

C L I N I C A L M A N A G E M E N T

extra

Pilonidal Sinus Disease: 10 Steps to Optimize Care



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PURPOSE:

To present a 10-step approach to the assessment and treatment of pilonidal sinus disease (PSD) and related wounds based on the Harris protocol, expert opinion, and a current literature review.

TARGET AUDIENCE:

This continuing education activity is intended for physicians and nurses with an interest in skin and wound care.

OBJECTIVES:

After participating in this educational activity, the participant should be better able to:

1. Explain the pathophysiology and the assessment of PSD and PSD-related wounds.
2. Delineate a systematic approach to managing PSD, including patient self-care teaching.

ABSTRACT

Pilonidal sinus disease (PSD) is a common problem in young adults and particularly in males with a deep natal or intergluteal cleft and coarse body hair. An approach to an individual with PSD includes the assessment of pain, activities of daily living, the pilonidal sinus, and natal cleft. Local wound care includes the management of infection (if present), along with appropriate debridement and moisture management. Treatment is optimized with patient empowerment to manage the wound and periwound environment (cleansing, dressing changes, decontamination, hair removal, minimizing friction). Self-care education includes the recognition of recurrences or infection. Early surgical intervention of these wounds is often necessary for successful outcomes. Pilonidal sinus healing by secondary intention often takes weeks to months; however, the use of the Harris protocol may decrease healing times. A number of new surgical approaches may accelerate healing. Surgical closure by primary intention is often associated with higher recurrence rates. Expert opinion in this article is combined with an evidence-based literature review. The authors have tabulated 10 key steps from the Harris protocol, including a review of the surgical techniques to improve PSD patient outcomes.

KEYWORDS: pilonidal sinus disease, pilonidal sinus wounds, pilonidal cyst

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INTRODUCTION

The prevalence of natal or intergluteal cleft pilonidal sinus disease (PSD) was estimated at 25 cases per 100,000 individuals in a French study and 28 cases per 100,000 individuals in a Norwegian report.^{1,2} Adolescents and young adults (peak age 15-30 years) have the highest incidence, and males are 2.2 times more likely to develop PSD.² Not all cases of PSD are symptomatic; a study examined 1000 Turkish soldiers and reported that 88 (8.8%) had PSD on physical examination, and 48 (4.8%) were symptomatic in this high-risk population.³ Local trauma or irritation has been documented to precede diagnosis in 34% of patients in the Norwegian report.¹

During World War II, PSD was nicknamed “jeep driver disease.” In the Turkish soldier study, 58 of 88 persons (65.9%) with PSD were vehicle drivers. The Norwegian study of pilonidal disease had 70.9% of subjects documented with long durations of driving vehicles and 44% with a sedentary occupation.² A correlation between obesity and pilonidal sinus incidence was noted in American college students as early as 1953.⁴ Although not all studies have demonstrated causality, other risk factors include family history, smoking, extensive body hair, stiff hair, poor hygiene (fewer than 3 baths a week), and an anatomically deep natal cleft (NC).²⁻⁹ Individuals who have excessive hair, sit down for more than 6 hours a day, and bathe 2 or fewer times per week are at a 219-fold increased risk of sacrococcygeal

pilonidal disease compared with those without these risk factors.⁹

Although previously thought to be a congenital disorder, it is considered an acquired disease whereby hair causes a traumatic penetration of the skin or enters through a preexisting sinus tract.^{10,11} A 1992 review study (6545 cases over 35 years) concluded that 3 main factors were involved in the hair insertion process.¹¹ First is *hair* (H) as the invader; then *force* (F) by which the hair is inserted, dependent on the angle of the NC; and the *vulnerability* (V) of the skin to repel or allow invasion. A deep NC retains moisture from sweating or bathing,¹ where the epidermis is also exposed to anaerobic conditions, hair, debris, and bacteria, or has preexisting folliculitis, making it more vulnerable to hair penetration.¹⁰⁻¹³

Pilonidal disease is one of a tetrad of hair follicle occlusion disorders that also include hidradenitis suppurativa, severe acne vulgaris, and dissecting cellulitis of the scalp.^{14,15} Patients with PSD may endure an average of 3 to 5 years of pain and suffering from the time of first symptoms to diagnosis.^{2,16}

Utilizing a modified Delphi technique and level of evidence ratings, the Harris Pilonidal Sinus Wound protocol for open and infected pilonidal sinus wounds (PSWs) demonstrated the complexity of managing and healing these wounds.^{17,18} In 2012, Harris et al¹⁹ provided a practical update to the protocol, based on lessons learned. This article outlines a 10-step approach to the assessment and treatment of PSD and related wounds, based on the Harris protocol, expert opinion, and a current literature review.

