the period of 1 year from December 2017 to December 2018 were included in this study.

INCLUSION CRITERIA

This is an interventional cohort study performed on 30 patients of both sexes in the age group of >15 years with uncomplicated sacrococcygeal pilonidal sinus.

EXCLUSION CRITERIA

It includes:

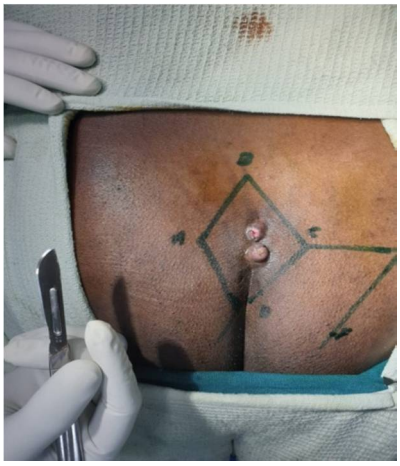
- Acute pilonidal abscesses or complex pilonidal sinuses
- Secondary opening >5 cm from the midline
- Immunodeficiency diseases
- Patients with psychiatric disease
- Existing recurrent disease or previous surgery in the sacrococcygeal region

METHODS

This prospective study was conducted in Coimbatore medical college hospital from December 2017 to December 2018 after getting ethical committee clearance. All patients of age >15 years including both sexes with uncomplicated sacro-coccygeal pilonidal sinus were subjected to 2 modalities of surgical treatment, either by Rhomboid excision and Limberg flap procedure (Group-A) or by excision and primary closure (Group-B). Informed consent was obtained from all patients whoever included in the study which was approved by the ethical committee. After admission of patients they were subjected to detailed history taking, complete clinical examination and laboratory investigations. Exclusion criteria in both groups includes patients with recurrent disease, patients with systemic disease affecting wound healing, presence of acute inflammation or associated with abscess formation.

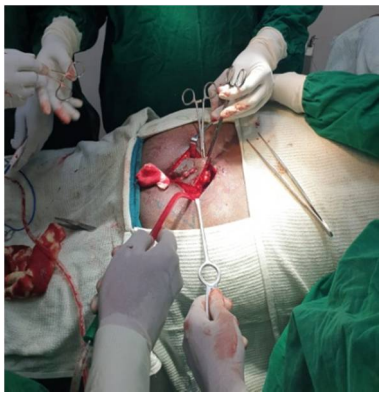
All included patients of diagnosed uncomplicated sacro-coccygeal pilonidal sinus got admitted in Coimbatore medical college hospital one day before operation. The intergluteal area will be shaved before surgery. Prophylactic parenteral broad-spectrum antibiotics was given at the time of induction (cefotaxime 2 gram iv after test dose). Under spinal anaesthesia, patient in prone position, the lateral traction of the buttocks was done using wide adhesive tapes. Appropriate sterilization of the surgical area with povidone-iodine solution was done and parts draped under sterile aseptic precautions. Using blunt probe or methylene blue injection, sinus tract was delineated in order to avoid missed side tracks.

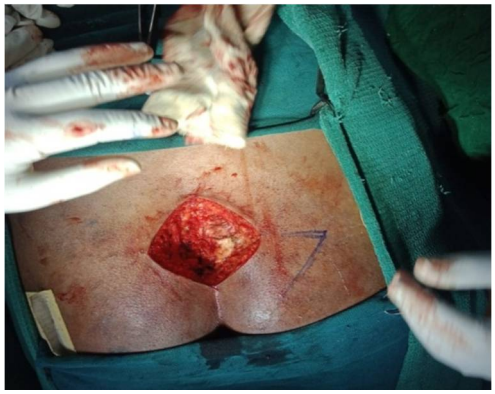
In group-A, a rhomboid-shaped incision was marked preoperatively around the sinus and incision was made. Then rhombic area of skin and subcutaneous fat including both the midline pits along with any lateral extensions was excised. The incision was then deepened up to the presacral fascia and excised in toto.



A-Rhomboid incision marked

B- Rhomboid incision deepened





C-Rhomboid excision

D-Rotation of flap to cover the defect **E- wound closure in layers**

F-post op pic

Fig.34 Rhomboid Excision with Limberg flap

Then Rhomboid fascio-cutaneous flap was raised containing skin, subcutaneous fat and the fascia overlying gluteus maximus from the underlying gluteus muscle. This flap was rotated to cover the midline rhomboid defect and the defect which was created by raising the flaps was closed in a linear fashion. Deep absorbable sutures using 1 vicryl was taken to include fat and fascia after keeping suction drain and finally the skin was closed with interrupted sutures using 2-0 ethilon. This procedure makes a tension free flap of unscarred skin in the midline. The skin sutures were removed on the 14^{th} postoperative day. In case of secondary wound infection or hematoma, the wound was drained by removing few sutures with regular dressing and covered with appropriate broad spectrum antibiotics.

In group-B, a vertical elliptical incision was made around the sinus and extended upto the presacral fascia. The excision was made atleast 1cm away from the sinus. Once perfect hemostasis attained, primary closure of the wound was done using 2-0 ethilon after keeping suction drain.

Operation time, early post op complications, post-operative pain score on day1 and day 4, day of pain free sitting and toileting, duration of hospital stay was recorded in both groups. In further follow up, day of suture removal and day of return to work or physical activity was also noted in both groups.

Fig.35 Excision with primary closure

After 1 month, all these patients were reviewed for delayed complications regarding status of wound healing and their cosmetic benefit of the scar. Further long term follow up after 6 months was also done for recurrence of the disease and recorded in both groups.

STATISTICAL ANALYSIS

All these collected data were organized and entered in Microsoft Excel. The continuous data was expressed in Mean ± Standard Deviation and the categorical data in percentage. Students unpaired t test was used for the comparison of two groups from continuous data. Categorical data was compared using chi square test. For all analytical purpose SPSS Software version 20.0 was used and p value less than 0.05 was considered significant.

OBSERVATIONS AND RESULTS

Pilonidal sinus disease is always least reported because patients seeks medical advice only after getting complications or when they have persistent discharging sinus. Hence what the patients presents is only the tip of the ice berg. Since there is no much studies on the pilonidal sinus disease in India and many patients go unreported or under/misdiagnosed, it is difficult to find out the incidence and prevalence of the disease.

In our study , total of 30 patients of uncomplicated sacrococcygeal pilonidal sinus disease were admitted, randomly divided into two groups by subjecting to Rhomboid excision and Limberg flap (Group-A) and Excision and primary closure procedure (Group-B). Both these procedures were studied for operation time, early post op complications and outcome of the procedure with followup till 6 months.

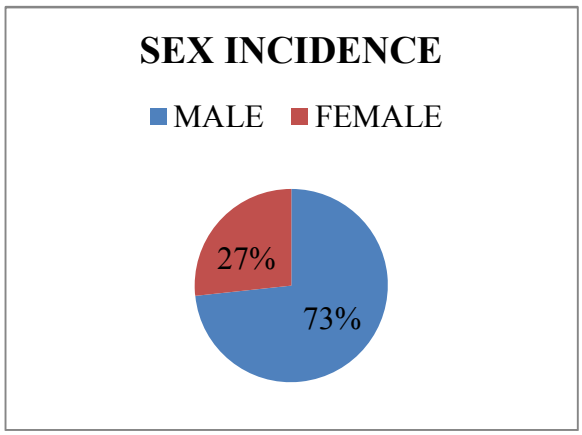
SEX INCIDENCE:

In our study, males (74%) are predominantly affected by pilonidal sinus disease compared to females (26%). This male preponderance could be due to overgrowth of hairs and their occupational habits.

