European Colorectal Congress

28 November – 1 December 2022, St.Gallen, Switzerland

Monday, 28 November 2022

09.50
Opening and welcome
Jochen Lange, St.Gallen, CH

10.00
It is leaking! Approaches to salvaging an anastomosis
Willem Bemelman, Amsterdam, NL

10.30
Predictive and diagnostic markers of anastomotic leak
Andre D'Hoore, Leuven, BE

11.00
SATELLITE SYMPOSIUM
ETHICON

11.45
Of microbes and men – the unspoken story of anastomotic leakage
James Kinross, London, UK

12.15
LUNCH

13.45
Operative techniques to reduce anastomotic recurrence in Crohn's disease
Laura Hancock, Manchester, UK

14.15
Innovative approaches in the treatment of complex Crohn Diseases perianal fistula
Christianne Buskens, Amsterdam, NL

14.45
To divert or not to divert in Crohn surgery – technical aspects and patient factors
Pär Myrelid, Linköping, SE

15.15
COFFEE BREAK

15.45
Appendiceal neoplasia – when to opt for a minimal approach, when and how to go for a maximal treatment
Tom Cecil, Basingstoke, Hampshire, UK

16.15
SATELLITE SYMPOSIUM
Medtronic
Further.Together

17.00
Outcomes of modern induction therapies and Wait and Watch strategies, Hope or Hype
Antonino Spinelli, Milano, IT

17.30
EAES Presidential Lecture - Use of ICG in colorectal surgery: beyond bowel perfusion
Salvador Morales-Conde, Sevilla, ES

18.00
Get-Together with your colleagues
Industrial Exhibition

Tuesday, 29 November 2022

9.00
CONSULTANT'S CORNER
Michel Adamina, Winterthur, CH

10.30
COFFEE BREAK

11.00
SATELLITE SYMPOSIUM
INTUITIVE

11.45
Trends in colorectal oncology and clinical insights for the near future
Rob Glynne-Jones, London, UK

12.15
LUNCH

13.45
VIDEO SESSION

14.15
SATELLITE SYMPOSIUM
BD

15.00
COFFEE BREAK

15.30
The unsolved issue of TME: open, robotic, transanal, or laparoscopic – shining light on evidence and practice
Des Winter, Dublin, IE
Jim Khan, London, UK
Brendan Moran, Basingstoke, UK

16.30
SATELLITE SYMPOSIUM
Takeda

17.15
Lars Pahlman lecture
Søren Laurberg, Aarhus, DK

Thursday, 1 December 2022
Masterclass in Colorectal Surgery
Proctology Day

Wednesday, 30 November 2022

9.00
Advanced risk stratification in colorectal cancer – choosing wisely surgery and adjuvant therapy
Philip Quirke, Leeds, UK

09.30
Predictors for Postoperative Complications and Mortality
Ronan O'Connell, Dublin, IE

10.00
Segmental colectomy versus extended colectomy for complex cancer
Quentin Denost, Bordeaux, FR

10.30
COFFEE BREAK

11.00
Incidental cancer in polyp - completion surgery or endoscopy treatment alone?
Laura Beyer-Berjot, Marseille, FR

11.30
SATELLITE SYMPOSIUM

12.00
Less is more – pushing the boundaries of full-thickness rectal resection
Xavier Serra-Aracil, Barcelona, ES

12.30
LUNCH

14.00
Management of intestinal neuroendocrine neoplasia
Frédéric Ris, Geneva, CH

14.30
Poster Presentation & Best Poster Award
Michel Adamina, Winterthur, CH

15.00
SATELLITE SYMPOSIUM
OLYMPUS

15.45
COFFEE BREAK

16.15
Reoperative pelvic floor surgery – dealing with perineal hernia, reoperations, and complex reconstructions
Guillaume Meurette, Nantes, FR

16.45
Salvage strategies for rectal neoplasia
Roel Hompes, Amsterdam, NL

17.15
Beyond TME – technique and results of pelvic exenteration and sacrectomy
Paris Tekkis, London, UK

19.30
FESTIVE EVENING

Information & Registration **www.colorectalsurgery.eu**

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SYSTEMATIC REVIEW

Endoscopic sinusectomy: 'a rose by any other name'. A systematic review of different endoscopic procedures to treat pilonidal disease

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Abstract

Aim: Pilonidal sinus or Pilonidal Disease (PD) is a relatively common, benign but challenging condition. Although commonly encountered in practice, its ideal treatment is controversial. One of the most validated treatments is video-assisted surgery. In this context, very similar endoscopic techniques have been published under different names. The aim of this systematic review is to assess the differences among these proposed techniques and their outcomes.

Methods: The Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines were followed during all stages of this systematic review. A systematic search of the English literature was performed on multiple databases from 1 January 2014 to 3 April 2022. The primary outcome measure was the IDEAL framework stage of innovation. The key secondary outcome measures were the adherence to the IDEAL reporting guidelines, the Blencowe framework and the core outcome set (COS) for studies evaluating the introduction and evaluation of novel surgical techniques, the qualitative assessment using appropriate tools, the procedural variations and outcomes of each technique.

Results: A total of 38 articles were included reporting a very similar technique under eight different acronyms. The number of patients varied from 9 to 250. Mean follow-up ranged from 1 to 60 months. There was only one published study of IDEAL 3. The majority (58%) were IDEAL 2a studies. Reporting of domains in the IDEAL reporting guidelines and Blencowe framework was poor, with most studies not reporting the component steps of procedures or efforts to standardize them. Half of COS domains were markedly underreported. The quality of the evidence was categorized as having a risk of bias from moderate to critical level in all nine comparative non-randomized series. Postoperative complications occurred in 0%–6% of cases, including surgical site infection, poor or failed wound healing bleeding, granuloma, haematoma, and pain requiring intervention. The recurrence rate varied from 0% to 22%.

Marco Milone, Gaetano Gallo and Ugo Grossi contributed equally.

Conclusion: The study demonstrates that reporting on technical aspects of interventions for PD is poor, thus warranting a better-quality control of surgical techniques. It is advisable to group all endoscopic procedures under the umbrella term of 'endoscopic sinusectomy', thus embracing the two main principles of this technique, that is, video assistance and PD ablation.

KEYWORDS
endoscopic sinusectomy, minimally invasive approach, pilonidal disease

INTRODUCTION

Pilonidal sinus or Pilonidal Disease (PD) is a benign yet tricky disease affecting the hair follicles of the natal cleft in the sacrococcygeal area. It is three times more frequent in men than women Pilonidal sinus and mainly affects young adults and teenagers, with an incidence of 26 per 100 000 people [1–3]. Although commonly encountered in clinical practice, the ideal treatment of PD has remained controversial since its first description by Mayo in 1833 [4]. After an extensive review in 1990, Allen-Mersh [5] concluded that 'the choice of a particular surgical approach depends on the surgeon's familiarity with the procedure and achieved results in terms of low recurrence of the sinus and of quick healing of the resulting cavity or surgical wound'. Is this time-tested statement still valid after 30 years? The management of chronic PD has many options and is subject to debate [6].

Recently, the Italian Society of Colorectal Surgery has proposed new guidelines for the treatment of PD [7], stressing that minimally invasive surgery (MIS), either endoscopic or not, should be considered as a validated approach and first option for limited PD. In this context, very similar surgical techniques of endoscopic MIS have been developed over the last 8 years under different acronyms.

The Idea, Development, Exploration, Assessment, Long Term Study (IDEAL) framework and recommendations were launched in 2009 to clarify and address the key challenges presented in surgical innovation [8]. The IDEAL framework has evolved over time and now includes frameworks for new surgical techniques and complex therapeutic technologies, the central tenet being that development and evaluation can and should proceed together in an ordered and logical manner that balances innovation and safety [9].

Moreover, a recent patient and professional stakeholder consensus study described an agreed minimum set of outcomes (namely, the core outcome set, COS) to measure and report on all studies evaluating the introduction and evaluation of novel surgical techniques prior to definitive randomized controlled trial (RCT) evaluation to promote safe, transparent and efficient surgical innovation [10].

Additional guidance exists for specific aspects of surgical study designs. The template for intervention description and replication checklist has been developed as an extension of CONSORT to improve reporting of intervention details [11]. While representing important progress for the design and reporting of interventions within RCTs, Blencowe et al. [12] pointed out that these guidance documents are not specific for, or easily applicable to, surgical interventions, thus proposing a framework broadly broken into three domains: intervention description, standardization of description, and monitoring the fidelity of the intervention.