STEP 1: EVALUATE THE HISTORY OF PILONIDAL SINUS DISEASE

Pilonidal sinus disease can present as an acute abscess with nociceptive and/or neuropathic pain that can be stimulated by an inflammatory insult. This may be treated initially as a furuncle or boil. The Turkish military study documented a furuncle or boil elsewhere on the skin in 25% of PSD cases.³ Based on this result, it may be important to ask about other sites and if the boils have necessitated previous medical care for drainage and/or antimicrobial therapy.

When sinus tracts are present, there may be intermittent discharge (pus, blood, or serum), and systemic symptoms may occur, including fevers, chills, and characteristic pain that requires acute medical care. Doll et al¹⁰ found an association between the onset of PSD at a young age and the presence of a larger number of sinuses at the time of surgery, suggesting that most or all of the sinuses originate at approximately the same time. This could be before or at the initial presentation of PSD symptoms. Contrary to common belief, the time length of a patient's chronic PSD symptoms did not result in an increased number of sinus tracts. Furthermore, the development of additional sinus tracts does not seem to be associated with infection.¹⁰

STEP 2: EXAMINE THE PILONIDAL WOUND WITH THE PATIENT IN THE MODIFIED JACKKNIFE POSITION

It is important to completely visualize the NC and the extent of PSD. The Harris protocol¹⁸ recommends a “modified jackknife” position, in which pillows are placed under the anterior pelvis with the individual lying prone. This flexes the hips slightly, while raising the buttocks, making it difficult for the patient to tense his/her gluteal muscles (a natural response to anticipated or procedural NC pain). The patient can help to separate his/her buttocks using both hands while in this position to allow for examination of the perianal area. Good overhead lighting is imperative in order to visualize the area.

Examination

Frequently, PSD occurs in the NC above the anus close to the midline. The most common finding is a sinus or incomplete cyst connected to a pit-like opening. Hypergranulation tissue, considered a sign of chronic inflammation and infection, may line the sinus tracts or abscess and prevent healing. Similarly, if hair is the focus of infection, the sinus or tracts will not heal until it is removed. In chronic PSD with multiple tracts, there is greater opportunity for wound exudate to drain. However, if occlusion of a sinus tract occurs, caused by existing or newly infiltrated hair, this can predispose to the development of an abscess.¹⁰

In 2007, Tezel²⁰ proposed a method of classifying the severity of PSD in the NC area extending between the lateral edges of the cleft (identified when the buttocks are pressed together), extending to the apex of the coccyx, where the crease ends. The use of a classification system helps to document the extent of PSD and provides a method of matching intervention to the severity of the disease (Table 1).

STEP 3. ASSESS THE PERIWOUND NATAL CLEFT AND HAIR DISTRIBUTION

Pilonidal sinus disease is more common in individuals with deep NCs. Affected individuals are often hirsute with abundant, coarse body hair in the region. The skin should also be assessed for coexisting hidradenitis suppurativa (abscesses and sinuses extending beyond the NC with potential involvement in the anterior groin, axillae, or under the breasts in females).

The differential diagnosis also includes the following:

- **Anal fistula** is a tract that travels from the skin to the anal canal. This type of tract can be probed to identify the connection with the anus or the opening confirmed with a digital examination of the rectum. Surgical removal may be necessary.
- **Perianal Crohn disease** may have several perianal fistulas communicating with the anus or even higher in the rectal region. Referral to a gastrointestinal tract specialist and endoscopic evaluation with biopsy may be required to confirm the diagnosis.
- **Furuncles** are boils involving the deep hair follicle system. These usually appear elsewhere on the body and can be associated with PSD. *Staphylococcus aureus* (including methicillin-