Table-1 Sex Incidence

GENDER	No. Of patients	Percentage (%)
MALE	22	73.3
FEMALE	8	26.7
TOTAL	30	100

Graph1



Graph-2

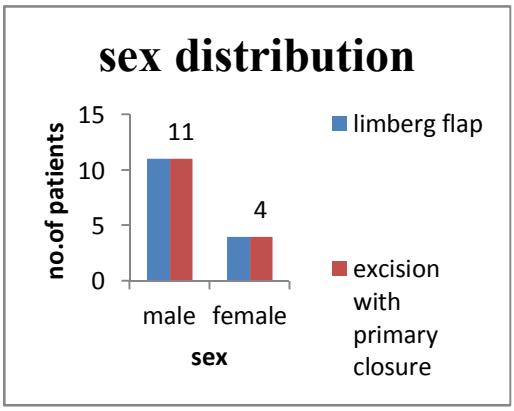


Table-1.1 Sex Incidence Comparison

STUDY	PRESENT STUDY	Surabhi P sai[62]	Sheeraj Shakoor et al.[61]
Male	22 (73%)	42 (84%)	24 (75%)
Female	8 (27%)	8 (16%)	8 (25 %)
Male:Female ratio	3:1	5:1	3:1

After comparing with other known studies, it has been found that this disease is more common in men.

AGE INCIDENCE:

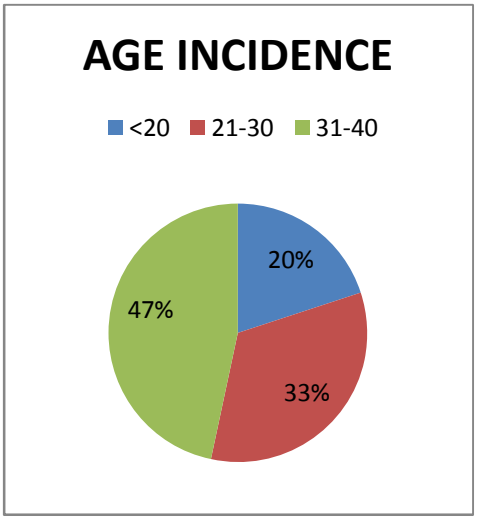
Pilonidal sinus disease is the disease of the young. It rarely occurs in old age groups unless it has been treated poorly in the past.

Table-2 Age Incidence

AGE GROUP (in years)	No. of patients	Percentage (%)
<20	6	20.0
21-30	10	33.3
31-40	14	46.7
TOTAL	30	100

MEAN ± SD : 28.47 ± 8.068

Graph-3



Graph-4

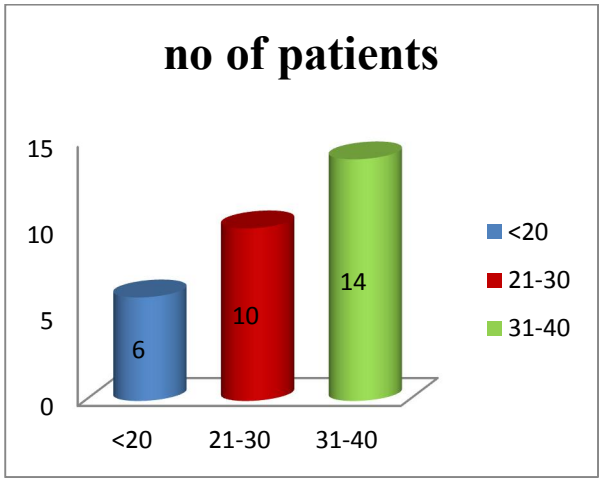
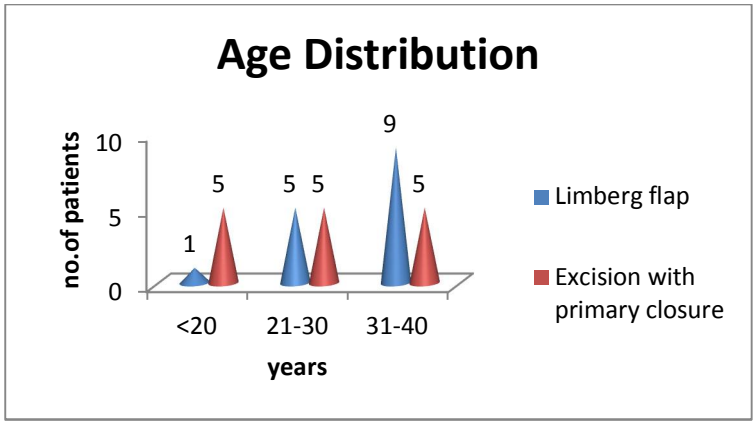


Table-2.1 Age Incidence Comparison

AGE	PRESENT STUDY	Surabhi P sai [62]	Baki Eaci et al.[63]
Mean ± SD	28.47 ± 8.068 yrs	29.48 ± 5.12 yrs	25.6 ± 6.3 yrs
Range	17-40	20-39	18-38

As compared to other studies, it has been found that mean age of incidence of pilonidal sinus remains almost same in the late twenties. It is also found that range of presentation of the disease remains the same as in other studies and hence it is rare after the age of 40 years.

Graph-5



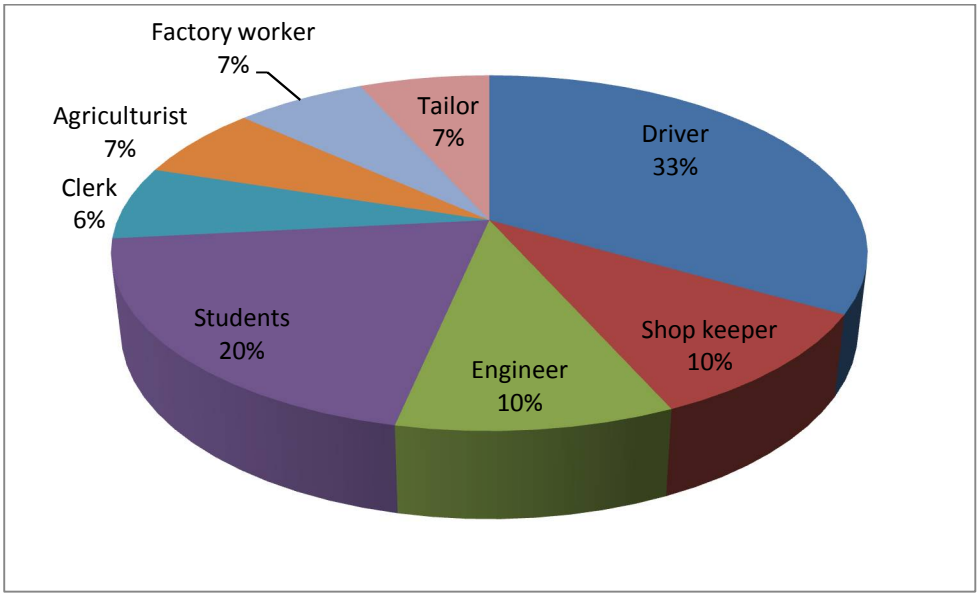
OCCUPATIONAL INCIDENCE:

Occupation has a close relationship in the causation of pilonidal sinus. Hence this disease also called as 'Jeep Bottom' as it was common in jeep drivers during world war-II. Occupation having prolonged duration of sitting or in near by to vibrating surfaces are at risk.

Table-3 Occupational Incidence

OCCUPATION	No.of Patients	Percentage (%)
Driver	10	33.3
Shop keeper	3	10.0
Engineer	3	10.0
Students	6	20.0
Clerk	2	6.7
Agriculturist	2	6.7
Factory worker	2	6.7
Tailor	2	6.7
TOTAL	30	100

Graph-6



As the name "Jeep bottom" named after its common incidence of disease in jeep drivers during world war II, in my study this pilonidal sinus disease predominantly occurs in drivers (33%) and in patients who gives history of prolonged sitting (30%).

CLINICAL PRESENTATION:

Most commonly patients with pilonidal sinus disease presents with intermittent discharge (50%) and pain (30%) in the gluteal region.

