Outcomes and Efficacy of Ejaculatory Preserving Transurethral Resection of Prostate

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Introduction:

The prostatic gland plays a central role in andrology. It is involved both in fertility and in sexuality with a major role in ejaculation and possibly in orgasm. This could explain the association between the andrological symptoms and prostatic disorders [1].

The prevalence of Benign Prostatic Hyperplasia (BPH) is approximately 50% for men in their fifties and reaches up to 80% for men over 80 years of age, representing one of the most common diseases affecting males, with potentially significant impact on their quality of life [2].

It is estimated that around half of men suffering severe or medical treatment unresponsive lower urinary tract symptoms (LUTS) will be offered a surgical procedure to relieve benign prostatic obstruction (BPO) [3].

Despite continuing development of new minimally invasive surgical methods, transurethral resection of the prostate (TURP) still remains the gold standard surgical treatment for LUTS due to BPH [4, 5]

Although it is benign, this disease has been shown to have a negative impact on the patient's health-related quality of life (HRQL), marked by obstructive and irritative LUTS [6, 7].

As BPH in most cases is not a life-threatening condition, the main outcomes of its treatment are not only the improvement in LUTS and functional parameters but also quality of life after surgery [8].

Whilst efficacy of the conventional TURP is proven, a common potentially bothersome side effect, the retrograde ejaculation (RE) which occurs in 65–90% of patients undergoing TURP [9].

It has been reported that ablative techniques like TURP and recent laser procedures including holmium, thulium and greenlight cause similar rates of ejaculatory dysfunction, occurring in almost three out of four to five men [10].

For decades, men have been counseled to expect dry orgasm after TURP because of the retrograde flow of semen as a result of bladder neck disruption [11].

Erectile dysfunction and Ejaculatory dysfunction (EjD) can have a substantial deleterious effect on the Quality of life (QoL) of men who have previously maintained regular sexual activity, inducing significantly increased levels of anxiety and depression [12].

More recently, a better understanding of ejaculation physiology has enabled the emergence of modified surgical techniques with the aim of preserving antegrade ejaculation [13–16].

The key point of standard TURP is resecting the tissues enveloped in the prostatic capsule and the bladder neck, while protecting the urethral tissues below the verumontanum [17].

The bladder neck plays a significant role in reproduction. For men, bladder neck closure facilitates anterograde ejaculation. It actively contracts the bladder neck during ejaculation through a rich noradrenergic innervation by sympathetic nerves [18].

Vernet et al. showed that contraction of the bladder neck was not important for anterograde ejaculation [19]. Using endorectal ultrasound videos performed during masturbation in 30 men, it was possible to visualize the bladder neck, the prostate, and the bulbar urethra during ejaculation. They observed that during ejaculation, the verumontanum underwent a slight

caudal shift, momentarily making contact with the opposite urethral wall and sperm emitted from the ejaculatory ducts was directed distally by contractions of the external sphincter coordinated with contractions of the bulbar urethra, thus demonstrating the importance of the muscular tissue around the verumontanum and particularly its proximal part. They described this area as a "high-pressure ejaculatory area". The closure of the bladder neck did not seem to play a role in this mechanism. As a result, one can conclude that as long as the tissues around the verumontanum are not injured, ejaculation should still occur even with a well-open bladder neck [20].

Recently, together with a better understanding of the mechanisms of ejaculation, a greater importance has been given to the impact of dry ejaculation on patients' QoL [21]. A balance between symptomatic improvement in LUTS and preservation of sexual function needs to be addressed for men seeking surgical treatment [22].

Modifications based on Supramontanal sparing hypothesis have reported favorable outcomes to as high as 92% [23].

Although preservation of bladder neck structures is often associated with preservation of antegrade ejaculation, the current modern approach is the preservation of the precollicular and para-collicular tissue in the area where the ejaculatory ducts emerge near the verumontanum in the distal apical tissue in laser, aquablation, and bipolar electrosurgical prostatectomy techniques [24].

Aim of the work:

The purpose of this study is to assess the outcomes and efficacy of ejaculatory preserving TURP in terms of voiding, erectile function, and ejaculation.

Patients and method:

-Place of the study:

Sohag university hospital, Urology department.

-Type of the study:

A prospective comparative study.

-Study Population:

The study will be carried out between July 2023 and January 2025. All patients who are eligible for inclusion will be picked up from Sohag University Hospital's urology outpatient clinic and will undergo TURP. They will be assigned to two groups.

-Patients:

-Inclusion criteria:

Adult patient > 45 years old.

Men with drug refractory urinary retention.

Prostate volume range: 20–60 mL.

The International Prostate Symptom Score (IPSS) > 19 after the medical therapy failure.

Maximum urinary flow rate (Qmax) < 10 mL/s.

Serum prostate-specific antigen (PSA) < 4 ng/mL with biopsy proven BPH if serum PSA >4 ng/mL or abnormal digital rectal examination findings.

Active and healthy sexual life with an ability to ejaculate (reported sexual activity over the last 3 months).

-Exclusion criteria:

History of prostate, bladder or urethral surgery.

Neurogenic bladder.

Untreated active urinary tract infection (UTI).

Urethral stricture disease.

Biopsy confirmed prostate cancer.

Bleeding diathesis.

Capsular or bladder perforation during surgery.

-Ethical consideration:

All patients will be fully informed about the operations, and written informed consents will be obtained.

Approval from ethical committee of Sohag faculty of medicine will be obtained.

-Methods of the study:

Pre-operative Evaluation:

- History, which includes IPSS, the International Index of Erectile Function 5 items Questionnaire (IIEF-5Q), and the Male Sexual Health Questionnaire-Ejaculatory Dysfunction Short Form (MSHQ-EjD).

- Physical examination, which includes a digital rectal examination.

- A pre-operative lab study, which includes urine analysis, hemoglobin, creatinine, and PSA levels.

-Trans abdominal ultrasonography to determine prostate volume and post void residual (PVR) urine volume.

- Uro-flow-metry (Qmax).

Surgical Technique:

Cystoscopy will be conducted under spinal anaesthesia with a 30° telescope and the patient in dorsal lithotomy posture. Eligible patients will be randomly assigned to one of two groups with double blind evaluation. Group 1 will have ejaculatory preserving TURP, whereas Group 2 will

have traditional TURP. Randomization will be done by computer programming such as SAS. The Operators will be the supervisors of the principle investigator.

All procedures will be carried out with bipolar-flow 26 Fr bipolar resectoscopes (Karl-Storz, Germany) configured for resection in 0.9% saline solution and cut/coagulation set at 130/70 W.

In Group 1, resection of lateral lobes to the capsule and the ventral side to the level of the verumontanum with avoidance of paracollicular digging. Circular resection of the internal bladder neck will be done. Then the next step will be apical resection utilizing the colliculus seminalis as a distal resection border and maintaining a 1 cm safety area for preservation of ejaculation.

In Group 2, the whole adenoma tissue, including the tissue in front of the verumontanum and bladder neck, will be removed to the prostatic capsule.

After full hemostasis, a 20 Fr three-way catheter will be placed into the bladder, traction will be performed, and the bladder will be irrigated with 0.9% saline postoperatively until clear effluent is seen.

The patient will be discharged from the hospital on the next postoperative day. Sexual activity will be prohibited for 6 weeks following the intervention.

Intra-operative Evaluation:

The following intraoperative factors will be evaluated: operative time (calculated from the insertion of the resectoscope to the final removal of all resected prostatic tissues), blood transfusion requirement, and intraoperative complications such as bleeding, capsular perforation, and transurethral resection (TUR) syndrome.

Post-operative Evaluation:

Clot retention, hemoglobin reduction, and electrolyte imbalance will be detected and treated postoperatively.

Follow up:

All patients will be followed-up regularly at 3 and 6 months postoperatively with the IPSS, Qmax, PVR, IIEF-5Q, MSHQ-EjD Short Form, and rates of complications (including urethral stricture, incontinence, bladder neck contracture, Recatheterisation, UTI, and retrograde ejaculation).

List of abbreviations:

BPH	Benign Prostatic Hyperplasia
LUTS	Lower urinary tract symptoms
BPO	Benign prostatic obstruction
TURP	Transurethral resection of the prostate
HRQL	health-related quality of life
RE	retrograde ejaculation (RE)
EjD	Ejaculatory dysfunction
QoL	Quality of life
IPSS	International Prostate Symptom Score
Qmax	Maximum urinary flow rate
PSA	prostate-specific antigen
UTI	urinary tract infection
IIEF-5Q	International Index of Erectile Function 5 items Questionnaire
MSHQ-EjD	Male Sexual Health Questionnaire-Ejaculatory Dysfunction
PVR	postvoid residual
TUR	Transurethral resection

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Statistical analysis:

Statistical analysis was done by SPSS v26 (IBM Inc., Chicago, IL, USA). Shapiro-Wilks test and histograms were used to evaluate the normality of the distribution of data. Quantitative parametric variables were presented as mean and standard deviation (SD) and compared between the two groups utilizing unpaired Student's T- test. Quantitative non-parametric data were presented as median and interquartile range (IQR) and were analyzed by Mann-Whitney test. Qualitative variables were presented as frequency and percentage and were analyzed utilizing the Chi-square test or Fisher's exact test when appropriate. A two tailed P value < 0.05 was considered statistically significant

Results

In this study, 103 patients were assessed for eligibility; 8 patients did not meet the criteria and 5 patients refused to participate in the study. The remaining patients were randomly allocated into two equal groups (45 patients in each). All allocated patients were followed-up and analyzed statistically (**Figure 42**).