Table 1.
CLASSIFICATION OF PSD AND RECOMMENDED INTERVENTIONS

Type of PSD and Description	Interventions
Type I: Asymptomatic pit(s) without a history of abscess and/or drainage	Requires no surgical therapy; consider local hair removal and good personal daily hygiene
Type II: Acute pilonidal abscess	Lateral incision and drainage; consideration of future surgery
Type III: Pit(s) with a history of abscess and/or previous drainage	Surgery is recommended using the Bascom technique (off-midline incision with rotational flap over the gluteal cleft, resulting in a modified shallow or lifted gluteal cleft). ²⁰ See Table 2 for other surgical options with associated healing times and results.
Type IV: Extensive disease where 1 sinus opening lies outside the natal cleft area. Such patients usually have a history of multiple abscess formation and drainage without definitive pilonidal surgery	
Type V: Recurrent pilonidal sinus following any surgical treatment	

Source: Tezel E. A new classification according to navicular area concept for sacrococcygeal pilonidal disease. *Colorectal Dis* 2007;9:575-6.
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resistant strains) is the most common organism associated with furuncles, and treatment requires local incision and drainage and antimicrobial therapies as needed.

- **Perianal ulcers** are often associated with herpes simplex, with weeping vesicles in clusters (herpetiform) that may be present on an erythematous base.
- **Unusual thickened or persistent lesions** may be verrucous (condylomata or genital warts) or have persistent inflammation that may develop a squamous cell carcinoma (keratotic papule or nodule).
- **Unusual infections**
 - Perianal tuberculosis can mimic PSD, but may be associated with inguinal lymphadenopathy and a higher incidence of human immunodeficiency virus infection.
 - Perianal syphilis often presents with a solitary ulcer or 2 opposite ulcers facing each other in a person with a history of sexual contact.

STEP 4. EVALUATE FOR POTENTIAL UNTREATED DEEP OR SURROUNDING INFECTION

With its proximity to the rectum, contamination with feces may be challenging to avoid with PSD. The NC is often tight, trapping

perspiration and moisture, and is ideal for bacterial proliferation. If deep infection develops, friable granulation tissue, pocketing of granulation tissue in the base, premature bridging of epithelial tissue, and abscess formation may occur in the wound area.²¹

The NERDS and STONEES mnemonics were described by Sibbald et al²² in 2006, validated by Woo and Sibbald²³ in 2009, and were featured in the Harris modified Delphi.^{17,18} The mnemonics outline 3 or more clinical features that are suggestive of superficial/local infection (NERDS—nonhealing, exudate, red friable granulation, debris, and smell) and deep infection (STONES, later revised to STONEES). For deep and surrounding infection, consider the wound margin and base as a soup bowl with a continuous compartment between the wound edge and base. The presence of any 3 of the 7 STONEES criteria would be an indication to treat deep infection. Use the STONEES mnemonic to help diagnose infection with these clinical signs:

- S**-size of wound is increasing in the wound margins
- T**-temperature: infrared thermometry demonstrates a 3° F or more increase in temperature compared with a mirror image (front and back of the leg, opposite extremity in the same location)
- O**-os is Latin for bone probing or exposed bone
- N**-new satellite areas of wound extension are developing in the wound margins that often join with the main wound
- E**-erythema and edema around the ulcer margin = cellulitis
- E**-exudate is formed as the host's response to injury
- S**-smell usually indicates that gram-negative or anaerobic bacteria are present in the wound.

Deep and surrounding infection syndromes may include erysipelas, cellulitis (with/without abscess), or osteomyelitis. Deep infection in association with a wound may occur without overt periwound cellulitis features (erythema, edema). Persistent inflammation with or without infection may also be caused by the hair follicle, hair tip, or foreign-body reaction to a PSW and can delay healing. If infection is diagnosed on the basis of the previously mentioned or additional criteria, systemic antimicrobial therapy is required. Although microbiology of PSD has not been extensively studied, on the basis of anatomy, and chronicity, PSWs are polymicrobial with gram-positive and gram-negative aerobic/anaerobic bacteria. Brook²⁴ examined cultures of aspirated pus in 75 patients with PSD and demonstrated the predominance of anaerobic bacteria and the polymicrobial nature of these wounds, supporting earlier work by Marks et al.²¹ A recent study of sacrococcygeal primary and recurrent PSD of 96 patients demonstrated that PSD wounds were polymicrobial with both aerobic and anaerobic organisms.²⁵ Researchers also noted an increased proportion of gram-positive bacteria and trend to greater proportions of aerobic bacteria in recurrent cases than with primary cases.²⁵