Table-4 Clinical Presentation

SYMPTOMS	No. of patients	Percentage (%)
Pain	9	30.0
Intermittent discharge	15	50.0
Swelling	6	20.0
Total	30	100.0

Graph-7

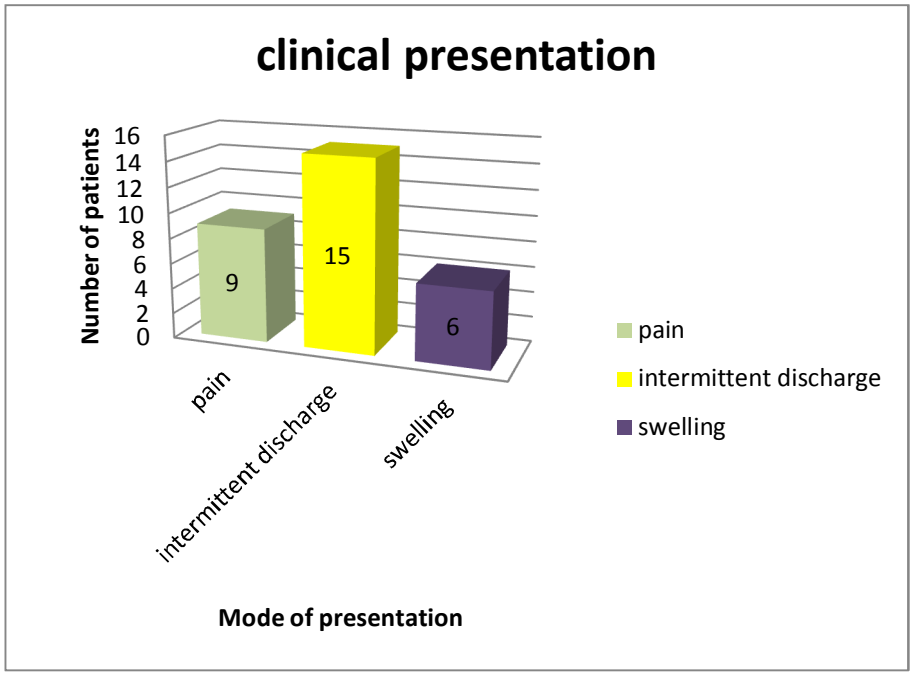


Table-4.1 Clinical Presentation Comparison

Symptom	Present study	Surabhi P sai[62]	Sondenaa et al.[23]
Pain	9 (30%)	46 (92%)	35%
Intermittent discharge	15 (50%)	13 (26%)	66%
Swelling	6 (20%)	36 (72%)	50%

By comparing with various studies, it is found that the most common clinical presentation will be pain (30%) and discharge (50%). Pain in the gluteal region will be vague in nature but interferes with the work and the discharge will be serous to purulent in nature. There are also the patients who presented with swelling (20%).

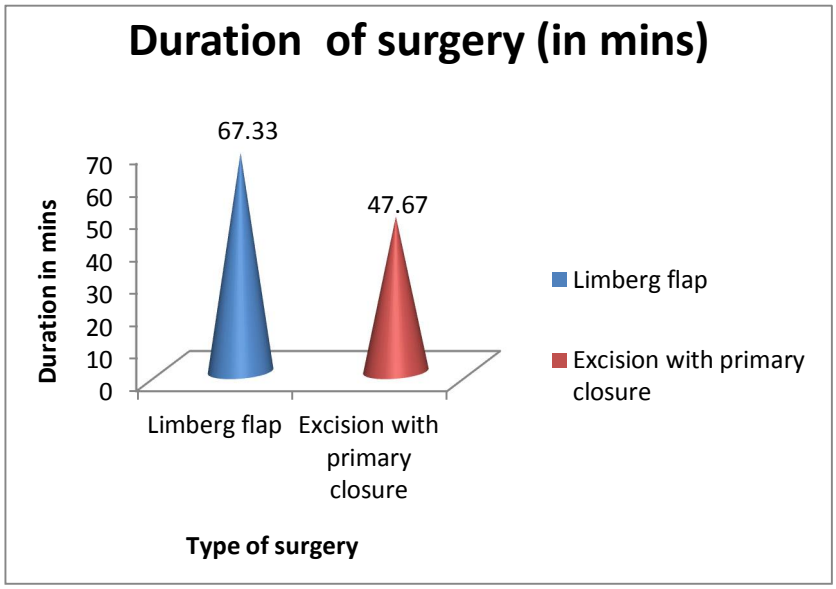
DURATION OF SURGERY:

Table-5 Duration of surgery (in mins)

	Type of surgery	**N**	**Mean**	**Standard Deviation**	**Std.Error Mean**	**T score**	**P Value**
Duration (in mins)	Group-A	15	67.33	6.230	1.609	8.453	**0.0001**
	Group-B	15	47.67	6.510	1.681		

The mean duration of surgery was 67.33 minutes in the Rhomboid excision with Limberg flap and 47.67 minutes in the Excision with primary closure technique. The difference was significant (**p<0.0001**).

Graph-8



EARLY POST OP COMPLICATIONS VS TYPE OF SURGERY:

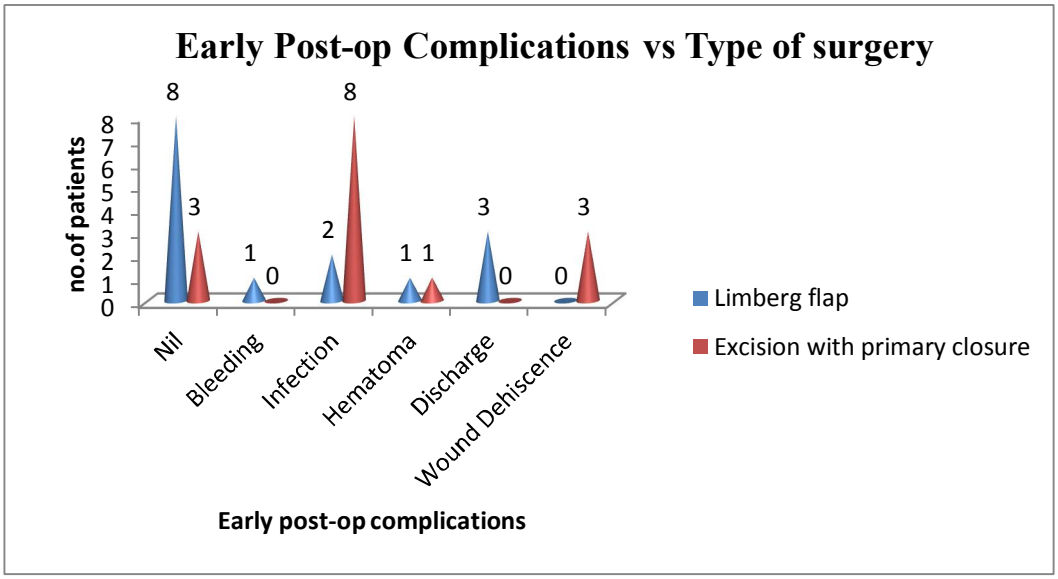
Table-6 Early Post Op complications vs Type of Surgery

EARLY POST OP COMPLICATIONS	GROUP-A	GROUP-B	Chi Sq Test	P value
NIL	8 (53.3%)	3 (20%)	12.873	**0.025**
BLEEDING	1 (6.7%)	0 (0%)		
INFECTION	2 (13.3%)	8 (53.3%)		
HEMATOMA	1 (6.7%)	1(6.7%)		
DISCHARGE	3 (20%)	0 (0%)		
WOUND DEHISCENCE	0 (0%)	3 (20%)		

In this study, 8 patients (53%) in group-A and 3 patients (20%) in group-B had no complications postoperatively. In Group-B, Early post op complications were predominantly wound infection 53% and next is wound dehiscence 20%. Wound discharge contributes to 3 patients (20%)

in group-A while nil patients in group-B. The difference in early postop complications vs type of surgery was statistically significant **(p-0.025)**.

