

Original Article

Predicting Postoperative Recurrence in Pilonidal Disease: A Risk Score Approach

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Key Words

Pilonidal disease;
Recurrence rate;
Risk factor

Objectives. Pilonidal disease (PD), commonly known as pilonidal sinus or pilonidal cyst, is a surgical condition predominantly observed in young adults. It typically manifests in the skin and subcutaneous tissue near the natal cleft of the buttocks. The condition is more prevalent in men, and the other risk factors include obesity, trauma, prolonged sitting, a deep natal cleft, family history, and Caucasian ethnicity. Its clinical presentation varies, but in cases of acute infection or chronic inflammation, individuals often face the burden of frequent hospital visits. Historically, simple excision has been the primary choice for most surgeons due to its accessibility; however, numerous studies have reported a high recurrence rate. Although various surgical methods have been proposed, no gold standard surgical treatment has been established.

Some studies have suggested that flap surgery may result in a lower recurrence rate. This study aims to provide valuable insights and foster communication to enhance treatment strategies for PD.

Methods. Through database research, we recruited a cohort of 30 consecutive patients who had undergone simple excision for histologically confirmed PD at our hospital between 1999 and 2021. Data analysis was conducted through logistic regression by using SPSS. Additionally, receiver operating characteristic curves (ROCs) and the corresponding area under ROC curves were employed to further assess the data. A comprehensive chart review was conducted for each patient.

Results. A total of 30 patients with PD had undergone simple excision at Wan Fang Hospital over the past 2 decades. Among them, a predominance of young men was observed, with a mean age of 32.3 years. Risk factors including age, sex, the presence of an abscess, lesion length, outpatient surgery, and wound closure method were associated with recurrence. Patients with multiple risk factors exhibited an increased recurrence rate, but objectively evaluating recurrence posed challenges. To address this, a risk score was developed for the more accurate evaluation of the recurrence rate. In our model, patients with scores of > 3 were considered to be at a higher risk of recurrence after surgery; thus, a flap procedure is recommended for these patients. For patients who exhibited favorable outcomes, simple excision was deemed sufficiently safe.

Conclusion. The treatment of PD poses a challenge due to the problem of recurrence. Evaluating patients with PD with a high recurrence rate is challenging. Therefore, we designed a model for addressing this problem in PD management. In our approach, we suggest a combination of debridement and simple excision followed by a flap procedure, especially for patients who are at a high risk of recurrence. By sharing our experiences, we aim to obtain feedback from the colorectal society.

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Pilonidal disease (PD), commonly referred to as pilonidal sinus or pilonidal cyst, is a surgical condition predominantly observed in young adults.^{1,2} It is typically located in the skin and subcutaneous tissue near the natal cleft of the buttocks, and it is often related to the presence of hair.^{3,7} Diagnosis involves a physical examination of the affected area, with additional imaging tests such as ultrasound or MRI to confirm the diagnosis. The disease exhibits a male predominance, and although the exact cause of the condition remains unknown, it is thought to be related to hair growth and friction in the affected area. Risk factors include obesity, trauma, prolonged sitting, a deep natal cleft, and family history. A review of various papers revealed that pilonidal sinus is rare in the Asian population but is prevalent among individuals of Caucasian ethnicity. Clinical presentations vary, with acute infection or chronic inflammation leading to the significant burden of frequent hospital visits. The acute state is characterized by cellulitis or the presence of a mass with an abscess. The abscess can become infected, resulting in pain, swelling, and redness in the affected area. If left untreated, the abscess can develop into a cyst or sinus tract.^{3,7} In the chronic state, drainage in the intergluteal fold is a common feature.^{4,6} Notably, midline pits can sometimes be misdiagnosed as anorectal fistulas.³ As of now, a wide range of recurrence rates has been reported for different surgical approaches.

