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Asymmetric sinus excision and primary closure with additional skin excision technique. Effect of reduction of dead-space with Karydakis modification.

OBJECTIVE: *Pilonidal sinus is one of the common diseases, although there is still no gold standard of treatment available. The aim of this study was to reduce the residual dead-space volume with a modification following the standard Karydakis procedure.*
METHODS: A *total of 100 patients were included in a randomised controlled trial, who were divided into two groups. Each group included 50 patients, and the patients in Group-1 were treated with the new technique, whereas in Group-2, the standard Karydakis technique was performed. In the new technique, following total sinus excision, an advancement tissue flap was performed using additional skin excision, in order to reduce the dead-space volume.*
RESULTS: *There was no significant difference in terms of sex, age, and sinus volume. Operation time was longer in first group (p=0,002). Seroma formation rate was higher in the secound group (p=0.036). There was no significant difference in terms of soft tissue infection (p=0.339) and wound dehiscence (p=0.218). The mean follow-up period was 30 months and no recurrence was observed in both groups.*
CONCLUSIONS: *The results of the study suggest that this technique may be considered as an alternative surgical method in pilonidal sinus surgery.*

KEY WORDS: Dead, Karydakis flap-space volume, Sacrococcygeal pilonidal sinus, Seroma, Skin excision

Introduction

Although pilonidal sinus is one of the common diseases, there is still no gold standard of treatment available. For this reason, many surgical techniques and medical methods are used in the treatment of pilonidal sinus disease. The aim of pilonidal sinus therapy is to remove the granulation tissue and prevent recurrence.

In the majority of surgical methods, the granulation tissue is excised. The diversity of methods is related to the closure of this defect. For this purpose, many surgical techniques such as primer closure after excision, healing by secondary intention, marsupialization, V-Y advancement flap, Z-plasty, Limberg flap and Karydakis flap are applied [1-3]. The identification of a large number of surgical techniques, which have advantages and disadvantages compared to each other, suggests that none of them is actually the ideal method and that the search for better surgical techniques is ongoing.

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Karydakis procedure is one of the most frequently used asymmetric flap techniques which has been described by Karydakis in 1973, and low recurrence rates have been reported [4,5]. However, in this method, the potential space formed by the subcutaneous flap causes long-term drain use and long-term hospitalization [6,7]. However, when the drain is not used in this procedure, complications such as seroma and related infections, wound dehiscence, or recurrence occur. We thought that the necessity of using drains could be eliminated by reducing the dead-space volume in the Karydakis procedure, and reduce the formation of seroma to the minimum, and developed a new technique accordingly, which we named "Asymmetric Primary Closure with Skin Excision (Modified Karydakis) Technique".
In this prospective and randomized study, we aimed to compare the early results of this new technique we have developed with the standard Karydakis flap technique.

Material and Methods

The study was performed with the approval from Faculty of Medicine, Harran University Ethics Committee (No:74059997.050.01.04/79, Date: 15.04.2015). Also the study was accepted by Clinical trials. gov (Identifier: NCT03424057). All patients participating in the study were informed about the procedure and the written consent of the patients who agreed to participate in the study was obtained.

Inclusion and Exclusion Criteria

Patients who did not accept the procedure (n: 9), had undergone previous pilonidal sinus surgery(n: 7), had active infection(n: 9), and were not minimum of 18 years of age(n: 4) were excluded. The number of sinuses in the sacrococcygeal region and their distances to each other were not considered.

Methodology of the Study

A total of 100 patients who were planned to have pilonidal sinus surgery were included in the study. The patients were randomized into two groups. Asymmetric Primary Closure with Skin Excision (Modified Karydakis) Technique was applied in the study group, and Standard Karydakis Technique was applied to the control group.
A randomization was made by asking to the first patient to be operated, to select one of the two envelopes, in which "the control group" and "the study group" were written. Since the first patient selected the envelope of the control group, the second patient that will be operated was accepted as the study group and the order up to the one hundred patient was continued in this way.