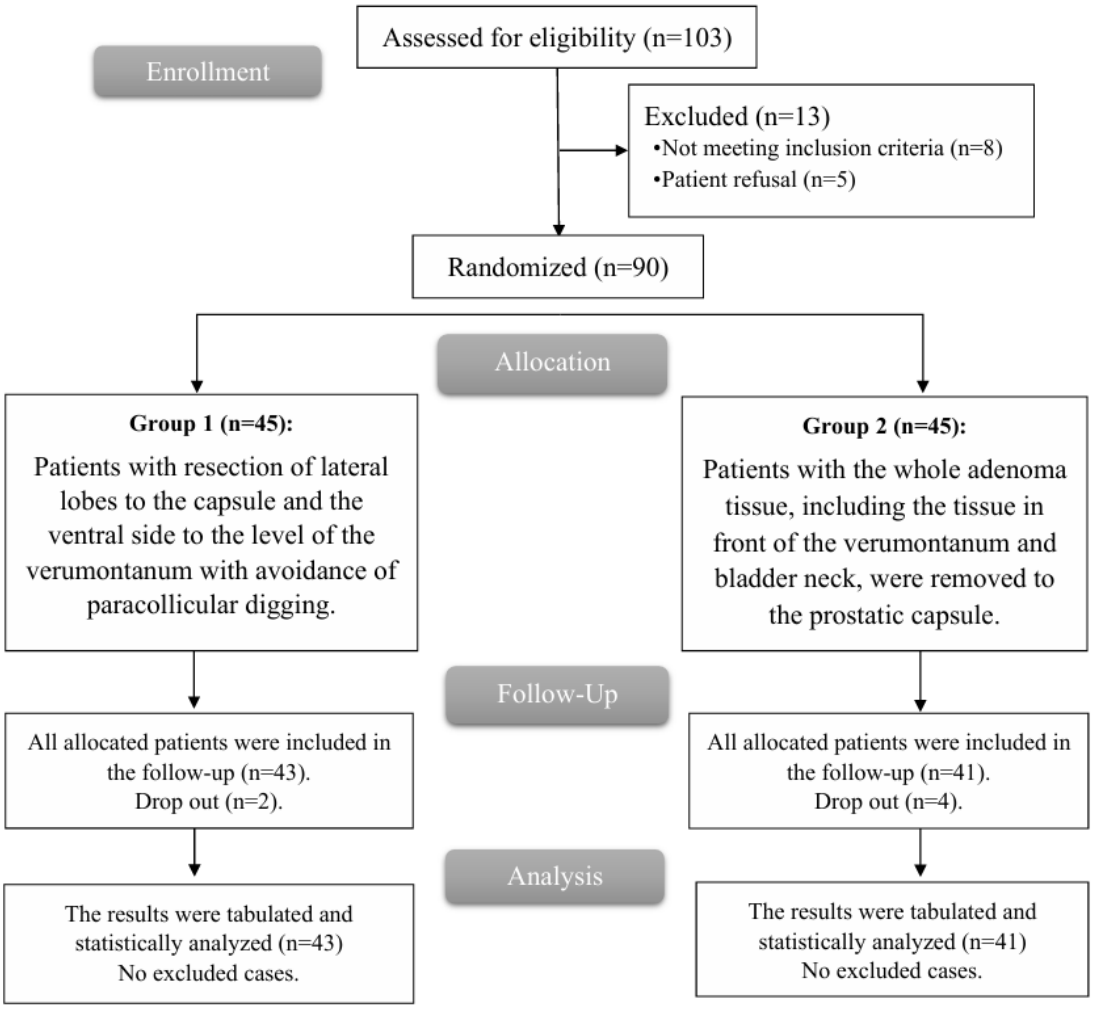

Figure 1: CONSORT flow chart of the enrolled patients.

Table 1: Demographic data and comorbidities of the studied groups

		Group 1 (n=45)	Group 2 (n=45)	P value	Mean difference or RR (95% CI)
Age (years)	Mean ± SD	62.76 ± 8.16	65.58 ± 7.98	0.101	-2.82(-6.2: 0.56)
	Range	46 - 85	50 – 83		
Diabetes mellitus		9 (20%)	7 (15.56%)	0.581	1.29(0.52:3.15)
Hypertension		10 (22.22%)	10 (22.22%)	1	1(0.46:2.17)
Ischemic heart disease		2 (4.44%)	0 (0%)	0.153	---

CI: Confidence interval, RR: Relative risk

Age, diabetes mellitus, hypertension and ischemic heart disease were insignificantly different between two groups.

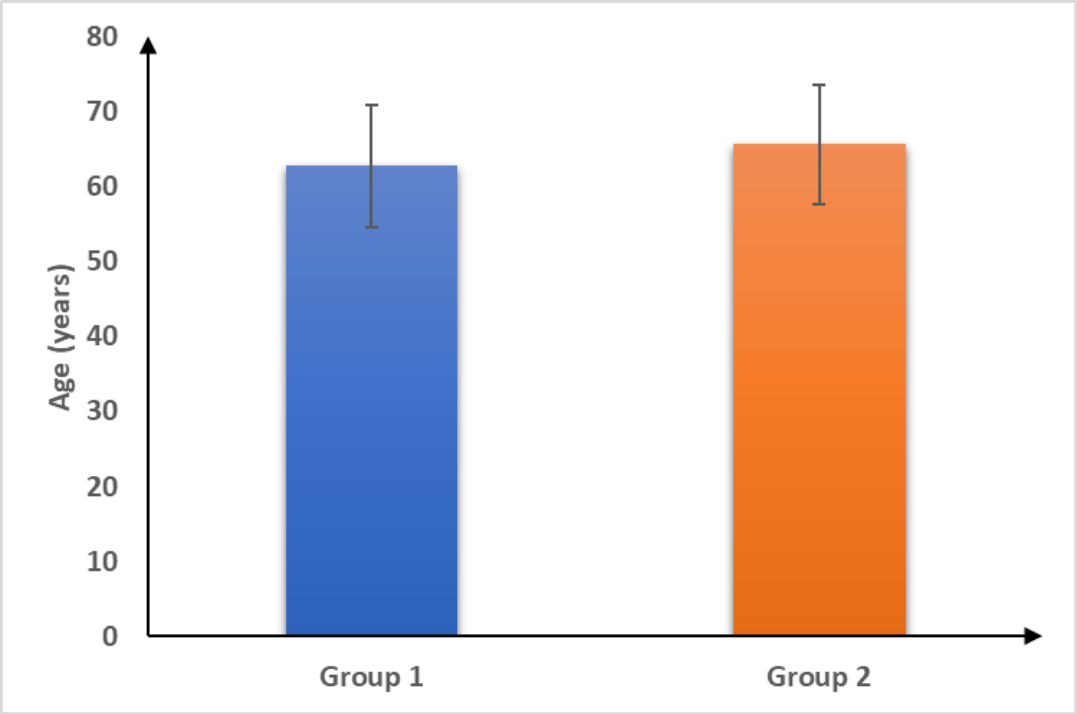

Figure 2: Age of the studied groups.

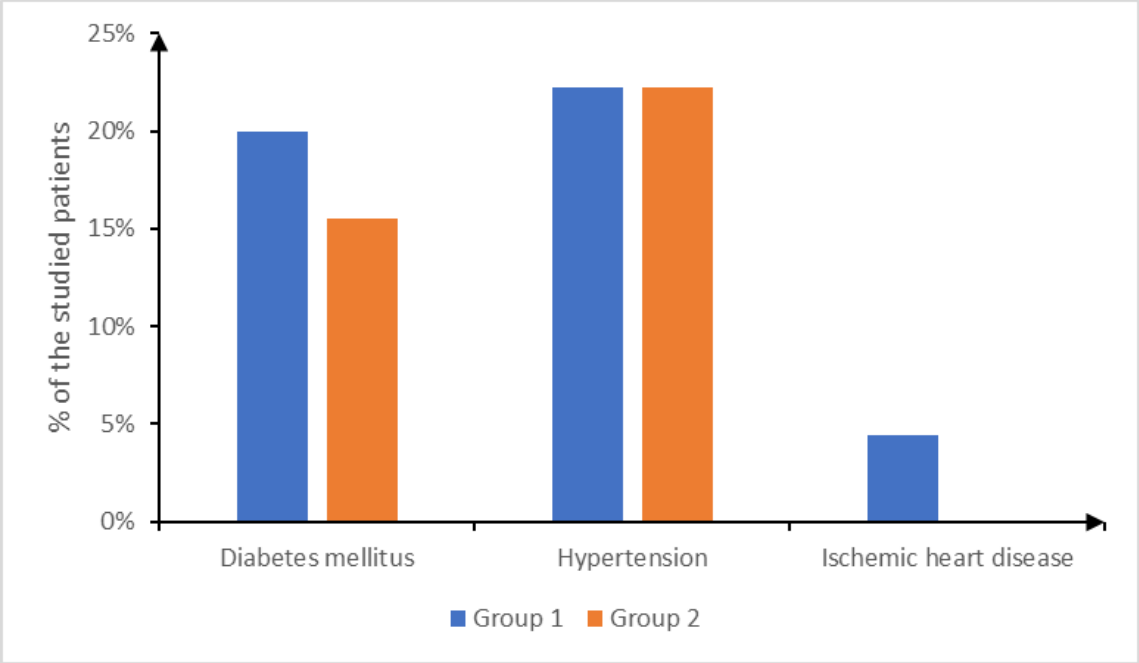

Figure 3: Comorbidities of the studied groups.

Table 2: IPSS score of the studied groups

	Group 1 (n=43)	Group 2 (n=41)	P value	Mean difference (95% CI)
Preoperative (0-35)	26.58±3.65	28.42±3.2	**0.013***	-1.84(-3.28: -0.406)
3 months postoperative	7.14±2.99	6.68±2.43	0.446	0.456(-0.729: 1.642)
6 months postoperative	5.12±2.62	4.07±3.38	0.117	1.043(-0.265:2.352)

*Significantly different as P value ≤0.05, CI: Confidence interval, IPSS: International prostate symptom Score

IPSS score was significantly lower at preoperative (0-35) in group 1 than group 2 as (P value = 0.013) and was insignificantly different at (3 and 6 months) postoperative between both groups.

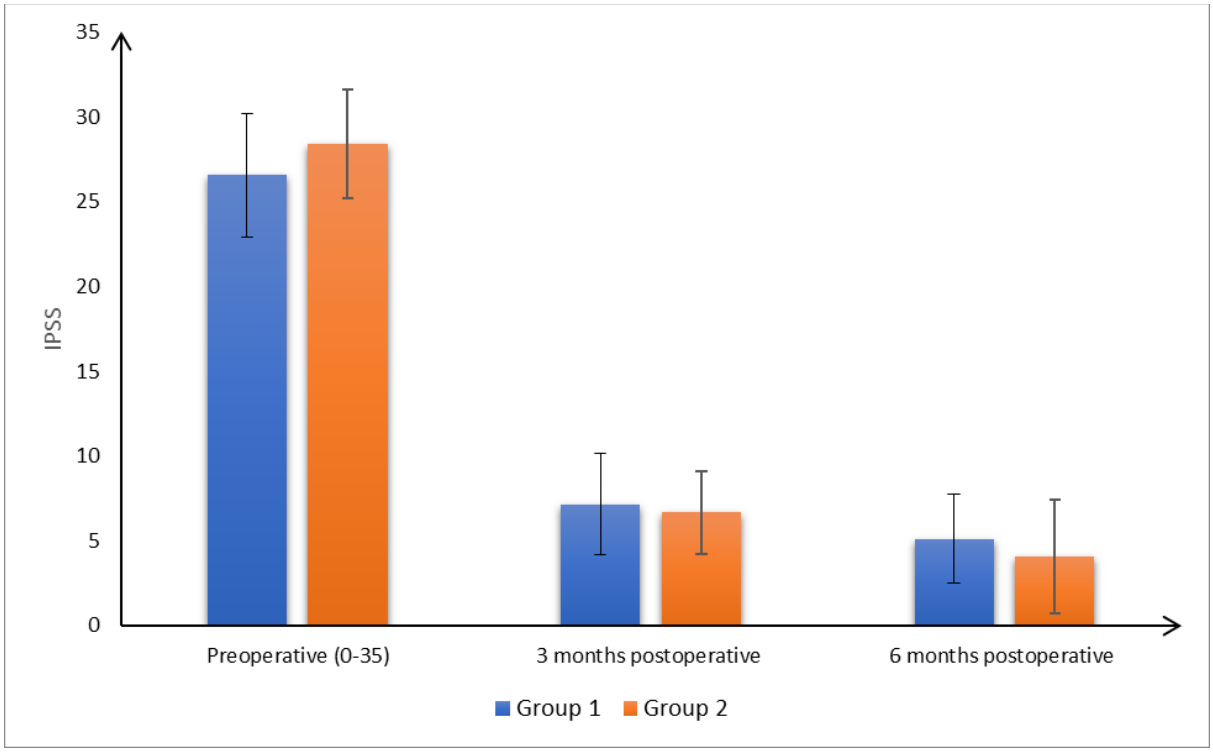

Figure 4: IPSS score of the studied groups.

