

Outcome of Z-plasty Technique for Reconstruction of Defects after Sacrococcygeal Pilonidal Sinus Excision. Systematic Review

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Abstract: Background: Sacrococcygeal pilonidal sinus disease is defined as a hair-filled cavity in the subcutaneous fat of the natal cleft (postsacral intergluteal region). **Aim of the Work:** to investigate the complications of z-plasty technique for reconstruction of defects after sacrococcygeal pilonidal sinus excision as regards the incidence of seroma, wound infection, flap necrosis, wound dehiscence and recurrence of sacrococcygeal pilonidal sinus. **Patients and Methods:** The current review was restricted to clinical studies that discuss z-plasty technique for reconstruction of defects after sacrococcygeal pilonidal sinus excision. Adolescents and adult patients from age 15 to 50 years who underwent excision of sacrococcygeal pilonidal sinus and reconstruction of the defect by z-plasty. All studies included depended on excision of sacrococcygeal pilonidal sinus and coverage by z-plasty. **Results and Conclusion:** our study advocates that z-plasty technique provides a reasonable method of treatment of sacrococcygeal pilonidal sinus that flattens the natal cleft with low overall incidence of complications and a low recurrence rate and the advantage of less frequent dressings, short hospital stay and rapid return to work. Surgical management of sacrococcygeal pilonidal sinus is a big challenge and there is no single approach recommended between surgeons.

[Emad El-dein F. Ibrahim, Shaaban M. Abdulmaged, Hossam S. Aly, Amira H. Sabry and Ahmed M. Hussein. **Outcome of Z-plasty Technique for Reconstruction of Defects after Sacrococcygeal Pilonidal Sinus Excision. Systematic Review.** *Nat Sci* 2019;17(6):61-66]. ISSN 1545-0740 (print); ISSN 2375-7167 (online). <http://www.sciencepub.net/nature>. 8. doi:[10.7537/marsnsj170619.08](https://doi.org/10.7537/marsnsj170619.08).

Key words: pilonidal sinus, sacrococcygeal pilonidal sinus, treatment of sacrococcygeal pilonidal sinus, z-plasty after sacrococcygeal pilonidal sinus excision, z-plasty

1. Introduction

Pilonidal sinus is a common disease referring to a hair containing mid-line cyst ⁽¹⁾. It was discovered first by Herbert Mayo in 1833, who described a hair-containing sinus ⁽²⁾, and in 1880 Hodge suggested the term "pilonidal" (Latin: pilus = hair and nidus = nest). Pilonidal sinus most commonly affects the sacrococcygeal area ⁽³⁾.

The incidence of sacrococcygeal pilonidal disease is not accurately known, but it is reported that 0.7% of adolescents are affected ⁽³⁾. Others reported an incidence of 26 per 100,000 regardless of age ⁽⁴⁾.

However, other locations have been reported, named extracoccygeal (atypical) pilonidal sinus. Those places- according to frequency- are umbilicus (90%), hand (3.9%), scalp (1.7%), perianal region (1.3%), intermammary area (1%), face (0.7%), periareolar (0.3%), penis (0.3%), clitoris (0.3%) and prepuce (0.3%). Only two cases of neck pilonidal sinus were reported in literature ⁽⁵⁾.

In the year 2000-2001 in England, in a Hospital Episode Statistics study, the Department of Health (England) recorded 11,534 admissions for pilonidal sinus disease. Males represented 71.85% of those admissions. The mean age was 30 years, (98.9% of ages were from 15-60 years, the productive age group), which is a considerable loss to society due to

loss of man working hours. 46.11% of the cases were treated as an emergency cases with mean hospital stay of 1.5 days, this accounted for 17,084 bed days which is a loss to hospital resources. This loss has led to increased interest in better understanding of the disease and best ways of treatment ⁽⁶⁾.

Recently, the pilonidal sinus is believed to be an acquired inflammatory disease caused by a foreign body reaction that happens upon the entry of hairs in the subdermal area while still attached to the skin piercing it following any trauma. The force that pulls the hair to pierce the skin is the vacuuming effect of the gluteal muscles which is maximum during sitting ⁽⁷⁾.