What does this paper add to the literature?

This study highlights the need to improve reporting and quality control of novel surgical techniques. Standardization of terminology for procedures that share the same therapeutic principles is warranted. This strategy may facilitate evidence synthesis on outcomes after minimally invasive endoscopic treatment of pilonidal disease.

The aim of this systematic review is to assess the quality of studies reporting the various endoscopic MIS techniques for PD, highlighting procedural variations and outcomes.

MATERIALS AND METHODS

This protocol was registered in the Open Science Framework system (https://osf.io/wzu9m) [13]. The review is reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Table S1) [14]. A systematic search of MEDLINE, the Cochrane Library, PubMed, Embase, Scopus and Web of Science was performed using the following search strategy: 'pilonidal' AND ('endoscopic' OR 'minimally'). The search started on 1 January 2014 until 3 April 2022, including only English-language papers. In addition, the reference lists of all retrieved articles were manually reviewed.

Eligibility criteria

The PICOS (Population, Intervention, Comparison, Outcome, Study design) model was adopted to determine the studies' eligibility criteria. Studies were considered if (1) patients with PD underwent an endoscopic MIS treatment and (2) outcomes were assessed irrespective of the design (e.g., randomized trial, cross-sectional,

case–control and cohort). Studies aimed to address other aspects of PD treatment and those focused on other techniques were excluded. Single case reports, letters to the editor and general reviews were also excluded. We avoided, as burdened by bias, studies in which there were conflicts of interest, under-age patients, relapses of PD, external financing.

Study selection and data extraction

Two independent authors performed the following steps: title screening, removal of duplicates, abstract screening, analysis of full-text articles and review of the selected articles. Disagreements were resolved by consensus.

Data were extracted by one author and checked by a second author. Disagreements were resolved by discussion between the two reviewers and a senior author. The information retrieved from each paper included authors, country and year of publication, study design, type of technique, postoperative outcomes and follow-up.

Outcomes

The primary outcome measure was the IDEAL framework stage of innovation, excluding Stage 1 (i.e., case reports as per protocol): Stage 2a, cohort study; Stage 2b, feasibility RCT; Stage 3, RCT; Stage 4, registry [15]. The key secondary outcome measures were (a) the incorporation of an agreed minimum set of outcomes (i.e., COS) to measure and report in all studies evaluating the introduction and evaluation of novel surgical techniques [10]; (b) adherence to the IDEAL reporting guidelines [9] and the Blencowe framework [12] (Table 1); (c) quality assessment using the Cochrane Collaboration risk of bias tool [16] over seven separate domains for randomized studies, the risk of bias in non-randomized studies of interventions (ROBINS-I) criteria [17] for non-randomized comparative series and the JBI (formerly known as the Joanna Briggs Institute) critical appraisal tool [18] for case series (the purpose of this appraisal is to assess the methodological quality of a study and to determine the extent to which a study has addressed the possibility of bias in its design, conduct and analysis); (d) procedural variations and outcomes of each technique.

The domains analysed for assessing the COS in each study were (1) intended benefit(s) of the procedure, including (i) before, (ii) during or (iii) after the procedure; (2) modifications to (i) the procedure, (ii) concomitant interventions or (iii) which patients were offered the procedure during the study (this excludes abandoning or changing to another procedure at any point); (3) procedure completion success, either with/without modifications; (4) problems with the device working, if applicable; (5) unexpected disadvantages, including (i) before, (ii) during or (iii) after the procedure; (6) overall desired effect (overall aim) of the procedure/device; (7) surgeons'/operators' emotional, psychological or physical experience of the procedure (e.g., ergonomic comfort during the operation); and (8) patients' emotional, psychological or physical experience relating to the procedure being innovative.

RESULTS

The systematic literature search yielded 229 articles. A hundred and sixty-two articles were considered out of scope on title and abstract screening and consequently were excluded. The full texts of the remaining 69 articles were assessed in detail. A total of 38 articles describing a subcutaneous endoscopic MIS repair for PD were finally included in this review (Figure 1). These techniques were reported under eight different acronyms (further details are given below): video-assisted ablation of pilonidal sinus (VAAPS), endoscopic pilonidal sinus treatment (EPSiT), paediatric endoscopic pilonidal sinus treatment (PEPSiT), PEPSiLaT, endoscopic pilonidal abscess treatment (EPAT), endoscopic pilonidal sinus resection (EPSI-R), endoscopic-assisted pilonidal irrigation and cleaning (EPIC) and laser-assisted EPSiT (LEPSiT; Table 2).

Study design and outcomes

Of the 38 included studies, only one was an RCT [1] with a subsequent study by the same institution reporting the long-term outcomes [19], nine were non-randomized comparative series [20–26] and 27 were non-comparative case series. Overall, 22 (58%) studies were IDEAL Stage 2a, 15 (39%) were 2b and only one [1] was Stage 3 (Table 1). Of the eight COS domains, only three were reported in all studies (Figure 2). Except for domain 6, the others were markedly underreported. None of the studies described domain 4.

Item 1.1 of the Blencowe framework, overall technical purpose of the intervention, was reported in 13 out of 38 (34%) studies; item 1.2, identification of the intervention components, in 26 (68%) and item 1.3, identification of individual steps of the intervention, in 21 (55%) studies (Table S2). With regard to section 2 of the Blencowe framework, standardization of surgical interventions, item 2.1 was reported in only three (8%) studies. Items 2.2 and 2.3 were only reported in one study. Five (13%) studies reported deviation from intervention, while only one described deviation from components and steps.

The randomized study [1] used computer generated randomization and allocation concealment in envelopes (low risk of selection bias). There was a high risk of bias due to lack of blinding of participants and personnel but low risk of bias due to blinding of outcome assessment, incomplete outcome data or selective outcome reporting.

The assessment of risk of bias of the nine non-randomized comparative studies is reported in Table 3. Only three studies [22, 26, 27] were deemed moderate risk of bias, while the others were considered at serious or critical risk.

Figure 3 shows the results of the qualitative analysis for non-comparative case series. The majority of studies duly reported all

TABLE 1 Summary of IDEAL reporting guidelines [9] and Blencowe framework [12]

	IDEAL reporting guidelines		
Item	**Stage 2A**[a]	**Stage 2B**[b]	**Blencowe framework**
1	a. Identification as a prospective case series of a novel technique in the title, including the IDEAL stage in the title or abstract	a. Identify the novel technique/device being investigated and the type of study conducted (e.g., multicentre, prospective cohort or feasibility RCT), including the IDEAL stage in the title or abstract	Intervention description 1.1 Overall technical purpose of the intervention 1.2 Identifcation of the intervention components 1.3 Identifcation of individual steps of the intervention
	b. Provide a structured summary of background, methods, results and conclusions		
2	a. Review of existing scientific literature, including reference to IDEAL Stages 1 and 2a reports in previous publications, if applicable		Standardization of surgical interventions 2.1 Types of standardization 2.2 Conditions relating to standardization 2.3 Flexibility of standardization
	b. Specific objectives stated, including refining the technique and progressing toward stability	b. Specific objectives, including reaching consensus on issues requiring resolution in order to determine whether an RCT is appropriate or feasible and to define the RCT question if it is	
3	Description of study design (e.g., sequentially reported prospective case series)	Description of multicentre study design, with prospective collection of standard data across centres	Fidelity 3.1 Deviation from intervention 3.2 Deviation from the components 3.3 Deviation from steps
4	a. Detailed account of patient inclusion and exclusion criteria	a. Detailed account of patient inclusion and exclusion criteria, defining any specific recognized patient subgroups or technique/device variants included for which there is not full consensus over their eligibility	
	b. Informed consent process described, including explanation of risks and acknowledgement of level of experience with technique/device		
	c. Setting, location and timeframe of recruitment and follow-up, including when and where the data were collected, as well as hospital characteristics and appropriate details regarding the operator/team (e.g., prior experience with novel technique)		
5	a. Clear and detailed description of (or reference to) planned technique, including necessary preoperative and postoperative care	a. Clear and detailed description of technique, or reference to it, including an assessment measure for quality of performance for operators/teams	
	b. Patient safety monitoring methods and safeguards	b. Description or reference to statistical learning curve assessment of operators/team using pre-defined objective quality metrics	
		c. Patient safety monitoring methods and safeguards	
6	Description of outcome measure(s) selected and how they will be assessed, including patient-reported outcome measures, when appropriate, utilizing those measures that are standardized and validated, when available and applicable. When these are not available, provide rationale for the outcome measure(s) used	Description of pre-specified primary and secondary outcome measures selected and how they will be assessed, including patient-reported outcome measures, when appropriate, utilizing standardized and validated core outcome sets, when available and applicable. When these are not available, provide rationale for the outcome measure(s) used	

