Specialized Pilonidal Care

A Minimally Invasive Alternative

CE 1.5 Contact Hours

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Introduction: In March 2014, a specialized Pilonidal Care Clinic was started at Boston Children's Hospital to standardize care; evaluate predictors of pilonidal treatment success/failure; decrease morbidity; and improve outcomes, including recurrences and quality of life.

Methods: A staging system for pilonidal disease was developed. Patients were treated with shaving and improved hygiene until inflammation and drainage subsided, then underwent pit-picking under local anesthesia and/or laser epilation, and followed for recurrences.

Results: In bivariate analysis, mild disease severity, longer duration of care in Pilonidal Care Clinic, undergoing pit-picking procedure, and female gender were statistically significant predictors of treatment success. Using multivariate regression analysis, we found that laser epilation independently led to statistically significant disease resolution. To date, the provider team (physician, physician assistant, and registered nurse) have performed >400 laser procedures without a single adverse event—establishing laser epilation as a safe, easy, and effective procedure to utilize in the treatment of pilonidal disease. Analyzing the initial 58 patients who underwent pit picking, only six patients required intraoperative treatment. Of patients with complete follow-up ($n = 51$), 47 (92%) were symptom- and recurrence-free for an average of 5 months without requiring narcotics or experiencing postoperative morbidity.

Conclusion: Minimally invasive pilonidal care with pit picking and/or laser epilation is an effective, safe, and well-tolerated treatment approach offering lower recurrence rates with minimal morbidity and avoidance of major operations.

Key Words: laser epilation, pilonidal disease, pilonidal sinus, pit picking

Pilonidal disease (PD) was first described in 1833 by Mayo and later termed "pilonidal" (Latin for hair [pilus] and nest [nidus]) by Hodges in 1880. Commonly presenting as a hair-filled abscess cavity, there are variations of PD manifestations but a singular source in the shared culprit: hair invading the skin in the natal cleft, causing a foreign body reaction. The assaulting hair causes folliculitis, leading to edema and obstruction of the follicle's opening. Gluteal motion creates a vacuum effect, drawing additional hairs into the tract and impeding the occluded follicles from draining. Keratin further accumulates, leading to more follicular distension and, ultimately, the formation of an epithelialized tube (pilonidal pit; see Figure 1). This entity may rupture deeper into the soft tissue, which appear as granulomas on the skin surface and are often confused as the primary manifestation of PD (see Figure 2). In almost all cases, a pilonidal pit is seen cephalad to the anus and is the primary anatomic element responsible for recurrences and progression of disease (Bendewald & Cima, 2007).

PD was thought initially to be congenital in origin. It is now known to be an acquired condition frequently presenting in adolescence and sometimes persisting until the fourth decade of life (Khanna & Rombeau, 2011). PD can occur alone or as part of follicular occlusion triad/tetrad, which includes hidradenitis suppurativa, acne conglabata, and dissecting cellulitis of the scalp. These diseases share a common origin: follicular obstruction and resultant inflammatory response (Scheinfeld, 2013). Patients evaluated for one of these follicular disorders can exhibit symptoms of the other components.

There is no clear consensus on a single superior modality for PD that provides low recurrence rates and minimal morbidity and is well tolerated. There are unique challenges to treating PD in the pediatric population. Typically, patients are healthy, high-school-aged teenagers experiencing painful abscesses, recurrent infections, or drainage on their clothing. Conventional surgical treatments may lead to missed school, work, sports, and social events as well as pain, prolonged wound healing, frequent medical appointments, and significant disruption with an embarrassing medical condition. They are also at the first precipice of this chronic condition, continuing to have symptoms or recurrences for another 5, 10, or 20 years.

Aggressive hygiene, incision and drainage, minimally invasive procedures, excision with primary or secondary

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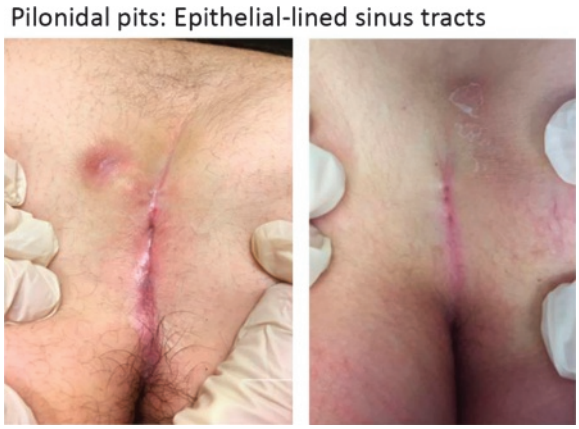

