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tention

A Novel Application of Fish Skin Grafts in Pilonidal Wounds: Technical Description and Retrospective Case Series

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Abstract

Background: Pilonidal disease involves an under the skin infection near the gluteal cleft and the only definitive treatment is full surgical excision. Still, surgical excision is associated with a high rate of complications and there is significant debate on the benefit of primary versus secondary closure. Kerecis™ is a fish skin derived acellular dermal matrix product that has shown promise in promoting the healing of complex wounds, but its application in wound closure in pilonidal disease has not yet been studied.

Objective: Here detail a novel technique of using Kerecis™ Omega3 MicroGraft to assist with granulation tissue and primary closure of pilonidal wounds and highlight seven patients who underwent this procedure for primary closure of pilonidal wounds without complications.

Methods: We selected seven patients with recurrent pilonidal disease who underwent excision and primary closure within the same calendar year. Each of these patients underwent excision of pilonidal disease as well as primary closure with Kerecis MicroGraft and a flap for off-midline closure.

Results: None of our patients experienced any complications including wound breakdown or infection. At 21-28 days postoperatively, all patients presented for removal of sutures and reported 0/10 pain with no complications.

Conclusions: Although closure of pilonidal wounds is associated with frequent complications, our study supports the use of Kerecis MicroGraft in primary non-midline closure in promoting wound healing and decreasing complications.

Introduction

Pilonidal disease involves an infection that occurs under the skin near the gluteal cleft originating from ingrown hair. Pilonidal cysts can cause excruciating pain and swelling. Recurrent infections can lead to a progression to abscesses causing additional complications. While incision and drainage of pilonidal cysts can offer a temporary relief, full surgical excision remains the definitive treatment [1]. Despite being the gold standard for definitive treatment of pilonidal disease, surgical excision is associated with high rates of surgical site complications, infection, and recurrence of disease [2].

Due to the high rate of major morbidity associated with pilonidal excisions, there are several methods that can be used to close wounds [2]. Notably, pilonidal excision wounds may be closed via primary or secondary closure as well as through using a variety of suture materials, flaps, and techniques. The choice of closure technique may depend on various factors including the size and location of the wound, surgeon preference, and the patient-specific factors [3].

Broadly speaking, surgeons may take an open or closed operative approach to pilonidal cyst removal. A closed operative approach involving primary

closure has been shown to result in faster healing than open operative approach. However, there is an increased risk of recurrence for closed approaches when compared to open approaches [2, 4]. In patients undergoing primary closure, closure with an off-midline wound was associated with lower rates of infection and recurrence [4]. Data on the benefits of primary versus secondary closure of wounds in pilonidal excisions is inconclusive and leads to a lack of standardization of techniques [5].

In this retrospective case series, we present a novel technique of using Kerecis™ MicroGraft, a fish skin derived acellular dermal matrix product in improving outcomes of primary wound closure in pilonidal cyst excisions. The Kerecis™ grafts have been used to improve granulation tissue formation and wound healing in the context of complex wounds, but no current research demonstrates the efficacy of using this product to close pilonidal wounds [6,7,8]. Here we hope to contribute to the improvement and standardization of pilonidal wound closure through highlighting seven patients who received Kerecis™ fish skin graft to assist with granulation tissue and primary closure without complications.

Methods

We selected seven patients with recurrent pilonidal disease who underwent excision of pilonidal cyst and tract application of Kerecis, piscine xenograft (MicroGraft), and primary wound closure in 2022 and 2023. A description of the technique used to extract the specimen, irrigate, and wash the wound, apply the xenograft granules and close with Karydaki flaps is provided below. Demographic data was collected on each of these patients including age, BMI, smoking status, and comorbidities. Information on perioperative complications, deviations in the procedure and estimated blood loss was recorded as well. Each patient presented for a 21-day postoperative follow up and removal

of sutures at which the status of the wound healing was noted. All the patients in this study consented to surgery and provided verbal consent for the use of the following images in this study. This data was de identified and all personal health information was omitted for patient anonymity.