Recurrence rate varies widely from 0% up to 40% depending on the surgical approach ⁽⁸⁾. Recurrence occurs early in case of failure in identification of any sinuses during surgery. Late recurrence (6 months post-operative) could be due to re-infection or midline tension with deep natal cleft ⁽⁹⁾. Recurrence may occur up to 20 years post-operative ⁽¹⁰⁾.

The treatment of sacrococcygeal pilonidal disease depends on the initial presentation of the disease. In acute pilonidal abscesses, incision and drainage is done. In simple chronic pilonidal sinuses, excision and laying open is an option, while in

recurrent and complex pilonidal sinuses, excision with reconstruction must be considered. Optimal treatment aims to provide an easy to perform option, short or no hospitalization, low recurrence rate, minimal pain and wound care, fast return to normal activity and cost effectiveness. It is important to remember that no single procedure or treatment meets all these criteria (11).

Wide local excision and reconstruction of the defect by Z-Plasty is the option preferred in cases with sinus tract 4 cm length or more with pathology limited to the midline (11).

Aim of the Work

The aim of this study is to investigate the complications of z-plasty technique for reconstruction of defects after sacrococcygeal pilonidal sinus excision as regards the incidence of seroma, wound infection, flap necrosis, wound dehiscence and recurrence of sacrococcygeal pilonidal sinus.

Patients and Methods

Criteria for considering studies for this review

- Types of studies

The review was restricted to clinical studies that discuss z-plasty technique for reconstruction of defects after sacrococcygeal pilonidal sinus excision.

Types of participants

Adolescents and adult patients from age 15 to 50 years who underwent excision of sacrococcygeal pilonidal sinus and reconstruction of the defect by z-plasty.

Types of interventions

Excision of sacrococcygeal pilonidal sinus and coverage by z-plasty.

Surgical technique:

All patients were operated under general or spinal anesthesia, placed in Jack-Knife position with buttocks separated. The sinuses and the tracts are identified using methylene blue dye then an ellipse is marked in the midline to include all the sinuses with two horizontal limbs marked cranially and caudally at 60 degrees with the vertical incision. Then the excision is carried down to the presacral fascia followed by incision of the limbs of the Z. After hemostasis flaps are transposed and the wound is closed with subcutaneous inverted interrupted absorbable sutures and skin is sutured by non-absorbable subcuticular sutures. A closed suction drain is then placed to be removed after 5-10 days.

Types of outcome measures

Outcome was measured in terms of, incidence of seroma, incidence of wound infection, incidence of flap necrosis, incidence of wound dehiscence and recurrence of sacrococcygeal pilonidal sinus.

Inclusion criteria

Studies included represented in studies written in English or English abstracts, clinical trials done on

human subjects, studies published from 1999 to 2019, studies with patients within age group from 15 to 50 years old and studies that used z-plasty technique for coverage of defects after sacrococcygeal pilonidal sinus.

Exclusion criteria

Case reports, literature reviews and technical descriptions, cadaveric studies, studies concerning pilonidal sinus outside the age group from 15 to 50 years old, studies using multiple z-plasties technique or redo of Z-plasty and studies using other local flaps were excluded from the study.

Search strategy for identification of studies

Clinical studies were identified by searching MEDLINE /PubMed, The Cochrane Central Register of Controlled Trials (CENTRAL), Clinical Trails.gov EMBASE, Web of Science, SCOPUS and Grey literature searching, and journal related to the topic and this by using Medical Subjects Headings and free text words.

Restrictions on the language for studies that were written in English or English abstracts.

- On site search in university and national libraries.

Methods of the review

- Locating and selecting studies

Abstracts of articles identified using the search strategy above were reviewed, and articles that appear to fulfill the inclusion criteria will be retrieved in full data on at least one of the outcome measures must be included in the study.

- Data extraction

Data were extracted from eligible studies using a standardized data extraction form.

