

Stress Urinary Incontinence After Holmium Laser Enucleation of Prostate: Incidence and Risk Factors

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Abstract

Objectives:

To evaluate the incidence and the risk factors of stress urinary incontinence (SUI) during the first year after HoLEP.

Patients and Methods:

This study presents a monocentric and retrospective study including 155 patients who underwent HoLEP for benign prostatic hyperplasia. The surgeries were performed by 2 expert surgeons. The continence was evaluated at 1, 3, 6 and 12 months. The predictive factors of SUI were analysed by logistic regression.

Results:

The SUI rate at 1, 3 and 6 months was 11.3%, 10.7% and 4.1% respectively. SUI remained present in 4 patients (2.6%) at 12 months. The mean ICIQ-SF scores in patients with SUI were 10.3 ± 6.09 and 8 ± 4.24 at 1 and 12 months respectively ($p < 0.05$). BMI > 30 (OR, 4.69; 95% CI, 1.51–14.52; $p = 0.007$) and patients over 70 years old (OR, 16.23; 95% CI, 1.96–134.09; $p = 0.010$) were identified as independent risk factors for SUI at 1 and 3 months respectively.

Conclusion:

SUI after HoLEP is transitory in most cases. It is favoured by a high BMI and an age over 70. These criteria should be considered before choosing the operative technique and preventive measures must be taken in high-risk patients.

Introduction

Transurethral resection of the prostate (TURP) and open prostatectomy (OP) still remains the 'gold standard' surgical treatment for symptomatic benign prostatic hyperplasia (BPH) resistant to medical treatment [1,2].

Currently, Holmium laser enucleation of the prostate (HoLEP) has become an important alternative treatment modality to TURP and OP [3]. This endoscopic approach enables a complete excision of the adenoma whatever its volume. Comparatively to TURP and OP, HoLEP improves patient recovery by reducing blood loss, urinary catheterisation duration and hospitalization length. Moreover, functional results are equivalent to conventional techniques [3,4].

Post-operative stress urinary incontinence (SUI) has been reported after HoLEP, with a negative influence on the patient's quality of life (QoL) [5,6]. This complication can concern up to 16% of patients 3 months after surgery, but is most often transient [7].

From a technical point of view, the difference between TURP/OP and HoLEP is the direction of adenoma dissection. In a HoLEP procedure, dissection is carried out retrogradely through the urethral sphincter (trans-sphincter endoscopic enucleation). This method could induce sphincter lesion if the apical adenoma is

improperly dissected [8]. Surgeons during their learning phase are especially prone to this mistake [5]. However, SUI has also been reported after HoLEP performed by experienced surgeons [9,10].

Several studies have identified peri operative urinary incontinence risk factors based on patient-reported data [10,11], but only a few have used validated urinary incontinence questionnaires in order to distinguish the different types of incontinence and their incidence [12,13].

The aim of this study was to evaluate the incidence of de novo stress urinary incontinence after HoLEP and to identify predicting risk factors.

Materials And Methods

A retrospective monocentric study was performed using observational data from all patients undergoing HoLEP for symptomatic BPH with no satisfactory response to medication therapy between May 2018 and December 2019. The procedure was carried out in patients with moderate to severe lower urinary tract symptoms and/or severe urinary retention and/ or other complications related to BPH. Patients with bladder or prostate cancer (except those on active surveillance), urethral stenosis, self catheterism, chronic renal failure or cognitive disorders, were excluded from the study. HoLEP procedures were conducted by 2 experts surgeons with an experience of more than 200 HoLEPs each one.

Surgical technique

Enucleation was performed according to the three-lobe technique described by Gilling [14] with early apical dissection using the white line technique to differentiate between apical adenoma and urethral sphincter. For enucleation, a reusable 1000 μ laser fiber was inserted through a 24.5 Fr endoscope and the holmium generator was set to 100 W (2 J, 50 Hz). The Morscope Wolf Piranha™ was used for morcellation of the adenoma.

