

A comparative Study between Open Excision and Modified Bascom's Technique in Sacro- Coccygeal Pilonidal Sinus

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ABSTRACT:

BACKGROUND:

Pilonidal sinus is a common disabling disease of young adults involving the sacro- coccygeal area, in the natal cleft , consisting of one or more, usually non-infected, midline openings, which communicate with a fibrous track lined by granulation tissue and containing hair lying loosely within the lumen. Many of the standard surgical procedures are associated with a significant risk both of delayed healing and of recurrent disease.

OBJECTIVE:

The study aimed to comparing the results of excision and packing method with those of lateral approach (Modified Bascom's procedure) in the treatment of sacro - coccygeal pilonidal sinus in regard to the hospital stay, time required for complete healing , time required to return to daily job or activity, early complications (infection, wound hematoma or seroma) and late complications (scar and recurrence) .

METHODS :

Eighty patients were operated on electively for pilonidal sinus, (62) male, (18) female who underwent elective operations of sacro-coccygeal pilonidal sinus at AL-Karama Teaching Hospital between June 2009 - June 2014 . Two surgical procedures were carried out, excision and packing (40 patients, group A) and modified Bascom's procedure (lateral approach) (40 patients, group B)" Five patients omitted from further follow 'up, two cases related to excision and packing and three of modified Bascom's procedure .

RESULTS :

It has been found that the third decade of life is the most frequent age group at which patient presenting symptoms was discharge (61.2%) and pain (26.2%) although both present in combination in most cases' 75% and 52%) of patients had discharge and pain respectively during the presenting period . The duration of the disease was from one month to two years.

It has been concluded that there was no significant difference in the occurrence of the early complication (infection , seroma / hematoma) 25% for group A and 37.5% group B, and recurrence rate 10.5 % for group A and 16.2% for group B , thus patients in group B provided a significantly quicker healing time { mean 49 days for group A and 28 days for group B }.

Shorter time - work { mean 47.8 days for group A and 28 days for group B } with better patient convenience (more pain free period), needs only simple oral analgesia , no patient needed hospital admission for pain control no dressing required and less risk of wound break down .

CONCLUSION :

The study had shown that modified Bascom's procedure for pilonidal sinus is safe and feasible as day-care surgery and is associated with potential cost saving.

KEYWORDS: pilonidal sinus, modified bascom's procedure , sacro- coccygeal .

INTRODUCTION:

The word pilonidal means a nest of hairs. A pilonidal sinus is a sinus that contains a tuft of hairs. However , the condition can occur without hairs ever being demonstrated ⁽¹⁾. These sinuses are commonly found in the mid-line skin

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covering sacrum and coccyx. They have been found elsewhere , sometimes between the fingers in hair dressers , and at the umbilicus ⁽¹⁾ .

Pilonidal disease is a common perianal disorder with a population incidence of 20–30 per 100 000. It is characterized by chronic inflammation in one or more sinuses in the mid-line of the natal cleft that contain hairs and debris ⁽²⁾. It is a common affliction among the military, it has been referred to as 'jeep disease' ⁽³⁾.

Perianal pilonidal disease is more common in males than females, and affects around 2% of the

population between the ages of 15 and 35. However, it is very rare after the age of 40, suggesting that there is an aetiological relationship with age and skin character. The disease is vanishingly rare before puberty, when sex hormones act on hair follicles and sebaceous glands⁽²⁾.

There is enlargement of a hair follicle, which allows the accumulation of extraneous hairs that are caught in the natal cleft itself. A foreign-body reaction is set up, with the result that there is a chronic discharging sinus that attracts other debris and hairs⁽²⁾.

A sedentary occupation, particularly where sweating is common, is a predisposing factor. The condition was described in large numbers of American troops in the Vietnam war, owing to the use of Jeeps in the warm climate⁽²⁾.

The typical pilonidal patient is a hirsute young man problem, who spends prolonged period of time sitting in moving vehicles, this does not mean, however; that women are immune to the pilonidal disease, as attested by the fact that 25% of patients who suffer from pilonidal disease are women.