Some studies have reported a recurrence rate of up to 40% within the first year after treatment. Evidence indicates an association between recurrence and the surgical procedure employed. The treatment options for PD encompass antibiotics to treat infection, draining the abscess or cyst, or surgically removing the affected tissue. Preventative measures such as keeping the area clean and dry and avoiding prolonged sitting can reduce the risk of recurrence. Despite numerous proposed surgical methods, a gold standard surgical treatment has yet to be established.^{2,9} Simple excision is the most commonly used surgical method because of its straightforward approach, but a high recurrence rate has been reported after this procedure. Studies have revealed that patients with PD undergoing flap procedures exhibited low recurrence rates. Conse-

quently, flap procedures are recommended, particularly for patients with complex or recurrent PD and when other techniques have proven ineffective.² Numerous studies have consistently shown that patients with more risk factors tend to experience a higher recurrence rate in the future. However, objectively evaluating the risk of recurrence remains a challenge. To address this, we designed a comprehensive risk score for the evaluation of recurrence rates in PD. Our primary objective was to develop a risk score that considers both the identified risk factors and the selected surgical procedures. Based on this risk evaluation, if a patient is identified to have a higher recurrence rate, we recommend the implementation of a flap procedure; otherwise, simple excision or other surgical procedures may suffice.

Materials and Methods

Database and study population

From August 25, 1999, to January 31, 2021, we obtained data on patients with PD at Wan Fong Hospital. We identified cases using keywords including *ICD-10* codes L05 and 685 as well as *ICD-9* codes L72 and code 706 along with the term “pilonidal” in patient department records, operation notes, and pathology reports.

Diagnosing PD can be challenging because it may be confused with sebaceous cysts, epidermal cysts, follicular cysts. The collected data were analyzed through logistic regression by using IBM SPSS Statistics® version # (IBM Corp, Armonk, NY, USA). A total of 203 patients with PD were enrolled, of which 167 patients who did not undergo surgery and 6 patients who underwent flap procedures were excluded.

Ultimately, 30 patients with PD who underwent simple excision were included. Among them, 7 experienced recurrence after surgery, with 5 of them having scores of > 3 (71%) and the remaining 2 having scores of < 2 (29%). Among the 23 patients without recurrence, 11 had a score of > 3 (48%), and 12 had a score of < 2 (29%). A flowchart of the study methodology is presented in Fig. 1. The primary outcome

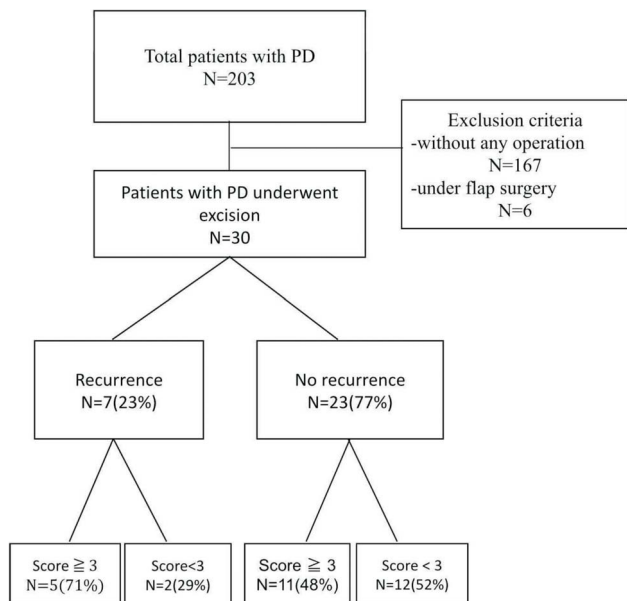


Fig. 1. Flowchart of patient selection.

was the patient’s risk factors for recurrence rates, with ongoing follow-ups extending for at least 3 years.

Statistical analysis

In our analysis, we employed logistic regression to estimate the β regression coefficient, p value, hazard ratio, and 95% confidence interval for each selected risk predictor. To generate a risk score, the regression coefficient of each risk predictor was divided by the regression coefficient associated with female sex. The resulting quotient was rounded to an integer value. The projected recurrence of PD was estimated using the following equation:

$$\hat{p} = \frac{1}{1 + \exp\left(-\sum_{i=0}^p \beta_i \text{score}_i\right)}$$

Results

For model validation, we employed receiver operating characteristic curves (ROC), area under ROC (AUROC) curves, sensitivity, and specificity.

