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Young Versus Experienced Surgeons in Endoscopic Treatment of Pilonidal Sinus Disease

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Abstract: Background: This study evaluates Endoscopic Sinusectomy procedures performed by young and experienced surgeons to compare outcomes achieved by young surgeons to those obtained by experienced surgeons. Methods: From a prospectively maintained database, patients with chronic non recurrent pilonidal disease who underwent Endoscopic Sinusectomy since 1 September 2011 to 31 December 2021, were enrolled. After the propensity score analysis, 200 patients were involved and divided in the group of procedures performed by young surgeons and the group performed by experienced surgeons. Results: About recurrence rate at 1-year follow up (7% vs. 10%, p=0.45) and 5-years follow-up (12.5% vs. 17.5%, p=0.53) and about time off from work (3.54±1.65 vs. 3.61±1.61, p=0.78) no significant results were found. About operative time (30.44±5.57 vs. 43.43±3.83, p=0.004), infection rate (4% vs. 14%, p = 0.013), time to healing of wound (27.89±11.06 vs. 42.22±13.63, p=0.002) and incomplete healing of wound rate (3% vs. 11%, p=0.027) statistically significant differences were found. The multivariate analysis demonstrated that being young surgeons influences the abovementioned significant results and that the mean distance between lateral orifice and midline impacts on the recurrence rate at 1- and 5-years follow-up for both experienced surgeons' (p=0.001 and p=0.009) and young surgeons' procedures (p=0.001 and p=0.003). Conclusions: The recurrence rate doesn't increase during the training but an adequate training path to perform endoscopic technique is need. A call to perform high-quality randomized controlled studies for establishing how many surgeries are required to be proficient and to outline the ideal endoscopic technique training path.

Keywords: endoscopic; pilonidal; recurrence; sinus; sinusectomy; training

Introduction

Pilonidal Sinus disease (PSD) is a chronic condition involving the sacrococcygeal area. Its frequency is higher in young males. Its incidence is approximately 26 per 100,000 population. [1,2] In 1833 it was described for the first time by Mayo, [3] however, a gold standard procedure for its treatment is yet to be found. [4–6] New guidelines have been put forward by the Italian Society of Colorectal Surgery (SICCR), [7] highlighting that minimally invasive surgery (MIS) should be performed only for limited and not complex PSD. The pilonidal sinus is defined as limited when it presents single pit or multiple pits on the midline [7] while it is defined as complex when it presents more than one orifice, pits off the midline, the distance of the lowest pit from anale verge of about 2 cm or recurrence [8]. Meinero [9] and Milone et al. [10,11] were the first researchers to desribe the endoscopic technique to treat PSD showing a lower time off from work, a reduced postsurgical pain and a greater patients' contentment [2,12–14] arousing the interest of several surgeons [15,16]. Thus the endoscopic technique has quickly gained wide popularity and it has been carried out by both experienced and young surgeons.

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The current study evaluates Endoscopic Sinusectomy procedures performed by young and experienced surgeons since 1 September 2011 to 31 December 2021 involving patients with chronic non recurrent pilonidal disease**.**

The study's aim is to compare Endoscopic Sinusectomy [17] outcomes achieved by young surgeons to those obtained by experienced surgeons.

Materials and Methods

Patients and Protocol

This is a retrospective study which involved patients with chronic non recurrent pilonidal disease who underwent Endoscopic Sinusectomy since 1 September 2011 to 31 December 2021, the patients were enrolled by means of a prospectively maintained database. **The inclusion criteria was the presence of chronic non recurrent pilonidal disease identified by a clinical evaluation and amenable for surgery; chronic pilonidal disease manifests itself clinically with the presence in the sacrococcygeal area of one or more pits without reddening or edema of the epidermis, abscesses and oozing of pus. Moreover chronic pilonidal disease was defined as non-recurrent when it was never treated surgically.** The exclusion criteria were acute pilonidal disease with the presence of inflammation in the sacrococcygeal tissues requiring antibiotic therapy, the patient's refusal to undergo surgery, the patient's refusal to sigh the informed consent and the lack of a follow-up of at least one year. All involved patients signed the informed consent form. The study protocol conforms to the ethical guidelines of the 1975 Declaration of Helsinki.

Two groups were organized: the group of procedure performed by young surgeons in training for this procedure and the group of procedures performed by experienced surgeons. The first citated group involved the first two years resident surgeons in general surgery, not yet specialized and in training for the procedure in question, the second citated group involved specialist surgeons in general surgery who performed Endoscopic Sinusectomy in their surgical practice for at last one year.