The exact pathogenesis of pilonidal disease remains elusive and controversial, hair seems to play a central role in the process of infection and perpetuation of granulation tissue in sinuses. This is consistent with the clinical observation that pilonidal patients are often hirsute and that pilonidal disease rarely occurs in those with less body hair⁽⁴⁾.

A sacro-coccygeal pilonidal sinus⁽⁸⁾ consists of a sinus tract situated at a short distance behind the anus and generally containing hairs. It involves sacro - coccygeal area, but also reported in axilla, inter- digital cleft⁽⁵⁾ umbilicus^(5, 8) inter mammary; nose, and the neck.

This problem is a wide scale problem that consumes a lot of health - care money and result in a large loss of productive time.

Etiology

There is a long-standing unresolved argument about the cause of the disease and the source of the hairs. A pilonidal sinus is lined by granulation tissue and not skin and there are no hairs growing within it. In fact, the hairs in the sinus are short, broken pieces of hair that often come from the scalp. A reasonable theory of the aetiology of pilonidal sinus is that the midline skin in the buttock cleft is tethered to the periosteum of bone. In walking, the motion of the buttocks on either side results in hairs getting sucked into a pre-existing dimple in the skin or actually piercing the normal skin. They then act

as foreign bodies and cause chronic infection. The end result is a chronic abscess which contains hair and which flares up at frequent intervals into an acute abscess⁽¹⁾.

The acquired theories of development are better accepted than the more historical congenital theories, exact mechanisms of development are speculative. Evidence that supports the acquired theory of origin of pilonidal sinuses can be summarized;

- 1 Interdigital pilonidal sinus is an occupational disease of hair dressers, the hair within the interdigital cleft or clefts being from the customers. Pilonidal sinuses of the axilla and umbilicus have also been reported⁽³⁾.
- 2 The age incidence of the appearance of pilonidal sinus (82% occur between the ages of 20 and 29 years) is at variance with the age of onset of congenital lesions⁽³⁾.
- 3 Hair follicles have almost never been demonstrated in the walls of the sinus⁽³⁾.
- 4 The hair projecting from the sinus are dead hairs, with their pointed ends directed towards the blind end of the sinus⁽³⁾.
- 5 The disease mostly affects men, in particular hairy men⁽³⁾.
- 6 Recurrence is common, even though adequate excision the track is carried out⁽³⁾.

Pathology

The sinus extends in to the subcutaneous planes as track. Branching side channels are not infrequent⁽¹⁾. The most constant finding is the presence of one or more mid-line pits lined by squamous epithelium in the sacro-coccygeal area, and each depression contains single hair follicle. In addition loose hair will usually be found in a sinus track. The sinus wall may be lined with either granulation or squamous epithelium. The inflammation usually proceeds in a cephalad and lateral direction; often form a secondary pit and openings⁽⁸⁾. A foreign body giant cells are common to be seen and it's said that the condition is merely one form of giant cell granuloma.

Carcinoma arising in chronic pilonidal disease has been described, but is exceedingly rare⁽²⁾.

Microbiology

Aspirate of pus from the infected sinus has shown anaerobic growth in the two third of patients (77%) mostly bacteroides and anaerobic streptococci. Aerobic in (4%) mostly E. coli, proteus and pseudomonas. Mixed growth of both aerobes and anaerobes in (19%)^(8,9).

Clinical features

The common symptoms are pain and a discharge, which develop when an abscess forms in the sinus tract. The pain may vary from a dull ache

to an acute throbbing pain , and the discharge will vary from a little serum to a sudden gush of pus . An acute abscess may be the first sign of the disease⁽¹⁾ .

Patients with pilonidal sinus may ask medical advice about asymptomatic pits or pores in the natal clefts. Tenderness after physical activity or along drive that requires the patients to sit for a long time are common presentations⁽⁴⁾ , 20% of patients present with pain, swelling and purulent discharge at the time of initial attack, fever and leucocytosis are less common finding. 80% of patients with pilonidal disease present with moisture and discharge and occasional bleeding⁽⁴⁾ .

