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Endoscopic pilonidal sinus treatment versus total excision with primary closure for sacrococcygeal pilonidal sinus disease in the pediatric population☆☆☆

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ABSTRACT

Purpose: To evaluate the effectiveness and safety of Endoscopic Pilonidal Sinus Treatment (EPSiT) in the pediatric population and compare it with excision followed by primary closure (EPC) regarding intra- and postoperative outcomes.

Methods: A retrospective analysis of all patients with chronic sacrococcygeal pilonidal sinus submitted to EPSiT and EPC during a 12-month period in our institution was performed. Data concerning patients' demographics and surgical outcomes were collected and compared between the two groups.

Results: We analyzed a total of 21 cases that underwent EPSiT and 63 cases of EPC, both groups with similar demographic characteristics. Operative time was similar for both groups (30 vs. 38 min; $p > 0.05$). No major intraoperative complications were reported. Wound infection rate was lower for EPSiT ((5.2% [n = 1] vs. 20.0% [n = 12]); $p > 0.05$). Healing time was similar for both groups (28 vs. 37.5 days). Recurrence occurred in 18.9% (n = 15), with 2 cases (10.5%) reported in the EPSiT group versus 13 (21.6%) in EPC. There were no differences between groups regarding postoperative complications, complete wound healing and recurrence rates or healing time ($p > 0.05$).

Conclusions: Our results suggest that EPSiT is as viable as excision followed by primary closure in the management of sacrococcygeal pilonidal sinus in the pediatric population.

Level of evidence: Therapeutic study – level III.

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Sacroccygeal pilonidal sinus (SPS) is a common inflammatory disease, with a reported incidence amongst teenagers of 26:100.000 [1].

SPS arises due to a foreign-body response to the chronic retention of hair debris in the gluteal fold facilitated by rubbing motion on the regional hair follicles, causing recurrent inflammation with formation of subcutaneous abscesses and usually multiple fistulae tracts [2,3]. Disease recurrence after surgical treatment is very common, with reported rates about 20% following excision, resulting in high morbidity rates [4].

Abbreviations: SPS, Sacrococcygeal pilonidal sinus; EPSiT, Endoscopic pilonidal sinus treatment; VAAFS, Video-assisted ablation of pilonidal sinus.

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Although little has been reported concerning pediatric populations, SPS is a common entity amongst children and adolescents, with complication and recurrence rates similar to the adult population [1,5].

Despite multiple operative methods being described, optimal treatment for SPS remains controversial. Conventional surgical approaches rely on total excision of the sinus area followed by either primary closure or secondary intention wound closure. The first allows for a shorter wound healing time but also a higher rate of wound-related complications, such as infection and suture dehiscence, and recurrence. Several techniques, including the use of transpositional flaps, have been proposed in order to avoid such problems [6–8].

In 2013, Meirero et al. described a novel minimally invasive approach for SPS – Endoscopic Pilonidal Sinus Treatment (EPSiT) [9] – reporting promising results such as a shorter wound healing and time off work and also improved pain control and cosmesis. However, the benefits of this method in comparison to conventional surgery are still under study, and no reports have been published concerning its utility in treating children and adolescents.

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Thus, this study aims to determine the efficacy, safety and potential benefits of EPSiT compared to conventional treatment for SPS in the pediatric population.

1. Materials and methods

1.1. Study population and data acquisition

In this study we performed a retrospective analysis of all patients with age ≤ 18 years presenting with chronic recurrent or non-recurrent sacrococcygeal pilonidal sinus disease submitted to either EPSiT or total excision followed by primary closure (EPC) during the course of a 12-month period (January through December 2015 for conventionally treated patients and January through December 2016 for EPSiT) in a single pediatric hospital.

Patients were selected for EPSiT according to surgeon's preference and surgical equipment availability. Recurrent SPS or SPS with multiple fistulas were preferably assigned to EPSiT. All EPSiT procedures were performed by a single pediatric surgeon, previously proficient with the technique, while EPC was performed by other 13 pediatric surgeons from our department. Patients presenting with acute pilonidal abscess were not excluded from the study; however, these were preferably given antibiotic treatment and submitted to the procedure after resolution of the inflammatory process.

