

## Outpatient surgical procedures: which is the ideal teaching procedure for a resident surgeon?

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**SUMMARY:** Outpatient surgical procedures; which is the ideal teaching procedure for a resident surgeon?

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*Aim.* The aim of our study is to evaluate which surgical procedures can be considered the ideal teaching procedure for a resident surgeon.

*Materials and methods.* This is a retrospective study. A chart review was performed on all patients who underwent inguinal hernia repair, saphenectomy, excision of pilonidal sinus and hemorrhoidectomy at our institution, between September 2000 and July 2011, and have at least 1 year of follow-up. We evaluated operative time and complications comparing the results obtained by resident or attending surgeon.

*Results.* We obtained a higher operative time among the procedures performed by resident surgeons for all evaluated interventions. Whereas the occurrence of complications after hernia repair and excision and primary closure of pilonidal sinus were similar in case and control subjects ( $p = 0,1$  and  $p = 0,1$ ), the occurrence of complications after hemorrhoidectomy and saphenectomy was significantly higher in the case group ( $p = 0,08$  and  $p = 0,1$ ).

*Conclusion.* Hernia repair and excision and primary closure of pilonidal sinus have to be considered the ideal teaching procedure in a residency program, giving to the young surgeon the opportunity of reach several skills that he needs to master most difficult surgical procedures. Saphenectomy and hemorrhoidectomy should be considered safe only if performed by a senior resident surgeon.

**KEY WORDS:** Teaching - Inguinal hernia repair - Saphenectomy - Excision of pilonidal sinus - Hemorrhoidectomy.

### Introduction

The goal of a surgical residency program is to prepare the trainee to function as qualified practitioner of surgery at the advanced level of performance of a board-certified surgeon (1). Adequate exposure and practice in the operating room is critical to the development of technical skills and surgical judgment, which a resident requires to ultimately practice competently and independently (2).

The outpatient surgical procedures have to be taken into consideration as the ideal training for young surgeon in a residency program (3). More in detail, these procedures give to the young surgeon the opportunity to develop several skills obtaining similar results than those performed by expert surgeons (4).

Most common surgical procedures in our department that the resident surgeon can perform are inguinal hernia repair, saphenectomy, excision of pilonidal sinus and hemorrhoidectomy.

The aim of our study is to evaluate which of these surgical procedures can be considered the ideal teaching procedure for a young surgeon.

### Materials and methods

#### Study design

This is a retrospective study. A chart review was performed on all patients who underwent inguinal hernia repair, saphenectomy, excision of pilonidal sinus and hemorrhoidectomy at our institution, between September 2000 and July 2011, and have at least 1 year of follow-up.

We have excluded from the study all recurrent procedures and the procedures performed with different techniques than those described below.

The patients were splitted into two groups according to the experience of surgeon: resident surgeon (case group) and attending surgeon (control group).

Medical records were reviewed to determine demographic and clinical characteristics of the included patients in both groups. We evaluated operative time and complications comparing the results obtained by resident or attending surgeon.

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## Techniques

### Lichtenstein hernia repair

The mesh is fashioned to fit the posterior wall of the inguinal canal. A slit of 2 cm long is made in the mesh, and the spermatic cord placed between the 2 tails of the mesh. The cord is then tagged in the cephalic direction, and the medial end of the mesh is made to overlap the pubic bone by approximately 2 cm. The mesh is then sutured to the fibro-periosteum of the pubic bone using interrupted polypropylene 3/0 suture. The interrupted sutures are continued laterally, suturing the inferior edge of the mesh to the shelving edge of the inguinal ligament, to a point 2 cm lateral to the deep inguinal ring. The superior edge of the mesh is then secured likewise to the internal oblique aponeurosis or muscle approximately 2 cm from the aponeurotic edge, while the lower edges of the 2 tails are sutured to the shelving edge of the inguinal ligament to create a new deep ring. Finally, the cord is allowed to fall back on the strengthened posterior wall of the canal, the aponeurosis of the external oblique repaired with continued polyglactin 910 2/0 suture and the superficial ring reconstructed to fit snugly around the cord (5, 6).