Graph-9



POST OPERATIVE PAIN SCORES ON DAY-1 AND DAY-4:

Table-7 PAIN SCORES ON DAY-1 & DAY-4

POST-OPERATIVE PAIN SCORE	TYPE OF SURGERY	N	MEAN	STANDARD DEVIATION	T score	P value
DAY-1	GROUP-A	15	3.87	1.060	6.375	**0.00001**
	GROUP-B	15	6.20	0.941		
DAY-4	GROUP-A	15	2.00	0.926	6.959	**0.00001**
	GROUP-B	15	4.13	0.743		

In the study, the mean pain score in limberg flap was 3.87 and 2.00 on day1 and day-4 respectively. Similarly the mean pain score in excision

with primary closure was 6.20 and 4.13 on day 1 and day 4 respectively. The difference was significant (**p<0.00001**).

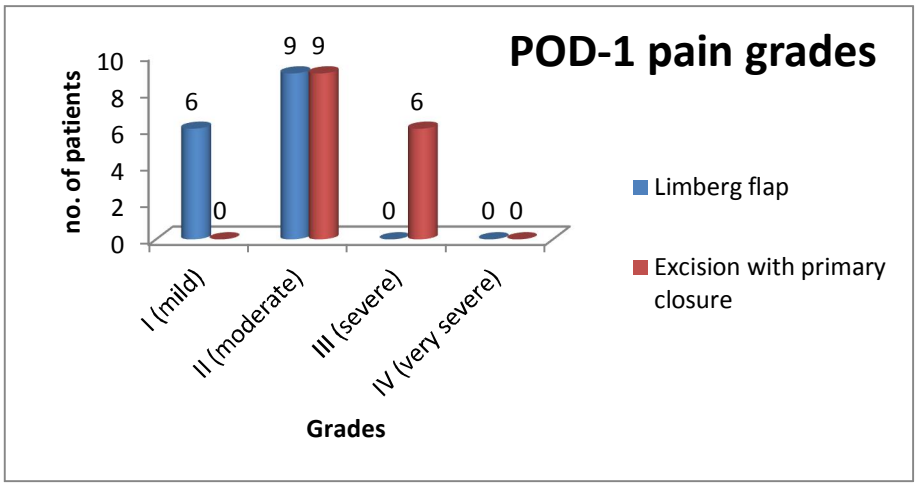
POST-OPERATIVE PAIN GRADES ON DAY-1:

Table-8 PAIN GRADES ON DAY-1

POST OPERATIVE PAIN GRADES ON DAY-1	GROUP-A		GROUP-B		Chi Sq Test	P value
	N	%	N	%		
I (MILD)	6	40	0	0	12.000	**0.002**
II (MODERATE)	9	60	9	60		
III (SEVERE)	0	0	6	40		
IV(VERY SEVERE)	0	0	0	0		

In the study, in limberg flap technique 60 % had grade II (moderate pain) and 40 % had grade I (mild pain) on POD-1. Similarly, in excision with primary closure, 60% had grade II (moderate pain) but 40 % had grade III (severe pain). The difference was significant (**p- 0.002**).

Graph-10



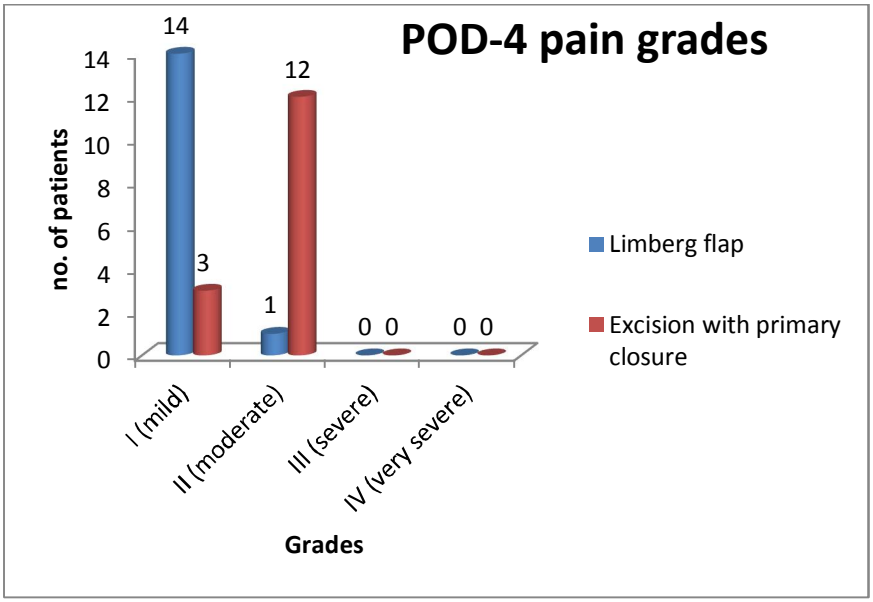
POST-OPERATIVE PAIN GRADES ON DAY-4:

Table-9 PAIN GRADES ON DAY-4

POST OPERATIVE PAIN GRADES ON DAY-4	GROUP-A		GROUP-B		Chi Sq Test	P value
	N	%	N	%		
I (MILD)	14	93.3	3	20	16.425	**0.000051**
II (MODERATE)	1	6.7	12	80		
III (SEVERE)	0	0	0	0		
IV(VERY SEVERE)	0	0	0	0		

In the study, in limberg flap technique 93.3 % had grade I (mild pain) and 6.7 % had grade II (moderate pain) on POD-4. Similarly, in excision with primary closure, 80% had grade II (moderate pain) and 20 % had grade I (mild pain). The difference was significant (**p- 0.000051**).

Graph-11



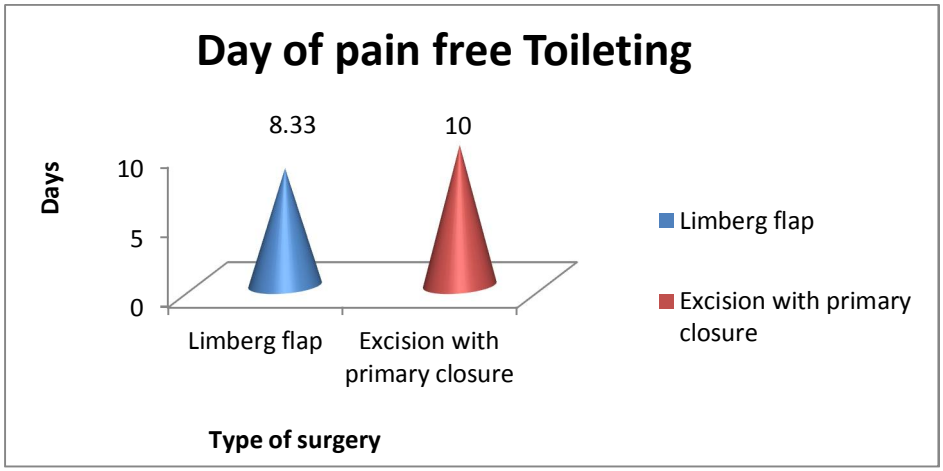
DAY OF PAIN FREE TOILETING:

Table-10 Day of pain free toileting

	DAY OF PAIN FREE TOILETING (MEAN ± SD)	T- VALUE	P-VALUE
GROUP-A	8.33 ± .617	6.168	**0.000001**
GROUP-B	10 ± .845		

The mean day of pain free toileting was 8.33 in rhomboid excision with limberg flap and 10 in excision with primary closure. The difference was significant (**p value-0.000001**).