FIGURE 1. Pilonidal pits: epithelial-lined sinus tracts.

closure, and an assortment of flap techniques have been used to treat PD with suboptimal success rates, from teen to adult. Recurrence rates in adults are reported to be as high as 40%–50% after incision and drainage (Jensen & Harling, 1988; Notaro, 2003), 40%–55% with only rigorous hygiene and weekly shaving (Notaro, 2003), and up to 30% after operative intervention (Humphries & Duncan, 2010; Rushfeldt, Bernstein, Norderval, & Revhaug, 2008). Similarly, pediatric surgeons continue to struggle with poor outcomes from surgical treatment of PD. In a retrospective 10-year study by Fike, Mortellaro, Juang, Ostlie, and St. Peter (2011), 120 patients with a mean age of 14.9 years had 45% incidence of wound breakdown after excision and primary closure or flap, 15% of all patients (whether primary closure or secondary intention) had postoperative wound infections, and recurrence rate was 20%–25% (Fike et al., 2011). Pediatric surgeons at the University of California, Los Angeles reported on 60 patients who had various surgical treatments of PD, with an overall postoperative complication rate of 17% and a recurrence rate of 42% (Zagory, Golden, Holoyda, Demeter, & Nguyen, 2016).

Dissatisfied with the status quo of PD care, the Department of Surgery at our institution, a quaternary academic teaching hospital, decided to reevaluate our approach to PD. The challenges, opportunities, procedures, and patient education changes adapted and their outcomes are presented here.

METHODS

The Department of Surgery established a dedicated Pilonidal Care Clinic (PCC) in March 2014. The goals of the PCC were to evaluate predictors of pilonidal treatment success or failure, improve patient education and compliance, decrease morbidity of PD and its treatments, standardize care, research best practices, improve outcomes, and expand access to specialized providers.

The published literature was extensively reviewed to evaluate best practices in PD. Studies lacked findings of quality-of-life impact as a result of PD or treatments, staging system for PD, unifying treatment algorithm, and multimodal or multidisciplinary approach and lacked uniformity in clinical outcomes.

Our team began by establishing patient database with intake and follow-up questionnaires in REDCap, a secure Web-based database and survey platform. The patient completed this form at the intake visit with the provider. Intake questionnaires queried the following fields: duration and type of symptoms, treatments received (no treatment, antibiotics, incision/drainage, shaving, excision and closure, excision with secondary intention, flap procedure, etc.), home care prescribed and/or performed, packing material used (if any), surgical outcomes, number and frequency of recurrences, comorbid conditions, and quality of life at the first pilonidal occurrence and at the time of first visit in PCC. The impact of PD on patients' pain, embarrassment, interruption of sports, routines, and social life (five quality-of-life domains chosen by our team) was measured with a Likert scale. Finally, our Patient & Family Education materials were revised and updated to provide more details of the etiology of this condition and prioritize the role of hygiene in controlling symptoms.

Clinic Setup

As the program launched, clinics were offered one half-day per month at our satellite hospital campus and

FIGURE 2. Midline pilonidal pit with secondary exit wound to the left of midline.

were attended by a pediatric surgeon (MD) and a physician assistant (PA). An immediate need rapidly emerged—further knowledge in wound care.

In response, the PA obtained continuing education courses in advanced wound care and hands-on training with a certified wound, ostomy, and continence nurse (WOCN). This bridged the knowledge gap in caring for patients with dehisced wounds from prior operations, a common patient presentation encountered in PCC. The WOCN became a valuable resource in treating challenging wounds in patients with PD.

We enlisted the help of a pediatric plastic surgeon with experience in performing flap procedures, should our patients require them. A clinic nurse was also needed to help facilitate and coordinate care and became a valuable asset in our demanding clinics.

Our multidisciplinary team was complete, with the MD and PA serving as the primary providers, a registered nurse (RN) in a coordinating role, and a WOCN and a plastic surgeon available as needed for consultation. The roles of each PCC member evolved over the 5 years since clinic inception. Our team is composed of the following:

1. Physician: strategic leadership, clinical care oversight, performing and teaching procedures, research principal investigator, and treating patients in an outpatient clinic or operating room, as needed.
2. PA: program management, evaluating and treating patients in clinic, patient education, intake of new patients, performing procedures (laser epilation [LE], pit picking), triage patients via phone, data procurement, and coauthor on publications.
3. Clinic RN: implementing safety policies and procedures, assisting MD/PA in procedures, performing laser treatment, maintaining medication supplies and surgical instruments, and clinical patient care.