ROC curves were plotted with 1 – specificity and sensitivity, with cumulative risk scores serving as cutoff points in the validation cohort, as illustrated in Fig. 2.¹¹

Various risk factors for recurrence, including age, sex, the presence of an abscess, lesion length, outpatient surgery, and wound closure, were examined.^{1,3} Patients were categorized into recurrence and nonrecurrence groups. The majority of patients were within the age range of 20-40 years, with a notable male predominance, with 25 male patients and 5 female patients. Recurrence was observed in 6 male patients and 1 female patient after excision. Of 10 patients with purulence, 3 experienced recurrence. Notably, the length of lesions did not exhibit a correlation with the recurrence rate in our database. The procedures for patients with PD were conducted at the outpatient department or in the surgery room, depending on the simplicity or complexity of the lesions. We expected that patients with a higher recurrence rate would have undergone surgery in the operation room because of more complex or larger lesions. Among the 7 patients who had recurrence, 4 underwent surgery at the outpatient department, whereas the remaining patients underwent surgery in the operation room. We investigated the effect of wound closure and open wound on the recurrence rate; however, we encountered challenges due to substantial missing data. No statistically significant differences were noted between the 2 groups in terms of age, sex, the presence of an abscess, lesion length,

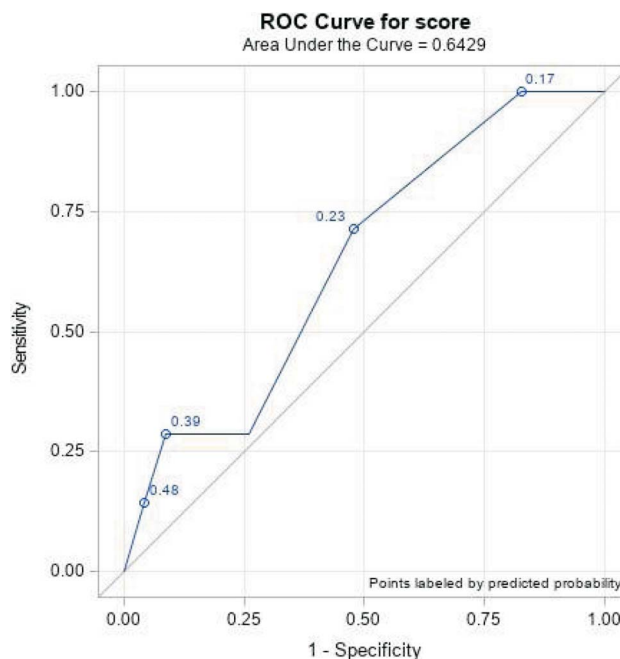


Fig. 2. ROC curve.

and surgery in the outpatient department. The patients' demographics data and variables are presented in Table 1.

Our risk scoring system was designed to align with specific risk factors. The regression coefficient for each risk predictor was divided by the regression coefficient for female sex, and the result was rounded into an integer to generate the risk score. Male patients or those with a lesion length of < 2.55 cm were assigned a score of 1.

Patients with an abscess or those who underwent surgery at the outpatient department received a score of 2. Conversely, patients without an abscess who had a lesion length of > 2.55 cm and those who underwent surgery in the operation room were assigned a score of 0. A shorter lesion length and surgery at the outpatient department were associated with higher risk scores. This inclination suggests that patients with more complicated PD or longer lesions are more likely to undergo surgery in the operation room. The risk scores

for the recurrence of PD are presented in Table 2.^{12,13}

We used the total risk score to predict the risk of recurrence for PD. For instance, a total risk score of 0 corresponds to a predicted risk of 0.29824. Similarly, a total risk score of 3 is associated with a predicted risk of 0.419674, as presented in Table 3. If patients score > 3, they are deemed to have higher risks of recurrence in the future.^{12,13}

In our database analysis, 7 patients experienced recurrence following simple excision, with 5 of these patients having scores of > 3 according to our total risk score evaluation. Conversely, among the patients without recurrence, 11 had scores of > 3 and 12 had scores of < 3. The demographic characteristics corresponding to the scores are presented in Table 4.