### Saphenectomy

Saphenous vein stripping is a simple, fast, safe, and standardized procedure for the treatment of varicose veins (7, 8). It involves the interruption of the femoral-saphenous junction, stripping of the great saphenous vein, multiple removal of the tributary vein of the saphena and ligation of the extrafascial perforating veins (9).

### Excision and primary closure of pilonidal sinus

The sinuses were injected with a few milliliters of methylene blue in order to stain all of the sinuses and their branches. A limited excision including all the marked tissues was performed. An elliptical excision was marked around the sinuses with its long axis midline oriented. The skin incision was deepened down to the presacral fascia with diathermy, but the fascia was not included in the excision. Hemostasis was carefully achieved with electrocauterization. Sutures are meticulously applied to close the bottom of the operative cavity and to ensure the absence of a dead space between the bottom of the cavity and the subcutaneous layer. A series of strong resorbable deep sutures (Polyglactin 910) were passed at intervals of 1 in. and at about halfway between the skin and the presacral fascia. Each deep suture was passed through the midline of the presacral fascia (10, 11).

### Hemorrhoidectomy

The surgical technique used was hemorrhoidectomy according to Ferguson with excision of three hemorrhoidal nodules. Exposure was achieved by means of a midsized Hill-Ferguson retractor. Hemorrhoids were excised to the anorectal junction with diathermy, with adequate preservation of the intervening skin and anoderm bridges. The base of the pedicle was transfixed with 2/0 polyglactin. The edges of the hemorrhoidectomy wound in the anoderm and skin were apposed with continuous polyglactin (12).

### Statistical analysis

Statistical analysis was performed with S.P.S.S 16.0. The Yates corrected chi-square test was used as a means of evaluating differences in categorical variables, and the independent t-test was used for continuous variables. Statistical significance was accepted when the *p* value was less than 0.05.

## Results

A total of 3217 subjects were identified. Of these, 2312 subjects were included for analysis; 235 subjects were ex-

cluded due to presence of a recurrent disease and 470 subjects were because they underwent a different technique.

### Hernia repair

1036 patients underwent Lichtenstein Inguinal hernia repair including 525 procedures performed by resident surgeon and 511 procedures performed by attending surgeon.

### Pilonidal Sinus

469 patients underwent excision and primary closure of pilonidal sinus including 315 procedures performed by resident surgeon and 154 procedures performed by attending surgeon.

### Hemorrhoidectomy

357 patients underwent Ferguson hemorrhoidectomy including 161 procedures performed by resident surgeon and 196 procedures performed by attending surgeon.

### Saphenectomy

450 patients underwent saphenectomy including 196 procedures performed by resident surgeon and 254 procedures performed by attending surgeon.

There were no significant demographic and clinical differences between case and control subjects (Table 1).

We obtained a higher operative time among the procedures performed by resident surgeons for all evaluated interventions (Table 2).

Whereas the occurrence of complications after hernia repair and excision and primary closure of pilonidal sinus were similar in case and control subjects ( $p = 0,1$  and  $p = 0,1$ ), the occurrence of complications after hemorrhoidectomy and saphenectomy was significantly higher in the case group ( $p = 0,08$  and  $p = 0,01$ ) (Table 2).

In a separate analysis including only the procedures performed by attending surgeon and senior resident surgeon who have already performed at least 50 outpatients surgical procedures ( $n=493$ ) similar results of operative time and complications' occurrence were identified in all evaluated procedures (Table 3).

## Discussion and conclusion

There are a number of studies that compare outcomes of procedures done at teaching hospitals by residents and those procedures performed by attending surgeons (13-15). Most findings indicate that residents can perform some index general surgery procedures safely.

An important caveat to operative independence of residents lies in the judgment of their teaching attending (16). Factors involved in an attending's decision to allow a re-

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TABLE 1 - PATIENTS' CHARACTERISTICS.