Patient intake began with a thorough history (using the questionnaire) and physical examination, focusing on proper exposure of the gluteal area, shaving 2-inch margins on either side of the gluteal crease using an electric trimmer, extracting hair nests, recognizing active pilonidal pits, manually removing hair contained in pits, identifying secondary exit wounds/tunnels, describing the nature of drainage (if any), and identifying the presence or absence of cellulitis, open wounds, and any undrained abscesses (for which an incision and drainage would be performed in the office).

Patient education composed the bulk of visits, focusing on etiology of PD and its natural history (frequent recurrences, flare-ups, establishment of tunnels, age of onset and resolution, etc.). Both the MD and PA performed these tasks interchangeably, but as the program grew, the PA evaluated every new patient, whereas the MD/PA team provided outpatient treatments.

Our initial treatment approach was strictly nonoperative management by soaking and shaving. All patients were instructed to soak in water (Jacuzzi, bathtub, pool, or ocean) for 20–30 minutes daily. Parents were asked to shave the area every 1–2 weeks. Shaving, we felt, would decrease the incidence of hair entering the pits, and daily soaking would irrigate and debride the pits of any contained material, hopefully decreasing the inflammation and potentially allowing the pits to close.

RESULTS

After 1 year of clinic sessions and data collection, our analysis of the first 70 patients yielded the following findings:

1. Seventy-two percent of new patients in PCC had received previous care for their PD. The treatments were varied in nature (see Figure 3; Delshad, Dawson, & Mooney, 2016).
2. The impact of patients' quality of life is understudied and underreported. No studies evaluating quality of life in adolescent patients with PD were found (Delshad et al., 2016).
3. When asked to quantify the impact of an initial episode of PD on their lives, patients reported a high percentage of "moderate or severe impact" on multiple domains, as distributed by gender, with girls having more severe impact than boys (see Figure 4).
4. Hair control was the most significant challenge. The anatomic area is physically awkward and caused significant embarrassment to patients, resulting in limited compliance from most patients and families, especially for long-term care. At this stage of development, adolescent patients are often incapable of continuing reliable hair removal at home.
5. Conservative therapy (improved perianal hygiene, weekly shaving, and incision and drainage of acute abscesses as needed) has historically been shown

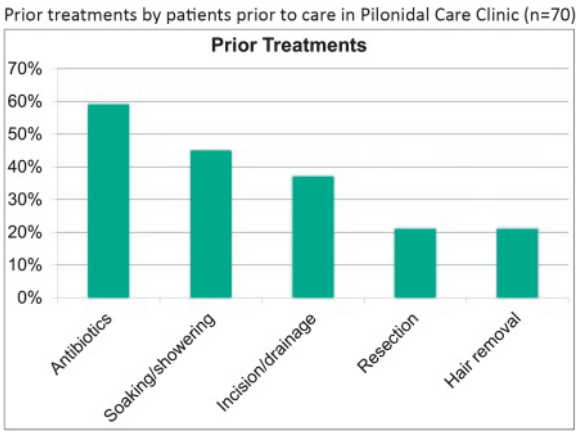

FIGURE 3. Prior treatments by patients before care in Pilonidal Care Clinic ($n = 70$).

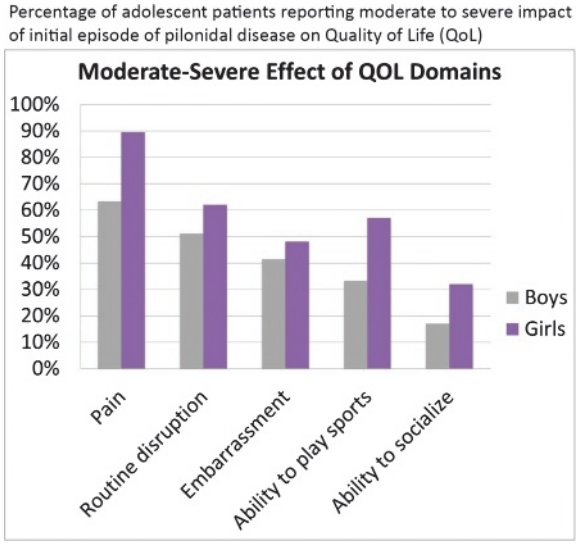

FIGURE 4. Percentage of adolescent patients reporting moderate-to-severe impact of an initial episode of pilonidal disease on quality of life (QOL).

to have positive outcomes (decreased hospitalization time, faster return to work; Armstrong & Barcia, 1994). In our practice, patients who maintained compliance with their shaving and soaking regimens had improved symptoms, less recurrences, and regression of their PD. We needed a way to make hair removal permanent.