Enucleation of the lobes was performed using the retrograde approach. The first step was to prepare the bladder neck by making a T incision at 5 and 7 o'clock to avoid ureteral meatus injury during midlobe enucleation. The second step involved detaching each lateral lobe at the apex of the adenoma, starting with a superficial incision of the mucosa at low power (20 W) (white line technique). The posterior incision opposite the veru (hockey stick-shaped) joined a second anterior incision to form an inverted Y. Once released at the apex, the lateral lobe was gradually pushed back into the plane of the capsule by the ballistic action of the laser beam at 100 W. In order to limit potential effects of leverage on the sphincter, no mechanical push was applied to the endoscope. (video: Duarte RC, Daily T, Fassi-Fehri H. HoLEP dangers: How to avoid them. Eur Urol Suppl. 1 mars 2018;17(2):e1981.)

Additional measures

Pelvic floor muscle training (PFMT) was systematically prescribed if SUI was reported by patients at the first follow-up.

Assessment of voiding status and continence

Patients' pre-operative evaluation included IPSS, QoL-IPSS and ICIQ-SF questionnaires as well as a clinical and rectal examination, a flow measurement including post-void residual volume (PVR), an assessment of prostatic volume by trans-rectal ultrasound and a PSA test.

The post-operative evaluation was systematically carried out at 1, 3, 6 and 12 months. At each point of follow up, a flow measurement with PVR as well as IPSS, QoL-IPSS and ICIQ-SF questionnaires were collected. The number of daily urinary pads was also noted at each visit. The PSA test was performed at 3 and 12 months.

General data

Demographic data, perioperative data were collected in a standardized and retrospective manner from the computerized medical record of each patient.

Statistical analysis

Statistical analyses were performed with SPSS Statistics (IBM SPSS Statistics Version 20). To compare pre and post-operative continence status, a nonparametric t test was used. The predictive factors for the occurrence of post-operative SUI were analysed by logistic regression. A P value of <0.05 was considered as statistically significant.

Ethics

This study was approved by the ethics committee of the Hospices Civils de Lyon and registered with the CNIL (Commission Nationale de l'Informatique et des Libertés) under number 18-127.

Results

One hundred and seventy-five HoLEPs were carried out consecutively in our institution, of which 155 were assessed. (Figure 1) The demographic and perioperative data are set out in Table 1. Complete functional results at 1, 3, 6 and 12 months are reported in Table 1. The nature and severity of urinary leakage is detailed in Table 2. The rates of SUI de novo at 1, 3 and 6 months post-surgery were 11.3%, 10.7% and 4.1% respectively. Despite beginning bladder and sphincter rehabilitation in the first postoperative month in all patients with urinary leakage, SUI persisted in 4 patients (2.6%) at 12 months. However, only 2 patients (1.3%) wore one pad per day at 12 months. The mean ICIQ-SF scores for patients with SUI were 11.69 ± 5.28 , 8.70 ± 4.24 , 1.81 ± 3.53 and 8 ± 4.24 at 1, 3, 6 and 12 months, respectively (Table 2). In univariate and multivariate analysis, Body Mass Index (BMI) > 30 (OR, 4.69; 95% CI, 1.51–14.52; p = 0.007) was an independent risk factor for the occurrence of post-operative SUI at 1 month, whereas age > 70 years (OR, 16.23; 95% CI, 1.96–134.09; p = 0.010) was an independent risk factor for occurrence at 3 months (Table 3). At the time of the study, none of the patients presenting SUI required an implantable device.

Discussion

Transient stress urinary incontinence is a complication commonly reported after HoLEP. Its occurrence varies in the literature from 3.3 to 26% at 3 months (Table 4). Fortunately, most cases recover within the first year [7]. However, its assessment in several studies is based only on patient reported data (Table 4), and one possible

explanation for the variation of reported SUI rates is the lack of a standard evaluation. Without the use of a validated questionnaire, incidence and prevalence of postoperative urinary incontinence could be underestimated, and precise determination of the type of incontinence is difficult [15]. The ICIQ-SF is a validated questionnaire in male urinary incontinence that distinguishes different types of urinary incontinence and estimates their severity [16]. The present study showed 11.4% and 10.5% de novo SUI at 1 month and 3 months respectively. The use of the same questionnaire at each follow up point confirmed the transient nature of SUI. Indeed, only 4 patients (2.6%) reported a persistent mild urinary leakage at one year despite PFMT.