To select the appropriate antimicrobial agent after a clinical diagnosis of infection is made, a bacterial swab may be useful with the Levine technique²⁶ (swab pressed lightly to extract fluid and then rotated 360 degrees). The culture can identify the bacterial species and resistance profile. Pending cultures, empiric

antimicrobials should cover gram-positive, gram-negative (not including *Pseudomonas aeruginosa*), and anaerobic bacterial species. Oral antimicrobials with anti-inflammatory actions include tetracyclines (especially doxycycline), sulfonamides, clindamycins, erythromycins, and metronidazole. Gram-positive oral antimicrobials with antistaphylococcal activity include cephalixin, cloxacillin, amoxicillin-clavulanic acid. Sulfonamides and doxycycline cover methicillin-resistant *S aureus*. The majority of the mentioned antibiotics have some gram-negative bacterial activity. Agents with extended gram-negative activity include the quinolones (ciprofloxacin, moxifloxacin), and anaerobic activity may be obtained from clindamycin and metronidazole. *Pseudomonas aeruginosa* empiric coverage is not required unless dictated by clinical presentation and culture results, and in these cases, ciprofloxacin is the best oral option available. For complicated infections, including postsurgical infections and infections with unusual organisms (mycobacterial species), infectious disease consultation should be considered.

STEP 5: MANAGE PAIN

Pain in persons with PSD can interfere with activities of daily living (attending work or school or refusing to have the wound packed).²⁷ Price et al²⁸ performed a quality-of-life survey of individuals with acute wounds (n = 80), 62 of whom were consistent with PSD. Discomfort from the wound interfered with sleep (49%) and diminished appetite (20%) at a time when good nutrition is needed for healing. For many patients, narcotic analgesia can impair daily activities, including driving, and may not be adequately effective. Other adverse medication events include central nervous system, respiratory, and gastrointestinal effects. To minimize pain associated with dressing changes, adequate preparation of the patient, use of gentle wound care, and local dressings are recommended.

Similar to other wounds, pain related to PSWs may be nociceptive or neuropathic. In general, the systemic approach to nociceptive (stimulus related) pain management involves use of the World Health Organization pain ladder.²⁹ If patients have gnawing, aching, tender, or throbbing pain that is stimulus dependent, then aspirin, nonsteroidal anti-inflammatory drugs, and narcotic agents may be used. Clinicians must consider issues of tolerance, addiction, and adverse effects when prescribing narcotic agents. For neuropathic pain (spontaneous burning, stinging, shooting, stabbing), tricyclic agents (especially nortriptyline, desipramine), gabapentin, pregabalin, and carbamazepine are useful. As individuals can have neuropathic and nociceptive pain, a detailed pain assessment is critical to ensure appropriate pain management.

STEP 6. EVALUATE ACTIVITIES OF EVERYDAY LIVING AND APPROPRIATE FUNCTIONAL RECOMMENDATIONS TO FACILITATE HEALING

Friction is caused by 2 surfaces rubbing against each other. When managing patients with PSWs, the healthcare professional needs

to evaluate activities of daily living. Sitting for long periods and activities such as prolonged driving (rough and bouncing action when behind the wheel) will add friction as each side of the buttock is subjected to trauma and friction in different directions. Sports that include many stops and starts and include deep knee bends (swimming, running, soccer, hockey, baseball) can all aggravate the PSD problem.

Walking may be a better alternative as a form of exercise, dependent on the tightness of the NC and the amount of friction created. If physical activities are important to the person with PSD, eliminating them can negatively impact quality of life. They should be encouraged to participate in modified activities, while balancing the risks of physical trauma and delayed healing with the gained benefits from the activity.¹⁸ The healthcare professional must negotiate a plan of care, including pain management strategies, which addresses the patient's needs. To engage in a management plan, patients are required to have knowledge of their disease, the wound healing trajectory, and suitable activities that fit within their lifestyle and current situation. In general, if healing rate and pain control are adequate, patients are encouraged to continue with activities as tolerated with no specific restrictions.