The primary sinus may have one or as many as six openings. Typically, a tuft of hair projects from the mouth of the sinus, the discharge is foul smelling, serous and / or purulent; often blood stained and may contain hair. The primary sinus strictly lies in midline between the level of sacro-coccygeal point and the tip of coccyx .It usually passes upward and forward toward the sacrum and dose not reach the bone and end blindly near it .

Secondary laterally tracks with granulation tissue may follow the formation of an abscess which might point and burst or incised to one side of the midline^(3, 10) .

Treatment options

Many different approaches have been put forward, ranging from a conservative treatment⁽¹⁾ to an extensive surgical excision. However, incision and laying open of the sinus tracts is still a preferred practice amongst majority of surgeons⁽⁷⁻¹¹⁾ . Many of the standard surgical procedures are associated with a significant risk both of delayed healing and of recurrent disease⁽⁷⁾ .

patient reporting for the first time with mild symptoms can sometimes be cured by conservative measure⁽³⁾ , which consist of cleaning out the track, removing all hairs from the area, followed by frequent washing of the parts with the detergent arid water and long sitting e.g.: driving a car is avoided if possible, these measures are tried on a large scale in different armies.

No treatment of pilonidal sinus disease is perfect, and many procedures have been described for the management of symptomatic pilonidal sinus, none of which judged by the yard stick of the primary healing and the recurrence of the disease are perfected⁽¹²⁾ .

Limited excision

Described by lord as an out - patient treatment by local excision of skin ellipse containing sinuses,

probing and brushing of the sinus track with circle excision of the external opening and daily post-operative shaving of the perineal region^(13, 14) . Healing takes an average of (40) days, berg had a similar method with mean healing time 42 days⁽¹⁵⁾ .

Laying open the track.

Both sinuses and abscesses were 'laid open' under general anesthesia in the left lateral position the sinuses was probed to outline the tract. Once the tract were opened, acutely angled skin edges between the tracts was trimmed, but otherwise no tissue was excised. All granulation tissue and hair were removed and the base of the sinus was abraded with gauz , wound was packed, the pack was removed on the second post-operative day and patient were discharged from hospital when they felt that packing was tolerable without analgesia⁽¹⁶⁾ . Result of different reports showing healing time 43 days. Average healing time is nearly similar (36) days with the use of cauterization of the cavity by diathermy⁽¹⁷⁾ , phenol⁽¹⁸⁾ , and silver nitrate⁽¹⁹⁾ , or freezing .

Excision and primary closure.

Is an attractive alternative because of the potential benefit of rapidly healing wound .the technique is especially useful in the case of large , complex and recurrent pilonidal cysts.

Advantage of this method is to avoid an open wound, greater convenience for patient, primary healing was achieved within (2) weeks in over (90%) of patients⁽¹⁰⁾ . Other studies reported the healing time was in (70%) of patients.

Wound infection in (20%)⁽⁵⁾ , recurrence rate (20 - 25%), skin flap procedure, (e.g.Karydakis procedure), is a symmetrical closure and the aim is to flatten natal cleft and keep scar away from the midline. To shorten the duration required for healing in asymmetrical closure technique, some surgeons used special dressing material such as silicone foam sponge dressing or collagen sponge containing gentamicine⁽²⁰⁾ .

Wide and deep excision the sacrum

Excision of all tissues between the skin and the presacral fascia. The theory behind this technique, apertures and tracks are eradicated along with the surrounding low grade sepsis.

Healing time from (31) to (90) days if the wound left opened⁽²¹⁾ , but if the wound partially closed by attaching the skin edge to the peri-sacral fascia (marsupialization) the healing time reduced to (27) days⁽¹⁰⁾ .

Modified Bascom's procedure (lateral approach)

Because midline wounds in the region heal poorly, some surgeons recommend using an

incision *lateral* to the intergluteal cleft⁽²²⁾. And this procedure preferred in pilonidal abscess and cellulites.