Table 3: IIEF-5Q score of the studied groups

	Group 1 (n=43)	Group 2 (n=41)	P value	Mean difference (95% CI)
Preoperative (5-25)	19.76±2.64	20.04±2.45	0.592	-0.289(-1.354: 0.776)
3 months postoperative	20.14±2.58	18.41±2.49	**0.003***	1.725(0.624:2.826)
6 months postoperative	20.05±3.11	17.78±2.96	**<0.001***	2.266(0.947: 3.585)

*Significantly different as P value ≤0.05, CI: Confidence interval, IIEF-5Q: International index of erectile function – 5-question version

IIEF-5Q score was insignificantly different at preoperative (5-25) between both groups and was significantly higher at 3 and 6 months postoperative in group 1 than in group 2 (P value <0.05).

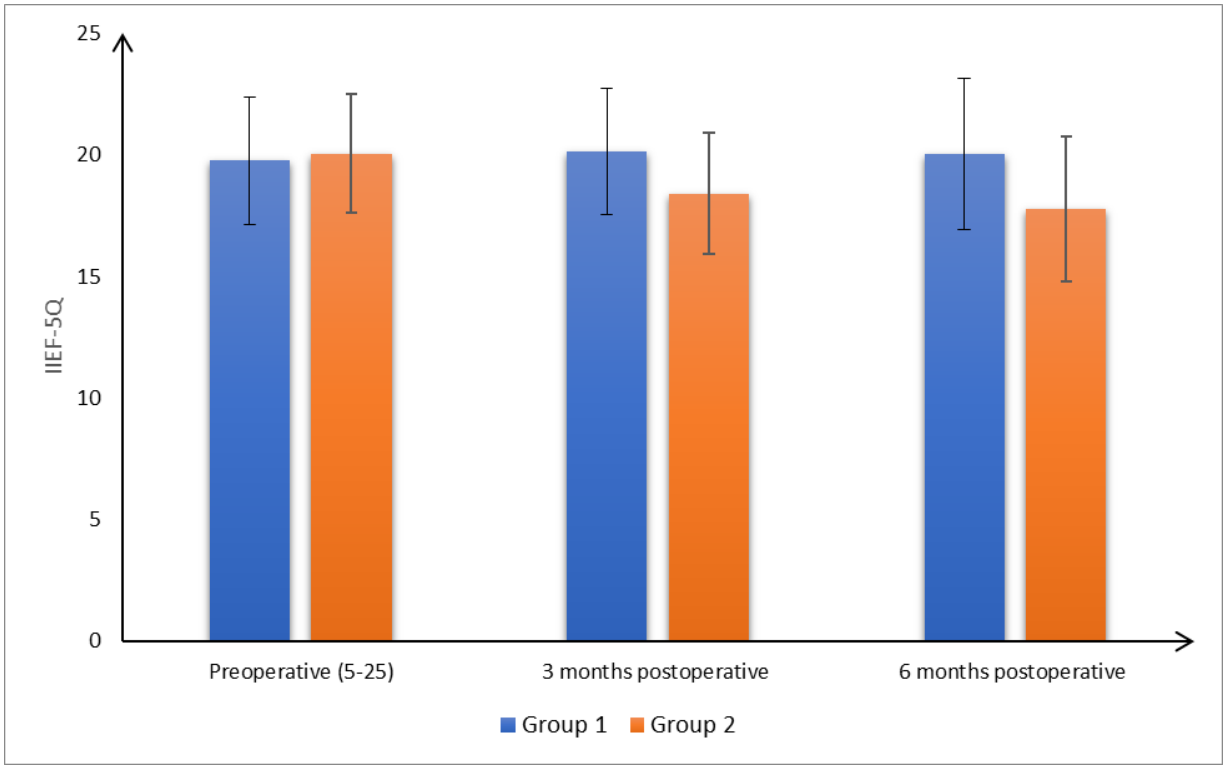

Figure 5: IIEF-5Q of the studied groups.

Table 4: MSHQ-EjD score of the studied groups

	Group 1 (n=43)	Group 2 (n=41)	P value	Mean difference (95% CI)
Preoperative (1-15)	12.42±1.23	10.98±2.16	**<0.001***	1.44(0.708: 2.181)
3 months postoperative	10.26±1.42	9.63±1.77	0.284	0.632(-0.544: 1.808)
6 months postoperative	10.62±1.76	10.38±2.26	0.741	0.243(-1.232: 1.717)

*Significantly different as P value ≤0.05, CI: Confidence interval, MSHQ-EjD: Male sexual health questionnaire – ejaculatory dysfunction short form, TTT: Treatment

MSHQ-EjD score was significantly higher at preoperative (1-15) in group 1 than group 2 (P value <0.001) and was insignificantly different at three and six months postoperative between both groups.

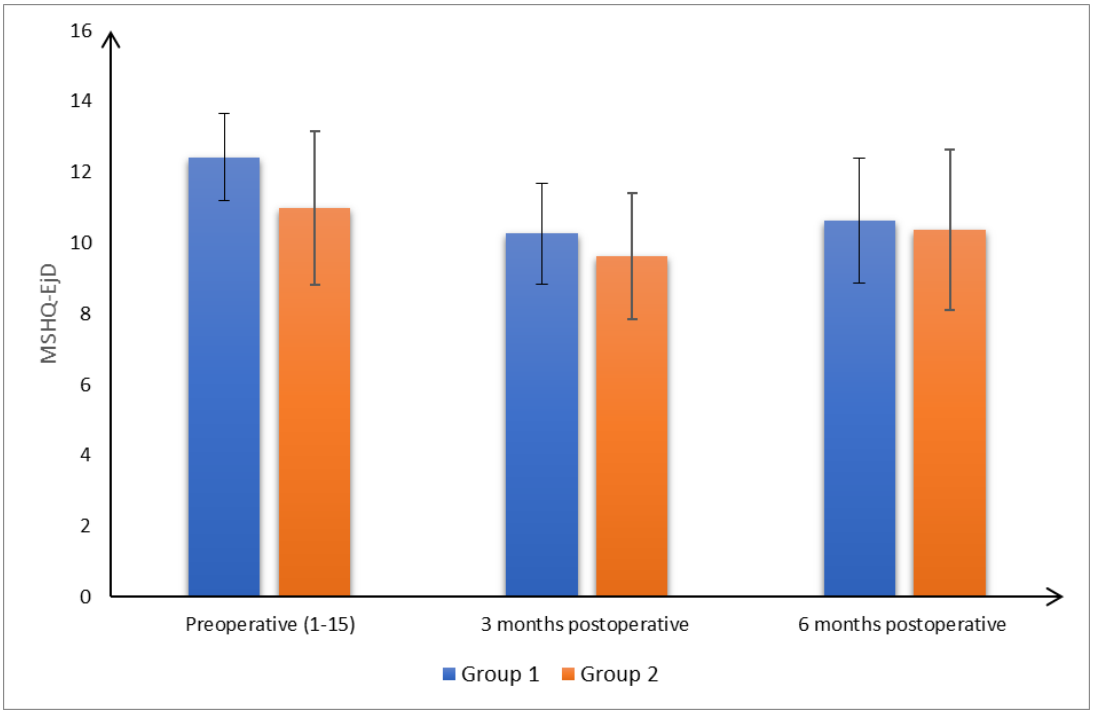

Figure 6: MSHQ-EjD of the studied groups.

Table 5: Laboratory investigation of the studied groups

		Group 1 (n=45)	Group 2 (n=45)	P value	Mean difference (95% CI)
Hemoglobin (g/dL)	**Preoperative**	13.34±1.85	13.88±1.35	0.121	-0.535(-1.21: 0.145)
	Postoperative	12.29±1.73	12.55±1.58	0.466	-0.256(-949: 0.438)
WBC (10^9/L)	**Preoperative**	8.23±3.27	8.1±2.88	0.842	0.13(-1.161: 1.42)
	Postoperative	10.18±2.09	10.55±3.22	0.524	-0.366(-1.50:0.772)
Creatinine (mg/dL)	**Preoperative**	1.18±0.41	1.07±0.36	0.195	0.106(-0.055: 0.267)
	Postoperative	1.11±0.24	1.1±0.33	0.874	0.009(-0.112: 0.132)
Total PSA (ng/mL)	**Median**	2.13	4.2	**0.001***	1.41(0.60: 2.30)
	IQR	1.39 - 3.8	2.6 - 5.3		

*Significantly different as P value ≤0.05, WBC: White blood cell, CI: Confidence interval, PSA: Prostate-specific antigen

Hemoglobin, WBC and creatinine were insignificantly different at preoperative and postoperative between both groups.

Total PSA was significantly lower in group 1 than group 2 as (P value =0.001).