TABLE 1 (Continued)

	IDEAL reporting guidelines		
Item	**Stage 2A**[a]	**Stage 2B**[b]	**Blencowe framework**
7	Patient baseline demographic and clinical characteristics, including how many patients were assessed for treatment and a description of which patients were included, excluded or refused, and why (to be displayed in a flow diagram format, when appropriate)	Statistical methods used to describe baseline characteristics and evaluate primary and secondary outcomes, when appropriate, including methods for additional analysis (e.g., learning curve analysis, pre-specified subgroup analysis, evaluation of known confounders)	
8	Transparent reporting of all cases in the sequence they were performed, clearly indicating when and why modifications to the technique took place, including visual aids of the technique and modifications (e.g., photographs, videos etc.) when available	Describe or reference attempts to evaluate patient and surgeon preferences and values relevant to future RCT trial design and conduct, including any qualitative work done to ascertain views about randomization	
9	Technical, clinical and patient-reported outcomes described for each patient, with all available outcome data incorporated into a comprehensive table or graph, whenever possible, to allow for the relationship to be clearly visualized between technique modifications and outcomes	Patient baseline demographic and clinical characteristics, including how many patients were assessed for treatment and a description of which patients were included, excluded or refused, and why (to be displayed in a flow diagram format, when appropriate)	
10	Transparent account of all harms or unintended effects reported for each patient	Report of learning curve assessment results for operators/team based on pre-defined objective quality metrics, including statistical analysis, if feasible	
11	Analysis of technique development, including consistency of results and a balanced discussion of benefits and harms	Describe results of each pre-specified outcome measure, including patient-reported outcome measures, where appropriate. Report the results of pre-specified subgroup analysis to investigate outcomes in patient groups or technique/device variants where pre-study investigator consensus about eligibility was not reached. Report on effects of known confounders	
12	Study limitations, addressing sources of potential bias	Transparent account of all harms or unintended effects reported	
13	a. Have the technique and outcomes reached stability in the hands of the current team (e.g., there is no intent to make further major modifications to the technique, and patient outcomes are stable)? Include an explanation of how you determined stability b. Discussion of whether the technique is ready for evaluation in a prospective, multicentre IDEAL Stage 2b study, and identification of indications for the technique	Report findings of attempts to evaluate patient and surgeon preferences and values relevant to future RCT trial design and conduct, including any qualitative work done to ascertain views about randomization	
14	Conclusions and relevance, including plans to progress to future IDEAL stages, if applicable	Study limitations, addressing sources of potential bias	

(Continues)

TABLE 1 (Continued)

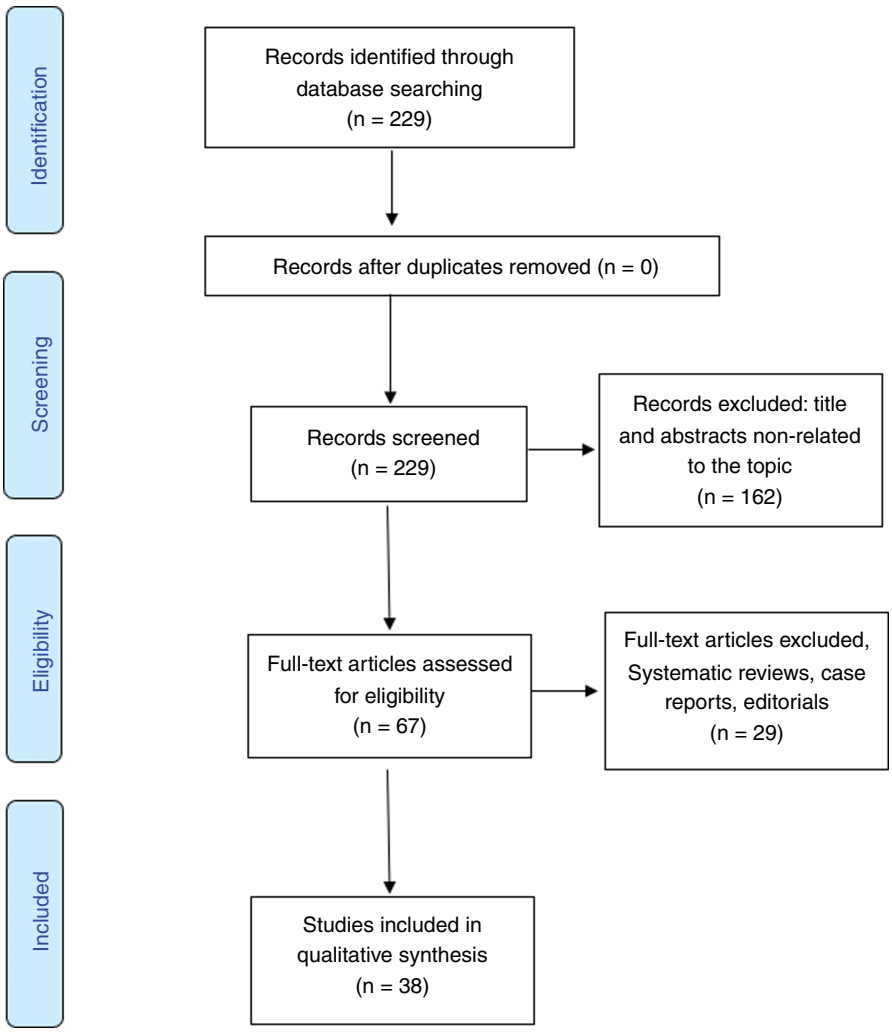
	IDEAL reporting guidelines		
Item	**Stage 2A**[a]	**Stage 2B**[b]	**Blencowe framework**
15	a. Please quote reference or DOI if a protocol was written in advance and made available. If a protocol was not made available, consider including as a supplement if the journal allows	a. Pre-planned consensus review of results and discussion of appropriateness of progressing to RCT or pilot/feasibility study	
	b. Reference to ethical approvals obtained, and independent oversight, if applicable	b Has agreement been reached about standard technique, including accepted variants, and quality standards based on operator/team experience during this stage?	
	c. Sources of funding and support, role of funders and other conflicts of interest	c. Has agreement been reached on the appropriate target patient population and indications, including identification of subgroups for which the applicability of the technique is considered uncertain?	
		d. Has agreement been reached regarding appropriate outcome measure(s) for a trial, including an estimated power calculation of the primary outcome for a future trial?	
		e. Has agreement been reached regarding the appropriate comparator treatment for a trial?	
		f. Are operators and patients willing to accept randomization between the proposed treatments (establishing equipoise)?	
		g. Ensure potential harms from learning curves are addressed by evidence of completion, training and mentoring prior to Stage 3, where appropriate	
16	Regulatory approvals being sought or obtained (e.g., CE Marking, FDA approval etc.) including the date of approval, if applicable	Conclusions and relevance, including plans to evaluate the technique/device in a high-quality RCT against the current standard of care. If not planning to further evaluate in IDEAL Stage 3 study, please explain	

Abbreviations: FDA, Food and Drug Administration; IDEAL, Idea, Development, Exploration, Assessment, Long Term Study; RCT, randomized controlled trial.

[a]Item 1, title and abstract; Item 2, introduction; Items 3–6, methods; Items 7–10, results; Items 11–14, discussion; Items 15–16, other information.

[b]Item 1, title and abstract; Item 2, introduction; Items 3–8, methods; Items 9–13, results; Items 14–16, discussion.

FIGURE 1 PRISMA diagram



items of the checklist except two, namely clear reporting of clinical information of the participants and the presenting site(s)/clinic(s) demographic information.