Demographic and clinical data such as age, gender and previous surgical approaches to SPS were retrospectively collected from clinical records. Postoperative assessment was performed by outpatient evaluation, either scheduled (see 2.3) or required by the patient when symptomatic at any given time, including after discharge. Thus, a complication-free postoperative period was assumed in absence of reported symptoms after complete healing. Long-term data collected included history of pain, wound infection or abscess formation, as well as wound dehiscence.

The primary endpoint of this study was complete wound healing, as defined by the complete epithelialization of surgical wounds. Disease recurrence was considered when symptoms and/or local inflammatory signs such as discharge occurred after an interval following complete wound healing. Secondary endpoints were healing time, procedure duration and occurrence of intra- and postoperative complications, such as wound infection or dehiscence. Healing time – defined as time to complete wound epithelialization – was determined when reported by the surgeon or, when that information was not explicit, the time of removal of stitches was considered (in absence of any reported complication).

1.2. Surgical technique

All procedures were performed under local anesthesia (2% lidocaine and 7.5% ropivacaine) with sedation. The patient is given a single dose of antibiotic prophylaxis (cefazoline 25 mg/kg). The EPSiT procedure was performed according to the technique described by Meinero et al. [9]. The main sinus openings are removed by circular incision until a 0.5 cm opening is available for placing a pediatric cystoscope with an 8-Fr working channel (Figs. 1, 2). Infusion of mannitol 1% solution opens the tracts for removal of hair follicles and necrotic material under direct vision (Fig. 3), followed by cautery ablation by use of a monopolar probe. Brushing of abscess cavities and any identified tracts is then performed using a disposable brush (designed for cytopathology of the uterine cervix), followed by curettage (Figs. 4, 5).

Excision followed by primary closure (EPC) with non-absorbable polypropylene suture was performed in the conventional treatment group. At the end of both procedures a compression dressing is applied.

All patients were admitted on the day of surgery and discharged the following day (due to equipment restrictions and institution regulations, we do not perform EPSiT in an outpatient setting).

Fig. 1. Sinus openings are excised and tracts are explored.

Instructions at discharge for all patients included daily dressing changes, improved local hygiene and hair removal (by shaving, depilatory cream or laser technology) after wound epithelialization. Patients submitted to EPC were recommended a 15-day household rest, in which the patient would preferably be in laying down in ventral or lateral decubitus. In contrast, EPSiT patients were given no restriction in return to daily activity.

1.3. Postoperative assessment

Postoperative assessment was performed weekly by the operating surgeon in an outpatient evaluation setting, beginning at the first week after the procedure and until complete wound healing (Fig. 6). When possible (considering access to hospital versus primary care units for wound-care), first-week dressing changes were also performed in alternate days under the surgeons' surveillance. Long-term follow-up was performed by a scheduled outpatient consultation at 3 months, 6 months and 1 year post-surgery. Additionally, patients were instructed to come promptly in order to be assessed in an outpatient setting at any given time if symptomatic.

Fig. 2. A cystoscope with working channel is placed into sinus openings.

Fig. 3. Hair follicles and necrotic tissue are removed by direct vision.

1.4. Data analysis

Collected data was analyzed using IBM®SPSS® Statistics version 24.0. Descriptive statistics were performed for all variables. Nonparametric continuous variables are described as median and value range. Pearson chi-square, Fisher's Exact test and Mann–Whitney *U* nonparametric tests were used for comparative analysis between nonparametric variables. Statistical significance was accepted at $p < 0.05$. Missing values were reported when present.

2. Results

A total of 84 patients with chronic SPS disease were submitted to either EPSiT ($n = 21$) or conventional EPC ($n = 63$). The majority were male ($n = 61$; 72.6%), the median age at time of surgery being 16.18 years (min:max 12.06:17.91). We found no statistically significant differences between male and female patients' age at surgery (median 16.22 vs. 16.31 years; $p > 0.05$), as well as no significant differences between the EPSiT and EPC groups regarding gender and age ($p > 0.05$). The median reported weight was 65Kg (min:max 42:120Kg). Most patients had not been previously submitted to surgery targeting SPS ($n = 69$; 82.1%). Demographic characterization is summarized in Table 1.

Fig. 4. Brushing of sinus tracts.

Fig. 5. Curettage of abscess cavities and tracts.

