The Summary

Pilonidal sinus disease is considered as a chronic, intermittent, inflammatory process rarely occurring in congenital cases as extensions of sinus and dura to neural canal. Lately the theory for congenital etiology has been superseded by a theory involving hair insertion to the natal cleft.

A deep natal cleft is an environment favoring sweating, hair penetration, and bacterial contamination. During walking, the buttock movements help hairs to penetrate the skin and cause a foreign body reaction and infection. This gradually leads to pilonidal abscess and/or sinus formation.

Pilonidal sinus disease occurs more often in adolescent or young males. Indeed in most reports there is a male preponderance, which is a further indication supporting the theory for acquired etiology, and the mean age is close to 26 years old.

There is also an increased incidence in Caucasians and decreased in African and Asian races. It is encountered more frequently in obese patients due to increased perspiration and gluteal friction and in patients with poor hygiene and local hirsutism.

The history of surgical therapy of pilonidal disease now dates back to more than a century, But there is considerable controversy regarding the optimal treatment of this common disease. Surgical interventions are generally preferred against conservative treatment. However, a long list of surgical techniques reflects the inability to find an efficient mode of treatment approved by all surgeons. Excision of the diseased tissue down to the presacral fascia is generally accepted, but the management of the remaining space is still a matter of debate.

Ideal operation for pilonidal sinus should be Minor surgery (Minor surgery ~ Day case - Day case ~ Local anaesthesia - Local anaesthesia ~ Few complications - Few complications ~ Minimal time off work - Minimal time off work ~ Low failure rate - Low failure rate ~ Low recurrence rate).

Excision and primary closure is a safe operative procedure for uncomplicated cases. It is found better in terms of short hospital stay, less postoperative time off work, quick healing. Complicated, complex or recurrent pilonidal sinuses require more aggressive treatments such as Rhomboid flaps, skin grafting, Z plasty or gluteal myocutaneous flaps etc.

Primary suturing after resection leads to a resultant dead space, which is actually a continuing natal cleft. This predisposes to infectious complications and a high recurrence rate approaching 20 %.

Other conventional methods, such as the "lay open" technique with continuous cleansing of the wound and packing until granulation occurs, and the "semi-open" techniques, i.e., closing the wound with partial sutures and marsupialization, are all associated with long-term wound care and high rate of recurrence.

Hodgson and Greenstein reported that cases treated by drainage or excision with marsupialization had a recurrence rate of 40 %. Others reported that marsupialization is associated with a lower recurrence rate of 1.2 %-8 %, but a long healing period of 3-5 weeks. In addition, patients complain of increased pain in the wound area, especially if the closure of the defect has been done under tension. Also, the large areas of scar tissue in the open or semi-open techniques may cause tension, especially on setting, even years after surgery.

Excision of pilonidal sinus and closure by advancement gluteal fasciocutaneous flap, which was initially described by Holman in 1946 and then modified by Stanley in 1972 but is not widely practiced. This procedure removes the pathology and deals the etiological factors by strengthening and leveling the natal cleft. The main complication of the

flap technique, which is not a completely tension-free repair, was wound breakdown, which improved with wound care. Stanley found no recurrence on application of this procedure.

To decrease the incidence of recurrence many procedures have been developed to avoid the midline sutures like "D" excision which is described by Mann and Springall. It is a surgical technique of elliptical incision and primary wound closure. The overall success rate is 80%.

Since most recurrences occur in the intergluteal sulcus, methods that flatten the intergluteal sulcus would eradicate the etiology and eliminate the risk of recurrence. Complete closure of the defect without tension is only provided by reconstructions such as the Z-plasty, the W-plasty, the V-Y plasty, and fasciocutaneous advancement flaps, such as the Karydakis and Limberg flap reconstruction.

Flap surgery enables the surgeon to excise tissue as widely as required, and then to close the defect using a reconstructive procedure, another important issue is wound tension. A tension-free suture improves patient comfort and shortens hospital stay. In this regard, flap procedures have all these advantages.

The Z-plasty technique has been described by Monro and McDermott in 1965.This was one of the first efforts to eliminate the

causative factors of the disease. However, this technique had a quite high recurrence rate (1.6%- 10 %), as well as flat tip necrosis in 20 % of cases.

The W-plasty technique has been introduced by Roth and Moorman in 1977, but it also has a quite high recurrence rate (0-16.7 %).

The V-Y flap technique was first described by Khatri, and was modified later by Schoeller et al. This technique was based on the use of an elliptical excision with closure of the defect through unilateral or bilateral advancement of the flap. The Schoeller modification was based in deepithelialization of the medial flap and an attempt at destroying all hair follicles and skin glands near the natal cleft, an aggressive procedure against recurrence, the complication rate is between 0% and 17%, recurrence rate is 0%. It is recommended for complicated and recurrent cases.