Graph-12

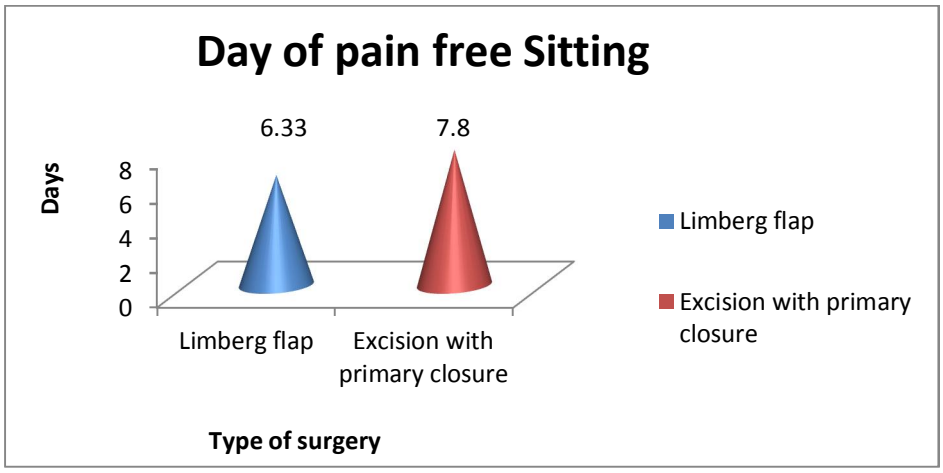


DAY OF PAIN FREE SITTING:

Table-11 Day of pain free sitting

	DAY OF PAIN FREE SITTING (MEAN ± SD)	T- VALUE	P-VALUE
GROUP-A	6.33 ± .816	4.785	**0.000050**
GROUP-B	7.80 ± .862		

Graph-13



The mean day of pain free sitting was 6.33 in rhomboid excision with limberg flap and 7.8 in excision with primary closure. The difference was significant (**p value-0.000050**).

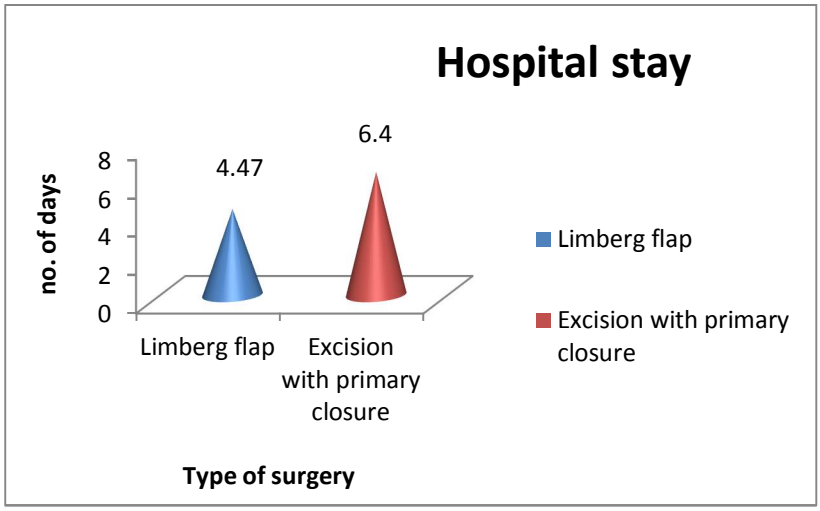
HOSPITAL STAY:

Table-12 HOSPITAL STAY

TYPE OF SURGERY	N	Mean	Std.Deviation	Std.Error Mean	T score	P value
GROUP-A	15	4.47	0.640	0.165	7.155	**0.00001**
GROUP-B	15	6.40	0.828	0.214		

The mean hospital stay was 4.47 days in the limberg flap group and 6.40 days in the excision and primary closure. The difference was significant (**p- 0.00001**).

Graph-14

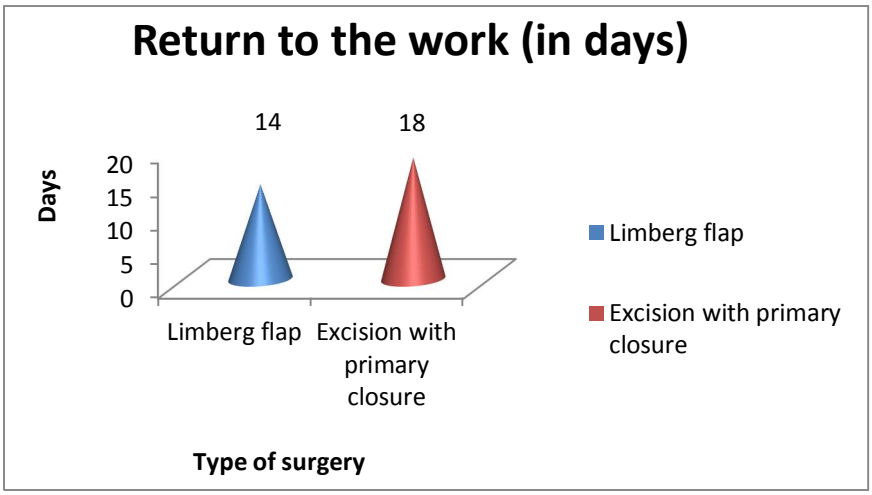


RETURN TO THE WORK OR PHYSICAL ACTIVITY:

Table-13 Return to the work (in days)

TYPE OF SURGERY	RETURN TO WORK in days (MEAN ± SD)	T- VALUE	P-VALUE
GROUP-A	14 ± 1.964	5.855	**0.000003**
GROUP-B	18 ± 1.773		

Graph-15



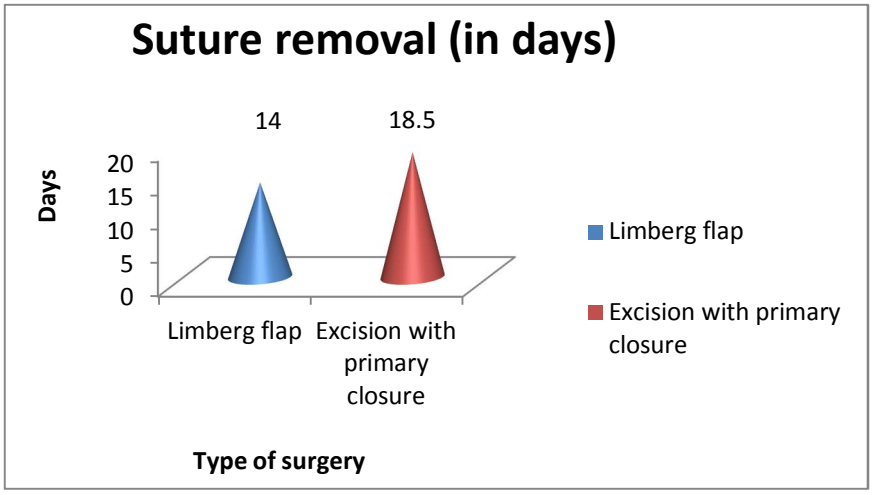
The mean time of return to work was 14 days in rhomboid excision with limberg flap and 18 days in excision with primary closure. The difference was significant (**p-0.000003**).

SUTURE REMOVAL:

Table-14 Suture removal (in days)

TYPE OF SURGERY	SUTURE REMOVAL (in days) MEAN ± SD	T- VALUE	P-VALUE
GROUP-A	14 ± .915	12.365	**0.000001**
GROUP-B	18.5 ± .990		

Graph-16



The mean time of suture removal was 14 days in rhomboid excision with limberg flap and 18.5 days in excision with primary closure. The difference was significant (**p-0.000001**).