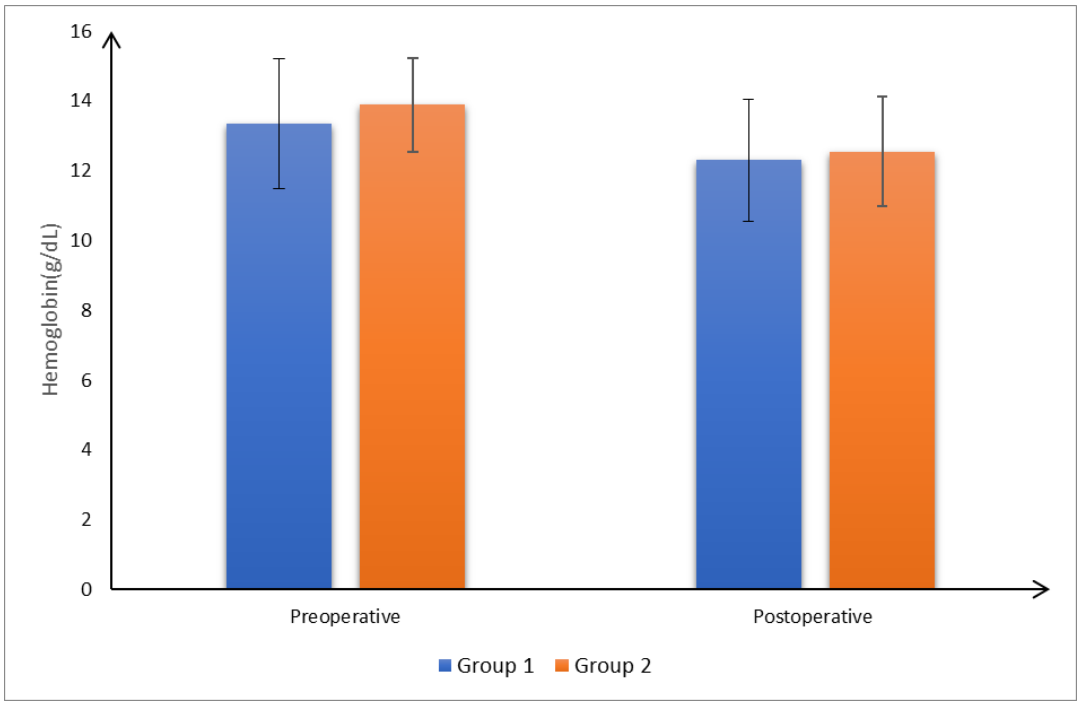

Figure 7: Hemoglobin of the studied groups.

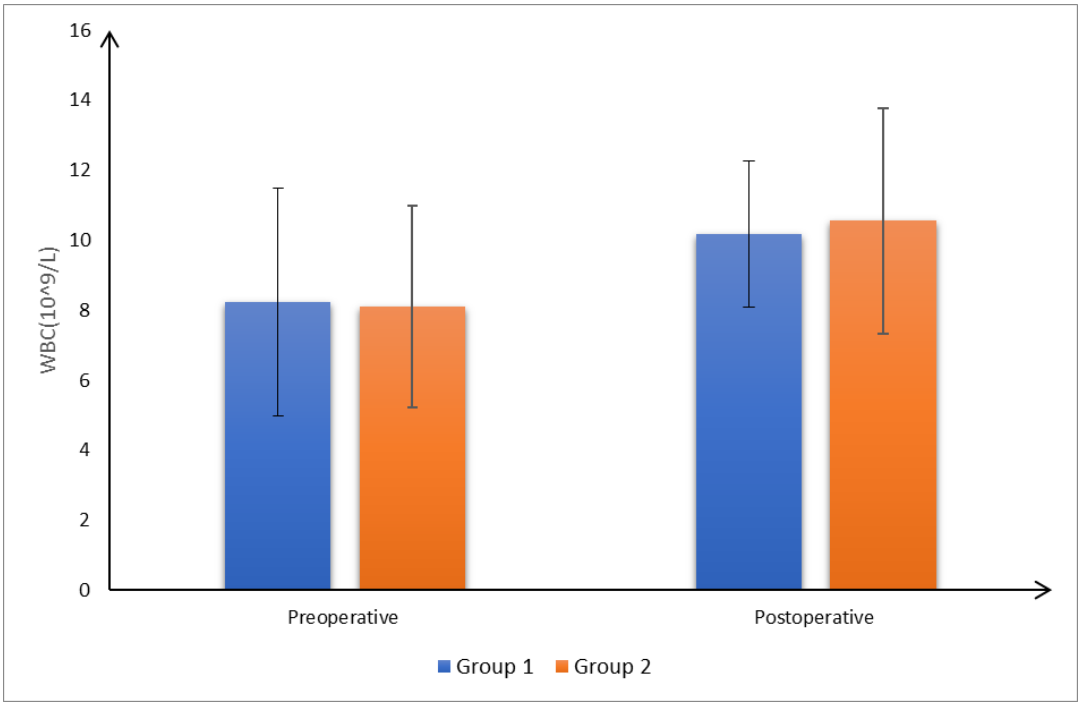

Figure 8: WBC of the studied groups.

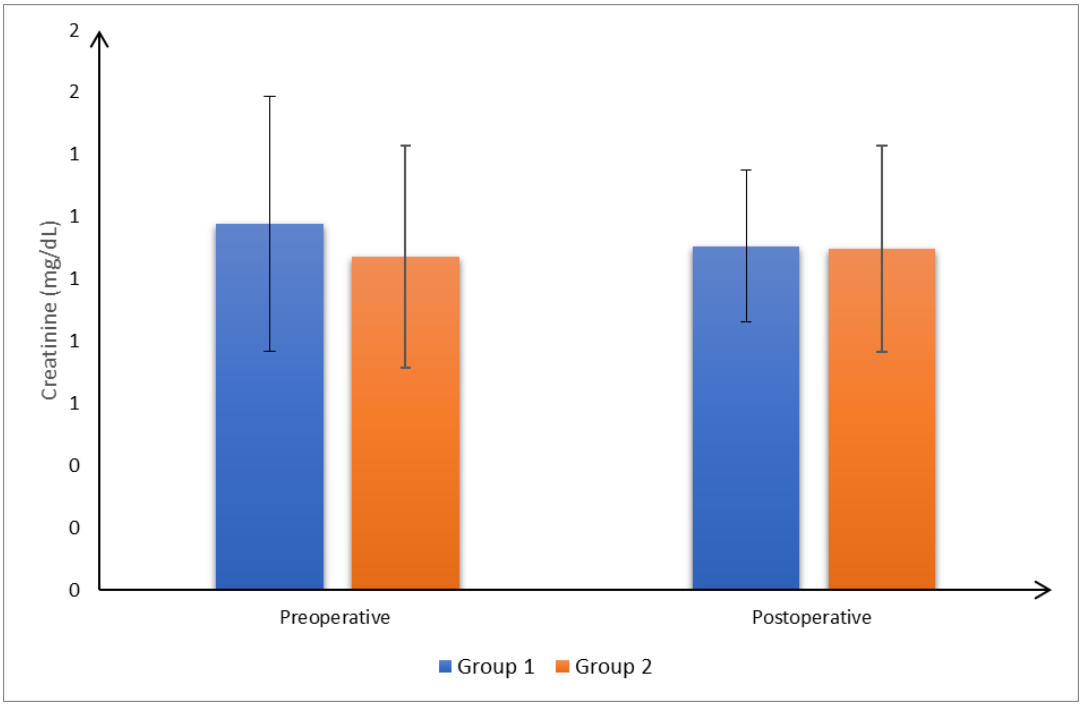

Figure 9: Creatinine of the studied groups.

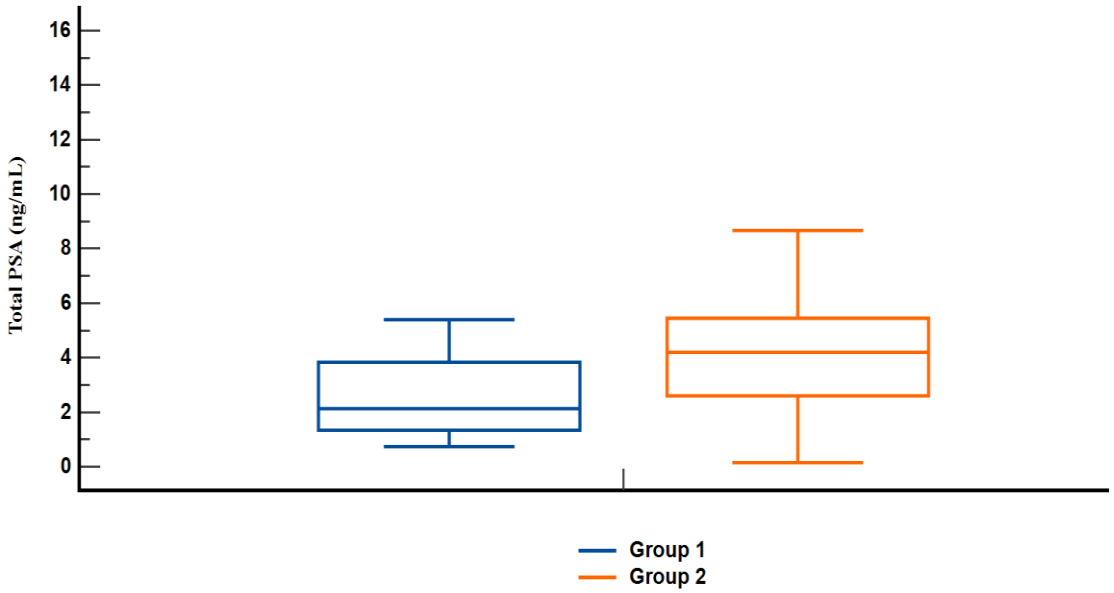

Figure 10: Total PSA of the studied groups.

Table 6: Prostate volume (ml) of the studied groups

		Group 1 (n=45)	Group 2 (n=45)	P value	Mean difference (95% CI)
Prostate volume (ml)	**Mean ± SD**	53.69 ± 17.71	57.11 ± 19.16	0.381	-3.42(-11.15: 4.31)
	Range	25 – 89	24 – 106		

*Significantly different as P value ≤0.05, PVR: Postvoid residual, Qmax: Maximum urinary flow rate, CI: Confidence interval

Prostate volume was insignificantly different between both groups.