Two main independent demographic risk factors for the occurrence of SUI during the first 3 postoperative months were identified: age greater than 70 years ($p < 0.02$) and a BMI greater than 30 ($p < 0.007$). These results confirm those of Nam et al [7] who reported, in a retrospective series of 391 patients, a significantly higher rate of transient SUI in patients over 65 years old. In another retrospective and multicentric series of 2346 patients, increasing age and elevated BMI were also significantly associated with urinary incontinence [17]. Other demographic risk factors such as a history of diabetes mellitus and a pre-operative prostate volume greater than 81g have also been reported [17] but were not found in our study. Intrinsic sphincter insufficiency in elderly, overweight and diabetic patients could favour the occurrence of transient SUI after endoscopic enucleation [18].

In this study, we did not identify any intraoperative factor that could induce transient SUI. However, during HoLEP, some factors could cause an occlusion defect of the urethra-sphincter complex which leads to transient SUI: widening of the bladder neck, tearing of muscle fibres due to excessive use of mechanical thrust, heat damage to muscle fibres due to excessive use of laser energy at the apex of the adenoma, incomplete occlusion due to circumferential tearing of the proximal sphincter's mucosa (seal effect). Elmansy et al showed that a decrease in PSA level greater than 84%, reflecting the amount of removed prostate tissue, was associated with a higher risk of stress urinary incontinence [19]. Similarly, enucleation weight have been considered as an independent intraoperative predictive factor of urinary incontinence at 3 and 6 months [17]. In the same way, technical difficulty like poor visibility of the operating field due to excessive bleeding was linked to a higher risk of inappropriate endoscopic manipulations and thus urethral sphincter injury [7,19,20]. Several authors have also suggested that reducing the energy delivered during enucleation, in particular when near the urethral sphincter, could minimize the risk of thermal damage without increasing operating time [12]. Unfortunately, no consensus for the optimal setting has yet been reached.

Several HoLEP techniques have been reported since the first procedure described by Gilling [14]: 2-lobes technique [21], En-Bloc technique [22], white line technique [23,24], anteroposterior dissection HoLEP [25], Top-Down HoLEP [26]. In a non-randomized retrospective monocentric study, Endo and al [25] reported a decrease of incontinence rate (2.7% vs 25.2%) in favour of anteroposterior dissection HoLEP versus Gilling's method. However, these results have not yet been confirmed. As described earlier, our technique is a mix of the white line and the 3-lobe techniques. Our modifications based on early apex dissection avoid stretching the urethral sphincter by first separating the adenoma from the sphincter area. Lateral lobe enucleation was carried out through the adenoma apex until reaching the capsule. Small apical adenomatous remnants were left in place as sphincter protective flaps. With this method, only 2 patients (1.3%) reported a persistent mild stress urinary

incontinence requiring one pad per day at one year. However, in the absence of comparative studies, it is impossible to identify one technique that would preserve continence more safely.

In our study, HoLEP was carried out by 2 operators which had conducted at least 200 HoLEP procedures. It is well known that the learning curve affects the incidence of SUI after HoLEP [7,11]. Fifty procedures at least are necessary to master the technique [26]. In this phase, the unassisted beginner surgeon is exposed to an increased risk of SUI by sphincter injury due to an inappropriate apex dissection [9,11,13] as well as an excessive operating time [27]. For these reasons, increased initial case density [11] and structured mentorship programs (video viewing, simulator training and active proctoring) are needed to improve the safety of HoLEP procedures [28]. Moreover, avoiding potentially complicated cases (prostate volumes greater than 80g, anticoagulated patients, patients with prostate cancer, prior prostatic radiotherapy) during the learning phase has been recommended [26].

The current study has several limitations, as a non-controlled study with a retrospective design and a small number of patients. In addition, there were no objective measurements, such as a pad test or a voiding diary. Finally, urodynamic tests other than uroflowmetry were not routinely performed. However, the use of the same surgical technique by two experienced operators in the same hospital and the systematic evaluation of postoperative urinary incontinence by a standardized and validated questionnaire, made it possible to reduce biases due to patients interview, learning curve and different practices.

Conclusion

In this study, we reported a low SUI rate one year after HoLEP. Transient SUI was more frequent in elderly and overweight patients. These results should be taken into consideration when informing patients about postoperative complications. We suggest that careful patient selection and appropriate preventive and therapeutic care (weight loss, PFMT) could be helpful in decreasing transitory SUI rate. Additional prospective and comparative studies on larger cohorts are needed to support these results.