Data of 450 patients were included in our analysis. After performing the propensity score analysis (Figure 1), 200 patients with chronic non recurrent pilonidal sinus disease were involved in the study and particularly 100 out of these patients were involved in the group of procedure performed by young surgeons in training for this procedure and 100 patients were involved in the group of procedures performed by experienced surgeons.

The enrolled patients were subject to a clinical examination at follow-ups performed after one week, one month, six months, one year and subsequently annually. A competent and indipendent observer, unawere of the type of surgeon, analyzed the data which were sex, age, obesity, smoking addiction , characteristics of sinus (the presence of more orifices, localization of pits, the distancing between the lowest orifice and anal verge and the distance between the lateral orifice and midline), postoperative complications (occurrence of incomplete wound healing, occurrence of infection and emergence of recurrence at 1- and at 5-years follow-ups), time to healing of wound and time off from work.

Surgical Technique

Endoscopic Sinusectomy procedure were performed in all cases according to a standardized technique. [10] The mepivacaine is used for local anesthesia, [18,19] the patients are positioned in pronation, their pelvis are lightly inflected and their glutes are retracted. The hysteroscope is introduced in the pilonidal cavity through the lowest orifice and the saline solution is used to irrigate the aforementioned cavity. The direct vision allows to remore hairs by using the grasping forceps. In the end, the ablation sinus cavity is realized with a bipolar electrode and its complete debridement is obtained by using the Volkmann spoon. [11,20]

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Outcomes

Recurrence rate after a follow-up of 1-year was the primary outcome. Operative time, infection rate, time to healing of wound, incomplete healing of wound rate and time off work were the secondary outcomes. Moreover patients and sinuses characteristics were analyzed. Patients characteristics involved gender, age, BMI and smoking addiction. Sinuses characteristics involved number of orifices, localization of pits, their distancing from both anal verge and midline.

The recurrence was diagnosed when there is re-operation need, a formation of another sinus, hair and oozing of pus from orifice.

Time off from work was defined as the time of absence from work due to the postsurgical pain.

Time to wound healing represented the period in which there is a complete wound epithelization. Incomplete wound healing occurred when wound epithelization is not complete at postsurgical day 60. Infection of wound involved the presence of erythematous skin, edematous skin and discharge.

Statistical Analysis

The SPSS 27 system (SPSS Inc., Chicago, IL, USA) was utilized to perform statistical analysis. Mean±standard deviation expressed continuous data, percentages were utilized for categorical variables. Continuous variables were confronted by utilizing the t-test. The chi-square test was utilized to analyze categorical data. All results were presented as two-tailed values with statistical significance set at p values < 0.05.

A propensity score matching analysis (PSM) was performed, it was achieved with a logistic regression model based on sex, age, BMI, and smoking habits. Matching of the propensity score was obtained with the "1:1 nearest neighbor" matching method. Multivariate analyses were also carried out by utilizing a logistic regression model with primary and secondary outcomes like dependent variables and with the mean distancing between the most lateral orifice and the midline and the type of surgeons (experienced or young surgeons) like independent variables.

Results

Patients Enrollment

Data of 450 patients were included in our analysis. After performing the propensity score analysis (Figure 1), 200 patients with chronic non recurrent pilonidal sinus disease were involved in the study and particularly 100 out of these patients were involved in the group of procedure performed by young surgeons in training for this procedure and 100 patients were involved in the group of procedures performed by experienced surgeons. **All patients underwent 1 year follow-up.**

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Figure 1: Enrollment of patients before and after propensity score matching