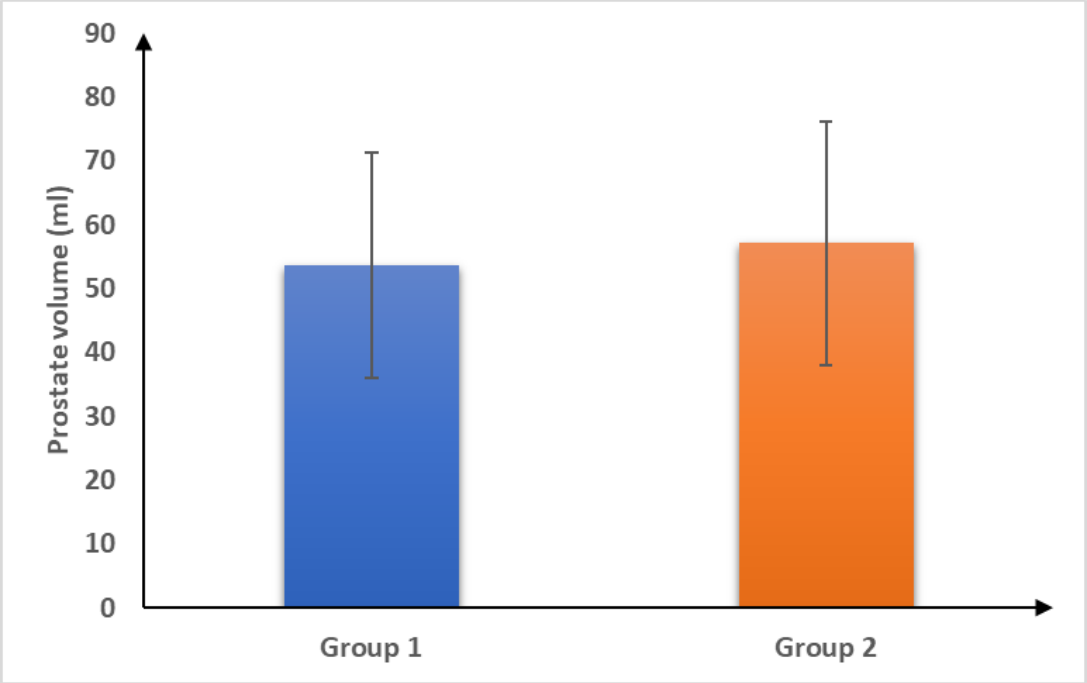

Figure 11: Prostate volume of the studied groups.

Table 7: PVR (ml) and Qmax (ml/sec) of the studied groups

		Group 1 (n=43)	Group 2 (n=41)	P value	Mean difference (95% CI)
PVR (mL)	**Preoperative**	356 (250-380)	340 (289-391)	0.345	14(-20:48)
	3 months postoperative	55 (43.5-68.5)	39 (29-52)	**0.003***	-13(-22: -4)
	6 months postoperative	49 (42.5-72)	34(22-47)	**<0.001***	-21(-29: -12)
Qmax (mL/sec)	**Preoperative**	4.92±1.73	4.5±1.88	0.270	0.42(-0.334: 1.178)
	3 months postoperative	19.04±4.77	21.73±4.63	**0.01***	-2.696(-4.738: -0.654)
	6 months postoperative	18.78±5.16	19.71±6.22	0.457	-0.93(-3.407: 1.55)

*Significantly different as P value ≤0.05, PVR: Postvoid residual, Qmax: Maximum urinary flow rate, CI: Confidence interval

PVR was insignificantly different at preoperative between both groups and was significantly higher at (3 months and 6 months) postoperative in group 1 than group 2 as (P value =0.003 and <0.001 respectively).

Qmax was significantly lower at 3 months postoperative in group 1 than group 2 as (P value =0.03) and was insignificantly different at (preoperative and 6 months postoperative) between both groups.

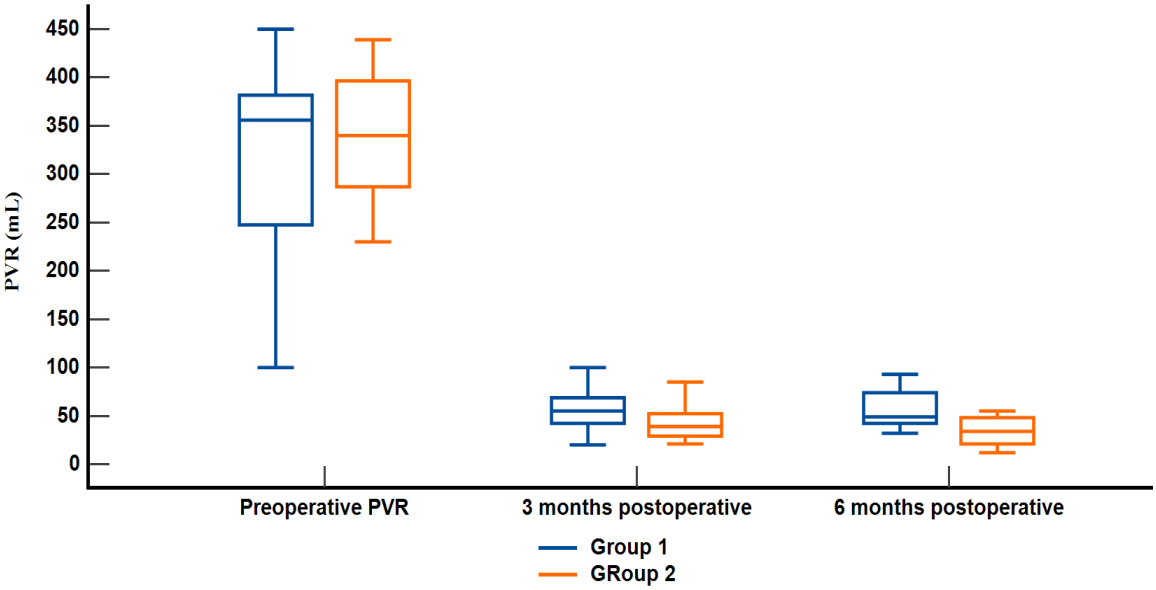

Figure 12: PVR of the studied groups.

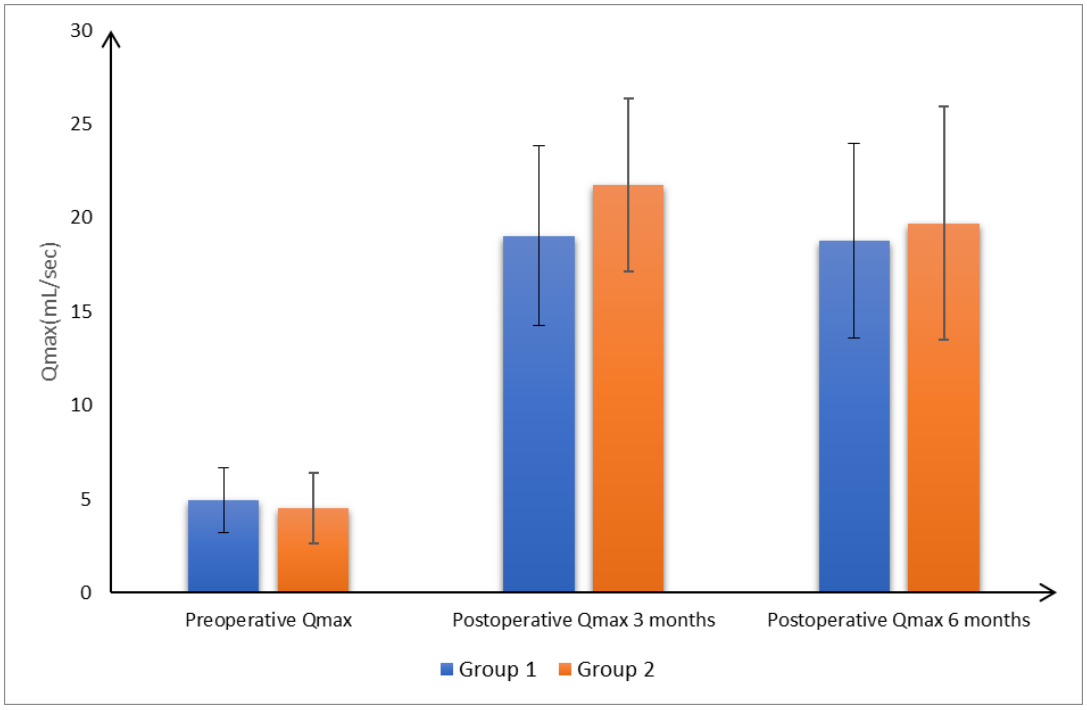

Figure 13: Qmax of the studied groups.

Table 8: Intraoperative factors of the studied groups

		Group 1 (n=45)	Group 2 (n=45)	P value	Mean difference or RR (95% CI)
Operative time (min)	**Mean ± SD**	33.51 ± 11.49	40.53 ± 14.64	**0.013***	-3.42(-11.15: 4.31)
	Range	15 – 60	18 – 75		
Blood transfusion		1 (2.22%)	2 (4.44%)	1	0.49(0.04:5.59)

*Significantly different as P value ≤0.05, CI: Confidence interval, RR: Relative risk

Operative time was significantly lower in group 1 than group 2 as (P value =0.013).

Blood transfusion was insignificantly different between both groups.

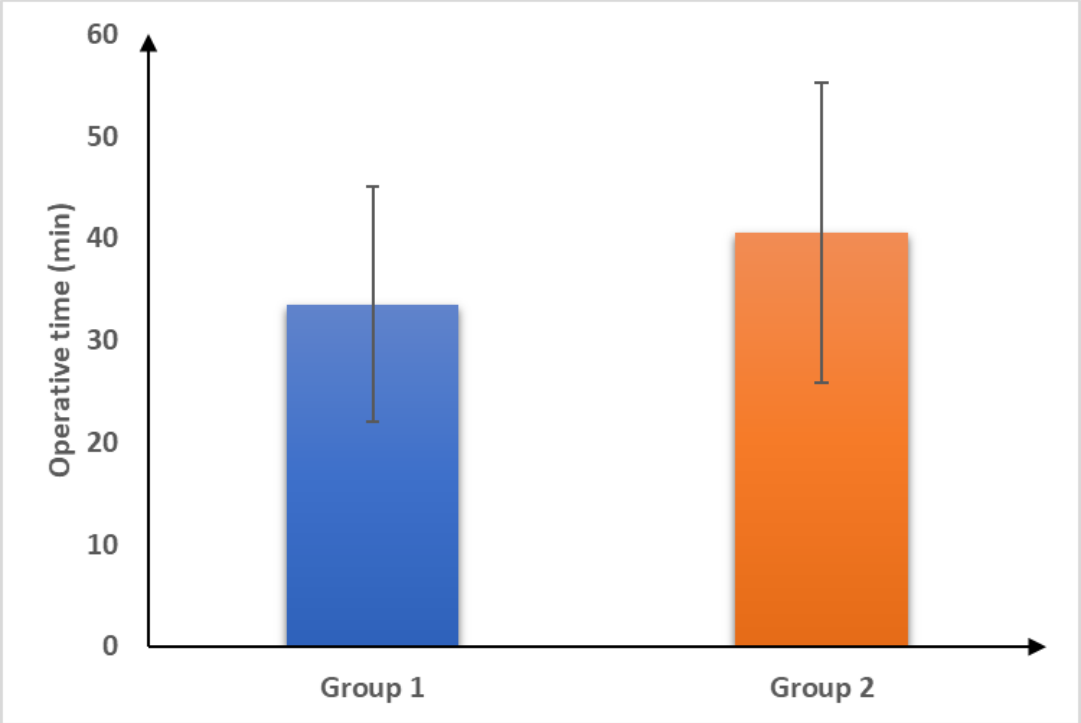

Figure 14: Operative time of the studied groups.