The patient lies prone and local infiltrative anaesthesia is satisfactory. The buttocks are strapped apart. Each pit is excised with the pointed no. 11 blade, removing a diamond-shaped piece of skin no larger than a rice grain, but to include the epithelialized portion of the pit which extends down for 2–3 mm. An incision of 2–3 cm in length is then made approximately 2 cm from the midline. A probe introduced into a pit may act as a guide as to which side to make this lateral incision if there is no other evidence of previous lateral infection. The incision is positioned so that it is alongside the area of the cleft in which the puncti are present⁽⁷⁾.

This incision serves three functions⁽⁷⁾;

First, it is used to enter the sinus system and curette out all hairs and infective granulation tissue.

Second, through it the midline skin is released from its tethering to the post sacral fascia, and the depth of the natal cleft is reduced.

Third, as the incision is left open, it relieves any tension on the subsequent closure of the pits.

The buttock strapping is then removed to relieve tension and each pit excision closed with a 5/0 subcuticular nylon suture.

The remaining steps described in the original Bascom procedure are omitted, in which a fibrofatty flap is rotated under the midline skin. A wick soaked in iodine is simply tucked into the lateral wound so that it lies under the midline, and is removed after 48 hours. A course of antibiotics is given, the pit closure sutures are removed at 1 week, and healing of the lateral wound is usually complete by 2 weeks⁽⁷⁾.

Techniques involving skin flaps (Karydakias flap & Limberg flap) .

when excision has resulted in tremendous volume of being sacrificed , rotational flap to cover a sacral defect being used to keep the scar away the midline and flattening natal cleft contour, and therefore , reducing skin friction and accumulation of hair and debris^(4,14). Complications are loss of skin of patients and flap in 50% of patients and flap tip necrosis⁽²³⁾ (16) days (29).

PATIENTS AND METHODS

Over a (60) months periods, (62) male (18) female patients were studied prospectively in the surgical unit of AL- KARAMA TEACHING HOSPITAL during the period between (June 2009 -June 2014) . All under elective operation for pilonidal sinus. Their age range was (18-42)

years (mean age was 29.7 years) random study of patients has done.

The patients were admitted at the day of operation and positioned prone with the buttocks strapped apart. To localize the extension of the tract probing was used followed by elliptical incision so that all tissues between skin down to the sacral area was excised with all lateral tracts so as to ensure removal of all the possibly involved tissue. Haemostasis was secured by cauterization. This was applied to forty patients (group-A) who underwent wide local excision and tight packing the packs usually were removed the day after operation and a loose pack left inside the wound leaving it to heal by granulation tissue and secondary intention.

Another forty patients underwent lateral approach (Modified Bascom's procedure) under local anaesthesia, (10) patients (25%) need supplementary intravenous sedation. Day case treatment was planned for all patients.

The mean duration of symptoms for all eighty patients was (1.4) year (18) patients had only one or two midline pits, the remainders (62) patients had a more complex disease with several midline pits. Of these (62) patients (15) patients had a lateral discharging since as evidence of a chronic abscess. In two patients of total (40) patients who underwent Modified Bascom's procedure, the anaesthesia changed from the local to general, one of them refuse local anaesthesia, the other because of intractable pain.

RESULT:

The study aimed to comparing the results of excision and packing method with those of lateral approach (Modified Bascom's procedure) in the treatment of sacro - coccygeal pilonidal sinus in regard to hospital stay, time required for complete healing , time required to return to daily job or activity, early complications (infection, wound hematoma or seroma) and late complications (scar and recurrence) .

1. Age incidence

The age range was between (18-42) years with mean age of (29.7) years. In (age < 10 years) there was nil patients , (age 11-20 years) only 5 patients , (age 21-30 years) 46 patients, (age 31-40 years) 27 patients , and (age > 40 years) only 2 patients .

2. Clinical presentations

The main presenting symptom was discharge (49) patient ; sero - sanguineous or bloody discharge (30) patients purulent discharge (19) patients. It is important to note that almost all patients with long standing disease (> 1 year) gave a history of having purulent discharge

during sometime in the history for which they might or might not receive treatment until the condition changed into chronic state.