Declarations

All methods were carried out in accordance with relevant guidelines and regulations

Ethics approval and consent to participate:

All Subjects have given their written informed consent

This study was approved by the ethics committee of the Hospices Civils de Lyon and registered with the CNIL (Commission Nationale de l'Informatique et des Libertés) under number 18-127.

Consent for publication :

NA

Availability of data and materials:

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Competing interests:

The authors have no competing interests to declare.

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The authors received no specific funding for this work.

Author Contributions:

Fassi-Fehri Hakim and Codas Ricardo designed the study and supervised the project. YE Haixia collected and analysed the data. Fassi-Fehri Hakim and Codas Ricardo performed the operations. Badet Lionel, Daily Theresa and Colombel Marc aided in interpreting the results and worked on the manuscript. YE Haixia, Fassi-Fehri Hakim and Codas Ricardo wrote the paper. All authors discussed the results and commented on the manuscript.

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Tables

Table 1: Patient's characteristics and urinary function

	Mean ± Standard deviation or N
Preoperative data	
Age (year)	69,53±7,58
BMI (kg/m ²)	26,25±4,13
Diabetes	34
Prostate cancer under active surveillance	11
Prostate volume (mL)	88,81±43,55
PSA(ng/mL)	6,84±5,98
ASA score (American Society of Anaesthesiology) (mean)	2,04±0,71
ASA Score	
1	36
2	77
3	42
Antiplatelet Agent	31
Direct Oral Anticoagulant	11
Antivitamin K	5
Urinary catheterisation	58
Operative data	
General anaesthesia	67
Spinal anaesthesia	88
Length of surgery (min)	105,68±48,93
Volume of irrigation fluid (L)	34,55±16,17
Energy delivered (kJ)	201±99,59
Enucleated weight (g)	51,87±32,11
Efficiency coefficient (weight enucleated/operating time) (g/min)	0.49±0,20
Postoperative data	
Duration of irrigation (day)	1,08±2,22
Duration of urinary catheterisation (day)	1,63±2,62
Length of stay (day)	1,86±2,43
Hemoglobin loss (g/dL)	1,29±1,24

Table 2: Urinary function follow-up and incidence of SUI

	Baseline	1 month	3 months	6 months	12 months
	Mean ± Standard deviation or N(%)				
Patients	155	150	149	146	150
IPSS	20.16±5.93	7.49±4.73*	5.70±5.25*	3.84±4.31*	3.30±3.75*
QOL	4.59±1.34	1.75±1.69*	1.28±1.48*	0.82±0.97*	0.69±0.84*
Mean ICIQ-SF score (global)	4.11±4.56	3.69±5.20	2.58±4.62	1.81±3.53	1.02±2.58
Mean ICIQ-SF (SUI)	0	11.69±5.28*	8.70±4.24*	7.45±2.84*	8±4.24*
Qmax(mL/s)	8.56±3.85	18.90±9.29*	22.90±11.06*	22.81±9.89*	23.43±11.66*
PVR (mL)	165.07±147.23	62.26±83.97*	60.31±60.63*	58.57±72.04*	47.33±65.57*
PSA (ng/mL)	6.84±5.98		1.65±1.62*		1.95±2.05*
SUI	0	11(7.3%)	12(8.1%)	5(3.4%)	4(2.7%)
Other UI	37(23.9%)	50(33.3%)	30(20.1%)	21(14.4%)	14(9.3%)
Patients with daily pads for SUI	0	8(5.3%)	4(2.7%)	2(1.4%)	2(1.3%)

* p<0.05 compared to baseline

Table 3 : Univariate and multivariate logistic regression analysis for predicting postoperative stress urinary incontinence