Karydakis used an asymmetric excision and closure with an advancement flap to avoid hair penetration into the natal cleft. Since the incisional scar has been transferred laterally from the midline the recurrence rate with this technique was quite low < 1%, and the mean hospital stay was 3 to 4 days.

Bascom, on the other hand supported that the actual source of the disease are the hair follicles and proposed another alternative technique

comprising excision of hair follicles and a lateral drainage. Bascom reports a 100% healing rate after minor revisions or a second cleft lift in 9–10% of his patients with refractory pilonidal sinus.

Closure of the defect with a rotation flap was described by Nessar et al . in 2004. The technique seems to be similar to elliptical rotation flap at first glance. However, it creates a line of tension along the radius of the arc that may be associated with the risk of decreased blood supply to the flap. It has an 8% recurrence rate in the Cherry study and no recurrence (0%) in the Nessar study.

All the above reconstruction techniques are not generally indicated in patients with extensive or complicated pilonidal disease.

The rhomboid transposition flap was introduced by Dufourmentel in 1963 to cover skin defects and then was introduced in the treatment of pilonidal disease by Azab et al in 1984. The use of rhomboid excision and closure of the defect with a gluteal transposition flap, the so-called Limberg flap, has gained growing attention in the recent year as a means to manage complicated or recurrent pilonidal sinus disease.

The Limberg flap repair has several advantages: it is a very efficient method to flatten the natal cleft and with simple modifications it may displace the incision scar from the midline. Thus skin maceration

and debris accumulation is diminished and sweating resulting from frictional movements of the buttocks is decreased. The recurrence rate is very low (0-7 %).

Since most of these recurrences occur in the midline, a modification of the Limberg flap technique has been used by several authors. No flap ischemia or necrosis was noted. The above results are equivalent or even better than the ones reported elsewhere. No recurrences were detected. A zero recurrence rate for the modified Limberg flap procedure is also reported by Mentes, Cihan and Tekin. The modified Limberg flap technique, since it is now considered as the most reliable technique.

The Limberg procedure has been proven to be a safe and advantageous technique in the treatment of complicated/ recurrent pilonidal sinus disease.

Radiofrequency pilonidal sinus excision has been reported that simpler treatment methods of pilonidal disease not only carry less morbidity, but also are associated with a lower recurrence rate. Technique of sinus excision by radiofrequency aims to remove the sinuses and the unhealthy tissues only, which causes minimum damage to the surrounding healthy tissues.

YAG and ruby lasers have been used in treating pilonidal disease and are reported to reduce pain and length of hospitalization and to facilitate early return to work in a similar way to the radiofrequency excision.

The radiofrequency instrument has almost all the advantages of the laser instruments without the attending disadvantages such as the risk of misdirected reflected beams, the prolonged healing period involved, and the high cost of treatment.

Another advantage of radio surgery is the availability of malleable electrodes that could be selected to suit the exact requirements of any surgical position. This is found to be of great help especially when working on a cavity of the pilonidal sinus in the presence of offending tissues.