Statistical considerations

Data were collected, revised, coded and entered to the Statistical Package for Social Science (IBM SPSS) version 23. Also qualitative variables were presented as number and percentages.

The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following:

P > 0.05: Non significant (NS)

P < 0.05: Significant (S)

P < 0.01: Highly significant (HS)

- Evidence of publication bias.

To facilitate the assessment of possible risk of bias for each study, information will be collected using the Cochran Collaboration tool for assessing the risk of bias.

3. Results

We investigate the outcomes of z-plasty technique for coverage of defects after sacrococcygeal pilonidal sinus as regard five outcomes; incidence of seroma, incidence of wound infection, incidence of

flap necrosis, incidence of wound dehiscence and incidence of recurrence.

The initial search identified 198 studies, 154 were excluded as an abstract or irrelevant title. 44 studies were retrieved for detailed reviewing. After applying inclusion and exclusion criteria 38 studies were excluded. 6 studies were included with a total number of 322 patients -mean age 22.88 years- with sacrococcygeal pilonidal sinus who underwent

excision and classic Z-plasty. The follow up period ranged from 6 months to 22 months. Suction drain was inserted in each case to be removed after 5-10 days. The total number of patients developing complications was 62/322 (19.3%). The hospital stay ranged from 1 day to 16 days with mean hospital stay 4.76 days post-operative. Time to return to work ranged from 10 days to 20 days with mean time to return to work 13.6 days.

Table (1): Patient demographic data.

Paper	Total no. of patients	Gender	Age	Previous surgeries for PNS
Fazeli et al., ⁽¹²⁾	72	62 males 10 females	25.8 mean age	6 cases had previous surgeries
Jamalil et al. ⁽¹³⁾	55	49 males 6 females	27 mean age	No previous surgeries
Rao et al. ⁽¹⁴⁾	40	36 males 4 females	25 mean age	not reported
Parveen et al. ⁽¹⁵⁾	40	28 males 12 females	25 mean age	no previous surgeries
Priyadarshi et al. ⁽¹⁶⁾	25	Not reported	29.44 mean age	No previous surgeries
Behdad and Hosseinpoor ⁽¹⁷⁾	90	64 males 26 females	26.82 mean age	Not reported

Regarding incidence of seroma:

Table (2): the incidence of seroma in z-plasty after pilonidal sinus excision.

Paper	Total no.	Cases developed seroma
Fazeli et al., ⁽¹²⁾	72	4 (5.6%)
Jamalil et al. ⁽¹³⁾	55	0
Rao et al. ⁽¹⁴⁾	40	5(12%)
Parveen et al. ⁽¹⁵⁾	40	0
Priyadarshi et al. ⁽¹⁶⁾	25	0
Behdad and Hosseinpoor ⁽¹⁷⁾	90	11(12.2%)

Our study reveals that the incidence of seroma in z-plasty after pilonidal sinus excision is 20 case/ 322 (6.2%).

Regarding incidence of wound infection:

Table (3): Incidence of wound infection in z-plasty after pilonidal sinus excision.

Paper	Total no.	Cases developed infection
Fazeli et al., ⁽¹²⁾	72	7(9.7%)
Jamalil et al. ⁽¹³⁾	55	0
Rao et al. ⁽¹⁴⁾	40	3(7.5%)
Parveen et al. ⁽¹⁵⁾	40	6(15%)
Priyadarshi et al. ⁽¹⁶⁾	25	0
Behdad and Hosseinpoor ⁽¹⁷⁾	90	3(3.3%)

Our study shows that the incidence of wound infection in z-plasty after pilonidal sinus excision is 19 cases/322 (5.9%).

Regarding incidence of wound dehiscence:

Table (4): Incidence of wound dehiscence in z-plasty after pilonidal sinus excision.

Paper	Total no.	Cases developed dehiscence
Fazeli et al., ⁽¹²⁾	72	0
Jamalil et al. ⁽¹³⁾	55	14(25.5%)
Rao et al. ⁽¹⁴⁾	40	0
Parveen et al. ⁽¹⁵⁾	40	3(7.5%)
Priyadarshi et al. ⁽¹⁶⁾	25	0
Behdad and Hosseinpoor ⁽¹⁷⁾	90	0

Our study found that the incidence of wound dehiscence in z-plasty after pilonidal sinus excision is 17 cases /322 (5.3%).