Technical Description: After induction of anesthesia, administration of perioperative antibiotics, and a proper time-out was performed, the presacral perianal area was prepped and draped in the usual fashion. An elliptical incision was made around the area of pilonidal disease. We dissected down subcutaneous tissue and excised the disease in its entirety (Figure 1a). No contamination was made during the excision. Once all the disease was excised, the area was irrigated. Hemostasis was achieved and the wound was irrigated with normal saline and hydrogen peroxide. The deep tissue Kerecis™ xenograft granules were placed (Figure 1b). Note that there must be some blood in the wound to activate the granules. Once hemostasis was achieved the wound was closed in multiple layers with nylon sutures in a mattress fashion on the skin using a Karydaki flap (Figure 1c). Bacitracin and dressing were applied. The patient was awakened from anesthesia and taken to the post anesthesia in stable condition. Following the operation, patients were sent home with wound dressing and bacitracin ointment and scheduled for a follow up and suture removal 21 days postoperatively. Prior to discharge, patients were educated on proper wound dressing and were instructed to keep pressure off the wound.

Six out of seven of these patients underwent primary closure with Karydaki flaps slightly lateral to midline to reduce tension and improve blood flow to the healing wound. One patient had extensive disease that led to a large wound and a rotational Y flap was required to decrease tension. No tension was present once the flap was applied. Three layers of deep sutures were applied, and the

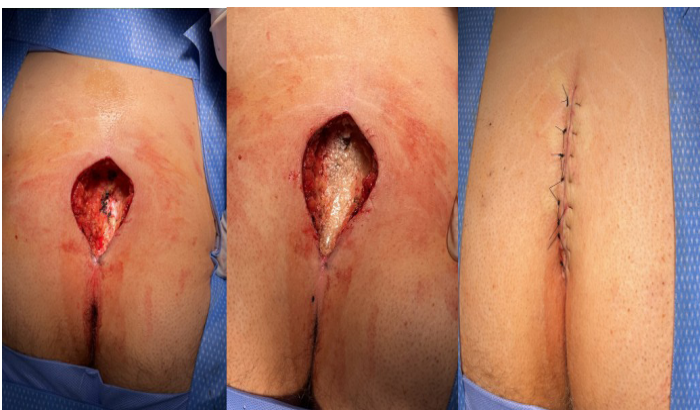


Figure 1: Intraoperative images of a pilonidal cyst removal. The images show the wound following dissection down to subcutaneous tissue and extraction of cyst (a), irrigation with saline and hydrogen peroxide and application of the Kerecis xenograft granules (b), and multi-layer closure with Karydaki flap to the right of midline (c)



Figure 2: Intraoperative images of a patient whose extensive disease required closure with a rotational Y flap. Once effectively debrided and irrigated, the wound was 12cm x 6cm x 3cm in dimension (a). The wound was tension-free and closed using a rotational Y flap and nylon sutures in a mattress fashion (b).



Figure 3: Images of wound healing and suture removal 21-28 days postoperatively. These images were of all of patients who underwent closure with a Karydakis flap. All patients had appropriate wound healing with no signs of infection or wound dehiscence. 3a and 3b show wounds prior to suture removal and 3c and 3d are images taken following removal of sutures.

wound was closed with sutures in a mattress fashion (Figure 2). All the patients followed 21-28 days postoperatively for assessment of wound healing and removal of the sutures (Figure 3).