The median operative time for the EPSiT group and the EPC group was similar (30 vs. 38 min; $p > 0.05$). There were no reports of major intraoperative complications. Early postoperative persistent bleeding occurred in one EPSiT patient at day two post-surgery, and thus re-submitted to EPSiT with cauterization and intraoperative use of a Micro-porous Polysaccharide Hemsphere hemostatic powder (HemaBlock®).

Five patients were lost to follow-up in the early postoperative period, resulting in missing postoperative data in 2 cases in the EPSiT group and 3 in the EPC group. Overall postoperative wound complications occurred in 24% ($n = 19$), with fewer cases occurring in the EPSiT group (10.5% [$n = 2$] vs. 28.3% [$n = 17$]; $p > 0.05$). Although the minimally invasive group showed fewer wound infections prompting antibiotic usage (5.2% [$n = 1$] vs. 20.0% [$n = 12$]), this difference was not statistically significant ($p > 0.05$). A 13.3% ($n = 8$) wound dehiscence rate was found in the EPC group.

Complete wound healing was observed in 93.6% ($n = 74$) (100% [$n = 19$] in EPSiT vs. 91.7% [$n = 55$] in EPC) with an overall median healing time of 33 days (min:max 11: 270), similar between the two groups (median 28 vs. 37.5 days; $p > 0.05$).

Overall disease recurrence occurred in 18.9% ($n = 15$), with two cases being reported in the EPSiT group (10.5%) versus 13 cases in the EPC group (21.6%). Time to disease recurrence in both EPSiT cases was 83 and 91 days, respectively, while in the EPC group we report a median 189.5 days to recurrence (min:max 37:465 days). Both recurrence cases were re-submitted to EPSiT, with complete wound healing at 10th and 4th weeks post-surgery, respectively; no postoperative complications occurred. There were no significant differences between groups regarding complete wound healing and recurrence rates ($p > 0.05$). We found no significant association between recurrence and a history of previous surgical treatments for SPS ($p > 0.05$). Moreover, we found no significant association between postoperative outcomes (wound infection, dehiscence, complete wound healing and recurrence rates) and patients' gender in both EPSiT and EPC groups ($p > 0.05$). Nevertheless, a significant association was observed between female gender and longer healing time in the EPC group ($p = 0.032$), which was not found regarding the EPSiT group ($p > 0.05$). Surgical outcomes are summarized in Table 2.

Median study follow-up was 11.9 months (min:max 4.6:16.2) for the EPSiT group and 24.7 months (min:max 19.48:31.11) for the EPC group.

Fig. 6. Wound healing at 1 week (A) and 3 weeks (B) after EPsIT.

3. Discussion

SPS is a fairly common inflammatory process in the pediatric population, and despite the multiple techniques described during the last century, the optimal treatment strategy has yet to be determined. Conventional surgical approaches rely on excision of the sinus area followed by either primary closure or secondary intention wound closure. Primary closure was shown to allow faster wound healing but also higher rate of wound-related complications such as wound dehiscence and infection, mainly due to tension forces on the suture and its midline placement, and ultimately higher recurrence rates [10,11]. Various techniques involving flaps [6–8] were designed in order to place sutures off-midline in order to reduce complications, but on the downside causing visible and complex scars. However, virtually all methods show considerably high recurrence rates due to SPS pathophysiology. Additionally, reports in pediatric SPS management are limited and represent mostly retrospective reviews, thus results vary widely and recommendations are often contradictory [5,12–17].

Less invasive strategies for SPS treatment are not novel. In 1983, Bascom et al. described a tissue-sparing technique that combined sinusectomy and a lateral incision for cavity debridement, which allowed for lower recurrence rates [18]. In recent years, new minimally invasive approaches to SPS have surfaced. In 2013, Meinero et al. described Endoscopic Pilonidal Sinus Treatment (EPsIT) [9], with promising results such as a shorter wound healing and time off work, and also improved pain control and cosmesis. A similar technique –

Table 1
Patient characterization.