Technical aspects of the techniques

VAAPS

Video-assisted ablation of pilonidal sinus was first performed in 2014 on 27 patients [28]. The procedure includes a study phase (i.e., insertion of a paediatric hysteroscope, identification of sinus and its lateral tracks, identification and removal of hair) and an operative phase (i.e., sinus cavity ablation and cleaning to achieve thorough debridement and irrigation of the cavity).

EPSiT, PEPSiT and PEPSiLaT

Meinero et al. [29] first performed EPSiT in 2014 on 11 patients. No recurrence was observed at a median follow-up of 6 months. Esposito et al. first described the PEPSiT in children using the Meinero fistuloscope [24, 25, 30–32]. Subsequently, the same authors proposed and renamed this variant using the acronym PEPSiLaT [24].

EPAT, EPSI-R, EPIC and LEPSiT

Javed et al. [20] first described the EPAT in 2016. The procedure involved a small 1-cm incision over the most fluctuant part of the abscess. The fistuloscope was then inserted to visualize the cavity, which was drained by irrigation and washout, followed by subsequent fulguration of the abscess cavity.

In 2020, Yuksel et al. [33] first described the EPSI-R for removal of PD by means of a bipolar resectoscope. More recently, Baxter et al. [34] introduced the EPIC procedure, allowing the removal of hair under direct vision using a small endoscope while flushing normal saline through the cavity via an angio-catheter. Gulcu and Ozturk [27] described the latest kid on the block of MIS procedures for PD, namely LEPSiT, in a case-matched study on 24 patients.

However, the experience with EPAT, EPSI-R, EPIC and LEPSiT is still in its infancy, with no published results in the literature following their first description.

TABLE 2 Studies describing endoscopic approaches to pilonidal disease ordered by technique's name (acronym)

Study	Year	Country	*N*	Acronym	Equipment	Anaesthesia	Follow-up (months)	Infection*N*(%)	Recurrence*N*(%)	IDEAL stage
Milone [28]	2014	Italy	27	VAAPS	Bettocchi Office Hysteroscope working channel 5 Fr	Local	12	0 (0)	1 (3.7)	2a
Milone [52]	2014	Italy	4	VAAPS	Bettocchi Office Hysteroscope working channel 5 Fr	Local	NR	0 (0)	0 (0)	2a
Milone [1]	2016	Italy	76	VAAPS	Bettocchi Office Hysteroscope working channel 5 Fr	Local	12	1 (1.3)	3 (3.9)	3
Milone [22]	2019	Italy	40	VAAPS	Bettocchi Office Hysteroscope working channel 5 Fr	Local	60	5 (12.5)	3 (7.5)	2a
Milone [19]	2020	Italy	74	VAAPS	Bettocchi Office Hysteroscope working channel 5 Fr	Local	60	0 (0)	18 (24.3)	2b
Manigrasso [26]	2021	Italy	82	VAAPS	Bettocchi Office Hysteroscope working channel 5 Fr	Local	60	4 (4.9)	5 (6.1)	2b
Manigrasso [35]	2021	Italy	63	VAAPS	Bettocchi Office Hysteroscope working channel 5 Fr	Local	60	5 (7.9)	3 (4.8)	2b
Esposito [32]	2020	Italy	127[a]	PEPSiT/PEPSiLaT	Storz Meinero fistuloscope working channel 7 Fr	Spinal	36	0 (0)	6 (4.7)	2b
Esposito [31]	2018	Italy	15[a]	PEPSiT	Storz Meinero fistuloscope working channel 7 Fr	Spinal	18	0 (0)	0 (0)	2a
Esposito [30]	2019	Italy	10[a]	PEPSiT	Storz Meinero fistuloscope working channel 7 Fr	Spinal	18	0 (0)	0 (0)	2a
Esposito [24]	2020	Italy	59[a]	PEPSiT	Storz Meinero fistuloscope working channel 7 Fr	Spinal	30	0 (0)	1 (1.7)	2b
Esposito [25]	2020	Italy	87[a]	PEPSiT	Storz Meinero fistuloscope working channel 7 Fr	Spinal	18	5 (5.7)	7 (8.0)	2b
Dotlacil [53]	2021	Czechia	18[a]	PEPSiT	Storz Meinero fistuloscope working channel 7 Fr	General	10	0 (0)	2 (11.1)	2a
Pérez-Bertólez [64]	2021	Spain	14[a]	PEPSiT	Storz Meinero fistuloscope working channel 7 Fr	Variable	12.5	0 (0)	0 (0)	2a
Gulcu [27]	2022	Turkey	24	LEPSiT	Storz Meinero fistuloscope working channel 7 Fr	General	9	0 (0)	1 (4.2)	2a
Meinero [29]	2014	Italy	11	EPSiT	Storz Meinero fistuloscope working channel 7 Fr	Local	6	0 (0)	0 (0)	2a
Chia [40]	2015	Asia	9	EPSiT	Storz Meinero fistuloscope working channel 7 Fr	Local	2.5	0 (0)	0 (0)	2a
Meinero [37]	2016	Italy	250	EPSiT	Storz Meinero fistuloscope working channel 7 Fr	Local	12	0 (0)	13 (5.2)	2b
Gecim [49]	2017	Turkey	23	EPSiT	Storz Meinero fistuloscope working channel 7 Fr	Local	22	0 (0)	0 (0)	2a
Giarratano [54]	2017	Italy	77	EPSiT	Storz Meinero fistuloscope working channel 7 Fr	Local	25	0 (0)	4 (5.2)	2b
Sequeira [21]	2018	Portugal	21[a]	EPSiT	Storz Meinero fistuloscope working channel 7 Fr	Local	25	2 (9.5)	2 (9.5)	2a
Pini Prato [55]	2018	Italy	43[a]	EPSiT	Storz Meinero fistuloscope working channel 7 Fr	Local	4	1 (2.3)	5 (11.6)	2a
Meinero [38]	2019	Italy	122	EPSiT	Storz Meinero fistuloscope working channel 7 Fr	Local	16	0 (0)	6 (4.9)	2b
Khafagy [56]	2019	Kuwait	35	EPSiT	Storz Meinero fistuloscope working channel 7 Fr	Local	6	0 (0)	2 (5.7)	2a
Mendes [41]	2019	South America	67	EPSiT	Storz Meinero fistuloscope working channel 7 Fr	Local	NR	0 (0)	6 (9.0)	2b
Kalaiselvan [57]	2020	UK	74	EPSiT	Storz Meinero fistuloscope working channel 7 Fr	Local	12	0 (0)	22 (29.7)	2b
Romaniszyn [23]	2020	Poland	26	EPSiT	Storz Meinero fistuloscope working channel 7 Fr	Local	12	2 (7.7)	7 (26.9)	2a
Azhough [58]	2021	Iran	100	EPSiT	Storz Meinero fistuloscope working channel 7 Fr	Local	1	0 (0)	4 (4.0)	2b
Gökbuget [39]	2021	Turkey	29	EPSiT	Storz Meinero fistuloscope working channel 7 Fr	Local	8	0 (0)	8 (27.6)	2a
Giordano [42]	2021	Italy	13	EPSiT	Storz Meinero fistuloscope working channel 7 Fr	Local	9	0 (0)	0 (0)	2a
Gallo [59]	2021	Italy	32	EPSiT	Storz Meinero fistuloscope working channel 7 Fr	Local	22	0 (0)	4 (12.5)	2a
Foti [60]	2021	Italy	42	EPSiT	Storz Meinero fistuloscope working channel 7 Fr	Local	62	2 (4.8)	5 (11.9)	2b
Gulcu [61]	2021	Turkey	72	EPSiT	Storz Meinero fistuloscope working channel 7 Fr	Local	12	0 (0)	1 (1.4)	2b
Hinksman [62]	2022	Australia	137	EPSiT	Storz Meinero fistuloscope working channel 7 Fr	General	56	1 (0.7)	17 (13.5)	2b
Yuksel [33]	2020	Turkey	2	EPSI-R	Storz 26-F bipolar resectoscope	Spinal	8	0 (0)	0 (0)	2a
Baxter [34]	2021	USA	20	EPIC	Storz Meinero fistuloscope working channel 7 Fr	General	28	1 (5.0)	3 (15.0)	2a
Javed [20]	2016	UK	20	EPAT	Storz Meinero fistuloscope working channel 7 Fr	General	10.5	0 (0)	0 (0)	2a
Jain [63]	2017	UK	19	EPAT	Storz Meinero fistuloscope working channel 7 Fr	General	6	0 (0)	1 (5.3)	2a

Abbreviations: Fr, French gauge; NR, not reported.