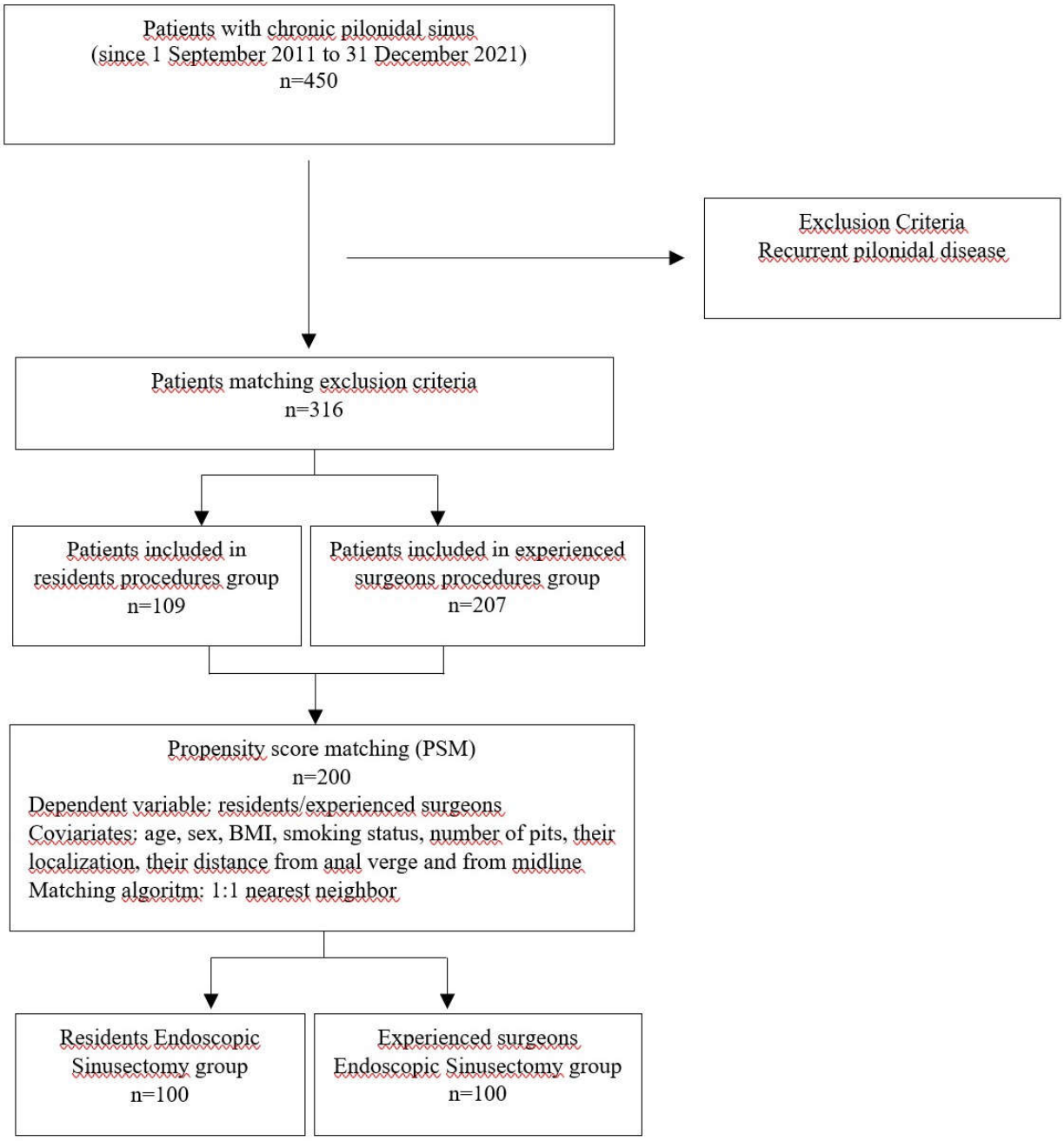

Figure 1. Enrollment of patients before and after propensity score matching.

Patients Demographic Characteristics

About sex, age, BMI, and smoking habits no significant differences were discovered between the two groups (Table 1).

Table 1. Demographic characteristics of the included patients.

Characterists	Experienced surgeons group (n=100)	Residents group (n=100)	*P* value
M/F (%)	58/42 (58%/42%)	56/44 (56%/44%)	0.775
Age (years)*	28.13±5.45	28.06±5.46	0.9
BMI (kg/m²)*	26.59±5.05	26.53±4.89	0.541
Smokers (%)	49 (49%)	52 (52%)	0.671

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*Mean ± SD was used to express Age and BMI.

The group of procedures performed by experienced surgeons involved 58 men and 42 women while the group of procedures performed by young surgeons involved 56 men and 44 women (p=0.775) (Table 1), the mean age of the patients operated by experienced surgeons was of 28.13±5.45 while the mean age of the patients operated by young surgeons was of 28.06±5.46 (p=0.9) (Table 1), the mean BMI of the patients operated by experienced surgeons was of 26.59±5.05 while the mean BMI of the patients operated by young surgeons was of 26.53±4.89 (p=0.541) (Table 1), in the group of procedures performed by experienced surgeons 49 patients were smokers while in the group of procedures performed by young surgeons 52 patients were smokers (p=0.671) (Table 1).

Pilonidal sinus Characteristics

About number of orifices, localization of pits, the distancing between orifices and anal verge and the distance between orifices and midline no significant differences were discovered between the two groups (Table 2).

Table 2. Pilonidal sinus characteristics.