6. Lifestyle, sports, activities, comorbid conditions, and access to water must be taken into account—patients with immune-compromised or impaired wound healing states (inflammatory bowel disease, diabetes, steroid dependency, etc.) require more aggressive treatment. College students have limited access to bathtubs or swimming pools; athletes need treatment with minimal activity limitation and to focus on hygiene especially after practices and games. Personalized care is critical for every patient.

DISCUSSION

Staging System

A reliable and accurate staging system for PD is necessary to individualize care and eliminate treating all patients with a "one size fits no one" approach. Finding no such published criteria, we created a PD staging system based on the following (see Figure 5):

Mild: 1–3 pits, no drainage

Moderate: >3 pits, intermittent drainage, open wound < 1 cm

Severe: Multiple pits, daily drainage, open wound > 1 cm

Dehiscence: Open wound from surgical dehiscence

This staging system was found to have multiple positive correlations, with more severe disease presentation in male patients, patients with a higher body mass index, and presence of coarse hirsute hair. It also was a positive predictor of increased care requirements (more visits needed; see Treatment Methods, Laser Epilation, and Outcomes sections).

TREATMENT METHODS

After extensive research, two treatment options were chosen to treat the core causes of PD: presence of midline pits and occluded hair follicles in the gluteal cleft. Description of each treatment, rationale, procedure methods, outcomes, and challenges are now described.

Laser Epilation

What Is LE?

Lasers (light amplification by stimulated emission of radiation) have broad applications, from the medical industry to consumer use. In medical settings, a specific medium (an excitable crystal, gas, or liquid) is stimulated to emit a distinct high-energy wavelength to produce a clinical response. When used for laser hair removal, the emitted energy is absorbed by melanin-containing hair follicles, heating hair shafts and causing selective photothermolysis (heat-induced destruction) of hair follicles while minimally absorbed by fat, blood, plasma, or other components of the integumentary system—providing safe and near-permanent hair reduction with few side effects.

Why This Treatment?

A number of studies have evaluated the role of LE as a long-term hair control solution in PD. In a prospective randomized control study, Ghnnam and Hafez (2011) compared patients undergoing excision and healing by secondary intention followed by either LE (n = 45) or routine shaving/cream depilation (n = 41) and found two recurrences in the nonlaser group and none in the laser group, although the difference was not statistically significant (Ghnnam & Hafez, 2011). Schulze, Patel, Hertzog, and Fares (2006) reported on 19 patients who had undergone surgery and were then treated with LE, and all healed with no further recurrences (Schulze et al., 2006). Conroy, Kandamany, and Mahaffey (2008)

Pilonidal disease classification used in Pilonidal Care Clinic based on presenting symptoms and physical findings

Mild:	1-3 pits, no drainage
Moderate:	>3 pits, intermittent drainage, open wound <1cm
Severe:	multiple pits, daily drainage, open wound >1cm
Dehiscence:	open wound from surgical dehiscence

FIGURE 5. Pilonidal disease classification used in Pilonidal Care Clinic based on presenting symptoms and physical findings.

evaluated 12 patients who received postoperative LE and found no recurrences over a 1-year period.

Most published studies had low enrollment and evaluated LE in conjunction with surgical intervention. Despite these limitations, utilization of LE as a primary or secondary treatment in PD remained promising with overall positive outcomes. Having appreciated symptom improvement with meticulous shaving and hygiene, along with potentially favorable studies using LE in PD, we explored LE as a new treatment modality.

Training and Education

The PA and MD researched available laser devices and met with sales representatives to compare the features of different devices, along with members of our Department of Plastic Surgery who would also utilize the laser for their own clinical applications. A Cynosure Elite MPX (Cynosure, Westwood, MA) was purchased to meet diverse clinical applications using two lasing media, Alexandrite and Nd:YAG crystals, which allow safe epilation on all skin types (from very fair to very dark) as well as treat pigmented lesions and facial or leg veins. The pediatric surgeon, PA, plastic surgeons, and clinic nurses received training in LE and laser safety by the manufacturer's education specialist (8-hour course). Additional requirements included online laser safety course and showing procedural competence. The medical providers then applied for credentialing for laser use through the Laser Safety Committee.

Much of laser training focuses on safety, as unsafe laser use can be deleterious to the target tissue (skin burns) or melanin in eyes. It can also be reflected back through metallic surfaces and cause indirect injury. So, together with the Laser Safety Committee, we developed a laser safety checklist that included all windows covered, metallic objects (e.g., Mayo stands) out of the room, requiring all present individuals to wear approved eyewear (patient, family, and providers), and water readily available in case of fire. Because of the odor of burned hair that is emitted, appropriate room filtration and a Buffalo smoke evacuator were installed. A safety time-out is undertaken before each treatment.