Management algorithm of pilonidal sinus

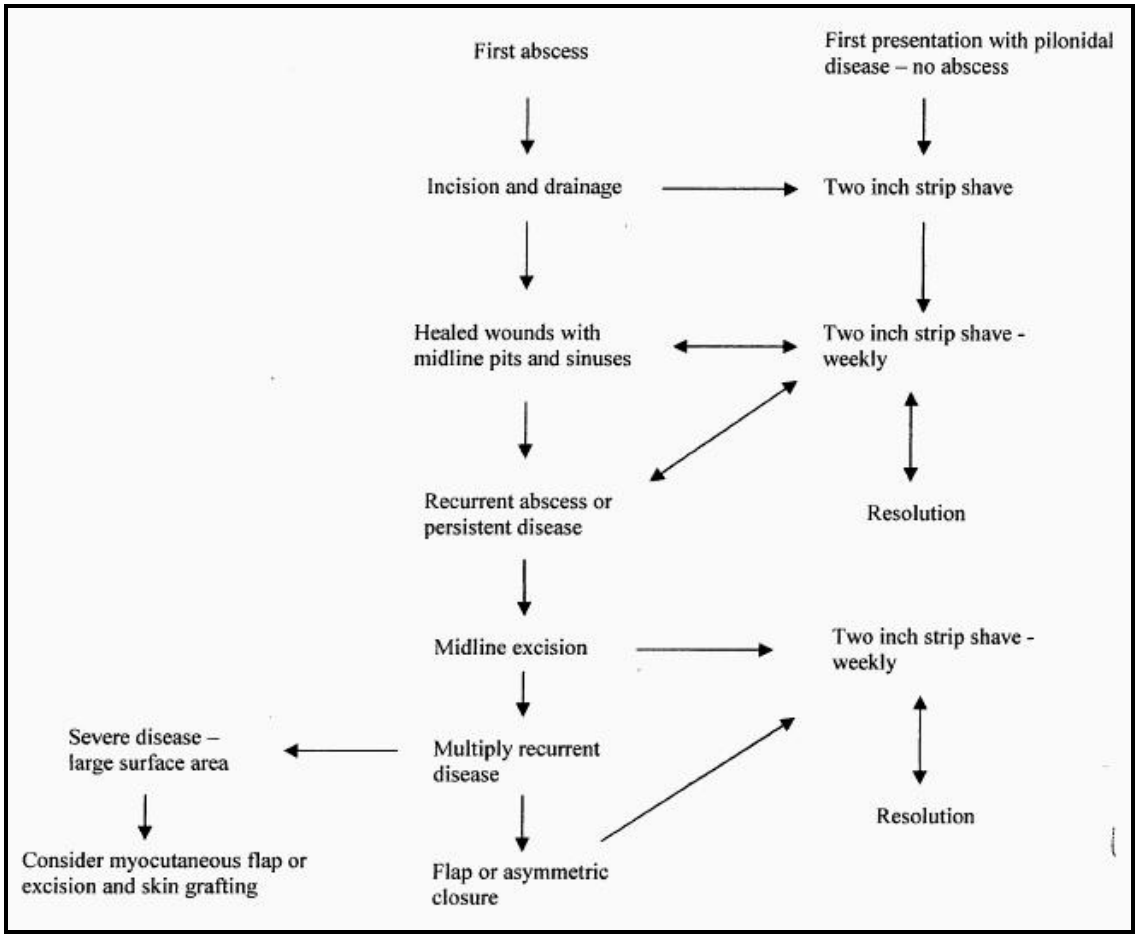

Table 4. Various types of flap techniques and their results

Operation	Flap type	Year	Patient number	Drain	LOH (days)	Follow up (years)	Morbidity %	Recurrence %
z-plasty	Transposition							
- Monro &McDermott		1965	20	Yes	21	-	-	0
- Toubanakis		1986	110	yes	-	1-10	0	0
w-plasty	Transposition	1977	12	yes	5.7	-	-	8
- Roth &Moorman								
Asymmetric incision	Advancement							
- Karydakis		1992	7471	No	3	2-20	8.5	<1
- kitchen		1996	141	No	4	2	9	4
Mann&Springall		1987	30	yes	17	-	20	0
Rhomboid-Dufourmental	Transposition							
- Azab		1984	30	Yes	10	0.5-3	20	0
-Milito		1998	67	yes	5.3	6	3	0
Limberg flap -Urhan	Transposition	2002	110	No	3.7	2.9	6	4.9
v-y flap	Advancement							
- Khatri		1994	5	Yes	5	0.5-4.5	0	0
-Dilek		1998	23	Yes	9	1.5	17	0
myocutaneous flap -Rosen	Advancement	1996	5	Yes	13	3.3	80	o
Cutaneous flap -Cherry	Advancement	1968	202	yes	8.7	2-4	9.4	8
Cutaneous flap	Rotation	2004	30	Yes	1	1-2	10	0

Minor wound infection	3 (5%)
Major wound infection	3 (5%)
Seroma formation	2 (3.3%)
Haematoma formation	1 (1.6%)
Overall recurrence	3 (5%)

Table 5. Summary of complications of pilonidal operation.

Findings	Our series	Other series
Hospital Stay	6-13 hrs	5.95[3] –26.5[17] days (Skin flaps- W-plasty closure)
Procedure Time	10-19 minutes	30[22]-120[17] minutes (Laser- W-plasty closure)
Period off Work	4-10 days	17[3]-28[18] days (Marsupialization-Excision & open)
Wound Healing time	42-75 days	22[1]-168[30] days (Marsupialization with collagenase dressing- Excision)
Failure of Treatment	5.5% patients	9.1%[4] patients (Excision and primary closure)
Recurrence	Nil	24[19]- 42[13]% (Excision and primary closure)
Wound Infection	None	3.6[7]- 14 [28]% (Excision and primary closure)

Table 6. Comparative results of radiofrequency pilonidal sinotomy and other techniques of pilonidal sinus surgery.