STEP 7. DOCUMENT THE WOUND CHARACTERISTICS

Pilonidal sinus wounds are usually located in the NC. The total length and width of the abnormal tissue should be documented, along with the depth of the deepest part of the wound as measured by a cotton tip applicator (placing a mark on the applicator at the wound surface). Wound characteristics, including signs of inflammation/infection (NERDS and STONEES), the number of surface openings, sinus tracts, abscesses or nodules, premature epithelialization, and undermining or pocketing should be recorded (Figure).

STEP 8. WOUND BED PREPARATION APPROACH (DEBRIDEMENT, LOCALIZED INFECTION, MOISTURE CONTROL)

Local wound care includes assessment of the wound's characteristics and modification of care strategies to meet the current findings.

Debridement

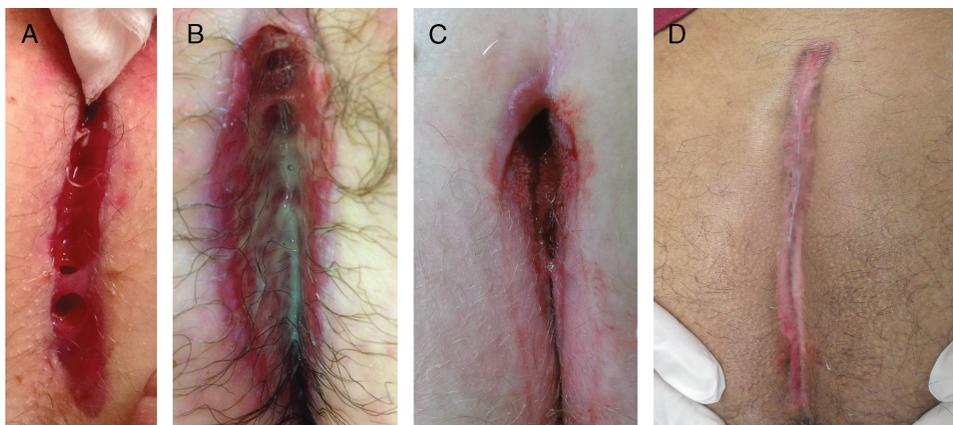
In many types of chronic wounds, slough, or eschar may be present, but are not seen to the same degree in PSD. Pilonidal sinus wounds often develop hypergranulation tissue, bridging or pocketing in the base, or undermining under a new epithelial bridge. These are all signs of infection requiring removal. Although silver nitrate (AgNO_3) has been recommended previously (it oxidizes organic matter, coagulates tissue, and destroys surface bacteria), it is now believed to cause further inflammation of the wound surface. In addition, AgNO_3 does not address issues of exudate management, reducing friction, or treatment of infection and it requires repeated applications.³⁰

The authors recommend that wound debridement can be accomplished by several more effective methods, which may be used concurrently including the following:

- curetting or conservative debridement with a curette or iris scissors to remove surface abnormal red friable granulation after suitable pain control with oral pain control or local anesthetic agents: intralesional xylocaine with or without adrenaline and topical anesthetic agents containing amine local anaesthetics (xylocaine, prilocane, pramoxine)
- autolytic debridement with dressings containing calcium alginates that will also control bleeding and hypertonic sodium chloride (NaCl)-impregnated gauze
- mechanical debridement using a handheld shower to cleanse during the patient's shower prior to dressing wound or irrigation with a volume of 100 to 150 mL at 7 to 15 psi.³¹

Figure.

PILONIDAL SINUS WOUND CHARACTERISTICS



Localized Infection

Superficial or localized infection occurs following colonization, most commonly with a polymicrobial community and subsequent biofilm formation on the surface of the wound, especially interfacing wound surfaces as found in PSWs.³² Localized infection can lead to delayed or stalled healing of a PSW.

Signs of surface bacterial damage that should be treated topically after properly debriding the wound bed are included in the NERDS mnemonic^{22,23}:

- **Nonhealing:** the size of a wound is stalled and not 30% smaller from a previous measurement 4 weeks ago
- **Exudate** has increased
- **Red** friable granulation with many blood vessels, an abnormal bright red color, and very little mature collagen—the clinician should examine removed dressings for blood and the surface of the wound for bleeding points when the dressing is removed
- **Debris:** presence of, or increase in, slimy, translucent, and confluent film and/or dead yellow slough on the wound surface
- **Smell** indicates the presence of gram-negative or anaerobic organisms.