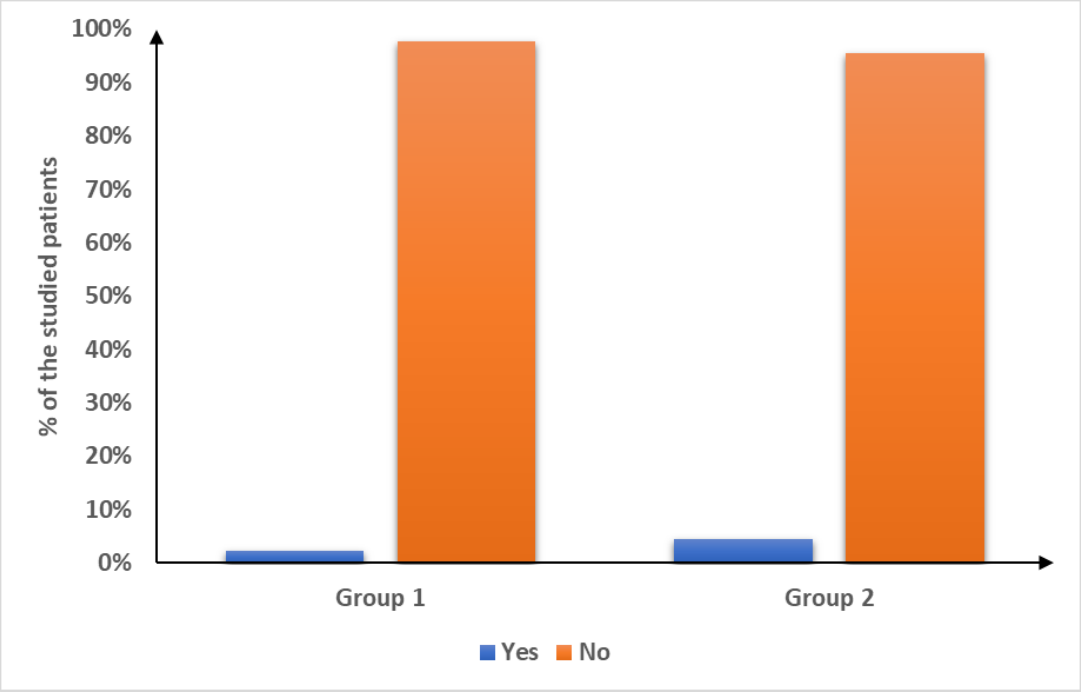

Figure 15: Blood transfusion of the studied groups.

Table 9: Complications of the studied groups

		Group 1 (n=45)	Group 2 (n=45)	P value
Intraoperative	**Capsular perforation**	1 (2.22%)	2 (4.44%)	0.620
	Intraperitoneal bladder perforation	0 (0%)	1 (2.22%)	
	Blood transfusion	1 (2.22%)	2 (4.44%)	
Early postoperative	**Severe irritative LUTs**	4 (8.89%)	7 (15.56%)	0.506
	Clot retention	2 (4.44%)	4 (8.89%)	
	Stress incontinence	1 (2.22%)	2 (4.44%)	
	Bladder neck contracture	1 (2.22%)	2 (4.44%)	
		Group 1 (n=43)	Group 2 (n=41)	P value
Late postoperative	**Stricture bulbar urethra**	1 (2.33%)	2 (4.88%)	0.699
	Bladder neck contracture	1 (2.33%)	2 (4.88%)	

LUTs: Lower urinary tract symptoms

Complications (intraoperative, early and late postoperative) were insignificantly different between both groups.

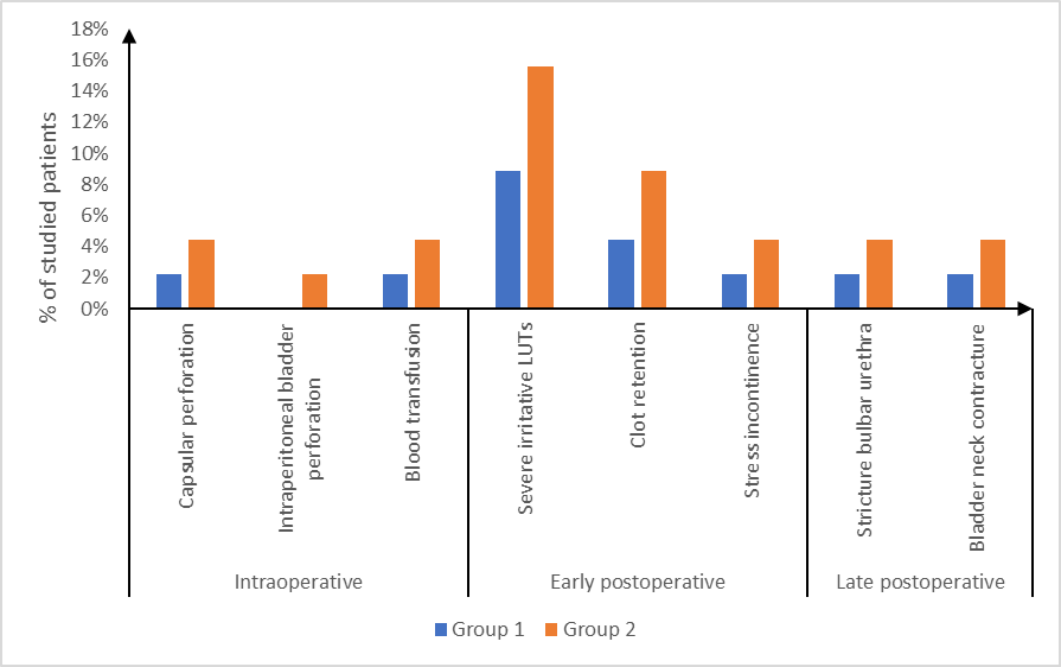

Figure 16: Complications of the studied groups.

Table 10: Post-operative preserved ejaculation, semen volume and concentration of the studied groups

		Group 1 (n=43)	Group 2 (n=41)	P value	Median, mean difference or RR (95% CI)
Preserved ejaculation	**After 3 months**	35 (81.4%)	8 (19.51%)	**<0.001***	18.05(6.07:53.64)
	After 6 months	34 (79.07%)	8 (19.51%)	**<0.001***	15.58(5.37:45.25)
Semen volume (mL)	**After 3 months**	2.37±0.78	2.01±0.58	0.223	0.362(-229: 0.953)
	After 6 months	2.41±0.78	2.49±0.73	0.797	-0.079(-0.165: 0.535)
Sperm concentration (million sperm/mL)	**After 3 months**	35 (13.75-82)	72 (62.75-89.25)	**0.036***	37(8: 60)
	After 6 months	32.5 (13-72)	86. (76-106.75)	**0.005***	54(20: 78)

*Significantly different as P value ≤0.05, CI: Confidence interval, RR: Relative risk

Preserved ejaculation (after three and six months) were significantly higher in group 1 than group 2 (P value <0.001).

Semen volume (after three and six months) was insignificantly different between both groups.

Sperm concentration (after three and six months) was significantly lower in group 1 than group 2 (P value<0.05).

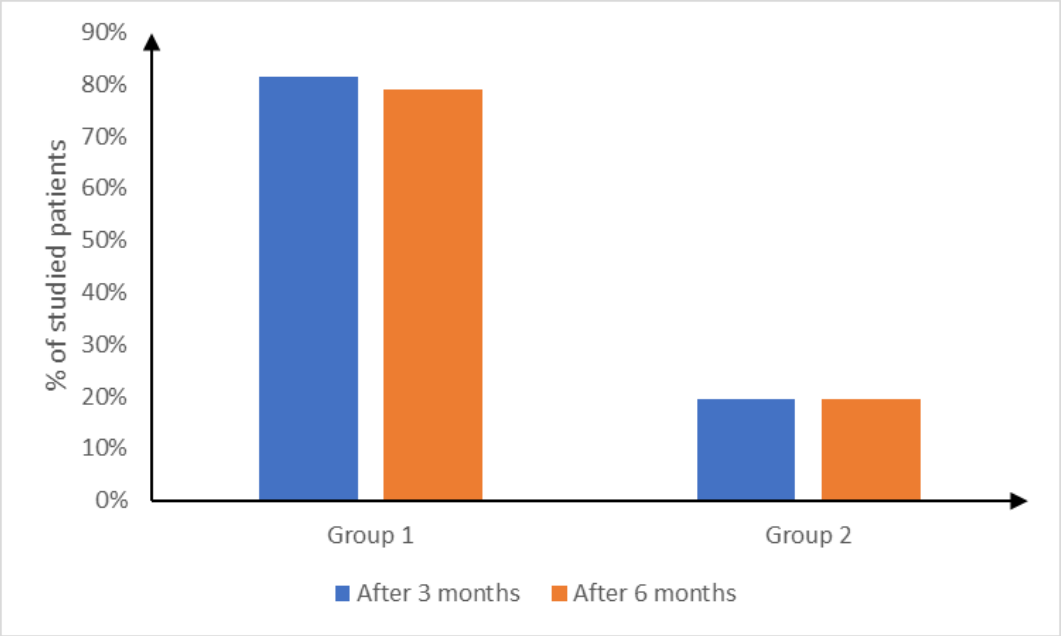

Figure 17: Preserved ejaculation of the studied groups.