Characterists	Experienced surgeons group (n=100)	Residents group (n=100)	*P* value
Mean n° of pits*	1.77±0.93	2.36±1.0	0.177
Pits off the midline	66	61	0.463
Mean distance from anal verge*	2.65±1.27	2.69±1.15	0.334
Mean distance from midline*	0.81±0.77	0.72±0.71	0.712

*Mean ± SD was used to express n° of pits, the distance between pits and anal verge and the distance between pits and midline.

In the group of procedures performed by experienced surgeons 66 out of 100 patients showed pits off the midline while in the group of procedures performed by young surgeons 61 out of 100 patients showed pits off the midline (p=0.463) (Table 2), the mean number of pits was 1.77±0.93 in the group of procedures performed by experienced surgeons while it was 2.36±1 in the group of procedures performed by young surgeons (p=0.177) (Table 2), in the group of procedures performed by experienced surgeons there was a mean distance from anal verge of 2.65±1.27 while in the group of procedures performed by young surgeons it was of 2.69±1.15 (p=0.334) (Table 2) and in the group of procedures performed by experienced surgeons there was a mean distance from midline of 0.81±0.77 while in the group of procedures performed by young surgeons it was of 0.72±0.71 (p=0.712) (Table 2).

Primary and Secondary Outcomes

Table 3 summarized both primary and secondary outcomes.

Table 3. Primary and secondary outcomes achieved by experienced and resident surgeons.

Characterists	Experienced surgeons group	Residents group	*P*
Recurrence at 1-year (%)	**7 (7%)**	**10 (10%)**	**0.45**
Recurrence at 5-years (%)	**5 (12.5%)**	**7 (17.5%)**	**0.53**
Operative time*	30.44±5.57	43.43±3.83	0.004
Infection (%)	4 (4%)	14 (14%)	0.013
Time to wound healing*	27.89±11.06	42.22±13.63	0.002
Incomplete wound healing (%)	3 (3%)	11 (11%)	0.027

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Time off work*	3.53±1.65	3.61±1.61	0.78

*Mean ± SD was used to express operative time, time to healing of wound and time off from work.

About recurrence rate after a follow-up of 1-year (7% vs. 10%, p=0.45) and after a follow-up of 5-years (12.5% vs. 17.5%, p=0.53) no significant differences were discovered between the two groups (Table 3). **However only 80 patients (40 in each group) carried out the 5-years follow-up.** Moreover about time off work no significant differences were discovered between the two groups (3.54±1.65 vs. 3.61±1.61, p=0.78) (Table 3).

About operative time (30.44±5.57 vs. 43.43±3.83, p=0.004), infection rate (4% vs. 14%, p = 0.013), time to wound healing (27.89±11.06 vs. 42.22±13.63, p=0.002) and incomplete healing of wound rate (3% vs. 11%, p=0.027) significant differences were found between the two considered groups (Table 3).

Multivariate Analysis

The multivariate analysis was carried out for assesing whether the type of surgeons (experienced or young surgeons) affects operative time, infection rate, time to wound healing and incomplete wound healing rate. The analysis demonstrated that being young surgeons was the feature which impacts on operative time (p=0.001) (Table 4), infection rate (p=0.02) (Table 4), time to wound healing (0.001) (Table 4) and incomplete wound healing rate (p=0.03) (Table 4).

In addition the multivariate analysis was also performed to evaluate whether the mean distancing between the most lateral orifice and the midline affects the recurrence rate after a follow-up of both 1- and 5-years. The evaluation attested that the mean distancing between the most lateral orifice and the midline was the factor which impacts on the recurrence rate after a follow-up of both 1- and 5-years for both experienced surgeons procedures (p=0.001 and p=0.009) and young surgeons procedures (p=0.001 and p=0.003) (Table 5).

Table 4. Multivariate analysis (type of surgeon and operative time, infection rate, time to wound healing and incomplete wound healing rate).

Characterists		B	S.E.	*Wald*	*gf*	*Exp(B)*	*P*
Operative time	Resident	4.715	1.025	21.170	1	111.638	< 0.001
	Constant	-4.595	1.005	20.904	1	0.010	< 0.001
Infection	Resident	1.363	0.586	5.407	1	3.907	0.02
	Constant	-3.178	0.510	38.784	1	0.042	< 0.001
Time to wound healing	Resident	2.307	0.331	48.470	1	10.043	< 0.001
	Constant	-1.208	0.238	25.857	1	0.299	< 0.001
Incomplete wound healing	Resident	1.385	0.668	4.305	1	3.996	0.03
	Constant	-3.476	0.586	35.162	1	0.031	< 0.001

Table 5. Multivariate analysis (the mean distance between the most lateral orifice and the midline and the recurrence rate both at 1- and 5-years).