[a]Paediatric population.

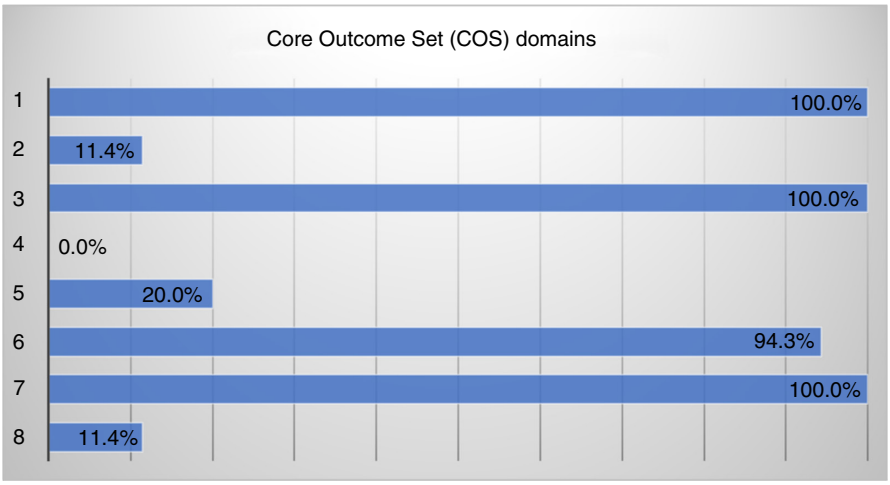


FIGURE 2 Core outcome set domains: 1, intended benefit(s) of the procedure, including (i) before, (ii) during or (iii) after the procedure (e.g., fewer tests needed before surgery, less operative time, better recovery); 2, modifications to (i) the procedure, (ii) concomitant interventions or (iii) which patients were offered the procedure during the study (excludes abandoning or changing to another procedure at any point, e.g., laparoscopic approach converted to open); 3, procedure completion success, with/without modifications; 4, problems with the device working (e.g., new stapler misfired), if applicable; 5, unexpected disadvantages, including (i) before, (ii) during or (iii) after the procedure (e.g., unexpected instrument clashing, inadvertent injury to nearby tissue and/or organs); 6, overall desired effect (overall aim) of the procedure/device achieved (e.g., tumour successfully excised); 7, surgeons'/operators' emotional, psychological or physical experience of the procedure (e.g., ergonomic comfort during the operation); 8, patients' emotional, psychological or physical experience relating to the procedure being innovative (e.g., anxiety because of the procedure being new)

TABLE 3 ROBINS-I risk of bias for non-randomized comparative studies

Study	Confounding	Selection bias	Classification of intervention	Deviation from intended intervention	Missing data	Outcome measurement bias	Selection of reported result bias	Overall
Milone [28]	Critical risk	Critical risk	Low risk	Critical risk	Low risk	No information	Serious risk	Critical risk
Sequeira [21]	Critical risk	Critical risk	Low risk	No information	Moderate risk	Serious risk	Moderate risk	Critical risk
Milone [22]	Moderate risk	Moderate risk	Low risk	Low risk	Low risk	Low risk	Low risk	Moderate risk
Romaniszyn [23]	Critical risk	Critical risk	Low risk	No information	Serious risk	Critical risk	Serious risk	Critical risk
Esposito [25]	Critical risk	Critical risk	Moderate risk	No information	Low risk	Critical risk	Serious risk	Critical risk
Esposito [24]	Critical risk	Critical risk	Moderate risk	No information	Low risk	Critical risk	Serious risk	Critical risk
Manigrasso [26]	Moderate risk	Moderate risk	Low risk	Low risk	Low risk	Low risk	Low risk	Moderate risk
Gulcu [27]	Moderate risk	Moderate risk	Low risk	Low risk	Low risk	Moderate risk	Moderate risk	Moderate risk
Pérez-Bertólez [64]	Critical risk	Critical risk	Low risk	No information	Low risk	Serious risk	Serious risk	Critical risk

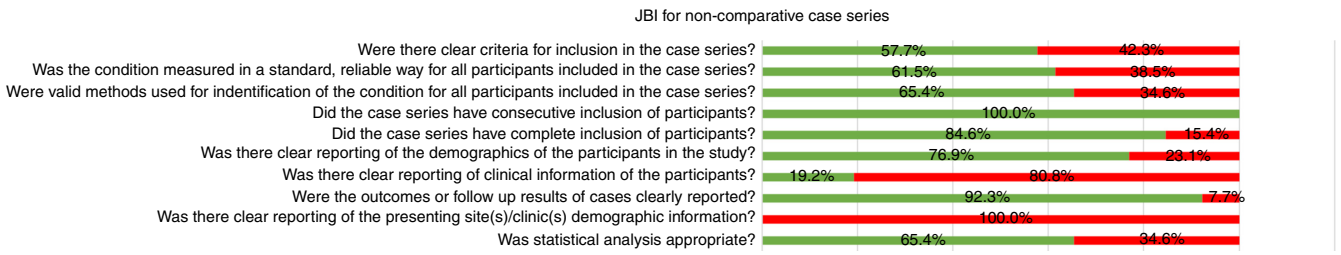


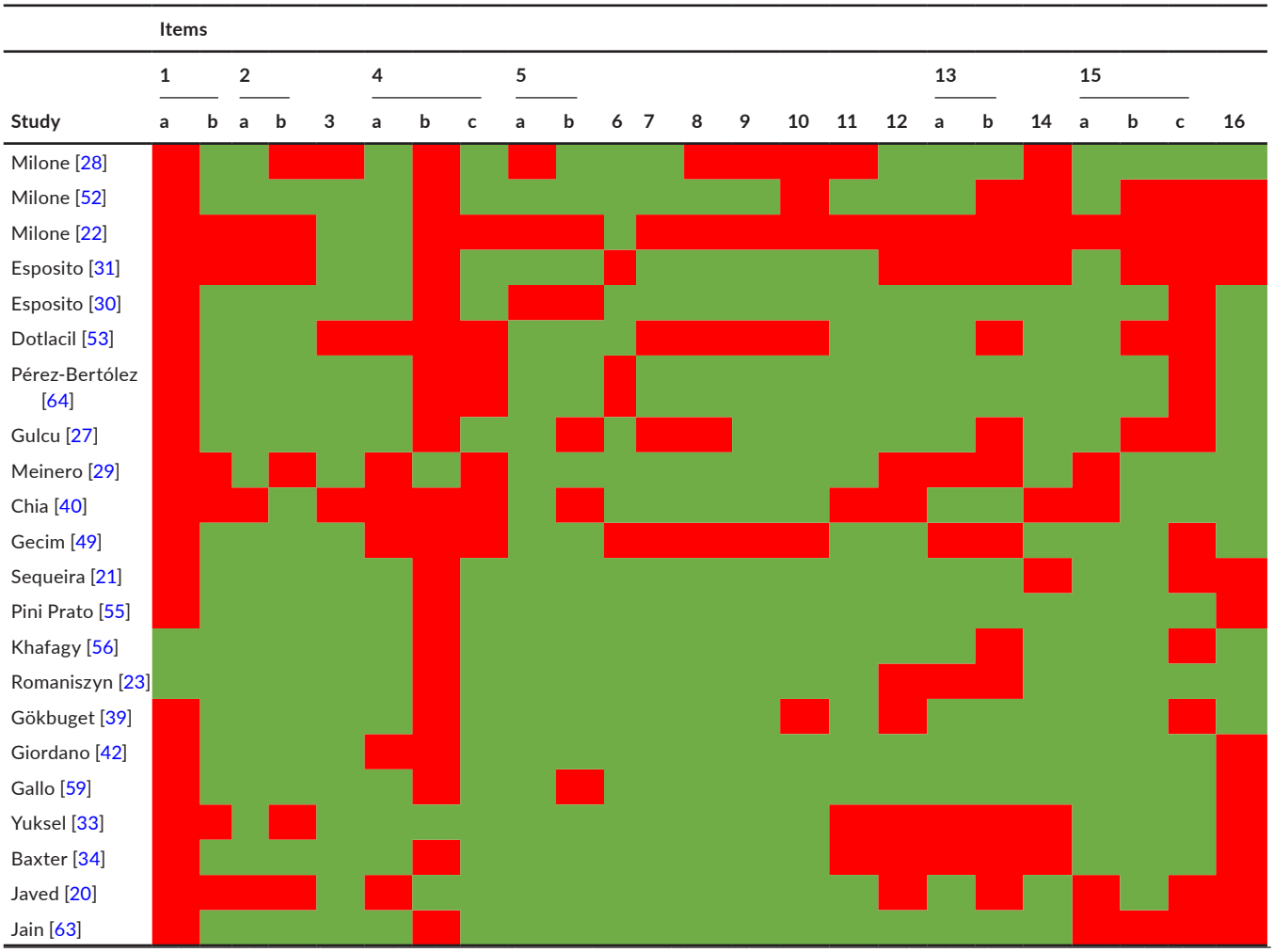
FIGURE 3 JBI checklist for non-comparative case series