Procedure

Inclusion criteria for laser treatments were as follows: hirsutism, resolved inflammatory process, and ability to tolerate the treatments in the outpatient setting. Patient selection is of critical importance to prevent adverse events. LE must be performed on healthy, uninfected or uninflamed skin. Using laser on an area with a clinical or subclinical infection can precipitate abscess formation. A rash resulting from chronic exposure to a moist environment would render the treatment excessively painful. Patients with active drainage are asked to soak and shave until inflammation or rash resolves.

Patients with bloody drainage and no evidence of cellulitis can be treated. Open granulation tissue cannot be treated with laser, but the skin surrounding it can be (and often is a prime facilitator of wound healing).

If a patient meets laser criteria on initial examination by a provider, they are closely shaved, then complete laser contraindication screening and informed consent forms, and then are brought to the laser treatment room. The epilation procedure is 2–5 minutes in duration. Patients unable to tolerate the procedure are offered topical anesthesia (4% topical lidocaine cream with an occlusive dressing for 30 minutes). Most laser devices are equipped with a cooling system—cold air in our device—which helps offset potential burns and provides pain relief during the procedure. Providers examine and screen every patient at every visit to ensure that laser treatment is appropriate on the day of visit, with no contraindications such as active infection or current use of photosensitizing medication (Accutane, select antibiotics, etc.).

Treatments must be timed along the hair growth cycle, typically every 6–8 weeks for the gluteal area. Clinical response is seen immediately with no hair growth for up to 4–5 weeks, followed by resumption of growth, necessitating follow-up treatments. Four to eight treatments are needed for clinically significant hair reduction. In our clinic, we see a clinical response (improved drainage, contraction and healing of pilonidal wounds and tunnels, improved healing of dehisced wounds) typically after one to two laser treatments. We postulate this is because of immediate cessation of hair growth in the natal cleft, allowing wound healing to occur without foreign body (hair) entrapment. In fact, we initially planned to offer LE as a pretreatment for further surgical treatments, to optimize the wound environment. However, we observed that patients' disease typically regressed to the point that conventional surgical treatment was not warranted.

Postlaser Care

Written postprocedure instructions are given to patients. The key restrictions are no exercise, strenuous activities, or excessively hot showers or baths for 24 hours after LE. Any activity that increases body temperature prevents the heat (energy) delivered via the laser from adequately dissipating, thus leaving the potential for burns. Overall, activity restrictions after LE are very limited in scope and duration.

Outcomes

We analyzed our results from March 2014 (when we began offering LE) to September 2017 and presented our

outcomes at the American Academy of Pediatrics, Section on Surgery Annual Meeting (Delshad, Dawson, Melvin, & Mooney, 2017).

All new patients who were seen in PCC and returned for follow-up care during the enrollment period were analyzed (n = 105). Descriptively, 65% were male, and the mean age was 17.5 years (range: 13–29 years). Using bivariate analysis to evaluate the role of disease severity at intake, we found statistically significant associations between severe disease in male patients, higher BMI, higher number of clinical visits needed, and presence of coarse/hirsute hair (see Table 1). This validated the role of a severity scoring system as a useful tool in stratifying PD.

Predictors of treatment success (symptom/disease resolution) included the following:

- Number of clinic visits (p = .041)
- Duration of months under our care ($p \leq .001$)
- Undergoing a pit-picking procedure (p = .004; see Pit Picking section)
- A greater number of LE treatments (median, 4) versus less (median, 2) in patients who received LE (n = 61; p = .001)

Using multivariate analysis, we controlled for all variables that predicted success (disease severity, treatment duration, and undergoing pit picking). We found that patients who had LE (compared with no laser treatments in our cohort) were found to have statistically significant improvement in symptom and disease resolution (p = .004, OR = 5.59). Simply put, laser patients were five times more likely to resolve their disease compared with patients who received no laser treatments (see Table 2; Delshad et al., 2017).

Challenges

Acquiring knowledge in an entirely different field (laser application), especially one utilizing unfamiliar technology, brought a steep learning curve to the provider team. However, it was embraced as an exciting and innovative leap in the treatment of PD. We chose to focus on only the laser hair removal capabilities of our device, following all safety precautions/requirements of our institution, developing safety checklists, meticulously adhering to manufacturer treatment parameters, and screening patients closely. Obtaining credentialing was also a challenge, especially for nonphysicians, as this had never been granted at our institution. However, with persistence and appealing to the safety committee that access to care was limited by having only the surgeon credentialed in laser use, credentialing was obtained for the PA and, eventually, the clinic nurse. This has helped to dramatically expand access to care and treat more patients per clinic session.