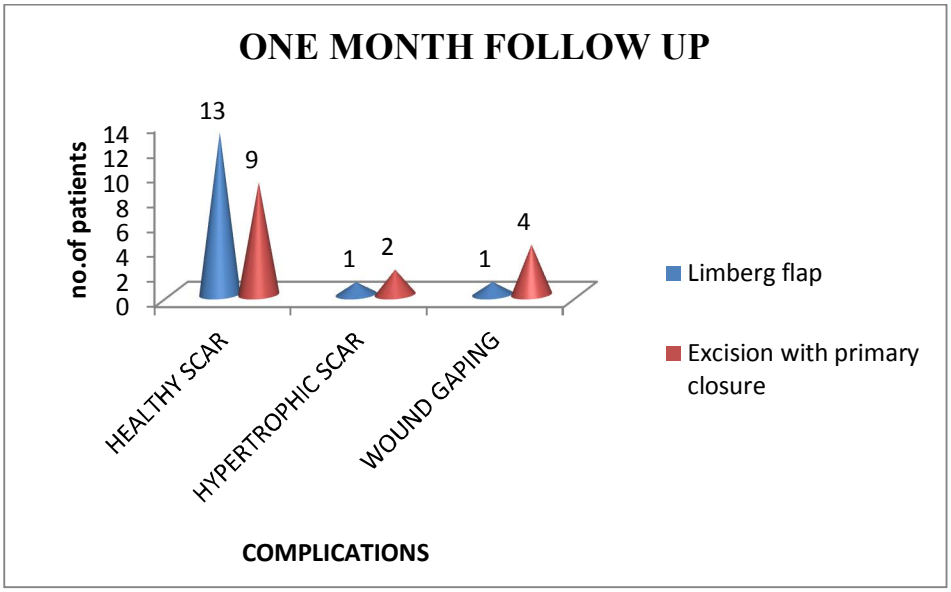
ONE MONTH FOLLOW UP:

Table-15 One Month follow up

ONE MONTH FOLLOW UP	GROUP-A	GROUP-B	Chi Sq Test	P value
HEALTHY SCAR	13 (86.7%)	9 (60%)	2.861	0.239
HYPERTROPHIC SCAR	1 (6.7%)	2 (13.3%)		
WOUND GAPING	1 (6.7%)	4 (26.7%)		

In the study, 13 (86.7%) patients in the Limberg flap and only 9 (60%) patients in the excision with primary closure had healthy scar at one month follow up. Similarly 4 (26.7%) patients in the excision with primary closure and only 1 (6.7%) patient in Limberg flap had wound gaping after 1 month of surgery.

Graph-17



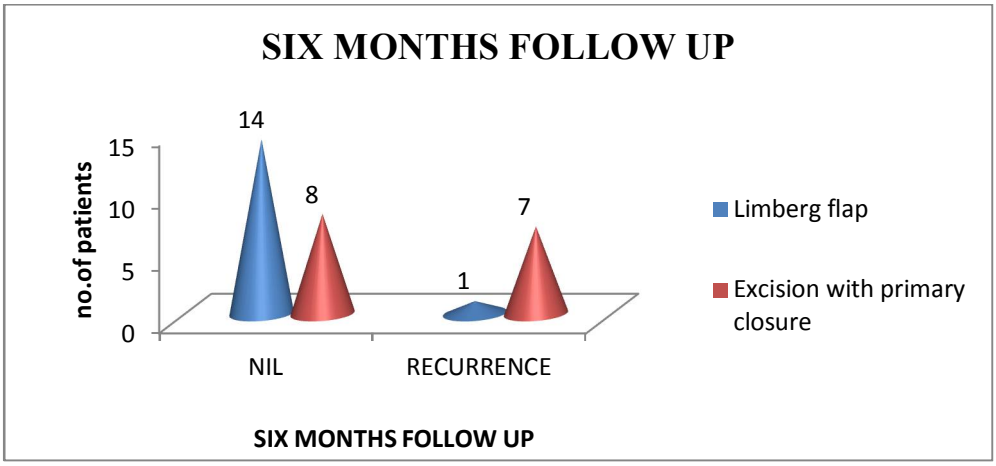
SIX MONTHS FOLLOW UP:

Table-16 Six months follow up

6 MONTH FOLLOW UP	GROUP-A	GROUP-B	Chi Sq Test	P value
NIL	14 (93.3%)	8 (53.3%)	6.136	**0.013**
RECURRENCE	1(6.7%)	7(46.7%)		

In the study, 14 (93.3%) patients in the Limberg flap and 8 (53.3%) patients in the excision with primary closure had nil recurrence at six months follow up. But there was a high incidence of recurrence 46.7% in excision with primary closure technique compared to limberg flap (6.7%). The difference was significant (**p value-0.013**).

Graph-18



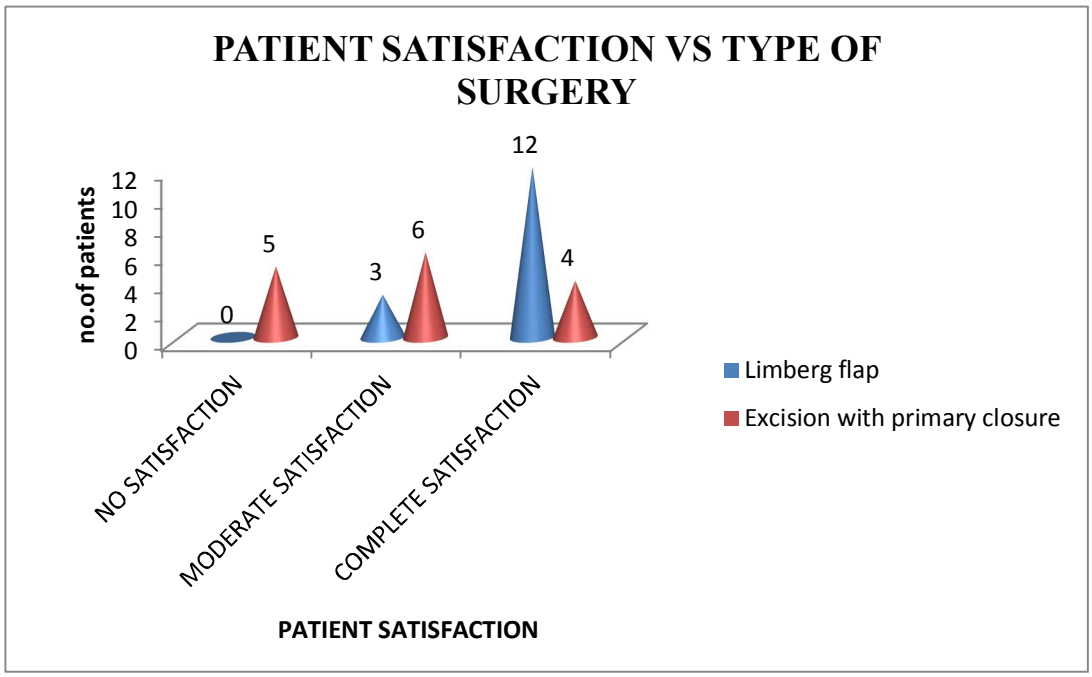
PATIENT SATISFACTION WITH SCAR:

Table-17 Patient satisfaction with scar

PATIENT SATISFACTION WITH SCAR	GROUP-A	GROUP-B	Chi Sq Test	P value
NO SATISFACTION	0	5 (33.3%)	10.000	**0.007**
MODERATE SATISFACTION	3 (20%)	6 (40%)		
COMPLETE SATISFACTION	12 (80%)	4 (26.7%)		

In the study, 12 (80%) patients in the Limberg flap and only 3 (20%) patients in the excision with primary closure had complete satisfaction regarding cosmetic benefit of the scar. Whereas in excision with primary closure technique 6 (40%) patients had moderate satisfaction and 5 (33.3%) patients had no satisfaction regarding post op scar. The difference was significant (**p value-0.007**).

Graph-19


PATIENT SATISFACTION VS TYPE OF SURGERY
no.of patients
12
10
8
6
4
2
0
0
5
3
6
12
4
NO SATISFACTION
MODERATE SATISFACTION
COMPLETE SATISFACTION
PATIENT SATISFACTION
Limberg flap
Excision with primary closure

DISCUSSION

Pilonidal sinus disease is a disease of young individuals. Although it causes significant discomfort and morbidity to the patients, it is always under reported unless until complications arises. Surgeon can give definitive treatment only when they presents initially thereby preventing unnecessary distress to the patient and loss of work.