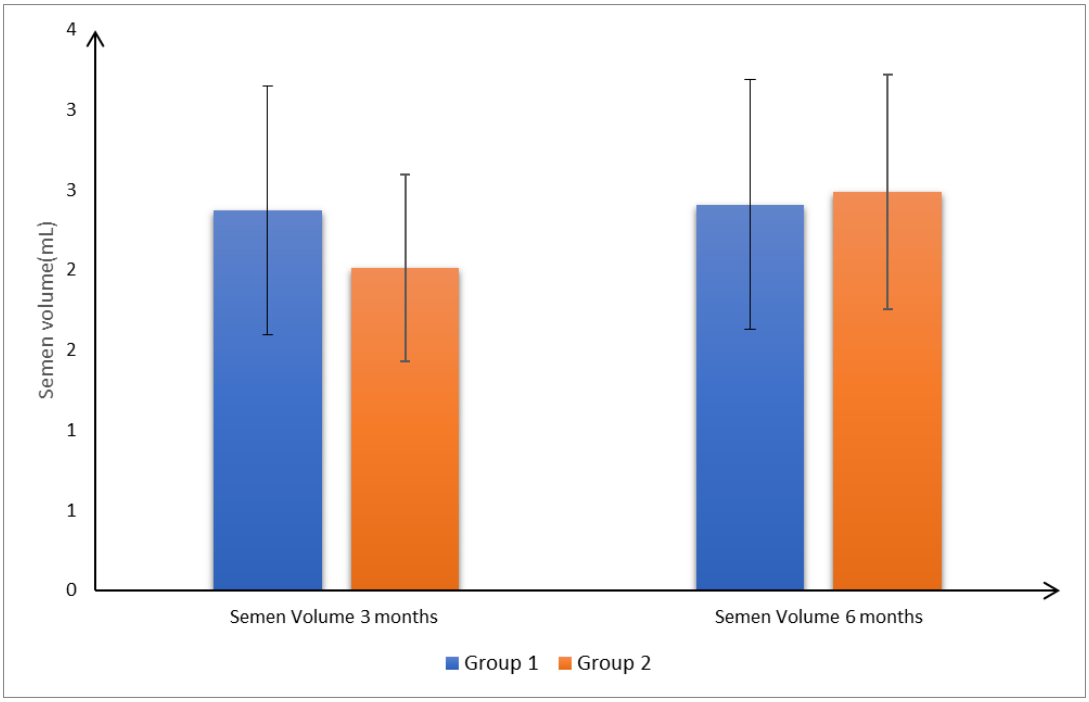

Figure 18: Semen volume of the studied groups.

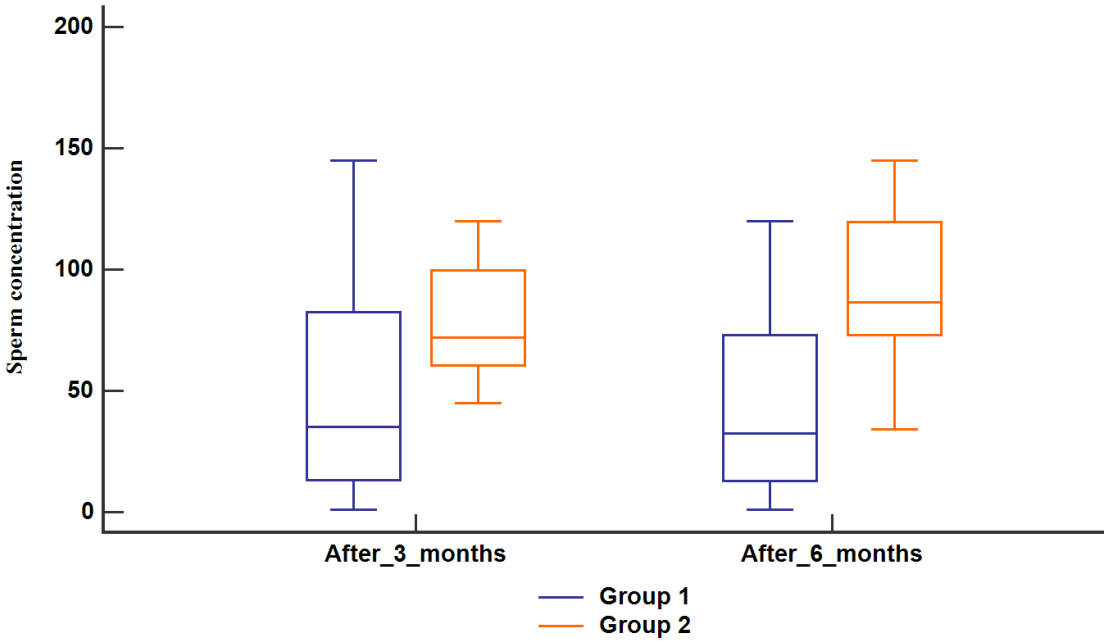

Figure 19: Sperm concentration of the studied groups.

Table 11: Relation between age groups and preservation of ejaculation

	<60 years (n=24)	(60-70) years (n=46)	>70 years (n=14)	P value
After 3 months	17 (70.83%)	24 (52.17%)	2 (14.29%)	**0.003***
After 6 months	17 (70.83%)	23 (50%)	2 (14.29%)	**0.004***

*Significantly different as P value ≤0.05

Preserved ejaculation after three and six months were significantly higher in patients <60 years than (60-70) and >70 years (P value<0.05).

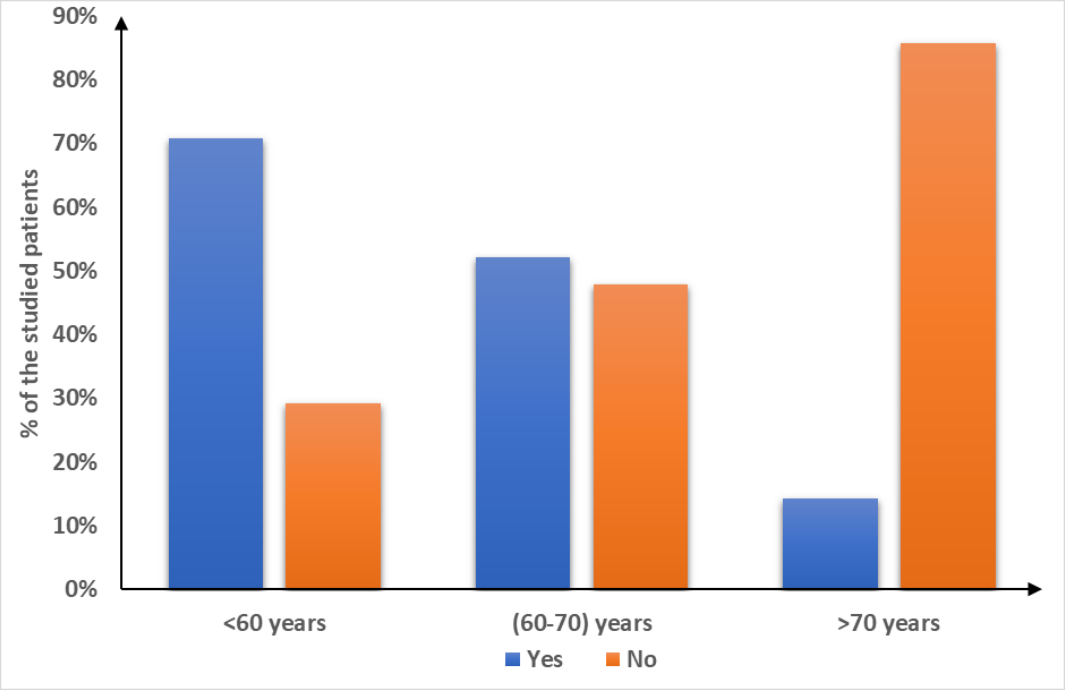

Figure 20: Preserved ejaculation after 3 months of the studied groups.

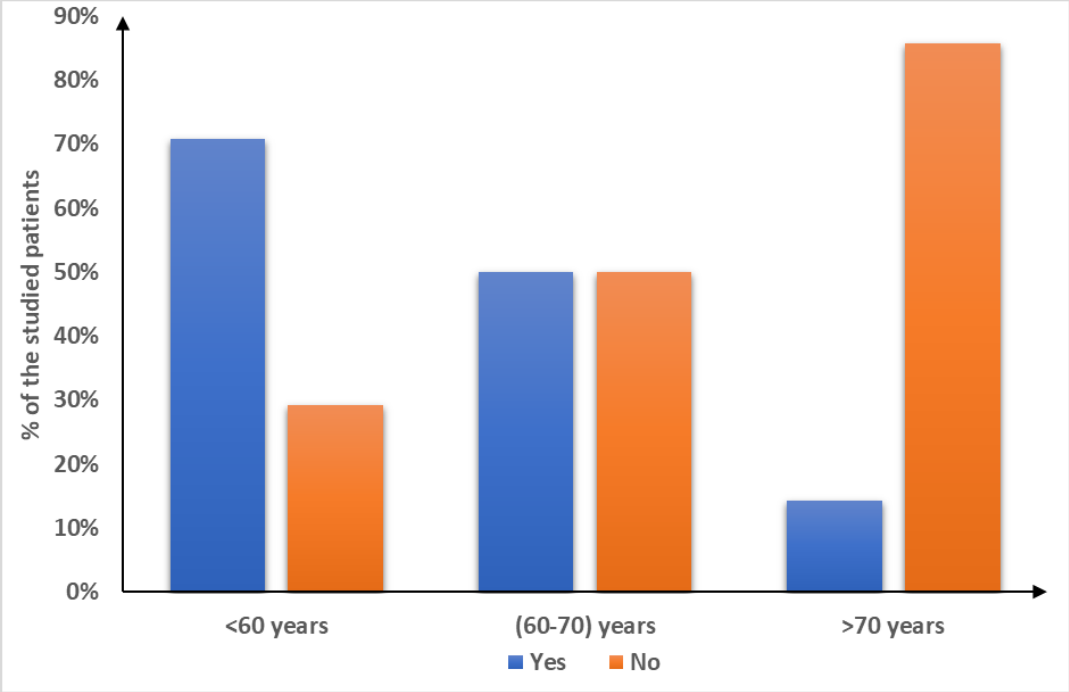

Figure 21: Preserved ejaculation after 6 months of the studied groups.

Table 12: Relation between size of prostate groups and (preservation of ejaculation and rate of complications)

		≤60 ml (n=51)	>60 ml (n=33)	P value	RR (95% CI)
Preserved ejaculation	**After 3 months**	25 (49.02%)	18 (54.55%)	0.621	0.9(0.59:1.37)
	After 6 months	25 (49.02%)	17 (51.52%)	0.823	0.95(0.62:1.47)
		(n=57)	**(n=33)**		
Intraoperative	**Capsular perforation**	1 (1.75%)	2 (6.06%)	**0.034***	---
	Intraperitoneal bladder perforation	0 (0%)	1 (3.03%)		
	Blood transfusion	0 (0%)	3 (9.09%)		
Early postoperative	**Severe irritative LUTs**	5 (8.77%)	6 (18.18%)	0.488	---
	Clot retention	3 (5.26%)	3 (9.09%)		
	Stress incontinence	2 (3.51%)	1 (3.03%)		
Late postoperative	**Stricture bulbar urethra**	0 (0%)	3 (9.09%)	0.309	---
	Bladder neck contracture	3 (5.26%)	0 (0%)		

*Significantly different as P value ≤0.05, CI: Confidence interval, RR: Relative risk

Preserved ejaculation, early and late postoperative complications were insignificantly different between both groups.

Intraoperative complications were significantly lower in patients with prostate volume ≤60 ml than >60 ml (P value=0.034).