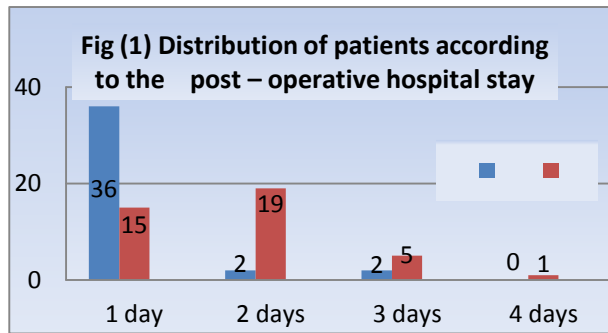
Although (30) patient the discharge was not the main presenting symptom as an additional to the presenting one or had a history of such discharge during the presented duration . The main presenting symptoms was discharge (49) patients , pouting granulation (10) patients , and pain occurs in (21) patients .

3. Duration of the disease

The duration of the disease ranged between (1) month and (2) years .Where (36) (45%) of patients in (< 1 year) , (30) (37.5%) of patients in between (1- 2 year) ,and (14)(17.5%) of patients in (> 2 year).

4. post - operative hospital stay

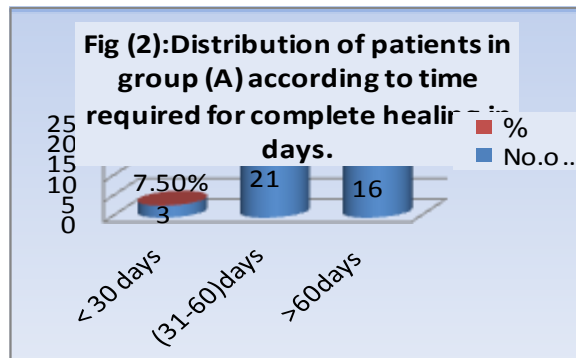
In group (A) , most the patients stay for (2) days post – operative in hospital 19 (47.5%) Patients ; while in group (B) most the patients stay only for one day 36 (90%) post - operative . Where , 15 (37.5%) patients in group (A) , and 36 (90%) patients in group (B) stay for (1) day post – operative in hospital , 19 (47.5%) patients in group (A) , and 2 (5%) patients in group (B) stay for (2) days , 5 (12.5) patients in group (A) ,and 2 (5%) patients in group (B) stay for (3) days ,and only1(2.5%) patients in group (A) , and nil patient in group (B) stay for (4) days post –operative in hospital .



5. Time required for complete healing

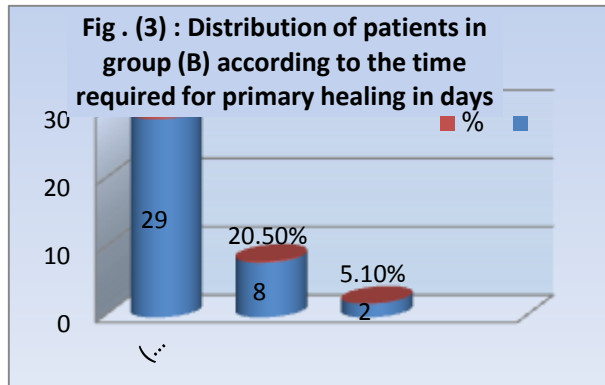
The time required for complete healing in group A, between (30-90) days. (21) 52,5% patients were in range of (31-60) days the mean healing

time was (49) days. (3)7.5% patients in less than 30 days ,and (16) 40% patients in greater than 60 days .



While in group B ; lateral wound healed at mean (28) days range between (7-60) days.