Outcomes of the techniques

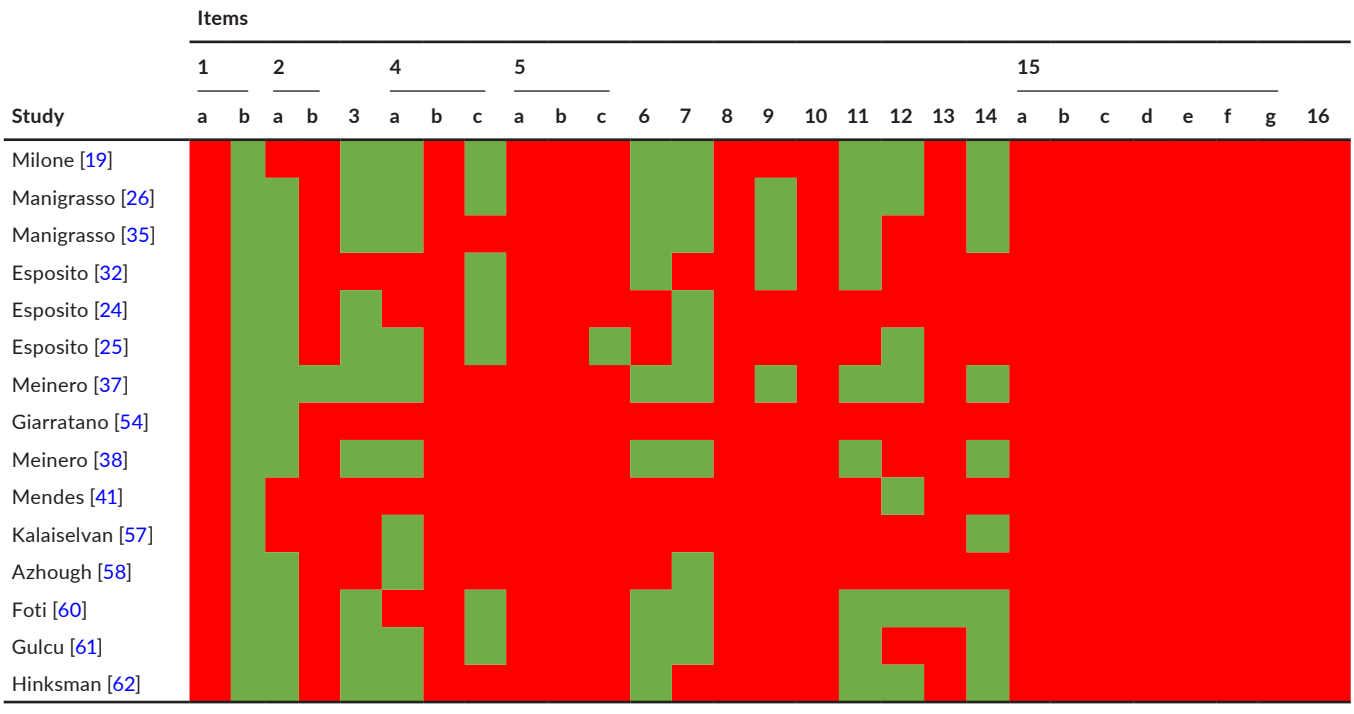
Studies on VAAPS showed that all patients were successfully treated with complete removal of the sinus cavity, no infection and only one recurrence at 1 year. Patients benefitted from immediate return to work and daily activities, high satisfaction and good cosmetic outcome [9]. Similar results were obtained by the same authors in subsequent studies [19, 22, 26, 35, 36].

TABLE 4 IDEAL checklists for IDEAL Stages 2a and 2b

Stage 2a



Stage 2b



A prospective multicentre trial showed a quick postoperative recovery and a good quality of life after EPSiT [37]. A prospective international multicentre study on 122 patients with recurrent PD showed a complete wound healing in 95% of patients, within a mean time of 29 days. The incomplete healing rate (5%) significantly correlated with the number of external openings [38].

Sequeira et al. [21] and Gökbuget et al. [39] assessed the safety and effectiveness of EPSiT in the paediatric population, Chia et al. [40] in the Asian population and Mendes et al. [41] in the Brazilian and Argentinean populations. In patients with complicated PD, EPSiT yielded a significantly lower success rate but a lower risk of complications compared to the Limberg flap procedure [23]. Recently, Giordano et al. [42] advocated the use of negative pressure during EPSiT to optimize the postoperative wound management.

Esposito et al. [24] retrospectively assessed the outcomes of PEPSiT on 15 patients (mean age 16 years; 60% male patients). No intra-operative or postoperative complications were reported. The external openings closed after 1 month in all patients without any recurrences recorded at 6-month follow-up. The authors concluded that PEPSiT was associated with a significantly shorter and painless recovery, and an overall 'better' outcome compared to the open technique [30, 31]. They standardized the technique suggesting preoperative and postoperative laser epilation [32] and oxygen-enriched oil-based gel dressing [25] to decrease the risk of recurrence, while promoting faster wound healing and higher patient satisfaction.

Compared to conventional EPSiT, LEPSiT resulted in better wound healing and patient comfort and a shorter time to return to work [27].

DISCUSSION

Since 1965, MIS for PD has gained wide popularity [43]. Lord and Millar [43] first introduced their treatment for PD based on tiny 'bottle' brushes. Fifteen years later, Bascom described a new technique that combined small local 'rice grain' excision(s) and a lateral incision for cavity debridement [44]. In 2008, Gips et al. [45] proposed a similar MIS technique, employing trephines or biopsy punches.

In 2002, Oncel et al. [46] introduced MIS 'sinusectomy' to avoid wide en bloc excision, showing a low recurrence rate and a fast return to normal daily activities. MIS 'sinotomy' was later described following the same principles [47, 48]. As the latest addition to the family of MIS, technological advancements favoured the development of endoscopic procedures for PD.

All the above-mentioned studies on endoscopic MIS for PD described techniques with a shared core of four procedural steps: (a) identification of the sinus cavity and its lateral tracks by endoscopic view; (b) identification of hair and its removal; (c) complete resection of the sinus cavity; (d) accurate debridement and irrigation of the sinus cavity. The only differences pertain to the type of instruments (e.g., fistuloscope, hysteroscope or resectoscope) and any associated procedures (i.e., crystallized phenol treatment [49], preoperative and postoperative laser epilation [32] or ablation [27], oxygen-enriched oil-based gel dressing [25] and negative pressure therapy [42]).

This systematic review reports the collective experience of different authors from different countries describing similar technical approaches to answer the same surgical question, that is, how to improve the minimally invasive treatment of PD.

Do minor technical changes justify the employment of seven different acronyms to describe in principle the same operation? Such a Babylon of different terms may fuel confusion for health insurance reimbursements, both in public hospitals (disease related groups) and in the private healthcare system (reimbursements by private insurances). All endoscopic MIS techniques seem to yield the same safe and effective results and, in our opinion, can be captured under an umbrella term—endoscopic sinusectomy—embracing the two main features of this technique, namely the endoscopic video-assisted approach and the ablation of PD with complete destruction of the granulation tissue.