Results

Our study included seven patients who underwent excision of a pilonidal cyst with application of Kerecis™ MicroGraft and primary closure of the wound. The patient population consisted of 4 males and 3 females. The average patient age was 21.85 (range: 17-28), average patient BMI was 35.26 kg/m² (Range: 19.5-47.2 kg/m²). One patient reported a history of smoking, and one patient had a history of second-hand smoke exposure. The other 5 patients had no history of smoking or second-hand smoke exposure. Two patients had a history of alcohol use socially. One patient had a known allergy to penicillin, and the other six had no known drug allergies. Two patients had a history of asthma, and another patient had a history of asthma, autism, epilepsy, and attention deficit hyperactivity disorder. One patient had a history of anal fistula which was closed by anal fistulotomy and marsupialization. Otherwise, none of these patients have a history of recent surgeries or immunocompromising conditions such as diabetes, immunodeficiency, or cancer.

Perioperatively, all patients underwent pilonidal excision, application of MicroGraft and primary closure of the wound. The average estimated blood loss for these procedures was 10.71mL (range: 5-25mL).

At the 28-day follow-up visits, all patients reported a 0/10 pain score, and none of the patients in this study had any complications in wound healing such as infection, wound dehiscence, or recurrence of disease in the postoperative period.

Discussion

This study evaluated the efficacy of application of Kerecis MicroGraft in improving wound healing and decreasing disease recurrence in healing of pilonidal wounds by primary intention. Though wound healing is quicker through primary intention, secondary closure may reduce disease recurrence rates [4]. However, leaving wounds open to heal through secondary intention slows wound healing and requires additional wound care and difficult management that may put physical and financial strain on the patients.

Other studies suggest that midline closure increases the risk of infection and recurrence [4]. All patients in this study received closure with an off-midline incision. While karydakis flap is ideal for most of our patients, one patient in our study required a rotational flap due to extensive disease. This patient was obese with a BMI of 47.2 kg/m² which likely contributed to the disease being so extensive that it required closure with a rotational flap. Regardless of the alternate method, this did not change the outcomes of healing and the patient had no complications. This suggests that the type of flap used to close the wound may vary by patient, but the effectiveness of the MicroGraft and decision to close by primary intention likely has little impact on healing outcomes. Our study supports the non-midline closure of these wounds. More data is needed to make further conclusions regarding the factors involved in healing outcomes.

Limitations of this study include small sample size, lack of a control group, and short follow-up period. Future studies should include larger sample sizes, a control group including patients undergoing an open operative approach or those undergoing primary closure without the use of fish granules. Additionally, future studies should aim to follow patients within the first two years post-excision to evaluate recurrence rate.

Although surgical removal remains the mainstay treatment for pilonidal disease, other methods such as laser depilation or laser hair removal, have been proposed as adjunctive therapy to minimally invasive surgery. As pilonidal disease is heavily linked to ingrown hair on the gluteal cleft, laser hair removal has been shown to be a safe and effective way to reduce recurrence of pilonidal disease

when used along with surgery [9,10]. None of the patients in this study had undergone laser hair removal for their pilonidal disease, but future studies may evaluate the role of laser hair removal when combined with surgical excision.

Conclusion

In this retrospective case series, we present a novel technique of using Kerecis™ MicroGraft, a fish skin derived acellular dermal matrix product, in improving outcomes of primary wound closure in pilonidal cyst excisions in seven patients. The Kerecis™ fish graft has been used to improve granulation tissue formation and wound healing in the context of complex wounds, but no current research demonstrates the efficacy of using this product to close pilonidal wounds [5]. Here we present the cases of seven patients who all underwent primary closure of pilonidal wounds with application of MicroGraft, and all patients reported outstanding wound healing with no complications at 21-28 days post operative. This supports the use of Kerecis™ fish skin graft to assist with granulation tissue and primary closure without complications.

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Data from our study may be retrieved upon request.

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Informed Consent: The patients in this study provided informed consent prior to participation

Author Contributions: Camryn Daidone, Naved Salim, Leslie Smith, and Dr. Ahsan Raza provided substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; Camryn Daidone and Naved Salim drafted the article or revised it critically for important intellectual content; Dr. Ahsan Raza gave final approval of the version of the article to be published; and all authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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