SEX INCIDENCE

This disease is more prevalent in males due to overgrowth, distribution of hairs and their occupation. Other studies in the western literature also tells that this disease is more common in males.

AGE INCIDENCE

The pilonidal sinus disease occurs mostly in the late teens and early twenties since the hormone levels will be high in these age groups and rarely beyond 40 years. But in females due to early onset of maturity, this disease occurs early. In our study, the mean age at presentation is 28 years though there will be earlier age at presentation of 24 years in western literature.

OCCUPATIONAL INCIDENCE

As the Pilonidal sinus disease is also called by the name "*Jeep Bottom*", this is more common in patients who spent lot of time in sitting

and working in close to vibration machinery. Our study also reflects the same.

CLINICAL PRESENTATION

In our study, patients with pilonidal sinus disease most commonly presents with intermittent discharge (50%) and pain (30%) in the gluteal region. Discharge may often be persisting and pain may be dull aching in nature causing discomfort to the patient.

20 % of patients in our study were also admitted with swelling in the midline cleft which is often intermittent in nature. In some cases this resolves after rupture on its own leaving foul smelling discharge containing hairs.

This disease if not adequately treated by definitive surgery will have high rates of recurrence.

DURATION OF SURGERY (in mins) :

The mean duration of surgery was 67.33 minutes in the Rhomboid excision with Limberg flap and 47.67 minutes in the Excision with primary closure technique. This shows that the operative time among the flap group (group-A) is more than primary closure group (group-B) and the difference was statistically significant (**p<0.0001**).

EARLY POSTOP COMPLICATIONS:

In our study, while comparing early post op complications between two groups, it is very clear that 53% in group-A and only 20% in group-B

had no complications. Wound infection predominates for 53% in group-B compared to only 13% in group-A. All these differences in incidence of early post op complications between the two groups was statistically significant **(p-0.025)**.

POSTOPERATIVE PAIN SCORES ON DAY-1 AND DAY-4:

In our study, the mean first postoperative pain score was 3.87 in group-A and 6.20 in group-B (p=0.00001). Similarly the mean postoperative pain score on fourth day was 2.00 in group-A and 4.13 in group-B (p=0.00001). Similar pain scores were also reported by Akca et al.[64]

After categorization of pain scores into four grades as follows, chi square tests was applied for comparison of pain grades between two groups on day-1 and day-4.

I-mild pain--- pain score of 1-3

II-moderate pain--- pain score of 4-6

III-severe pain--- pain score of 7-9

IV-very severe pain--- pain score of 10

In our study, 60% had grade II pain in group-A and 40% had grade III pain in group-B on POD-1 (**p- 0.002**). Similarly 93% had grade I pain in group-A and 80% had grade-II pain in group-B on POD-4 (**p-0.000051**).

DAY OF PAIN FREE TOILETING:

In evaluating the day of pain free toileting in our study, it was found that it was 8.3 in group-A compared to 10 in group-B (**p value-0.000001**). Mahdy et al.[65] also reported that day of pain free toileting was shorter in the flap group.

DAY OF PAIN FREE SITTING:

In our study the mean day of pain free sitting was 6.33 in group-A and 7.8 in group-B. The difference was statistically significant (**p value-0.000050**). In a study by A. Tavassoli et al[66], it was 6.5 days in the flap group and 8.6 in the primary repair which confirms that day of pain free sitting was earlier in limberg flap compared to primary closure.

HOSPITAL STAY:

In our study, the mean hospital stay was 4.47 days in the limberg flap group compared to 6.40 days in the excision and primary closure. The difference was statistically significant (**p- 0.00001**).

RETURN TO WORK OR PHYSICAL ACTIVITY:

In our study, the mean day of return to work was 14 days in group-A and 18 days in group-B (**p-0.000003**). In a study by Abdelraheem O et al[67], the mean day of return to work was 18 days in limberg flap group compared to 22 days in primary closure group.

SUTURE REMOVAL:

In our study wound healing is determined by the day of suture removal which was 14 days in group-A and 18.5 days in group-B (**p-0.000001**). In another study by A. Tavassoli et al[13], it was 12.3 days in the flap group and 15.5 days in the primary repair group.

ONE MONTH FOLLOW UP:

In our study after 1 month of follow up, it was found that 86% of patients had healthy scar in group-A compared to only 60% in group-B. More over 26% had wound gaping in group-B and only 6.7% in group-A. While evaluating for hypertrophic scar it was found that 13.3% in group-B and 6.7% in group-A (**p-0.239**).

SIX MONTH FOLLOW UP:

In our study after successful 6 months of follow up, it was found that 93 % in group-A had no recurrence. But there was high incidence (46%) of recurrence in group-B as compared to 6.7% in group-A (**p-0.013**). In another study by Abdelraheem O et al[14], there was a 3.3% of recurrence in limberg flap group compared to 20% in primary closure group (**p-0.035**). In the study of Akca et al., recurrence rate was higher in the primary repair than the Limberg flap group.[64]

PATIENT SATISFACTION WITH SCAR:

In our study, 80 % had complete satisfaction in group-A as compared to only 20% in group-B. Moreover 40 % in group-B had moderate satisfaction and 33% had no satisfaction (**p-0.007**).

CONCLUSION

In our study of 30 patients of pilonidal sinus who presented with various presentations the following observations were made:

- Pilonidal disease is a disease of the midline natal cleft predominantly affecting young male adults and with occupation involving prolonged sitting.
- The modes of presentation vary from asymptomatic to painful discharging sinus or swelling.
- It is more common in patients with deep natal cleft and hirsute.
- It's a diagnosis based on clinical findings.
- Conservative management along with definitive surgical treatment forms the main aim of management of pilonidal disease.
- Rhomboid excision with Limberg flap procedure is the most effective way to treat the disease since it obliterates midline natal cleft on comparing with excision and primary closure.

SUMMARY

- Pilonidal sinus disease is not routinely reported.
- Although this is common in the midline natal cleft, extra natal sites have also been reported.
- Pathology is due to an acquired condition caused by various predisposing factors.
- It is more common in males because of their hirsute nature compared to the females.
- It commonly affects young adults under the age of 40 years.
- Clinical presentation varies from asymptomatic pits to chronic pain and discharge and acute presentation of abscess.
- Patients having occupation with prolonged sitting and working close to vibrating machinery are at risk of developing this disease.
- Conservative management of the pilonidal disease is by maintaining adequate personal hygiene and regular shaving of the local area.
- Pilonidal abscess is an surgical emergency and requires incision and drainage through a lateral incision well away from the mid line. Though this is not a definitive procedure and the rates of recurrence are very high.
- Although there are various types of treatments available for the management of pilonidal sinus disease, each of them have their own advantages, drawbacks and recurrence rates.

- Among various surgical procedures, reconstruction following excision of the sinus using flap techniques is the most effective because of its low rate of recurrence, shorter hospital stay and early return to physical activity.
- Therefore flap techniques are best recommended among which Limberg flap is the widely used to treat pilonidal disease with low recurrence.

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CASE SHEET PROFORMA

Name

Age/Sex — Date of admission

Occupation — Date of surgery

I.P.number — Date of discharge

Chief complaints:

- ♣ Pain
  - Mode of onset
  - Site of pain
  - Duration of pain
  - Type of pain
  - Character of pain
  - Aggravating factors
  - Relieving factors
- ♣ Swelling
  - Number
  - Duration
  - Aggravating factors
  - Relieving factors
- ♣ Discharge
  - Duration
  - Amount
  - Type-serous/serosanguinous/purulent/bloody
  - Foul smelling
- ♣ Fever
- ♣ Difficulty in sitting

Past History

History of similar complaints-Duration & no. of episodes

Associated with other medical / surgical illness.