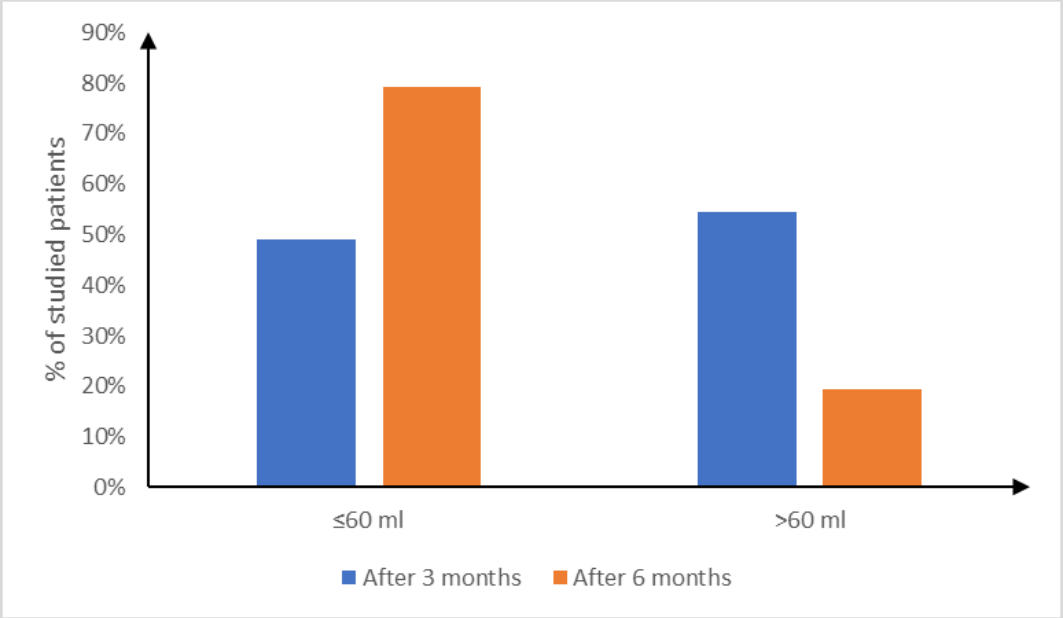

Figure 22: Preserved ejaculation after 3 months of the studied groups.

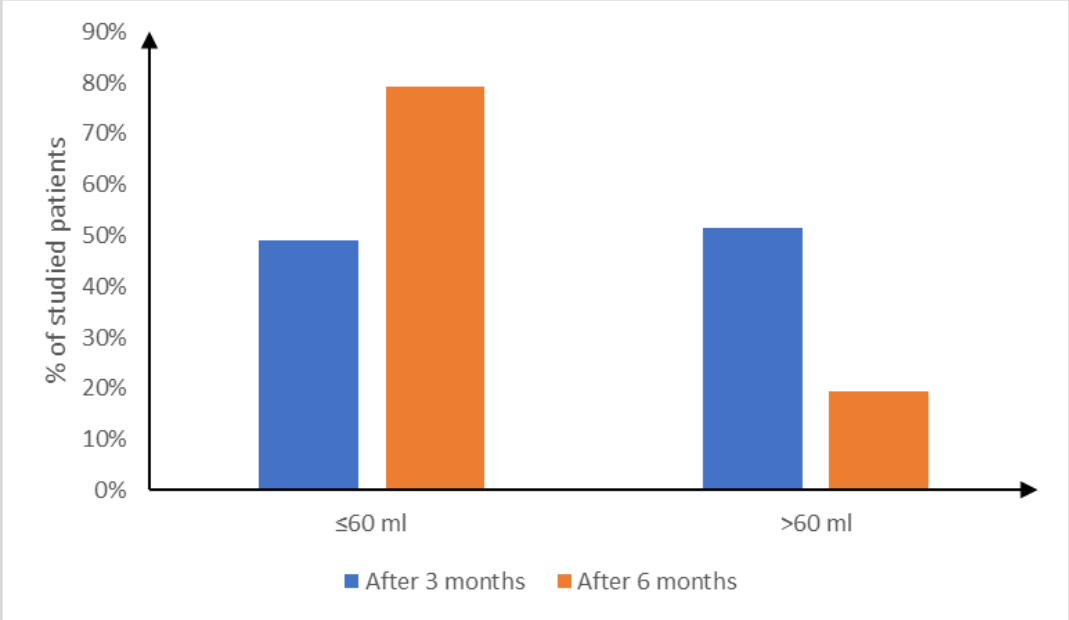

Figure 23: Preserved ejaculation after 6 months of the studied groups.

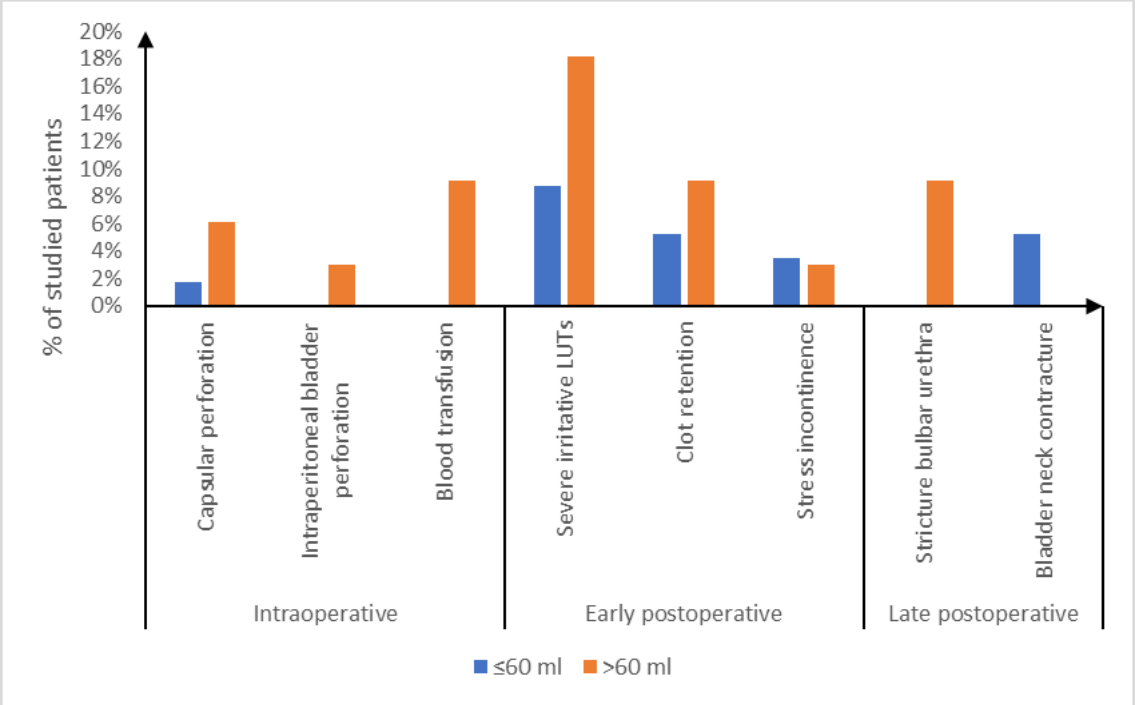

Figure 24: Complications of the studied groups.

Table 13: Role of volume of prostate in prediction of preservation of ejaculation after 6 months

Cut-off	Sensitivity	Specificity	PPV	NPV	AUC	P value
>57	50%	57.14%	53.8%	53.3%	0.520	0.749

PPV: positive predictive value, NPV: negative predictive value, AUC: area under the curve.

Volume of prostate can't predict preservation of ejaculation after 6 months (P = 0.749 and AUC = 0.520) at cut-off >57 with 50% sensitivity, 57.14% specificity, 53.8% PPV and 53.3% NPV.

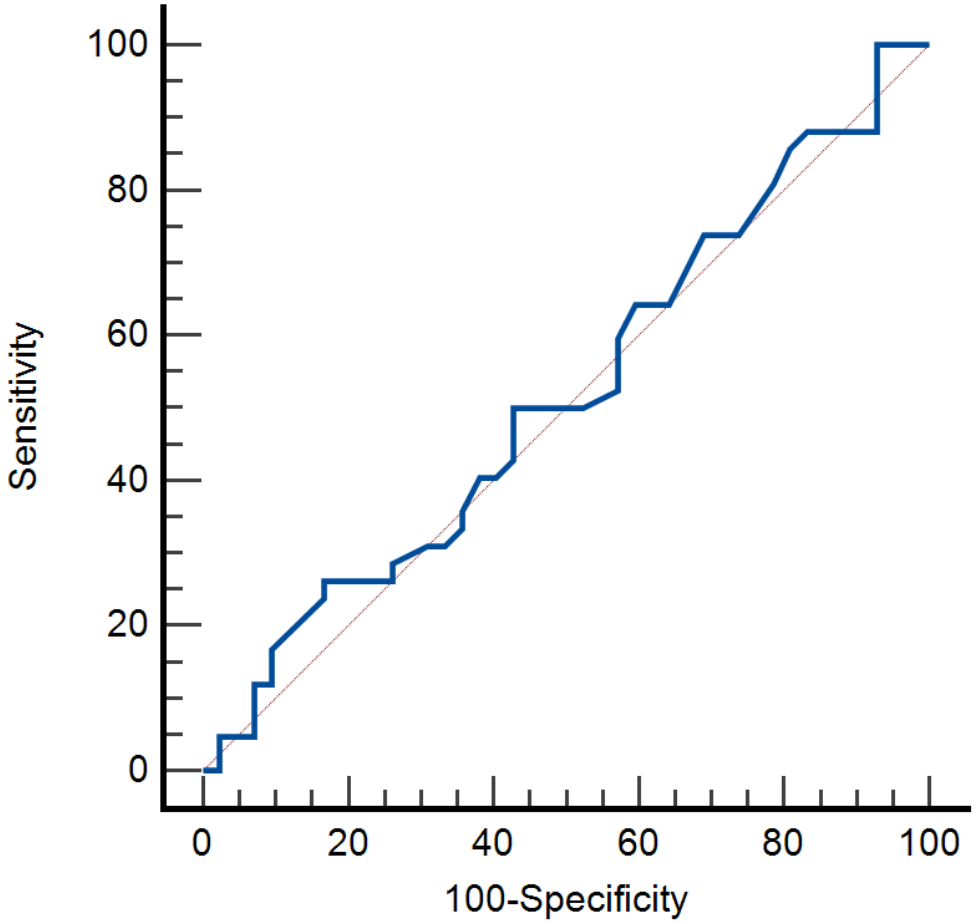

Figure 25: Role of volume of prostate in prediction of preservation of ejaculation after 6 months.