Discussion

Patients with multiple risk factors including age,

Table 1. Demographic characteristics of patients with pilonidal disease in Wan Fang Hospital

	Number		p value
	Recurrence n = 7 (23%)	No recurrence n = 23 (77%)	
Age			0.978
0-20	1 (14%)	3 (13%)	
20-40	5 (72%)	17 (74%)	
> 40	1 (14%)	3 (13%)	
Sex			1
Male	6 (86%)	19 (83%)	
Female	1 (14%)	4 (17%)	
Abscess			0.657
No	4 (57%)	16 (70%)	
Yes	3 (43%)	7 (30%)	
Length of lesion			1
≤ 2.55 cm	4 (57%)	11 (48%)	
> 2.55 cm	3 (43%)	12 (52%)	
Outpatient Operation			0.666
No	3 (43%)	14 (61%)	
Yes	4 (57%)	9 (39%)	
Wound closure			0.445
No	1	2	
Yes	1	9	
Missing data	17/30 (57%)		

Table 2. Risk scores for the recurrence of pilonidal disease

	Regression coefficient	Odds ratio (95% CI)	Score
Sex	0.3234		
Female		Ref.	0
Male		1.3818 (0.1535-30.3714)	1
Length of lesion	0.5084		
≤ 2.55 cm		Ref.	1
>2.55 cm		1.6626 (0.2647-12.1169)	0
Abscess	0.7418		
No		Ref.	0
Yes		2.0996 (0.3058-15.0654)	2
Outpatient Operation	0.7467		
No		Ref.	0
Yes		2.1101 (0.3648-15.0654)	2

Table 3. Predicted risks of recurrence for pilonidal disease

Total risk score	Predicted risk
0	0.29824
1	0.330077
2	0.369522
3	0.419674
4	0.485578
5	0.576037
6	0.707914

Table 4. Demographic characteristics corresponding to the scores

Score	Number		Odds ratio (95% CI)
	Recurrence n = 7 (23%)	No recurrence n = 23 (77%)	
≥ 3	5/7 (71%)	11/23 (48%)	0.283 (0.059-2.292)
< 3	2/7 (29%)	12/23 (52%)	Ref.

sex, the presence of an abscess, lesion length, outpatient surgery, and wound closure method exhibited an increased recurrence rate after surgery. In this study, we use these risk factors to establish a predictive score model. In our score model, patients with scores of > 3 were considered to be at a higher risk of recurrence after simple excision; thus, a flap procedure is suggested for these patients. For patients who exhibited favorable outcomes, simple excision was deemed sufficiently safe.

The treatment approach for PD may encompass antibiotic therapy for infection control, drainage of abscesses or cysts, or the surgical excision of the affected tissue. Asymptomatic cases of PD typically do not require treatment,⁶ but for patients with clinical manifestations, surgery is generally recommended based on the general consensus.⁴ Despite treatment, PD may recur in some cases, necessitating further surgical intervention. The recurrence rate of PD varies depending on several factors, including the severity of the initial infection, the effectiveness of treatment, and the patient's risk factors.

Simple excision involves removing the affected tissue and closing the wound with sutures, which is relatively straightforward. It can be performed under local anesthesia in an outpatient setting and without hospitalization. Simple excision offers advantages such as ease of access, short period, minimal rework, and straightforward self-care. In a comprehensive review of multiple studies, the results support excision as the standard treatment method for patients with chronic PD.³ In addition to excision, another commonly employed technique is midline wound closure, which is the second most frequent treatment for PD.^{6,8} Several studies have indicated recurrence rates of up to 10% in patients who underwent excision with primary closure within 1 year.⁶ Alternatively, leaving an open wound

after excision is another option, but this approach is associated with delayed return to work and long healing periods ranging.^{4,5} However, the recurrence rate tends to increase if patients undergo repeat surgery with a poorly healed wound after an open wound procedure.⁴ Therefore, we attempted to identify alternative procedures that can either replace or enhance current approaches. Partial primary closure is another alternative intermediate between complete primary wound closure and open wound healing. This technique involves leaving the wound slightly open, which can limit issues related to wound infection and dehiscence.¹⁰

Flap surgery, also known as a cleft lift procedure, involves repositioning the skin around the affected area to prevent the formation of new cysts or sinus tracts. Flap procedures are associated with lower recurrence rates and are particularly recommended for patients with more complicated PD or larger lesions.^{3,5} Following excisions or drainage procedures for PD, flap procedures may be considered. Among these, the Karydakos and the Bascom cleft lift procedures are widely recommended given their lowest recurrence rates.^{2-5,9} V-Y advancement and Z-plasty techniques have also been used, which demonstrate minor wound complications, improved wound healing, and reduced recurrence rates, as reported in some case series.³ Although flap procedures appear to be advantageous due to their low recurrence rates, potential complications such as hematoma, seroma, and wound infection should be acknowledged.¹⁰

Given the difficulty in objectively evaluating the risk of recurrence, we designed a risk score for recurrence rate evaluation. In our model, patients with scores of > 3 are considered to have a higher risk of recurrence after surgery, prompting the recommendation of flap procedures. In our database, 6 patients with PD underwent flap procedures, including rotation flap, fasciocutaneous flap coverage, and V-Y flap. Based on our study results, we recommend patients with PD with scores of > 3 to consider undergoing surgery with the flap technique in the operation room. Conversely, for patients with scores < 3, simple excision or outpatient procedures may suffice.