	Age	Male patients	BMI
<b>Hernia repair</b>			
Resident	57,9 ± 11,2	525	24 ± 2
Attending	57,3 ± 9	511	23,8 ± 1,9
<b>Saphenectomy</b>			
Resident	48,7 ± 7,8	33	24,7 ± 2,5
Attending	51 ± 6,8	28	26 ± 2,7
<b>Sinus excision</b>			
Resident	26,5 ± 7,1	159	25,8 ± 2,9
Attending	26 ± 7,6	67	25,6 ± 3,2
<b>Hemorrhoidectomy</b>			
Resident	47,9 ± 6,5	85	23,8 ± 3,5
Attending	50,3 ± 5,8	101	25 ± 2,9

TABLE 2 - RESULTS AMONG RESIDENT AND ATTENDING SURGEONS.

	Complications, pts	P value	Operative time (min)	P value
<b>Hernia repair</b>				
Resident	32 (6,1%)	0,1	61,9 ± 32,8	<0,001
Attending	20 (3,9%)		40,1 ± 5,5	
<b>Saphenectomy</b>				
Resident	28 (14,3%)	0,02	37,1 ± 5,6	<0,001
Attending	19 (7,5%)		33,1 ± 5,5	
<b>Sinus excision</b>				
Resident	36 (11,4%)	0,1	28,8 ± 6	<0,001
Attending	10 (6,5%)		22,1 ± 3,2	
<b>Hemorrhoidectomy</b>				
Resident	22 (13,7%)	0,08	31,8 ± 5,3	<0,001
Attending	15 (7,6%)		26 ± 4,1	

TABLE 3 - RESULTS AMONG SENIOR RESIDENT AND ATTENDING SURGEONS.

	Complications, pts	P value	Operative time (min)	P value
<b>Hernia repair</b>				
Senior Resident	11 (4,2%)	0,8	40,9 ± 6	0,07
Attending	20 (3,9%)		40,1 ± 5,5	
<b>Saphenectomy</b>				
Senior Resident	9 (9,4%)	0,65	34 ± 5	0,1
Attending	19 (7,5%)		33,1 ± 5,5	
<b>Sinus excision</b>				
Senior Resident	4 (6,8%)	1	21,6 ± 3,3	0,4
Attending	10 (6,5%)		22,1 ± 3,2	
<b>Hemorrhoidectomy</b>				
Senior Resident	6 (7,7%)	1	27 ± 4,3	0,07
Attending	15 (7,6%)		26 ± 4,1	

sident to perform, like first operator, any surgical intervention include, among others, the skill and ability of the resident, the complexity of the patient and his/her disease, the resources of the hospital, and the urgency of the case (2, 17).

The Italian residency program states that a resident must perform in his teaching development at least 80 procedures including either the more easy outpatient surgical procedure or most difficult procedures such as colectomy or gastrectomy.

In order to master most difficult surgical procedure, a resident need to reach several skills and the outpatient procedures could be useful to obtain this target (18, 19).

However the outcomes should not get worse in a good residency program. The results, obtained by resident or attending surgeon, should be similar in order to ensure safety and efficacy of each surgical intervention. Thus a resident should reach several skills step-by-step.

In this setting, our findings demonstrate that inguinal hernia repair and pilonidal sinus excision comparing to others surgical procedures evaluated in our study, can be the ideal teaching operation for a resident surgeon.

More in details, the study demonstrates that the occurrence of complications after inguinal hernia repair and excision and primary closure of pilonidal sinus were similar either if performed by a resident or by an attending surgeon. At variance, the results obtained after safenectomy and hemorrhoidectomy were worse if performed by a resident surgeon.

However in a separate analysis we have demonstrated that the results obtained by senior resident or attending surgeon were similar among all surgical interventions.

Whereas outpatient surgical procedures have to be taken into consideration as the ideal training for young surgeon in a residency program, saphenectomy and hemorrhoidectomy should be considered safe only if performed by a senior resident surgeon.

Thus hernia repair and excision and primary closure of pilonidal sinus have to be considered the ideal teaching procedure in a residency program, giving to the young surgeon the opportunity of reach several skills that he need to master most difficult surgical procedures.

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