At our institution, the MD, PA, and RN have performed more than 400 combined LE treatments on greater than 180 patients without a single adverse event. LE is now the

Table 1: Correlation of Variables: Pilonidal Disease Severity

	Index Pilonidal Disease Severity (N = 173)						
	Low Severity		Moderate Severity		High Severity		
	N = 62		N = 70		N = 41		
	n	%	n	%	n	%	p
Gender							
Female	33	53.2	21	30.0	7	17.1	<.001
Male	29	46.8	49	70.0	34	82.9	
BMI (index visit)							
Median (IQR)	25.3 (22.7,29.5)		28.0 (22.8,32.5)		30.6 (26.1,35.6)		.004
Hair type							
Coarse hirsute	11	17.7	24	34.3	22	53.7	.005
Coarse scant	5	8.1	10	14.3	3	7.3	
Fine hirsute	1	1.6	3	4.3	2	4.9	
Fine scant	22	35.5	12	17.1	5	12.2	
Missing	23	37.1	21	30.0	9	22.0	

Table 2: Association Between Pilonidal Treatment Groups and Resolution of Symptoms: Multivariate Analysis

	Crude			Adjusted Final		
	Odds Ratio	95% CI	*p*	Odds Ratio	95% CI	*p*
Treatment type						
Laser hair removal	2.14	[0.9, 4.9]	.071	5.59	[1.8, 17.7]	.004
Other (hygiene and shaving alone)	1.00			1.00		
Starting severity of disease						
Low	3.29	[1.0, 11.0]	.148	6.94	[1.3, 35.7]	.063
Moderate	1.70	[0.7, 4.3]		1.41	[0.5, 4.2]	
Severe	1.00			1.00		
Number of months in study						
Per 1-month increase	0.89	[0.8, 0.9]	<.001	0.88	[0.8, 0.9]	<.001
Pit-picking procedure						
Yes	4.07	[1.5, 11.0]	.006	–	–	–
No	1.00			–	–	–

first treatment intervention (outside home hygiene) in most patients' journey to resolving PD through the PCC.

PIT PICKING

Pit picking (PP), or sinusectomy, is a minimally invasive procedure to excise pilonidal pits, which are lined by epithelial tissue, precluding their ability to close. Various approaches have been published.

Why This Treatment?

In our clinic, we found that patients had significant disease resolution with LE but their pits did not resolve despite months of observation and thus were at risk for recurrence. In addition, many patients were not hirsute and did not receive LE but continued to have intermittent PD recurrences.

Researching available therapies, we found a body of work by Dr. John Bascom (1980) evaluating the role of pilonidal pits, found microscopically to be distorted hair follicles and implicated as the source of PD in 90% of patients. Bascom argued for the excision of all enlarged, epithelial-lined pits through very small incisions individually while creating a lateral incision to debride the abscess cavity. Reporting on 50 adult patients treated with this method, recurrence rate was 8% with a mean follow-up period of 24 months and a mean disability time of 1 day (Bascom, 1980).

Historically, minimally invasive pilonidal excision was reported decades earlier. In 1965, British surgeons Lord and Millar published a treatment for PD in the *British Journal of Surgery*. After excising the offending pits via small elliptical incisions under local anesthesia and removing entrapped hair with a small bottle brush, they continued meticulous postoperative soaking and shaving in a dedicated Saturday Pilonidal clinic. Their results showed resolution of disease in 32 of 33 adult patients with a follow-up interval of 6–24 months (Lord & Millar, 1965).

Larger studies in the adult population have supported these outcomes. An Israeli Military Pilonidal Sinus Clinic treats adult patients by excision of pilonidal pits using trephines under local anesthesia, debridement of cavity tracts, and leaving wounds open to drain. Patients were shaved weekly until wound healing occurred, with a mean time of 3.4 weeks to achieve complete wound healing. Recurrence rate was 13% at 5 years and 16% at 10 years with a patient cohort of 1,165 patients (Gips, Melki, Salem, Weil, & Sulkes, 2008).

In the pediatric population, there are few studies on this treatment. Speter, Zmora, Nadler, Shinhar, and Bilik (2017) published a retrospective analysis in the *Journal of Pediatric Surgery* comparing minimal incision using trephines versus wide excision on a matched cohort of 42 adolescent patients with a mean age of 16 years. Findings indicated better functional outcomes, less analgesia requirements, and fewer sick days for minimal incision but failed to show a statistically significant difference in overall recurrence (Speter et al., 2017).