Characterists		B	S.E.	*Wald*	*gf*	*Exp(B)*	*P*
Recurrence at 1-year in experienced surgeon group	DFML*	3.819	1.201	10.114	1	45.559	0.001
	Constant	-7.884	2.080	14.363	1	0.000	< 0.001
Recurrence at 1-year in resident group	DFML	2.873	0.781	13.551	1	17.696	< 0.001
	Constant	-5.469	1.111	24.209	1	0.004	< 0.001
Recurrence at 5-year in experienced surgeon group	DFML	2.945	1.134	6.742	1	19.002	0.009
	Constant	-4.724	1.664	8.060	1	0.009	0.005
Recurrence at 5-year in resident group	DFML	3.040	1.022	8.856	1	20.912	0.003
	Constant	-4.112	1.271	10.465	1	0.016	0.001

*DFML: distance from midline of the most lateral orifice.

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Discussion

The ideal treatment of PSD is yet to be determined [4–6,21] despite minimally invasive techniques' popularity. In 2014, for the first time, Meinero [9] and Milone et al. [10,11] portraied the endoscopic technique to treat PSD showing a lower time off from work, a reduced postsurgical pain and a greater patients' contentment [2,12–14] arousing the interest of several surgeons [15-16 ~~14–15~~]. The aim of the endoscopic procedure was to remove the inflamed subcutaneous tissue without damagin the overlying skin. In details, due to endoscopic view the endoscopic technique allows you to identify the pilonidal sinus cavity with its lateral tracks and hair, its resection, meticulous debridement and irrigation. The outcomes of endoscopic technique have been evaluated by non-comparative or retrospective studies. [2,12–14,22–32] Endoscopic approach to PSD has been compared to traditional surgical treatments by two comparative studies [33–34] and one RCT [2]. It has been proven that endoscopic treatment could be performed in not complex PSD achieving comparable postsurgical complications but better postsurgical recovery. [33] New guidelines have been put forward by the Italian Society of Colorectal Surgery (SICCR), [7] highlighting that minimally invasive surgery (MIS) should be performed only for limited and not complex PSD. In addition two comparative studies [26,35] showed that the endoscopic technique has also been performed for the treatment of acute clinical cases [26,35,36] achieving reduced postsurgical pain, shorter healing of wound and time off from work. Esposito et al. [37] obtained better outcomes than open surgery by performing endoscopic procedure in pediatric population. Thus scientific evidences has proved that endoscopic approach presents better postoperative outcomes with higher patient satisfaction. [38–44]

Less is known about young surgeons learning curve for Endoscopic Sinusectomy and about safety and efficacy of procedures carried out by the latter.[45] In this study we compare Endoscopic Sinusectomy outcomes achieved by young surgeons to those obtained by experienced surgeons. About time off work, recurrence rate after a follow-up of 1-year and after a follow-up of 5-years no significant differences were showed between the two groups. However statistically significant differences were found about operative time, infection rate, duration of wound healing and incomplete wound healing rate. In detail, the group of procedures performed by young surgeons presented a longer operative time, a greater infection rate, a longer duration of wound healing and a greater incomplete wound healing rate. The multivariate analysis attested that being young surgeons was the feature which impacts on operative time, infection rate, time to wound healing and incomplete wound healing rate .

It's interesting to underline that the mean distancing between the most lateral orifice and the midline was the factor which impacts on the recurrence rate after a follow-up of both 1- and 5-years for both experienced surgeons procedures and young surgeons procedures as demonstrated by Milone et al. [8,46] in the past who explained how the recurrence could be predicted through the 2 cm cut-off.

Main limitation of the study resides in its retrospective design. However, the study highlights the need to evaluate what is the proper number of procedures to obtain the required level of proficiency and to outline the ideal training path to learn the endoscopic technique. Moreover, high quality randomized controlled studies are needed to analyze the young surgeons learning curve, the surgical results obtained by them and to better evaluate long-term recurrence.

Conclusion

In conclusion the results presented in this paper show that the recurrence rate doesn't increase in the group of procedures performed by young surgeons. This means that the Endoscopic Sinusectomy can be performed by young surgeons effectively during the training. On the other hand the longer operative time and duration of wound healing and the greater infection rate and incomplete wound healing rate in the group of procedures performed by young surgeons demonstrate that there is need for an adequate training path to perform endoscopic technique as already happened for other techniques used for the treatment of pilonidal sinus disease [47].

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Institutional Review Board Statement: The study was conducted according to the guidelines of the 1975 Declaration of Helsinki.

Informed Consent Statement: Informed consent was obtained from all subjects enrolled in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Confict of interest: The authors declare that they have no confict of interest.

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