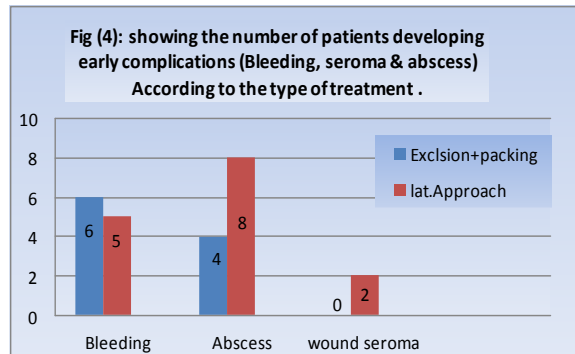
(29) 74.3% patients were in range of (7-14) days. (8)20.5% patients in in range of (15-30) days,and (2) 5% patients in greater than 30 days .



6. The occurrence of early complication

In group A. bleeding occurs in(6) patients stop spontaneously by applying pressure, abscess was patients and was treated by drainage under local anaesthesia while wound seroma didn't occur in any patient .
 In group B. Bleeding occur in (5) patients stop spontaneously with pressure. This complication may more frequent with intra - operative use of

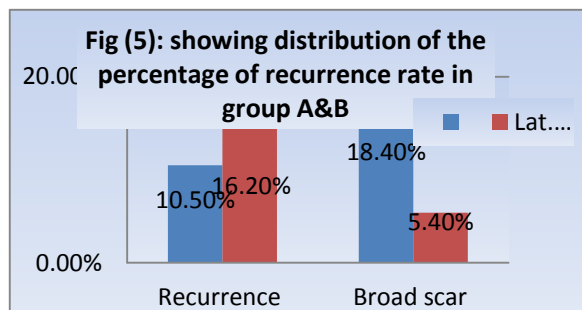
dilute adrenaline solution. Abscess was seen in 8 patients mostly due to early closure of lateral wound, abscess was treated by re-opening lateral incision under local anaesthesia - while wound seroma was present in 2 patients.
 Bleeding ,occur in 6(15%) in group A, 5(12.5%) in group B . while abscess occur in 4(10%) in group A, 8(20%) in group B . and wound seroma ,there was no seroma in group A , and 2(5%) in group B .



7. The occurrence of late complication

The recurrence of pilonidal sinus occurs in 4/38 (10.5%) Of group A , and in 6/37 (16.2%) of

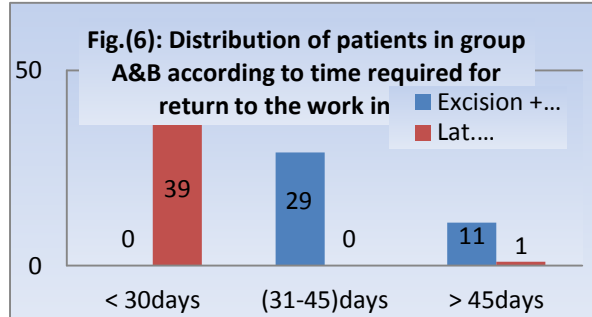
group B. Broad scar occurs in 7/38(18.4%) of group A ,and in 2/37(5.4%) of group B .



8. Time required for return to work

For group A, the maximum time required for the patients to return to work or full daily activities was between (30-70) days (mean 47.3 days).

While , for group B , the maximum time required for the patients to return to work of full daily activities less than (30) days from the operation (mean 18.7 days) with much better convenience and pain free periods .



9.Occupation

The pilonidal sinus most commonly occurs in drivers (16) 20% ,militarys (10) 12.5%, typists (8) 10% , tailors (7) 8.75% , self- employers (7) 8.75%, teachers (6) 7.5% , house wives (5) 6.25%, hair dressers (5) 6.25% , students (4) 5% , farmers (3) 3.75% , engineers (3) 3.75% , carpenters (2) 2.5% , builders (2) 2.5% , bakers (2) 2.5% 2.5% .

DISCUSSION :

A pilonidal disease is an illness which appear in younger population (second and third decades) dominantly in male and especially in hairy, pilous persons ⁽²⁴⁾ .

Male predominance was a fact in all studies although the ratio differ from place to place as it was male patients admitted to England hospital in 1985, 4:1 in studies performed in USA on California universal Students involved by this condition ⁽²⁵⁾ .