The presence of 3 or more NERDS signs is an indication to include topical antimicrobial agents as part of the local wound care. Topical antimicrobials can consist of silver, iodine preparations, polyhexamethylbiguanide (PHMB), medical-grade manuka honey, or other miscellaneous agents with antimicrobial properties. The choice of dressing will depend on the amount of exudate, the desired frequency of dressing changes, and the ability of the patient to manage self-care. Silver has anti-infective and anti-inflammatory properties and is available in foam, hydrofiber, alginate, or hydrogel forms, which have varying silver release and moisture balance capabilities. Iodine has the ability to penetrate biofilms because of its small molecular size, but it may promote inflammation. Iodine is also available in combination with cadexomer absorbptive molecule, slowly releasing iodine as it absorbs wound exudate.

Polyhexamethylene biguanide is a disinfectant and antiseptic available in foam and gauze formats, which act to provide moisture balance. Medical-grade honey is available in alginate, hydrocolloid, and hydrogel formulations with several antimicrobial actions, including hyperosmolar properties that may be neutralized when the dressing becomes oversaturated. The gentian violet/methylene blue-impregnated foam is available in flat or narrow tunneling dressings, and although it needs to be dampened before applying, it can absorb additional exudate. The wicking/capillary action pulls bacteria, endotoxins, and other inflammatory materials from the wound bed into the antimicrobial foam. Foam dressings containing detergents (surface active agents) may be beneficial for PSWs because they can remove feces. If the exudate is excessive, and additional signs of deep and surrounding signs of infection are present (STONEES), additional investigations and systemic treatments may be required. In 2014, Woo et al³³ reviewed the existing literature on

antimicrobial dressings and PSWs and concluded that PHMB and silver dressings may be superior to other topical agents in reducing the bacterial burden in PSWs; however, evidence was insufficient because of methodological limitations and biases of the studies. Whatever the choice of antimicrobial dressings, use only 1 type of dressing at a time and only while the signs and symptoms of infection are present.

Moisture Balance

Pilonidal sinus wounds often have copious exudate. Dressings should prevent “strikerthrough” (where exudate soaks through to the outside of the dressing), which potentiates bacterial contamination, and wick moisture away from the wound surface. Excess moisture on the wound surface can contribute to excess local inflammatory metalloproteases, causing the development of friable granulation tissue.³⁴ With many chronic wounds, the goal is to change the dressings 2 to 3 times per week, but this may not be appropriate for all patients or for PSWs. To decrease dressing frequency, the more expensive moisture-retentive dressings can be considered (adhesive foams with or without silver). The clinician needs to assess how each dressing manages moisture. Selecting the right dressing for each patient involves evaluation and reassessment that is based on the patient’s comfort, acceptability, bowel and hygiene habits, ability to perform self-care, and economic sustainability. In the authors’ experience, self-management for patients with PSD includes the use of a topical antiseptic (povidone-iodine, chlorhexidine, or PHMB) as prophylaxis and as needed for superficial or localized infection, then covered with soft nonwoven gauze as the secondary dressing. Patients can change the dressing as needed throughout the day. Specific to this particular wound type, the soft gauze secondary dressings or superabsorbent dressings with diaper-like polymers provide patients with independence (self-management), help prevent contamination, and maintain contact with the wound surface to promote wound closure. For heavily exudative wounds, superabsorbent dressings including panty liners, foam-packing strips (may be cut longitudinally to have a flat surface), or foam dressings with silver and/or detergents may be used for daily changes, especially after bowel movements.

Many clinicians have had anecdotal success with negative-pressure wound therapy for highly exudative wounds in this region if underlying etiologies and infection have been adequately addressed.

STEP 9. EDUCATION AND PATIENT MANAGEMENT OF PERIWOUND ENVIRONMENT (DECONTAMINATION, HAIR REMOVAL, FRICTION MANAGEMENT)

Patient education is aimed at self-management keeping the NC skin clean, removing unwanted peri-pilonidal sinus skin hair, which often carries *S aureus*,³⁵ and managing the exudate and odor.