The main strength of this study lies in the rigour of our systematic review process. The limitations of our study include language and publication bias. Only papers published in English have been included, while studies published in other languages were excluded. Despite the broad literature search, not all studies focusing on this surgical technique may have been identified. Most studies included in this review were IDEAL Stage 2 (case series or cohort studies) with a very low GRADE quality of evidence (Table 4), indicating that MIS for PD remains in the early stages of evaluation and adoption. This is compounded by a wide variation in terminology, making synthesis of evidence ineffective. The overall scarce adherence to the Blencowe framework merits further remarks, as it might lead to less applicable reporting for the surgical community. Two of the more remarkable areas where information was missing were across the sections of standardization and fidelity. The systematic review has also shown huge variation in the quality of reporting, with fewer operative details reported as decreasing the IDEAL stage (Table S2). As recently suggested [50], we also encourage journal editors to consider adherence to reporting frameworks when publishing future procedure-based studies. It is worth noting that the full COHESIVE framework has not yet finished development and other aspects relevant to our study such as the core measurement set and the ENNOVATE video platform are still in progress [51].

CONCLUSIONS

This study highlights the need to improve reporting and quality control of novel surgical techniques. Marked heterogeneity in terminology exists with regard to MIS for PD. This may generate confusion among coloproctologists and hamper evidence synthesis. The recently developed consensus-based IDEAL checklists may help improve the standards of reporting of early-stage innovation.

AUTHOR CONTRIBUTION

Conceptualization: Marco Milone and Gaetano Gallo. *Methodology*: Marco Milone, Gaetano Gallo, Ugo Grossi and Michele Manigrasso. *Formal analysis*: Gaetano Gallo, Ugo Grossi and Patrizia Pelizzo. *Writing – original draft preparation*: Marco Milone, Gaetano Gallo, Ugo Grossi, Anna D'Amore and Luigi Basso. *Writing – review and editing*: Marco Milone, Gaetano Gallo, Ugo Grossi, Roberto Perinotti and Marco La Torre. *Supervision*: Roberto Perinotti, Giovanni Domenico De Palma and Luigi Basso. *Critical Revision and Final Approval of the manuscript*: All Authors.

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CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICAL APPROVAL

Not required.

INFORMED CONSENT

Not required.

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REFERENCES

1. Milone M, Fernandez LM, Musella M, Milone F. Safety and efficacy of minimally invasive video-assisted ablation of pilonidal sinus: a randomized clinical trial. JAMA Surg. 2016;151(6):547–53.
2. McCallum IJ, King PM, Bruce J. Healing by primary closure versus open healing after surgery for pilonidal sinus: systematic review and meta-analysis. BMJ. 2008;336(7649):868–71.
3. Sondenaa K, Andersen E, Nesvik I, Soreide JA. Patient characteristics and symptoms in chronic pilonidal sinus disease. Int J Colorectal Dis. 1995;10(1):39–42.
4. Observations on injuries and diseases of the rectum. Med Chir Rev. 1833;19(38):289–306.
5. Allen-Mersh TG. Pilonidal sinus: finding the right track for treatment. Br J Surg. 1990;77(2):123–32.
6. Enriquez-Navascues JM, Emparanza JI, Alkorta M, Placer C. Meta-analysis of randomized controlled trials comparing different techniques with primary closure for chronic pilonidal sinus. Tech Coloproctol. 2014;18(10):863–72.
7. Milone M, Basso L, Manigrasso M, Pietroletti R, Bondurri A, La Torre M, et al. Consensus statement of the Italian Society of Colorectal Surgery (SICCR): management and treatment of pilonidal disease. Tech Coloproctol. 2021;25(12):1269–80.
8. McCulloch P, Altman DG, Campbell WB, Flum DR, Glasziou P, Marshall JC, et al. No surgical innovation without evaluation: the IDEAL recommendations. Lancet. 2009;374(9695):1105–12.
9. Bilbro NA, Hirst A, Paez A, Vasey B, Pufulete M, Sedrakyan A, et al. The IDEAL reporting guidelines: a Delphi consensus statement stage specific recommendations for reporting the evaluation of surgical innovation. Ann Surg. 2021;273(1):82–5.
10. Avery KNL, Wilson N, Macefield R, McNair A, Hoffmann C, Blazeby JM, et al. A core outcome set for seamless, standardized evaluation of innovative surgical procedures and devices (COHESIVE): a patient and professional stakeholder consensus study. Ann Surg. 2021.
11. Hoffmann TC, Glasziou PP, Boutron I, Milne R, Perera R, Moher D, et al. Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. BMJ. 2014;348:g1687.
12. Blencowe NS, Mills N, Cook JA, Donovan JL, Rogers CA, Whiting P, et al. Standardizing and monitoring the delivery of surgical interventions in randomized clinical trials. Br J Surg. 2016;103(10):1377–84.
13. Grossi, U. Endoscopic sinusectomy – "the name of the rose". A systematic review of different endoscopic procedures to treat pilonidal disease. 2022. https://doi.org/10.17605/OSF.IO/WZU9M
14. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021;372:n71. https://doi.org/10.1136/bmj.n71
15. Kamarajah SK, Smart NJ, Daniels IR, Pinkney TD, Harries RL. Bioabsorbable mesh use in midline abdominal wall prophylaxis and repair achieving fascial closure: a cross-sectional review of stage of innovation. Hernia. 2021;25(1):3–12.
16. Higgins JP, Altman DG, Gotzsche PC, Juni P, Moher D, Oxman AD, et al. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. BMJ. 2011;343:d5928.
17. Sterne JA, Hernan MA, Reeves BC, Savovic J, Berkman ND, Viswanathan M, et al. ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. BMJ. 2016;355:i4919.
18. Munn Z, Barker TH, Moola S, Tufanaru C, Stern C, McArthur A, et al. Methodological quality of case series studies: an introduction to the JBI critical appraisal tool. JBI Evid Synth. 2020;18(10):2127–33.
19. Milone M, Velotti N, Manigrasso M, Vertaldi S, Di Lauro K, De Simone G, et al. Long-term results of a randomized clinical trial comparing endoscopic versus conventional treatment of pilonidal sinus. Int J Surg. 2020;74:81–5.
20. Javed MA, Fowler H, Jain Y, Singh S, Scott M, Rajaganeshan R. Comparison of conventional incision and drainage for pilonidal abscess versus novel endoscopic pilonidal abscess treatment (EPAT). Tech Coloproctol. 2016;20(12):871–3.
21. Sequeira JB, Coelho A, Marinho AS, Bonet B, Carvalho F, Moreira-Pinto J. Endoscopic pilonidal sinus treatment versus total excision with primary closure for sacrococcygeal pilonidal sinus disease in the pediatric population. J Pediatr Surg. 2018;53(10):2003–7.
22. Milone M, Velotti N, Manigrasso M, Milone F, Sosa Fernandez LM, De Palma GD. Video-assisted ablation of pilonidal sinus (VAAPS) versus sinusectomy for treatment of chronic pilonidal sinus disease: a comparative study. Updates Surg. 2019;71(1):179–83.
23. Romaniszyn M, Swirta JS, Walega PJ. Long-term results of endoscopic pilonidal sinus treatment vs Limberg flap for treatment of difficult cases of complicated pilonidal disease: a prospective, non-randomized study. Colorectal Dis. 2020;22(3):319–24.
24. Esposito C, Mendoza-Sagaon M, Del Conte F, Cerulo M, Coppola V, Esposito G, et al. Pediatric Endoscopic Pilonidal Sinus Treatment