Encouraged by the simplicity and ease of the pit picking procedure, its outpatient application, lack of

narcotic needs, and the minimal morbidity and disability associated with it, we adopted this procedure as our primary pilonidal surgical technique.

Procedure

Patients with resolved acute inflammation were offered a pit picking under local anesthesia in the outpatient setting. For patients who had procedural anxiety or special needs requiring sedation or general anesthesia, the procedure was performed in the operating room.

After closely shaving the affected area (if hirsute), patients were brought to an outpatient procedure room and placed in a prone position. A procedure tray was set up using the necessary instruments and materials (see Figure 6).

The skin in the gluteal crease was prepped with betadine solution, followed by infiltration of buffered local anesthetic (typically 9 ml of 2% lidocaine with epinephrine and 1 ml of sodium bicarbonate) in the area around the pits and any exit sites. Hirsute patients received LE at this point (the betadine must be removed before laser). After reapplication of betadine, a sterile drape was applied, and using 2- or 3-mm skin punch biopsy devices, midline pits were excised through the full thickness of the skin. Any retained subcutaneous hair was manually extracted using a fine (Jake) clamp. If exit sites were present, a notched incision was made over them using a #15 blade and the underlying cavity was debrided of any foreign material. The pit incisions were closed with interrupted 4-0 nylon vertical mattress sutures, and exit site wounds were left open to drain without packing. We found that suturing the pits allowed for faster healing times, whereas debridement of the exit sites allowed the tracts to close secondarily. A dry dressing was applied. The procedure duration is approximately 15–20 minutes, including setup and safe sharp disposal.

FIGURE 6. Instrument setup for pit picking. (One of each item) Sterile materials: 10-cc syringes, 18g and 27g needles, sterile glove, sterile drape with round aperture (#1030), sterile box of 4 × 4 gauze, 4-0 Ethilon suture, suture removal kit, #11 or #15 blade, 2- or 3-mm punch biopsy, needle driver, and curved Jake instrument. Nonsterile materials: iodine prep sticks, bacitracin, nonsterile gauze for dressing, paper tape, and local anesthetic.

Patients were instructed to apply antibiotic ointment on the sutures twice daily, to shower each morning, and to soak every evening. Resumption of normal activities including exercise was permitted as tolerated (typically within 24 hours), and pain was treated with ibuprofen and acetaminophen as needed. Sutures were removed 10 days postprocedure (see Figure 7). Patients who had more than three midline pits underwent sequential pit pickings every 2 months, allowing for the healing of previous pit excisions. Patients were followed at the PCC for wound healing problems, infection, or recurrence.

Outcomes

We analyzed the first 58 patients who underwent pit picking and presented our results at the 2018 American Pediatric Surgical Association Annual Meeting, which were later published in the *Journal of Pediatric Surgery* (Delshad, Dawson, Melvin, Zotto, & Mooney, 2019). By disease severity, 20 patients (34%) had a mild disease, 30 (52%) had a moderate disease, and eight (14%) had a severe disease. These demographic and severity measures were not different than the patients who did not undergo a pit picking.

Patients required 0–3 days of as-needed over-the-counter analgesics, and all returned promptly to their preprocedure activities. Fifty-two patients (90%) tolerated the procedure in the outpatient setting, and only six (10%) required intravenous sedation or general anesthesia. Thirty-seven of the 58 patients (64%) were hirsute and also underwent LE.

Follow-up was available on 51 (88%) of 58 patients by clinic visit or telephone (seven patients were lost to follow-up). Forty-seven of the 51 patients with complete follow-up (92%) were symptom- and recurrence-free an average of 5.0 months after the procedure (range: 1–20 months). Four patients (8%) reported continued intermittent drainage at the exit site.

CONCLUSION

To date, the PCC has treated more than 300 patients. The goals established at the clinic's inception have been achieved. Our current objectives are aimed at publishing and disseminating our results within the pediatric (and adult) surgical community; evaluating long-term treatment outcomes; showing a decrease in resource utilization by eliminating operative interventions, thus encouraging insurers to cover the cost of LE; and making treatments tolerable and accessible to patients

FIGURE 7. Pit-picking procedure at completion (left) and at suture removal in 10 days (right).

with special needs by offering LE and pit picking under sedation.

To date, only three of our patients have been referred for flap procedures—one with severe disease that failed minimally invasive treatment; one with a failed excision at an outside hospital with a large, chronic wound and a complex medical history; and one with severe autism who could not tolerate outpatient treatment rendering them outliers in light of the overall volume of patients we treat.