Hygiene and Periwound Decontamination

Pilonidal sinus wounds need to be kept clean and dry. Baths should be avoided, and showering using liquid antimicrobial soap substitutes and handheld shower heads are preferred for cleansing, once or twice per day. Sitz baths should be used only if they are specifically ordered, using specialized kits and with 2 to 3 inches of water in the basin for no longer than 5 minutes. They do not provide optimal wound cleansing, although they do improve hygiene and provide some comfort.³⁶ After a bowel movement, PSWs should be cleaned to avoid fecal contamination. A handheld shower head can remove fecal debris in the home; however, in public places, premoistened personal wipes or wet toilet paper may be effective with wiping down toward the anal opening.¹⁹ As a routine part of dressing changes, topical antiseptics should be applied to the periwound area prior to irrigating the wound. The Harris protocol advised cleansing the periwound area and extending 5 cm around the wound with a topical agent such as 0.5% chlorhexidine. Leaving the topical agent in place for 1 minute (5 minutes for wounds infected with *P aeruginosa*) may also decrease surface organisms.^{17,18} The authors' experience suggests that PHMB solutions or applications of 0.50% or 1.0% acetic acid (white vinegar [5% acetic acid] diluted 1/10 or 1/5 with water) are also effective. Care must be taken to remove topical agents from the skin to decrease the risk of contact dermatitis. There does not appear to be any harm if these products also contact the wound surface.

Hair Removal

Embedded hair and debris should be removed at each wound inspection because of the chronic inflammation that they induce. Periwound skin in the NC often contains bacteria, including staphylococci, and the hairs trap feces that contain bacteria and other debris.^{35,37} Long hair protruding into the PSW contributes to chronic inflammation and increases the risk of infection.^{37,38} The Harris protocol recommended shaving the NC at least weekly in a 5-cm-wide strip extending at least 2.5 cm from all edges of the wound and from the anal verge to the presacrum to remove all hair in the area between the distal wound and the anus.¹⁸ Hair removal is necessary (from the wound and periwound skin) to prevent a nidus of inflammation/infection. In the authors' experience, smaller razors specifically designed for the bikini area that include a swivel razor head work most effectively. Anecdotally, the authors have seen improved client outcomes from regularly shaving the periwound area. Shaving should be accompanied by prewetting the area, using a mild soap or shaving cream, shaving in the direction that the hairs are lying on the skin (not lifting the hairs with the shaving motion), and shaving over each area only once. In open wounds, it is critical to carefully examine the wound and wound edge at each visit to identify and remove hairs or foreign bodies. Even careful shaving can cause minor trauma to the wound margins.

Some patients are better using scissors (small nail, surgical iris) to remove hair, avoiding the local trauma from shaving.

Laser hair removal is ideal for selected patients. The color of the hair needs to be distinct from the skin color. For hirsute individuals, this method can remove hairs for a longer period than other procedures, although it can be painful and costly. Laser centers that are cosmetically oriented are reluctant at times to carry out procedures on individuals with open wounds, although this is not a contraindication. Multiple sessions are often required, and the hair removal is not permanent, but new hair growth will require less frequent maintenance.

Avoiding Friction and General Measures for Activities of Daily Living

Persons with PSD need to be careful to avoid activities with excessive friction, especially after surgical procedures. Buttock friction is maximal with activities such as cycling, swimming, competitive sports, and even picking up heavy objects (eg, a young child). Driving or sitting for long periods will also be an aggravating factor, especially driving a car. Gentle yoga or meditation exercises may be beneficial.

Constipation should be avoided through a high-fiber diet, adequate hydration, and use of stool softeners as needed. Patients with PSD should have a diet high in natural dietary sources of zinc, vitamin C, and protein, which are the building blocks of wound healing. Although PSD occurs primarily in adolescents and young adults, nutritional deficiencies can still occur, and assessment is required.

STEP 10. REFER FOR EARLY SURGICAL MANAGEMENT

Appropriate surgical management is paramount to the treatment of PSWs. Although not covered in the Harris protocol, it was understood that a surgical procedure preceded the need for care, as part of "treat the cause."¹⁸ Some individuals' symptoms resolve with simple incision and drainage with appropriate systemic antibiotics when clinically indicated. Recurrences can take months to years to heal and may be associated with a significant impact on quality of life. Newer surgical techniques involve incisions off the midline and are associated with a lower recurrence rate. The Karydakias flap scar is off the midline and reduces the depth of the gluteal cleft and may decrease the risk of pilonidal sinus recurrence. A comparison of the various surgical procedures is outlined in Table 2.