	EPsIT (N = 21)	Conventional treatment (n = 63)	P value
Age, median (min:max), years	15.9 (14.56:17.83)	16.3 (13.1: 17.9)	> 0.05
Male/Female (%)	76.2/23.8	71.4/28.6	> 0.05
Previous treatment, No/Yes (%)	61.9/38.1	88.9/11.1	> 0.05

Video-assisted ablation of pilonidal sinus (VAAPS) – has been described by Milone et al. [19], with similarly promising results. Recently, a prospective multicenter trial has shown EPsIT to be safe and effective, reporting a 5% recurrence rate at 12-month follow-up and mean time off work of 2 days with <10% patients requiring analgesics [20]. Similarly, a randomized trial comparing VAAPS to Bascom cleft lift procedure has described shorter times off-work, less postoperative pain and higher satisfaction levels in endoscopically treated patients. However, the overall complication rate was similar between the two test groups [21].

To our knowledge, this is the first report on endoscopic treatment for SPS in the pediatric population.

Our study population characteristics reflect previous studies in regards to age since most reports cite a median age of 16 years old, with the youngest cases being around 12 years old at the time of surgery [5,13,16,22]. In contrast to findings in the adult population, gender distribution in pediatric SPS studies is often contradictory, with some describing either male preponderance [5,17,23] (as we report), similar rate for males and females [16] or a slight female preponderance [15,24]. Also, and in contrast to previous reports, we found no significant differences between male and female patients regarding age at surgery – previous studies report on a younger age at diagnosis and

Table 2
Surgical outcomes.

	EPsIT (n = 21)	Conventional treatment (n = 63)	P value
Operative time, median (min:max), min	30 (20:90)	38 (17:105) ^a	> 0.05
Wound infection (%)	5.2	20 ^b	> 0.05
Wound dehiscence (%)	 ^c	13.3 ^b	> 0.05
Complete healing (%)	100	91.7 ^b	> 0.05
Time to complete healing, median (min:max), days	28 (15:270)	37.5 (11:203) ^b	> 0.05
Recurrence (%)	9.5	21.7 ^b	> 0.05

^a Data not available in 2 patients (n = 61).

^b Data not available in 3 patients (n = 60).

^c Data not applicable.

surgery in females, and it has been postulated to occur due to the early puberty in girls *versus* boys [13].

Postoperative results on the EPC group were in line with previous reports, which observed wound infection and recurrence rates of 20% and 19–25% respectively (vs. 20% and 21.6%). Conversely, we report a much lower dehiscence rate of 13.3% in the EPC group, versus previous reports of 44% [24]. We postulate that this could be due to the use of deep tension sutures anchoring the subcutaneous fat to the gluteal fascia, as it is standard practice in our unit.

Regarding EPSiT, our postoperative outcomes are comparable to those reported by Meinerio et al. [20] – 94.8% complete healing and 5% recurrence rate [20], which validates our technical performance despite the small sample size. Moreover, and although we failed to reach statistical significance, EPSiT was shown to have better outcomes than EPC such as a lower wound complication rate, specifically wound infection rate, and also recurrence rate. Thus, we suggest that EPSiT is noninferior to total excision followed by primary closure regarding postoperative complications and disease recurrence. Paired with the fact that it allows for a less inconvenient postoperative care, with fewer dressing changes and no activity restriction, we suggest that EPSiT should be considered as a safe and effective surgical approach to SPS and thus should be encouraged in pediatric care.

However, the present study has several limitations. Firstly, study design as a retrospective analysis does not allow for uniform follow-up data availability, as well as data on postoperative pain and need for analgesia or quality of life after surgery. Differences in sample size between groups should also be accounted for. Both surgical experience and selection bias might influence outcomes – as previously stated, the choice of surgical technique was dependent on the surgeons' preference, and all EPSiT cases were performed by the same surgeon, as opposed to the EPC cases. Postoperative assessment such as determination of healing time also relied on surgeon report, possibly allowing for bias. Lastly, due to our recent experience in EPSiT, only short-term follow-up data is available, and thus the overall follow-up time was different for both groups. A longer follow-up period such as a 5-year follow-up, as well as a larger sample size, would be necessary in order to draw definitive conclusions regarding recurrence rate.

4. Conclusions

Minimally invasive strategies providing a rapid return to regular activity, improved surgical outcomes and cosmetic results are favored when considering children and adolescents. Considering the high morbidity rates following most surgical approaches to SPS and the fact that its natural history is that of a chronic, often recurrent inflammatory process, optimized solutions for pediatric patients are due.

EPSiT is a safe and reliable alternative to conventional techniques used in pediatric SPS. Prospective randomized comparative studies are

necessary to establish a definitive advantage of a minimally invasive approach over conventional treatment.

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