However, the validation of these recommenda-

tions is constrained by the limited number of cases in our study. To address this, we continued our search for patients who received a diagnosis of PD from February 1, 2021, to July 31, 2023. Three patients were diagnosed as having PD, each evaluated using our risk score methodology. A male patient who had a score of 2, a history of hemophilia B and hypertension, and a lesion size of ≤ 2.55 cm without an abscess also underwent a simple excision in the operation room. Similarly, a female patient with a history of thalassemia, a score of 1, a lesion size of ≤ 2.55 cm without an abscess also underwent a simple excision in the operating room. Contrastingly, an 18-year-old man with a score of 3, with no history of any systemic disease, and presenting with a lesion size of ≥ 2.55 cm with an abscess underwent an evaluation for the high risk of recurrence.

Subsequently, for the patient, we opted for simple excision followed by fasciocutaneous flap coverage in the operation room. Notably, all 3 patients did not report any recurrence after the follow-up period. Our risk score model facilitates the evaluation of whether a patient needs surgery with a flap. This approach enables the selection of more appropriate surgical interventions based on individual risk profiles.

Conclusion

The treatment of PD is complex, particularly due to the challenge of recurrence. However, objectively evaluating patients with PD and identifying those at high risk of recurrences are challenging. To address this challenge, we designed a model for providing a more systematic and standardized approach to evaluating the risk of recurrence in PD. We posit that combining simple excision with a flap procedure offers additional benefits, especially for patients who are at high risk of recurrence.

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原 著

預測藏毛疾病術後復發之風險評分法

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目的 藏毛疾病（又稱藏毛竇/囊腫），通常表現在臀間隙附近的皮膚和皮下組織，好發於青壯年男性。其危險因子包括肥胖、外傷、久坐、較深臀間隙、家族史及白種人。患者如有急性感染或慢性發炎等情況，往往需就醫接受內科或外科治療。單純病灶切除術因操作容易，且大多在門診即可處理，故成為大多數外科醫生的首選。然而，研究發現單純病灶切除術的術後復發率高。目前此疾病有多種外科處理方法，但直至今日醫學界尚未有針對藏毛疾病的外科治療共識。有研究發表，皮瓣手術可以降低術後復發率。本研究旨在提供有價值的見解，以改善藏毛疾病的外科治療策略。

方法 我們搜尋萬芳醫院從過去 1999 年至 2021 年期間的資料庫，所有患有藏毛疾病之患者中，有 30 患者接受單純病灶切除術。在此篇內文，我們使用 SPSS 系統進行邏輯迴歸分析，並運用 ROC curve 和 ROC 曲線下面積來做統計處理。

成果 過去 20 年中，萬方醫院共有 30 名接受單純切除術之藏毛疾病患者。其中年輕男性居多，患者平均年齡為 32.3 歲。年齡、性別、膿瘍、病灶長度、是否為門診手術和傷口是否縫合等危險因子皆影響術後復發。已知患者擁有的風險因子越多，術後復發率風險越高，但是目前沒有客觀的風險高低評估工具。因此，我們設計一項風險評分法，希望可以更準確的評估術後復發率。在我們設計的風險評分法中，分數大於 3 分的患者被認為術後復發率較高，因此，我們建議這些患者進行皮瓣手術。對於分數小於 3 的患者，意味著較低的術後復發率，因此單純切除術即足夠。

結論 藏毛疾病的高復發率特性一直為人所困擾，然而有效且客觀的評估復發率風險甚難，因此我們設計一項風險評分法，以便更準確評估術後復發率。依照我們設計的風險評分法，建議經評估後復發風險較高的患者接受皮瓣手術。透過分享此篇文章和經驗，希望對藏毛疾病的治療有所幫助與回饋。

關鍵詞 藏毛疾病、復發率、風險評估。