Surgical Technique

All patients were operated in the jack-knife position under spinal anesthesia (SA). During the induction of anesthesia 1 gram cefazolin sodium was administered intravenously. The gluteal parts of the patients were stretched in both directions with bandage and intergluteal cleft was opened. Methylen blue was administered from the sinus openings in the gluteal region. Then, horizontal total sinus excision was performed, including the entire sinus tracts by passing the skin, subcutaneous tissues up to the presacral fascia. The volume of the

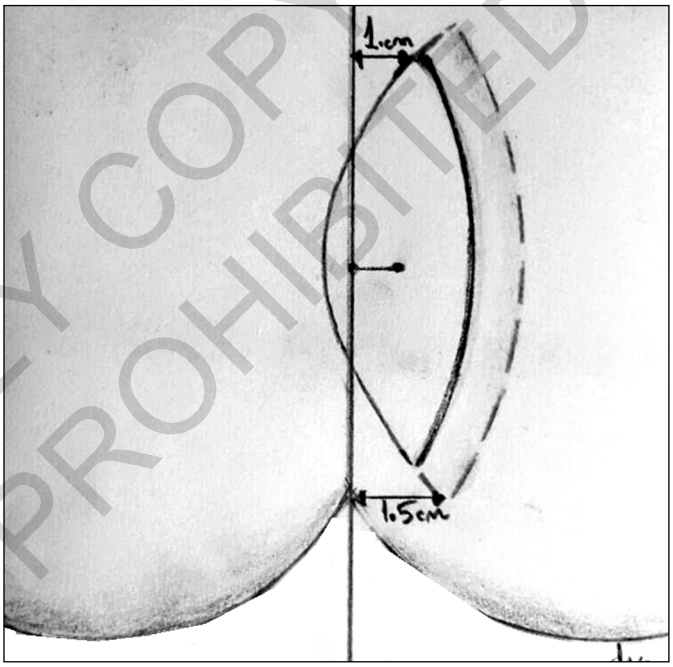

Fig. 1: Schematic drawing of pre-operative asymmetrical sinus excision (black) and re-excision limits (blue intermitten line).

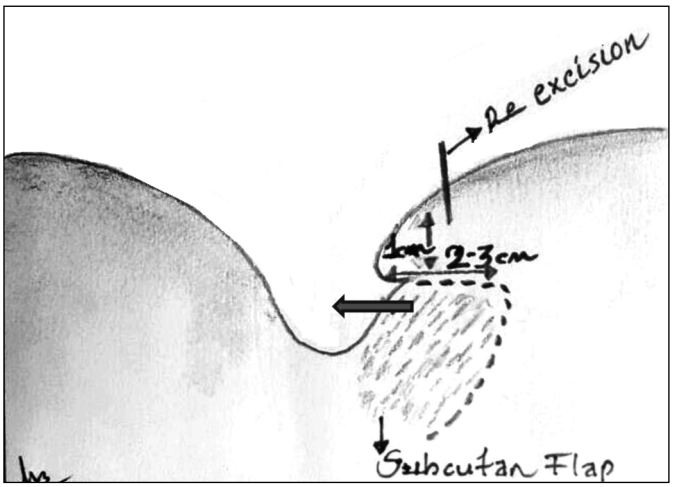

Fig. 2: Formation of subcutaneous flap after sinus excision and suturing to presacral fascia.