characteristics	1 month				3 months			
	Univariate analysis		Multivariate analysis		Univariate analysis		Multivariate analysis	
	Odds ratio (95% CI) p value							
age (<70 vs ≥70), years	2,25(0,79-6,42)	0,13	1,68(0,51-5,48)	0,39	14,37(1,81-114,3)	0,012	16,23(1,96-134,09)	0,01
BMI (<30 vs ≥30)	5,19(1,79-15,07)	0,002	4,69(1,51-14,52)	0,007	2,49(0,76-8,16)	0,13	2,98(0,83-10,72)	0,09
diabetes	1,21(0,36-4,00)	0,757			1,70(0,55-5,31)	0,358		
ASA (<3 vs ≥3)	3,15(0,76-13,1)	0,11			1,38(0,39-4,85)	0,61		
Anti-aggregation or anticoagulant treatment	1,75(0,62-4,93)	0,29			1,39(0,47-4,10)	0,545		
Prostate volume (<90 vs ≥90), g	0,86(0,31-2,39)	0,77			0,6(0,17-2,08)	0,42		
Urinary catheterism	1,19(0,43-3,33)	0,73			0,82(0,24-2,87)	0,76		
Enucleation time (≥60 vs <60), min	2,78(0,86-8,98)	0,09			0,97(0,2-4,7)	0,97		
Operating time (≥90 vs <90), min	0,67(0,24-1,85)	0,44			0,78(0,24-2,52)	0,67		
Energy delivered (<200 vs ≥200), kJ	1,31(0,48-3,6)	0,6			1,02(0,31-3,38)	0,97		
Enucleated weight (<50 vs ≥50), g	1,38(0,5-3,79)	0,53			1,2(0,37-3,9)	0,76		
Efficiency coefficient (<0.5 vs ≥0.50), g/min	1,38(0.50-3.80)	0,529			1,20(0,37-3,91)	0,759		
characteristics	6 months				12 months			
	Univariate analysis		Multivariate analysis		Univariate analysis		Multivariate analysis	
	Odds ratio (95% CI) p value							

age (<70 vs ≥70), years	5,96(0,68-52,22)	0,11	6,27(0,67-59,03)	0,11	4,7(0,51-43,01)	0,17	5,04(0,47-53,84)	0,18
BMI (<30 vs ≥30)	2,39(0,46-12,28)	0,3	2,45(0,42-14,23)	0,32	3,16(0,32-30,75)	0,322	1,17(0,09-15,64)	0,906
diabetes	0,70(0,08-6,24)	0,752			0,88(0,10-8,18)	0,913		
ASA (<3 vs ≥3)	1,36(0,24-7,73)	0,73			1,83(0,3-11,38)	0,52		
Anti-aggregation or anticoagulant treatment	0,45(0,05-3,98)	0,474			0,54(0,06-4,95)	0,584		
Prostate volume (<90 vs ≥90), g	1,26(0,25-6,44)	0,78			0,83(0,13-5,09)	0,84		
Urinary catheterism	0,32(0,04-2,83)	0,31			0,43(0,05-3,98)	0,461		
Enucleation time (≥60 vs <60), min	0,97(0,11-8,65)	0,98			1,22(0,13-11,39)	0,86		
Operating time (≥90 vs <90), min	0,78(0,15-4,01)	0,77			0,52(0,08-3,18)	0,48		
Energy delivered (<200 vs ≥200), kJ	0,7(0,13-3,97)	0,69			0,95(0,15-5,86)	0,96		
Enucleated weight (<50 vs ≥50), g	6,29(0,72-55,14)	0,1			1,81(0,29-11,14)	0,52		
Efficiency coefficient (<0.5 vs ≥0.50), g/min	6,31(0,72-55,33)	0,096			4,97(0,54-45,54)	0,156		

Table 4: Stress urinary stress incontinence rates after HoLEP reported in the literature

Authors Years	Patients	Surgical technique and setting	Centres Operators	Continen- ce questionnaires	SUI before 1 year	SUI at 1 year
Placer, 2009 (13)	125	3 lobes 2J-50 Hz	Monocentric 1 surgeon	Yes, ICIQ-SF	6 (4,8%) At 6 months	6 (4,8%)
Shuichiro Kobayashi, 2016 (20)	127	3 lobes 100 W	Monocentric 2 surgeons	No	17 (13,3%) At 3 months	2(1,5%) (mixed UI)
Jong Kil Nam, 2015 (7)	391	3 lobes 2 j , 40 Hz	Monocentric 1 surgeon	No	13 (3,3%) At 3 months	1 (0,3%)
Jeongyun Jeong, 2015 (29)	110	3 lobes 80 – 100 W	Monocentric 1 surgeon	Yes, ICIQ-SF	-	-
Elzayat, 2005 (3)	552	3 lobes 80-100 W	Monocentric 1 surgeon	No	24 (4,2%) Between 1 and 6 months	3 (0,5%)
Shah, 2007 (9)	280	2 – 3 lobes 2J 50 Hz	Monocentric 1 surgeon	No	-	2 (0,7%)
Vavassori, 2008 (30)	330	3 lobes 60 – 80 – 100 W	Monocentric 1 surgeon	No	24 (7,3%) At 3 months	2 (0,6%)
Elmansy, 2011 (19)	949	-	Monocentric 1 surgeon	No	47 (4,9%) At 3 months	8(1,04%)
Krambeck, 2013 (21)	1065	3 lobes	Moncentric Several surgeons	No	60 (12,5%) At 3 months	5(1,8%)
Lerner, 2010 (11)	77	3 lobes	Monocentric 1 surgeon	No	17 (26%) At 3 months	2(3%)
Cho, 2011(5)	204	3 lobes 2,6J, 30 Hz	Bicentric Several surgeons	No	9 (5%) At 3 months	2(1,1%)
Minagawa, 2017 (12)	74	En-Bloc 1.5J, 20 Hz	Monocentric 3 surgeons	Yes ICIQ-SF	3 (5,5%) At 3 months	-