Regarding incidence of flap necrosis:**Table (6): Incidence of flap necrosis in z-plasty after pilonidal sinus excision.**

Paper	Total no.	Cases developed flap necrosis
Fazeli et al., ⁽¹²⁾	72	0
Jamalil et al. ⁽¹³⁾	55	0
Rao et al. ⁽¹⁴⁾	40	0
Parveen et al. ⁽¹⁵⁾	40	0
Priyadarshi et al. ⁽¹⁶⁾	25	1(4%)
Behdad and Hosseinpoor ⁽¹⁷⁾	90	0

Our study reveals that the incidence of flap necrosis in z-plasty after pilonidal sinus excision is 1 case/322 (0.31%).

Regarding incidence of recurrence:**Table (7): Incidence of recurrence in z-plasty after pilonidal sinus excision.**

Paper	Total no.	Cases developed recurrence	Follow up period
Fazeli et al., ⁽¹²⁾	72	0	22 months
Jamalil et al. ⁽¹³⁾	55	0	6 months
Rao et al. ⁽¹⁴⁾	40	0	12 months
Parveen et al. ⁽¹⁵⁾	40	2(5%)	6 months
Priyadarshi et al. ⁽¹⁶⁾	25	0	6 months
Behdad and Hosseinpoor ⁽¹⁷⁾	90	3(3.3%)	6 months

Our study shows that the incidence of recurrence of pilonidal sinus managed by excision and coverage by z-plasty in 22 months is 5 cases/322 (1.6%).

4. Discussion

Pilonidal sinus is a hair-filled cavity in the natal cleft ⁽¹⁾; named by Hodges ⁽³⁾. (Latin: pilus=hair, nidus=nest). Pilonidal sinus mainly affects the sacrococcygeal region. However, other sites could be affected named atypical pilonidal sinus ⁽⁵⁾.

Sacrococcygeal pilonidal sinus has an incidence rate of 0.7% in adolescents with a male-female ratio ranging from 2.1:1 to 4:1. ⁽³⁾

Previously pilonidal sinus was thought to be a congenital disease. Recently it is believed to be an acquired inflammatory disease which happens when hair pierces the skin under the vacuuming effect of the gluteal muscles causing foreign body reaction. After the puberty, sex hormones affect the pilosebaceous glands, and the hair follicle becomes distended with keratin and develops folliculitis producing edema and follicle occlusion which eventually extends and ruptures into the subcutaneous tissue resulting in a pilonidal infection with a sinus tract formation that leads to subcutaneous cavity. ⁽³⁾

Risk factors for developing pilonidal sinus include a deep natal cleft, obesity, hirsutism, prolonged sitting, bad personal hygiene and family history ⁽¹⁸⁾.

Sacrococcygeal pilonidal sinus has a recurrence rate up to 40% depending on the surgical approach ⁽⁸⁾.

Treatment of pilonidal sinus has remained controversial. There are different modalities of treatment ranging from conservative in asymptomatic

cases, to complex surgical procedures including wide local excision with primary closure with different ways ⁽¹³⁾.

The ideal treatment aims to achieve short hospital stay, rapid return to work, patient satisfaction, less complications and decreased recurrence rates. There are 2 main surgical options; open method and closed method. Excision of the pilonidal sinus and leaving the wound open to heal by 2ry intention has the disadvantage of prolonged healing time with frequent painful dressings and delayed return to work. However, it provides a simple easy way with low recurrence rates. In closed method the wound is closed either primarily or with flap. Primary wound closure is a simple rapid technique with rapid recovery and return to work with less frequent dressings but with high recurrence rates due to placing the suture line in the midline with high tension. Flap-based treatment helps to flatten the natal cleft decreasing hair accumulation, friction and maceration. It also provides a tension free closure with the suture line placed off the midline ⁽¹⁹⁾.