Although LE and PP have limitations in treating 100% of patients with PD and disease severity, we find this therapeutic approach worthwhile by initiating care with the least invasive treatment possible to avoid morbidity. This approach is supported by the APSA Outcomes and Evidence-based Practice Committee, which presented their official recommendation at the 2018 Annual Meeting:

> "Sinusectomy, and/or minimal surgical approach should be strongly considered because of both lower recurrence rates and faster healing time than I&D alone, and less pain/time off work than more invasive procedures (Grabowski, Jancelewicz, & Oyetunji, 2018)."

Next Steps

There is no question that PD has historically been a frustrating, intractable condition for patients and providers. Looking for new therapeutic modalities should always be part of nursing and medical practice, especially for clinical entities with poor outcomes. Today, our treatment approach focuses on extensive patient education, soaking and shaving until resolution of acute symptoms, and prompt LE/pit picking using a collaborative, team-based model. With the algorithm we have devised, as seen in Figure 8, along with improved access to providers and close clinical follow-up, we have successfully resolved 80%–90% of PD encountered in PCC.

Using LE and minimally invasive pit picking as the mainstay of treatments, we have allowed patients to resume their adolescence with minimal treatment-associated morbidity. By utilizing the skills of many members of the care team—nursing, surgeon, PA, WOCN, dermatologist, plastic surgeon, administrative support staff, and more—we have improved care for adolescent PD. Although outside the scope of this clinical review article, further research on the fiscal improvement of this treatment method would be an appropriate next step in future research considerations, especially one

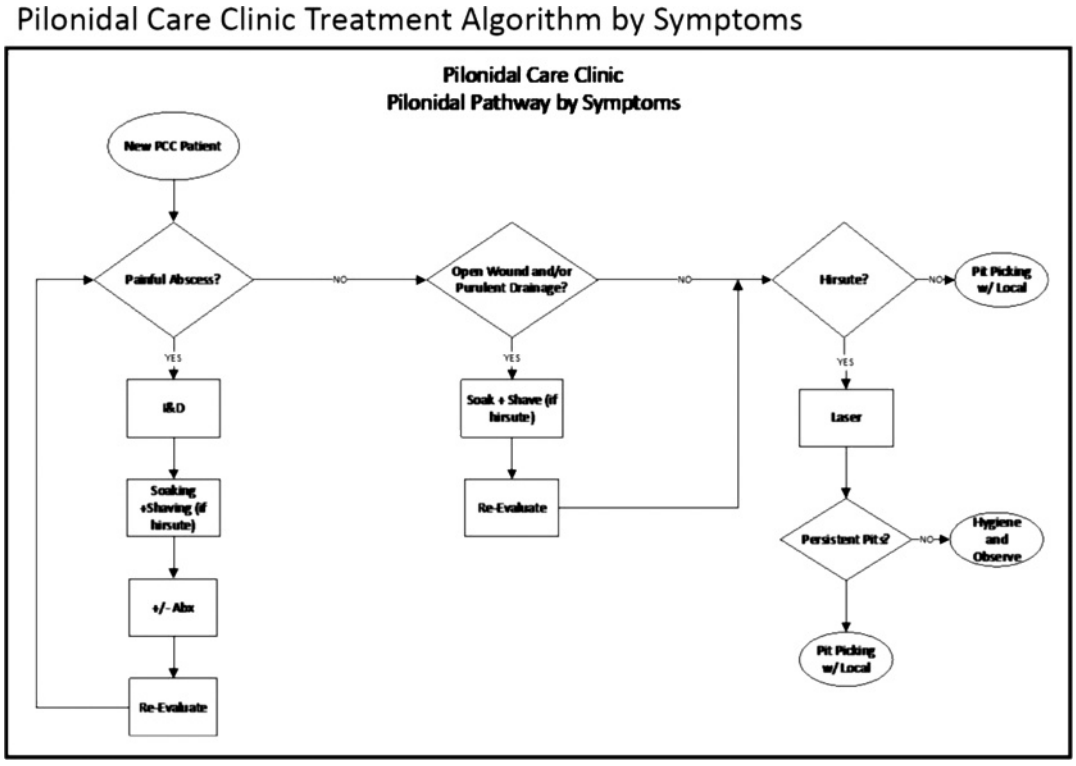

FIGURE 8. Pilonidal Care Clinic treatment algorithm by symptoms.

investigating how to make this clinic model financially viable for an advanced practice provider.

An advanced practice provider can contribute significantly to quality improvement, patient care, evidence-based practice, and research by specializing in a particular condition, especially one that does not require intraoperative treatment. Through this path, one can develop independent practice, leadership skills, and professional growth, as well as diversify one's skill sets by mastering new procedures and treatments.

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