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excised specimen was measured with the assistance of a beaker and saline. The volume of the overflowing liquid was accepted as the volume of the specimen.
In patients operated with standard Karydakis procedure, a flap (Karydakis flap) extending along the incision was prepared, with the medial side of the wound to be 1 cm deep and 2-3 cm inward. The prepared flap was shifted to medial and sutured to the presacral fascia with 2/0 vicryl (Fig. 1).
In patients who were operated with the asymmetric primary closure with skin excision technique, after the karydakis flap was formed, 5-10 mm skin was excised along the incision from the side of the flap to reduce the volume of the dead-space laterally (Fig. 2).
In both groups, subcutaneous tissue was approximated with 2/0 vicryl suture. The skin was sutured with mattress technique using 2/0 Prolen or subcutaneous technique using 3/0 monocryl suture (Figs. 3, 4). No drains were used in patients from either group. Patients who were recommended daily dressing were discharged on the first postoperative day and were invited to the outpatients clinic on the 10th postoperative day for suture removal, and postoperative 1st month, 6th month and 18th month control examinations were performed. Patients were followed up for wound leakage, seroma and hematoma formation, skin dehiscence and recurrence.

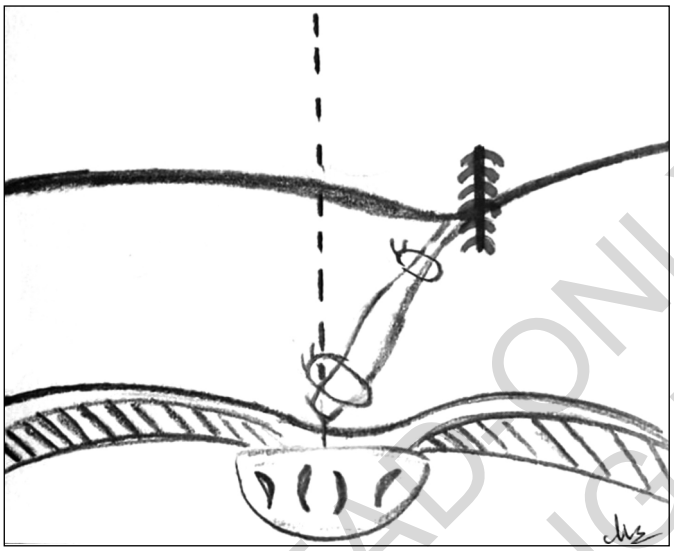

Fig. 3: Appearance after skin suturation 1.

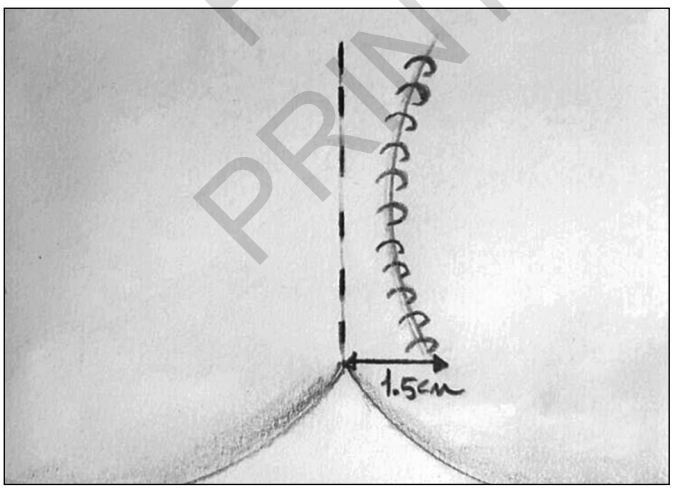

Fig. 4: Appearance after skin suturation 2.

Statistical Analysis

The results were evaluated by SPSS (Statistical Package for the Social Sciences version 20.0, SPSS Inc, Chicago, Illinois, USA) statistics program. Complications were evaluated with Chi-square test; age, sinus volume and duration of operation were evaluated with Student's t-test. P <0.05 was considered statistically significant.