CONCLUSIONS

An approach to PSD requires a comprehensive assessment and management plan incorporating local, systemic, and patient factors. Early surgical intervention remains a mainstay of PSD management, and newer surgical techniques have been associated with improved outcomes. Treatment is optimized with patient self-care and education to manage the wound and

Table 2.
SURGICAL TECHNIQUES FOR PILONIDAL SINUS DISEASE

Surgical Technique	Closure Rate/Time of Closure	Adverse Events	Comments
Simple cystectomy open technique (secondary closure)	Variable: 25.1-41 d Healing may take 41-79 d or longer ^{39,40}	Maceration Wound dehiscence Hematoma Early suture removal Surgical site infection	Open technique: wounds left open and allowed to heal via secondary intention Open healing is associated with a lower risk of recurrence as compared with primary closure; however, this involves longer wait time before return to work as compared with primary closure.
Simple cystectomy (primary closure)	Variable ⁴¹	Maceration Wound dehiscence Hematoma Early suture removal Surgical site infection ⁴¹	Primary closure: after cystectomy, wound is closed via nylon stitches along the midline; higher rate of recurrence as compared with open technique/secondary closure
Karydakias flap	Median wound healing time = 21 d ⁴²	Hematoma Wound site infection (high) Fluid collection Flap edema Hematoma Partial wound dehiscence ^{43,44}	Procedure designed to move wound away from the midline. Involves elliptical incisions lateral to midline. Low recurrence rate due to a shallow midline furrow free from scar or suture holes.
Bascom procedure/cleft closure	11.3 d ⁴⁵	Wound infection Wound drainage Wound dehiscence ^{45,46}	Involves lateral incision, removal of hair, and excision of sinus tract Avoids midline incision and involves minimal tissue removal Recommended for refractory pilonidal disease ¹³ Very low recurrence rate ^{13,46}
Limberg flap	15.3 d ⁴⁷	Wound Infection Fluid collection Wound infection Flap edema Hematoma Partial wound dehiscence ^{44,48}	Involves a rhomboid flap that is designed to keep healing wound away from the midline Rhomboid incision is made over the affected region, and the tissue is removed A second rhomboid flap is dissected from 1 side and rotated to cover the wound defect from the initial incision Low recurrence rate. Lower risk of complications, shorter hospital stays, and quicker return to physical activity ⁴⁸
Z-plasty	15.4 d ³⁹	Hematoma Infection Recurrence Hematoma ³⁹	Procedure decreases tension on wound after repair Elliptical excisions are used to remove the cyst, and Z incisions are made approximately 30 degrees to midline Fast wound healing and return to normal activity ³⁹ Low recurrence rates ⁴⁹
Y-V plasty	15.3 d ⁵⁰	Rare Wound dehiscence Seroma Severe wound pain ⁵¹	Designed for larger wounds Elliptical incisions used to remove all affected tissues “V-shaped” incisions made lateral to wound and advanced over the wound Useful technique for recurrent and refractory pilonidal disease ^{51,52}

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periwound environment. When open wounds are part of the healing process, meticulous examination and careful adherence to all aspects of the plan of care are required to achieve successful healing.

PRACTICE PEARLS

- Early recognition, diagnosis, and treatment of PSWs can improve patient outcomes.
- Assessment should include documentation of the wound size, as well as the local components:
 - asymptomatic pit(s)—no treatment necessary.
 - acute pilonidal abscess, pit(s) within the pilonidal cleft with a history of abscess drainage, and extensive disease, including multiple pits and drainage episodes, all require surgery, with most recent results favoring off-midline procedures.
- Superficial/localized infection (3 or more NERDS) requires topical antiseptic treatment, but deep and surrounding infection should be treated with systemic antimicrobial therapy (3 or more STONEES criteria).
- Local debridement of slough or foreign material, including hair and hypergranulation tissue, is equally important as the topical antiseptic choice.
- Silver nitrate may cause a proinflammatory eschar and should not be the first choice for debridement.
- Patient self-care, including gentle removal of hair (at a minimum, weekly), at least daily showers, and local wound hygiene/dressing procedures are the most important components.

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