Elmansy, 2019 (25)	60	Top-down	Monocentric 1 surgeon	No	2 (3,3)	-
Our Study	155	3 lobes + white line 2 J, 50 Hz	Monocentric 2 surgeons	Yes ICIQ-SF	12 (10,7%) At 3 months	4 (2,6%)

Figures

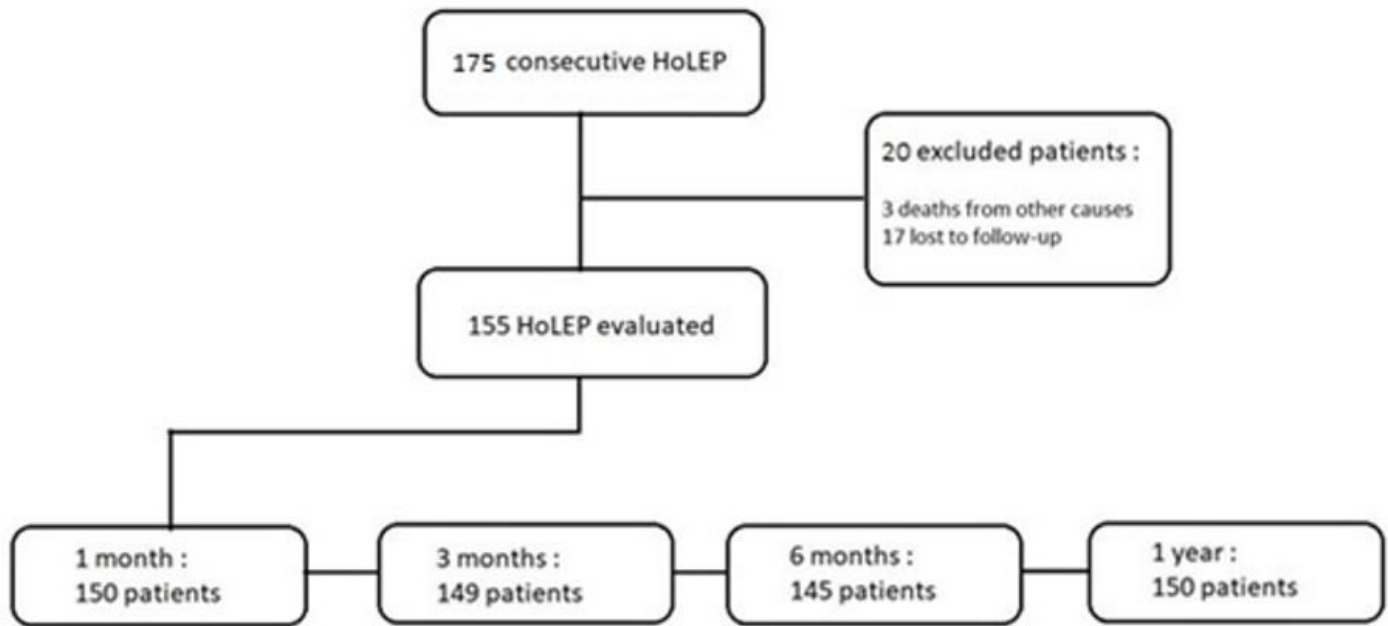


Figure 1

Flow chart