Results

There was no statistically significant difference in sex and age between the study (Group 1) and control group (Group 2) (p=0.729). Similarly, there was no significant difference in sinus volume between the two groups (p=0.22). Of the patients in the group, 42 were male, 8 were female. Of the patients in the control group, 41 were male, 9 were female. This was significant in terms of showing that the patients were homogeneously distributed between the two groups.
The duration of operation was 35.51 ± 7.59 min in the first group and 31.20±5.68 (min) in the second group. There was a statistical difference between the two groups (p=0,002) (Table I).
In the first group seroma (6%) occurred in 3 patients, soft tissue infection in 2 patients (4%) and wound dehiscence in 2 patients (4%). Seroma (20%) in 10 patients, soft tissue infection in 4 patients (8%) and wound dehiscence in 5 patients (10%) occurred in the second group. There was a statistically significant difference between the groups in terms of seroma (p: 0.036). There was no statistically significant difference in terms of soft tissue infection and wound dehiscence (p: 0.339 and p: 0.218, respectively) (Table II).
The mean follow-up period was calculated as 25 (18-33) months in both groups. During the follow-up, no recurrence was seen in the patients in both groups.

Discussion

The most important problem after pilonidal sinus surgery is thought to be recurrence, and one of the most impor-

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TABLE I - *The demographic datas of the patients.*

Charecteristics	Group 1	Group 2	P value
Numbers (n)	50	50	
Gender (Male/Female)	42/8	41/9	0,790
Age (years)	24,28 ±7.40	24,78±7.00	0.729
Operating time (min)	35.51±7.59	31,20±5.68	0,002
Specimen volume (cc)	26,94±15.85	25.50±15,68	0,622

Values are mean ± standard deviation (range).

TABLE II - *Postoperative outcomes*

Complications	Group 1	Group 2	Total	P value
Seroma/hematoma (n/%)	3 (6%)	10(20%)	13(13 %)	0,036
Infection (n/%)	2(4%)	4(8%)	6(6 %)	0,339
Wound dehiscence (n/%)	2(4%)	5(10%)	7(7%)	0,218
Total (n/%)	7(14%)	19(38%)		

tant aim of different surgical techniques used is to reduce the recurrence rate. Although early and late recurrences are very important problems, early complications should not be overlooked which are more common and cause prolonged hospitalization, loss of workforce and poor quality of life. The most common of these complications are seroma/hematoma, wound dehiscence, delayed wound healing, and surgical site infections [8-10].

The potential dead-space in pilonidal sinus surgery being wide, seems to be related with seroma/hematoma formation, increase in surgical site infections and consequent wound dehiscence. Karydakis reported a complication rate of 8% in his own series with his own technique and stated that the cause of wound infections was fluid collection [4].

In this randomized, prospective study, there was no significant difference between the groups in terms of sinus volume. However, in the study group, the mean duration of operation was 5 minutes longer, compared to the control group. We think that this is because of the measurement made for the excision, the excision of the skin and the learning curve required for a new technique. When we look at the literature, we see that the operation time of this new technique (average 35.51±7.59 min) is comparable to other techniques, even shorter. Öz et al. reported an average of 55±19 (min) for the Limberg flap procedure and 75±25 (min) for the V-Y advancement flap in their series. Again, Can et al. reported the mean duration of operation as 52±5 (min) for Limberg and as 49±7 (min) for Karydakis procedures [11,12].

In terms of complications, the rate of seroma progression was 20% (10 cases) with the standard Karydakis procedure and 6% (3 cases) in the new technique. The difference was statistically significant (p:0.036). Seromas required repeated drainage with needle and healing time was longer in this patients. Gurer et al. reported that the use of routine drain in the Karydakis method significantly reduced the fluid collection rate and suggested routine drain use. In the literature, different ratios have been given in the series operated using the Karydakis technique and seroma is reported to occur at different rates. Bessa et al. reported seroma rates of 2.4%, Bali et al. 4.2% seroma and 11% hematoma, and Arslan et al. reported seroma rates of 19.8% [9,13-15]. In our technique, the rate of seroma was only 6%, even though no drain was used. We think that this is associated with the reduced dead-space.