In our study (62) male and (18) female ; (Male: female 3.4:1) . Most patients present in the third decade of life , the age at which sex hormone is known to maximally affect pilo-sebaceous glands⁽²⁶⁾ . Pain (26.2%) and discharge in (61%) of patients were the main presenting symptoms which were identical to the other studies (34% and 78%) respectively ⁽¹⁰⁾ . However combination of symptoms with the presence of discharge during some period in the history is detected in (75%) of patients and pain in (53%) of patients .

The duration of symptoms before reporting to hospital was (2) years. During this period all patient consult a doctor about treatment, with relative loss of income with multiple course of medical treatment .

Regarding to occupation, most of them are drivers (16) patients who needs to sit for

prolonged period of time which is a fact supported in this study and other studies .

Regarding hospitalization ;(19) patients of group A patients were discharge within (2) days of the operation while for group B , most of the patient (36) patients discharged as day case at the same time of operation.

In (6) patients, with group (A) had post – operative bleed was stopped by local pressure. Another (5) patients in group (B) develop bleeding, mostly due to use of intra - operative diluted adrenaline, which cause vaso-constriction and after the operation, vaso - dilatation occurred which lead to development of bleeding in some patients .

Only four patients developed abscess in group (A) responding to simple drainage and broad spectrum antibiotics. In group (B), (8) patients developed abscess most probably due to early closure of lateral approach, were treated by re-opening the lateral wound. Wound seroma occurs only in group B, (2) patients, which respond to frequent change of dressing .

The use of vacuum suction drainage has been shown to be effective in preventing sepsis and haematoma ⁽²⁷⁾ as it is important dominator in failure of the approaches, it has also been stated that meticulous attention to haernostasis and the use of subcutaneous fat stiches to minimize subcutaneous cavity has similar results ⁽⁹⁾ .

Early complication (seroma, abscess formation) were slightly but not significantly lower in group A, than group B .

The mean time needed for healing in group A (49 day) ; mean duration needed for returning usual work capacity was (47.3 days) in group A. In group B, the average primary healing time of

(28.7) days and returned to fully work capacity within a period of (25 ± 5) days with lesser or no pain and in convenience .

Recurrence rates for group A and group B were (10.5%) and (16.2%) respectively within follow up period ranged from (10 – 60) months. The recurrence rate increase with the length of follow up after treatment, it has been reported that the majority occur with (3) years⁽¹⁰⁾ .

CONCLUSION :

The ideal therapy for pilonidal sinus disease should be simple, should inflict minimal pain, need a short hospitalization, have a low recurrence rate, require minimal wound care, and allow early return to normal activity.

Shorter hospital stay, earlier healing, shorter time off work , and lower pain perception are the main advantages of Modified Bascom's procedure (lateral approach) relative to wide excision with Laying open in pilonidal sinus surgery.

The recurrence rate following open method of treatment is less than after Modified Bascom's procedure. There is no much difference between group A and group B regarding occurrence of complications.

REFERENCES:

1. Norman L. Browse , John Black , Kevin G. Burnand , William E. G. Thomas ; Pilonidal Sinus ; Browse's Introduction to the Symptoms and Signs of Surgical disease ; fourth edition ,2005;463-64 .
2. James O.Garden ,Andrew W. Bradbury , John L. R. Forsythe , Rowan W. Parks; Pilonidal disease, Principles and Practice of Surgery , 6th edition , 2012;277 .
3. Norman S. William , Christopher J.K.Bulstrode & P. Ronan O'Connell; pilonidal sinus ; Bailey & Love's Short Practice of Surgery; 26th edition , 2013;1244-45.
4. Townsend M.Courtney, Beauchamp R. Daniel, Evers B. Mark, Mattox L. Kenneth; Pilonidal disease ; Sabiston textbook of surgery: the biological basis of modern surgical practice ; 19th edition 2012: 1396 - 97.
5. Stoll; Pilonidal sinus self -Help Page, Surgical Tutor; 2001; Nov., (cited from the internet)
6. Ohtsuka H. Arashirok And Watanble T., Pilonidal Sinus Of the Axilla. Rreport of five patients And Review of the literature, Ann plas Surg.; 1994;33: 322-25 .
7. Farquharson Margaret, Moran Brendan; Pilonidal sinus; Farquharson's textbook of operative general surgery; 9th edition, 2005;456 –57 .
8. Steven D.Wexner; the pilonidal Disease Treatment , David E.Beck & Davide R.Wellings , patient care , in colo- rectal surgery 3rd edition, 1991:255-65.
9. Richardson H.C; Intermammary Pilonidal Sinus, Br.J. Clin Pract. 1994 ; 48: 221-22.
10. Alien- Mersh T.G. pilonidai sinus finding the right track for treatment, Br. L surg., 1990; 77:123-32.
11. Fatal -M, R , Bassini L, Nashad R.etal. interdigital Pilonidal of The hand , a granuloma, AnnHand Surg. 1990;15.
12. Samar J.A1 Hamod, Alaa S. Abdul- Jabbar, Management of Sacro- coccygeal pilonidal disease, Saudi Med. J.; 2001;22: 762- 64.
13. . M.A.R, AL- fallouji, Pilonidal Sinus Surgery, Post-Graduate Surgery, The candidate guide Second edition ,Butterworth - Heinmann, 1998 :284-85.
14. Lord P.H and Millar D.M₅ Pilonidal Sinus A simple treatment, Br. J. Surg. 1977; 4: 867- 71.
15. Maurice, B.A. and Greenwood R.K., Aconservative treatment of Pilonidal Sinus, Br. J.Surg. 1964; 51: 510-12.
16. Samar J.A1 Hamod, Alaa S. Abdul- Jabbar, Management of Sacro- coccygeal pilonidal disease, Saudi Med. J.; 2001;22: 762- 64.
17. Shafik A.Electro- cauterization In The treatment of the Pifcnidal Sinus, Int.Surg. (cited from the Medline, abstract). 1996; 81:83-84.
18. Cimarelli S. Magnano- G. treatment of Pilonidal Sinus by phenol injection, Minerva. Chir, (Cited from Medline-abstract).1989; 44,1131-34.
19. Biegeleisen H.L. Sclero therapy for Pilonidal Sinus Alilf! Surg. 1998;137:112-14.
20. Vogel P. and Lenz J., Treatment of Pilonidal sinus with Excision And Primary Suture Using Local Resorbable Antibiotic Carrier results of a prospective randomized study. chirurg, 1992 ;63: 74&-53.(cited from the , Mmedline, Abstract).
21. Senpati , Cripps NPJ, Thompson M,R , Bascom's operation In The Day- Surgical Management Of Symptomatic pilonidal Sinus , Br. J. Surg. ,2000 ;86:1067-70.

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22. Brunicardi F.Charles , Andersen K. Dana, Billiar R. Timothy, Dunn L. David, Hunter G. Jahn , Matthews B. Jaffrey & Pollock E. Raphael ; Pilonidal disease; Schwartz's Principles of Surgery; ninth edition, 2010;1067-68.
23. Jimenez Romero, Alcaidem , Martin F.jet.al. Treatment of pilonidal Sinus By excision And Rhomboid Flap. Int J. Colo-rectal Disease..(cited from The Medline, abstract). 1990; 5:200-2.
24. Rukavina B; Omergic H., Radical Treatment of pilonidal Sinus, Acta chir. Logusl, (cited from The Medline, abstract) 1989;36:287-93
25. Zimmer E.Z and Bronshtein M.Early Sonographic Findings Suggestive of Human fetal Tail, Prenatal Diag., 1996;16:360-62.
26. Alien- Mersh T.G. pilonidai sinus finding the right track for treatment, Br. L surg., 1990;77:123-32.
27. Williams Rs., A simple Technique for Successful primary Closure After Excision of pilonidal Sinus Disease , Ann R. coll Surgery Eng., 1990;72:313-14.