Treatment History

Mode of intervention & no.of interventions.

Family History

Personal History

- Diet
- Appetite
- Sleep
- Health hazardous habits- Tobacco and alcohol consumption
- Bowel and Bladder habits

Obstetric and menstrual History- in females

Drug/allergy history

General Physical Examination

Vital Signs

Pulse	B.P.
Temperature	Respiratory rate

Cardinal Signs

Pallor Icterus Cyanosis Clubbing Lymphadenopathy Oedema

Systemic Examination

Cardio vascular system

Respiratory system

Central nervous system

Musculoskeletal system

Abdomen

Local Examination

- Inspection
  - Natal cleft
    1. Deep
    2. superficial
  - Sinus
    1. site
    2. number
  - Swelling
    1. Site
    2. Number
    3. Size
    4. Shape
    5. Extent
    6. Surface
    7. Skin
    8. surrounding area
  - Discharge
    1. Amount
    2. Type of discharge-serous/serosanguinous/purulent/bloody
    3. Associated with foul smelling
    4. Presence of hair

- Palpation
  - Local rise of temperature
  - Tenderness
  - Induration
  - Fibrosis

Examination of spine and pelvis

Per rectal examination

Clinical Diagnosis : Pilonidal sinus/cyst/abscess

Investigations

- Routine investigations- complete haemogram, Bleeding & Clotting time, random blood sugar, urine routine, renal function tests, viral markers- H.I.V./Hbs.Ag. and chest radiography/ electrocardiogram.
- Specific investigations:Wound swab for culture and sensitivity , MRI sacrococcygeal region with sinogram in selected cases

Treatment

- Group-A: Limberg Flap- duration of surgery
- Group-B: Excision with primary closure-duration of surgery

Post Operative period: in each group:

- Early post-op complications-bleeding/discharge/infection/wound dehiscence/nil
- Pod-1 and pod-4 pain score-0 to 10
- Day of pain free sitting
- Day of pain free toileting
- Day of suture removal
- Mean hospital stay
- Return to work or physical activity

Follow up

- At one month- healthy scar/hypertrophic scar/wound gaping
- At six months-nil/recurrence and patient satisfaction with scar.

CONSENT FORM

I, _____ voluntarily agree for the participation as a subject of study. By signing this consent form I am not giving up any of my legal rights, I may withdraw from the study anytime. I am signing this consent form after having read or been read form in vernacular language, including the risks and the benefits and having all my questions answered.

Subject Name : _____

Signature or Left Thumb Print of the subject :

Witness Name : Signature : Date :

Investigator Name : Signature : Date :

Place :

ஒப்புதல் படிவம்

பெயர் :

வயது :

பாலினம் :

முகவரி:

கோவை அரசு மருத்துவக்கல்லூரி மருத்துவமனையில் மருத்துவர் **அ.நவரெத்தின ராஜன்** தலைமையில் நடைபெறும் இந்த ஆய்வில் முழு சம்மதத்துடன் கலந்துகொள்ள சம்மதிக்கிறேன் .இந்த ஆய்வில் என்னை பற்றி விவரங்களை பாதுகாப்புடன் இந்த ஆய்வில் வெளியிட ஆட்சேபணை இல்லை என்று தெரிவித்துக் கொள்கிறேன் .எந்த நேரத்திலும் ஆய்வில் இருந்து எந்த நேரத்திலும் விலக்கிக்கொள்ளும் உரிமை உண்டு என்று அறிவேன் .

இடம் :

தேதி:

KEY TO MASTER CHART

Type of surgery:

1 Rhomboid excision with limberg flap
2 Excision with primary closure

Sex:

M Male
F female

Occupation:

1 driver
2 shop keeper
3 Engineer
4 students
5 Clerk
6 Agriculturist
7 Factory worker
8 Tailor

Symptoms:

1 Pain
2 intermittent discharge
3 swelling

Early post op complications:

1 bleeding
2 infection
3 Hematoma
4 discharge
5 wound dehiscence
0 nil

post operative pain score:

grades	score	
0	0	no pain
1	1 to 3	mild pain
2	4 to 6	moderate pain
3	7 to 9	severe pain
4	10	very severe pain

1 month follow up:

1 healthy scar
2 hypertrophic scar
3 wound gaping

6 month follow up:

1 nil
2 Recurrence

patient satisfaction with scar:

1 No satisfaction
2 Moderate satisfaction.
3 Complete satisfaction

S.NO	NAME	AGE	SEX	occupation	symptoms	Type of surgery	operation time (mins)	Early post op complications	pod-1 pain score	pod-4 pain score	day of pain free sitting	day of pain free toileting	suture removal (days)	mean hospital stay (days)	Return to the work (days)	1 month follow up	6 month follow up	patient satisfaction with scar
1	Prabanth	22	M	1	2	1	60	0	5	3	6	8	14	4	16	1	1	3
2	Yesvanth kumar	22	M	5	1	2	45	3	6	4	8	10	17	6	18	1	1	2
3	krishnaveni	35	F	8	2	1	70	3	4	2	5	9	13	5	14	1	1	3
4	karuppusamy	34	M	2	2	2	50	2	5	3	7	9	18	7	16	3	2	1
5	Arputharaj	37	M	1	1	1	65	0	6	3	6	9	15	4	17	1	1	3
6	Jayaram	23	M	1	1	2	40	2	7	5	8	10	19	6	20	2	2	1
7	Paulraj	37	M	1	2	1	75	4	5	3	7	9	13	5	15	1	1	3
8	Devnashmin	17	M	4	2	2	45	2	5	4	6	9	18	5	16	1	1	3
9	vijay	22	M	5	2	1	60	0	3	2	6	8	14	4	12	1	1	3
10	Rajgokul	23	M	2	2	2	50	2	6	4	7	9	18	6	19	1	1	2
11	Parameshwari	30	F	7	3	1	70	1	2	1	5	8	14	4	13	2	1	2
12	Manikandan	21	M	1	1	2	50	0	7	5	8	11	19	6	20	1	1	3
13	Amutha	38	F	8	1	1	65	0	4	2	7	9	13	4	12	1	1	3
14	Fazil	29	M	3	2	2	55	5	7	5	7	9	18	8	20	2	2	1
15	Ajith kumar	21	M	2	2	1	55	0	3	1	6	8	15	4	12	1	1	3
16	Venmugil	19	F	4	2	2	45	2	6	4	9	11	20	6	18	1	1	2
17	Syed Nisar	24	M	3	1	1	70	4	3	1	6	9	13	5	12	1	1	3
18	Yasmin sulithana	17	F	4	1	2	50	0	6	4	8	10	19	6	16	1	1	3

19	valarmathy	19	F	4	2	1	70	0	4	2	7	8	14	4	12	1	1	3
20	Sevanthi	19	F	4	2	2	40	2	5	3	8	10	18	6	17	1	1	2
21	Sathiyamoorthy	40	M	1	3	1	80	2	5	4	8	9	16	6	17	1	2	3
22	karunakaran	40	M	1	3	2	65	5	7	5	9	11	20	7	21	3	2	2
23	Abdul kadhar	38	M	1	3	1	65	2	3	1	6	7	14	5	16	1	1	3
24	Jithendra balan	19	M	4	2	2	45	2	8	5	8	11	19	6	16	1	1	3
25	balaji	31	M	3	1	1	70	0	4	2	7	8	15	4	13	1	1	2
26	Esther rani	39	F	6	2	2	50	0	7	4	7	9	20	6	18	3	2	1
27	karthick	32	M	7	3	1	65	0	3	1	6	8	15	4	13	1	1	3
28	marimuthu	33	M	1	1	2	40	2	5	3	9	11	17	8	19	1	2	2
29	karuppusamy	36	M	1	2	1	70	4	4	2	7	8	14	5	16	3	1	2
30	krishnan	37	M	6	3	2	45	5	6	4	8	10	18	7	16	3	2	1