Different local flaps could be used. Z-plasty is preferred when the pathology is limited to the midline. Z-plasty provides a tension free technique with decreased recurrence by decreasing risk factors by flattening the natal cleft, decreasing hair accumulation, decreasing friction and skin maceration, decreasing vacuuming effect of the natal cleft and placing the suture line off the midline ⁽¹⁹⁾.

In our meta-analysis we investigate the outcomes of z-plasty technique for coverage of defects after sacrococcygeal pilonidal sinus excision as regard five outcomes; incidence of seroma, incidence of wound infection, incidence of flap necrosis, incidence of wound dehiscence and incidence of recurrence.

-As regard the incidence of seroma, we found that (6.2%) 30 patients/322 of patients developed seroma after sacrococcygeal pilonidal sinus excision and coverage by z-plasty.

In a study by **Kartal et al.** ⁽²⁰⁾, a metanalysis showed that the incidence of seroma in primary closure was 15.13% (41 cases/271), while the incidence in Limberg flap was 9.92% (13 cases/131).

-We found that the incidence of wound infection is (5.9%) 19 patients/322.

Kartal et al. ⁽²⁰⁾ found that the incidence of wound infection in primary closure was 18.82% (51 cases/ 271), while Limberg technique showed 13.74% incidence of wound infection (18 cases/ 131).

Petersen et al. ⁽²¹⁾ found that the incidence of wound infection in primary closure was 215 cases/1731 (12.42%), 12 cases/460 in Limberg flap (2.61%), and 1 case/52 in V-Y flap (1.92%).

Fazeli et al. ⁽¹²⁾ found that the incidence of wound infection in lay open was 10cases/72 (13.9%).

The incidence of wound dehiscence was found to be (5.3%) 17patients/322.

In **Kartal A. et al.**, ⁽²⁰⁾, the incidence of dehiscence in primary closure was 12.92% (35 cases of 271), and 21.37% in Limberg (28 cases/ 131).

The incidence of developing flap necrosis is (0.31%) 1 patient/322.

In 2013, a study by **Aithal et al.** ⁽²²⁾, one patient of 30 patients developed flap necrosis after treatment of pilonidal sinus by Limberg flap.

Yogishwarappa and Vijayakumar ⁽²³⁾ had 52 patients who underwent Limberg flap after pilonidal sinus excision, 2 of them developed flap necrosis (3.8%).

-As regard recurrence of sacrococcygeal pilonidal sinus, this study reveals an incidence of (1.6%) recurrence rates after pilonidal sinus excision and coverage by z-plasty.

Kartal et al. ⁽²⁰⁾ found that the incidence of recurrence in primary closure was 11.44% (41 cases/271). In Limberg flap the recurrence was 3.82% (5 cases/ 131).

In 2015, **Garg et al.** ⁽²⁴⁾ conducted a meta-analysis of open method in treatment of pilonidal sinus that showed that recurrence rate in open method was 4.47% (63 cases/ 1511).

Petersen et al. ⁽²¹⁾ found that the incidence of recurrence in primary closure was 128 cases/1308 (9.79%), in Limberg flap 8 cases/526 (1.5%), while it was 2 cases/72 in V-Y advancement flap (2.78%).

Fazeli et al., ⁽¹²⁾, found that the incidence of recurrence in lay open technique was 3cases/72 (4.2%).

So, our study advocates that z-plasty technique provides a reasonable method of treatment of sacrococcygeal pilonidal sinus that flattens the natal cleft with low overall incidence of complications and a low recurrence rate and the advantage of less frequent dressings, short hospital stay and rapid return to work.

5. Conclusion

Surgical management of sacrococcygeal pilonidal sinus is a big challenge and there is no single approach recommended between surgeons.

In our study, statistics shows that z-plasty technique provides a reasonable method of treatment of sacrococcygeal pilonidal sinus that flattens the natal cleft with low overall incidence of complications and a low recurrence rate with the advantage of less frequent dressings, short hospital stay and rapid return to work.

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