(PEPSiT) in children with pilonidal sinus disease: tips and tricks and new structurated protocol. Front Pediatr. 2020;8:345.
25. Esposito C, Del Conte F, Esposito G, Coppola V, Cerulo M, Escolino M. Standardization of pre- and postoperative management using laser epilation and oxygen-enriched oil-based gel dressing in pediatric patients undergoing pediatric endoscopic pilonidal sinus treatment (PEPSiT). Lasers Surg Med. 2020;53:528–536. https://doi.org/10.1002/lsm.23318
26. Manigrasso M, Velotti N, Sosa Fernandez LM, Vertaldi S, Maione F, Gennarelli N, et al. Early versus delayed endoscopic treatment of acute pilonidal abscess: a propensity score-matched analysis. Int J Colorectal Dis. 2021;36(2):339–45.
27. Gulcu B, Ozturk E. Endoscopic pilonidal sinus treatment vs. laser-assisted endoscopic pilonidal sinus treatment: short-term results from a retrospective case-matched study. Tech Coloproctol. 2022;26(4):271–7.
28. Milone M, Musella M, Di Spiezio Sardo A, Bifulco G, Salvatore G, Sosa Fernandez LM, et al. Video-assisted ablation of pilonidal sinus: a new minimally invasive treatment—a pilot study. Surgery. 2014;155(3):562–6.
29. Meinero P, Mori L, Gasloli G. Endoscopic pilonidal sinus treatment (E.P.Si.T.). Tech Coloproctol. 2014;18(4):389–92.
30. Esposito C, Gargiulo F, Izzo S, Cerulo M, Del Conte F, Severino G, et al. Pediatric endoscopic pilonidal sinus treatment: an effective procedure for children with recurrent pilonidal sinus disease after failed open surgery. J Laparoendosc Adv Surg Tech A. 2019;29(7):981–6.
31. Esposito C, Izzo S, Turra F, Cerulo M, Severino G, Settimi A, et al. Pediatric endoscopic pilonidal sinus treatment, a revolutionary technique to adopt in children with pilonidal sinus fistulas: our preliminary experience. J Laparoendosc Adv Surg Tech A. 2018;28(3):359–63.
32. Esposito C, Turra F, Cerulo M, Del Conte F, Esposito G, Prato AP, et al. Technical standardization of MIS management of children with pilonidal sinus disease using pediatric endoscopic pilonidal sinus treatment (PEPSiT) and laser epilation. J Pediatr Surg. 2020;55(4):761–6.
33. Yuksel BC, Aslan Y, Er S. Endoscopic pilonidal sinus resection (EPSI-R): a new method. Tech Coloproctol. 2020;24(10):1091–2.
34. Baxter J, Espinosa JA, Leinwand MJ. The EPIC procedure (endoscopic-assisted pilonidal irrigation and cleaning): a simple and effective treatment for pilonidal disease. Surg Endosc. 2022;36(2):1380–4.
35. Manigrasso M, Velotti N, Sosa Fernandez LM, Vertaldi S, Maione F, Gennarelli N, et al. Endoscopic approach to recurrent pilonidal sinus: a retrospective analysis. J Laparoendosc Adv Surg Tech A. 2021;31(1):1–5.
36. Milone M, Velotti N, Manigrasso M, Anoldo P, Milone F, De Palma GD. Long-term follow-up for pilonidal sinus surgery: a review of literature with meta-analysis. Surgeon. 2018;16(5):315–20.
37. Meinero P, Stazi A, Carbone A, Fasolini F, Regusci L, La Torre M. Endoscopic pilonidal sinus treatment: a prospective multicentre trial. Colorectal Dis. 2016;18(5):O164–70.
38. Meinero P, La Torre M, Lisi G, Stazi A, Carbone A, Regusci L, et al. Endoscopic pilonidal sinus treatment (EPSiT) in recurrent pilonidal disease: a prospective international multicenter study. Int J Colorectal Dis. 2019;34(4):741–6.
39. Gokbuget ZM, Ozcan R, Karagoz A, Tutuncu AC, Topuzlu Tekant G. Endoscopic pilonidal sinus treatment (EPSiT) in the pediatric age group: short-term results. Ulus Travma Acil Cerrahi Derg. 2021;27(4):443–8.
40. Chia CL, Tay VW, Mantoo SK. Endoscopic pilonidal sinus treatment in the Asian population. Surg Laparosc Endosc Percutan Tech. 2015;25(3):e95–7.
41. Mendes CRS, Ferreira LSM, Salim L. Brazilian and Argentinean multicentric study in the surgical minimally invasive treatment of pilonidal cyst. Arq Bras Cir Dig. 2019;32(3):e1447.
42. Giordano P, Schembari E, Keshishian K, Leo CA. Negative pressure-assisted endoscopic pilonidal sinus treatment. Tech Coloproctol. 2021;25(6):739–43.
43. Lord PH, Millar DM. Pilonidal sinus: a simple treatment. Br J Surg. 1965;52:298–300.
44. Bascom J. Pilonidal disease: origin from follicles of hairs and results of follicle removal as treatment. Surgery. 1980;87(5):567–72.
45. Gips M, Melki Y, Salem L, Weil R, Sulkes J. Minimal surgery for pilonidal disease using trephines: description of a new technique and long-term outcomes in 1,358 patients. Dis Colon Rectum. 2008;51(11):1656–62; discussion 1662–3, 1663.
46. Oncel M, Kurt N, Kement M, Colak E, Eser M, Uzun H. Excision and marsupialization versus sinus excision for the treatment of limited chronic pilonidal disease: a prospective, randomized trial. Tech Coloproctol. 2002;6(3):165–9.
47. Al-Naami MY. Outpatient pilonidal sinotomy complemented with good wound and surrounding skin care. Saudi Med J. 2005;26(2):285–8.
48. Soll C, Hahnloser D, Dindo D, Clavien PA, Hetzer F. A novel approach for treatment of sacrococcygeal pilonidal sinus: less is more. Int J Colorectal Dis. 2008;23(2):177–80.
49. Gecim IE, Goktug UU, Celasin H. Endoscopic pilonidal sinus treatment combined with crystallized phenol application may prevent recurrence. Dis Colon Rectum. 2017;60(4):405–7.
50. Tyrell S, Coates E, Brown SR, Lee MJ. A systematic review of the quality of reporting of interventions in the surgical treatment of Crohn's anal fistula: an assessment using the TIDiER and Blencowe frameworks. Tech Coloproctol. 2021;25(4):359–69.
51. https://www.bristol.ac.uk/population-health-sciences/centres/surgical-research/research/outcome-measures/cohesive-study/. Accessed July 26, 2022.
52. Milone M, Bianco P, Musella M, Milone F. A technical modification of video-assisted ablation for recurrent pilonidal sinus. Colorectal Dis. 2014;16(11):O404–6.
53. Dotlacil V, Rygl M, Frybova B. Initial experience with minimally invasive treatment of pilonidal sinus in children. Wideochir Inne Tech Maloinwazyjne. 2021;16(2):417–22.
54. Giarratano G, Toscana C, Shalaby M, Buonomo O, Petrella G, Sileri P. Endoscopic pilonidal sinus treatment: long-term results of a prospective series. JSLS. 2017;21(3):e2017.00043.
55. Pini Prato A, Mazzola C, Mattioli G, Escolino M, Esposito C, D'Alessio A, et al. Preliminary report on endoscopic pilonidal sinus treatment in children: results of a multicentric series. Pediatr Surg Int. 2018;34(6):687–92.
56. Khafagy A, Al Haddad E, AlSabah S. The endoscopic treatment of pilonidal sinus disease: a short-term case-series study. Ann Saudi Med. 2019;39(3):192–6.
57. Kalaiselvan R, Liyanage A, Rajaganeshan R. Short-term outcomes of endoscopic pilonidal sinus treatment. Ann R Coll Surg Engl. 2020;102(2):94–7.
58. Azhough R, Azari Y, Taher S, Jalali P. Endoscopic pilonidal sinus treatment: a minimally invasive surgical technique. Asian J Endosc Surg. 2021;14(3):458–63.
59. Gallo G, Carpino A, De Paola G, Fulginiti S, Novelli E, Ferrari F, et al. Endoscopic pilonidal sinus treatment: a tertiary care academic center experience. Front Surg. 2021;8:723050.
60. Foti N, Passannanti D, Libia A, Campanile FC. A minimally invasive approach to pilonidal disease with endoscopic pilonidal sinus treatment (EPSiT): a single-center case series with long-term results. Tech Coloproctol. 2021;25(9):1045–54.
61. Gulcu B, Ozturk E. Endoscopic pilonidal sinus treatment: rapid recovery, satisfactory success, and high quality of life. Surg Laparosc Endosc Percutan Tech. 2021;31(6):711–5.
62. Hinksman M, Naidu S, Loon K, Grundy J. Long-term efficacy of endoscopic pilonidal sinus treatment: a single-centre Australian experience. ANZ J Surg. 2022;92(5):1142–8.

63. Jain Y, Javed MA, Singh S, Rout S, Joshi H, Rajaganeshan R. Endoscopic pilonidal abscess treatment: a novel approach for the treatment of pilonidal abscess. Ann R Coll Surg Engl. 2017;99(2):134–6.
64. Pérez-Bertólez S, Martin-Sole O, Moraleda I, Cuesta M, Massaguer C, Palazon P, et al. Advantages of endoscopic pilonidal sinus treatment. Cir Pediatr. 2021;34(4):191–9.

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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