When viewed from the point of wound dehiscence and soft tissue infection, Asymmetric Primary Closure with Skin Excision is found to be superior to the Karydakis procedure. But the results we obtained are not statistically significant (p:0.339 and 0.218). In the group we applied the Karydakis procedure, 4 cases had soft tissue infection, 5 cases had wound dehiscence; in the group where the new technique was applied, there were 2 cases of soft tissue infection, and 2 cases of wound dehiscence. Kitchen et al. reported an infection rate of 10% in their first series of 40 patients and a 4.5% infection rate in the next series of 141 cases. Sözen et al. reported 2.7% of wound dehiscence after the suture has been removed in their series and that this was due to seroma accumulation [1,8,16]. Our results were statistically not significant despite being numerically in the favor of our technique. It is thought that this may be due to the limitation of the number of patients. We believe that the results to be achieved in the wider series may be significant for the new technique.

An important criticism that may be directed at our new technique may be that whether there will be skin tension following the re-excision. As performed in the Karydakis technique, the subcutaneous fat tissue is shift-

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ed medially and sutured to the presacral fascia after asymmetrical incision, thus, there is no tension when the skin is closed, and even there is excessive skin. This is why the drains are used to prevent seroma formation in standard Karydakis procedure. In the new technique, we prevent the complications and unnecessary hospitalization by excluding the discomfort due to the drain, by excising the excess skin that causes dead-space and performing an untensioned repair.

A significant advantage of our new technique is that it is very easy for surgeons, especially those who deal with pilonidal sinus surgery, and does not require a long learning curve. All patients who were operated on with the new technique were mobilized and discharged within 24 hours and no recurrence was observed during follow-up. We see different hospitalization durations reported after pilonidal sinus surgerywhen we look at the literature. In cases operated with Karydakis technique, the mean duration of hospitalization is reported as 2-4 days [17], the time required for the removal of the drain as 1-3 days [18] and in some studies this is reported as in 6-7 days [19]. As there is no drain in patients operated with new technique, there is no need for hospitalization for more than 1 day. All patients were discharged on the first postoperative day. In our technique, the absence of drain did not increase the rate of seroma and hematoma, and significantly reduced the hospitalization period, leading to earlier reutrn to the daily activities and work.

As a result, this technique we have developed is practical and easy to learn. By reducing the dead-space in the surgical area, it leads to a shorter discharge time, reducing complications such as seroma and wound dehiscence in the early period. There was no recurrence during follow-up, but a longer follow-up is needed to assess the recurrence accurately.

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Riassunto

Il sinus pilonidalis è una delle patologie comuni, e ciononstante non è ancora definito il gold standard del suo trattamento. Lo scopo di questo studio è quello di ridurre il volume residuo di spazio morto dopo l'escissione con una modifica che segue la procedura standard di Karydakis.

Sono stati inclusi nello studio controllato e randomizzto un totale di 100 pazienti, divisi in due gruppi. Ogni gruppo comprendeva 50 pazienti e i pazienti del gruppo 1 sono stati trattati con la nuova tecnica, mentre nel gruppo 2 veniva eseguita la tecnica standard di Karydakis. Nella nuova tecnica, dopo l'escissione totale del seno, è stato eseguito un lembo del tessuto di avanzamento utilizzando un'asportazione cutanea aggiuntiva, al fine di ridurre il volume dello spazio morto.

Non c'era alcuna differenza significativa in termini di sesso, età e volume del sinus. Il tempo di operazione è risultato più lungo nel primo gruppo (p = 0,002). L'entità di formazione del siero è risultato maggiore nel secondo gruppo (p = 0,036). Non c'è stata alcuna differenza significativa in termini di infezione dei tessuti molli (p = 0,339) e deiscenza della ferita (p = 0,218). Il periodo medio di follow-up è stato di 30 mesi e non è stata osservata recidiva in entrambi i gruppi.

I risultati dello studio suggeriscono che questa tecnica potrebbe essere considerato come un metodo chirurgico alternativo per il trattamento chirurgico del sinus pilonidalis.

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