

COMPARATIVE ANALYSIS OF COMPLICATIONS AFTER HOLMIUM LASER ENUCLEATION OF THE PROSTATE (HOLEP) AND TRANSURETHRAL RESECTION OF THE PROSTATE (TURP) IN PATIENTS WITH BENIGN PROSTATIC HYPERPLASIA

Kasimov S.S., Xudaybergenov U.A.

Tashkent state medical university, Uzbekistan, Tashkent.

Abstract.

Aim of the study: to conduct a comparative analysis of the incidence and nature of postoperative complications in patients with benign prostatic hyperplasia (BPH) after holmium laser enucleation of the prostate (HoLEP) and transurethral resection of the prostate (TURP).

Materials and methods: The study included 50 patients with clinically confirmed benign prostatic hyperplasia (BPH) who underwent surgical treatment during the observation period. The patients were divided into two groups: Group I consisted of 25 patients who underwent holmium laser enucleation of the prostate (HoLEP), and Group II included 25 patients who underwent transurethral resection of the prostate (TURP). Intraoperative and early postoperative complications, as well as the duration of catheterization and hospitalization, were evaluated.

Results: The incidence of postoperative complications was lower in the HoLEP group compared with the TURP group. The most common complications after TURP were macroscopic hematuria, the need for prolonged catheterization, and transurethral resection (TUR) syndrome. In the HoLEP group, fewer bleeding events and a shorter duration of hospitalization were observed.

Conclusion: HoLEP is a safer surgical treatment option for benign prostatic hyperplasia compared with TURP, as it is associated with a lower rate of complications and a more favorable postoperative course.

Keywords: Benign prostatic hyperplasia, HoLEP, TURP, postoperative complications, laser surgery

Introduction

Benign prostatic hyperplasia (BPH) remains one of the most common diseases in elderly men and often requires surgical intervention. Transurethral resection of the prostate (TURP) has long been considered the “gold standard” for surgical treatment of BPH. However, the introduction of laser technologies, particularly holmium laser enucleation of the prostate (HoLEP), has allowed for a reduction in the incidence of complications and improvement in functional outcomes. Despite the widespread use of both techniques, the issue of comparative evaluation of postoperative complications remains relevant, especially when selecting the optimal treatment strategy. Portional TUR entails the removal of approximately 30–80% of hyperplastic tissue, creating a cone-shaped channel between the bladder and prostate. This

approach may be categorized as either palliative or subtotal. Total TUR (transurethral adenomectomy) is characterized by the resection of up to 100% of hyperplastic tissue, which some authors [2,3] equate with open adenomectomy. Radical (subradical) TUR involves the excision of the entire prostatic parenchyma together with its capsule [4].

Complete removal of BPH tissue along with the fibrous capsule via resectoscope loop, however, is technically unfeasible due to the presence of an intracapsular venous network. Injury to this network is frequently accompanied by significant intraoperative bleeding. Moreover, full excision of the prostate by this method carries the risk of damaging the paraprostatic venous plexus.

The primary clinical indication for TURP in BPH is the relief of lower urinary tract symptoms. The likelihood of symptomatic improvement reaches up to 88%, according to data from the ANSRK (1994). In 1996, the World Health Organization (WHO) formulated and recommended standardized indications for TURP in BPH for clinical validation, including: Prostate volume less than 60 cm³; Presence of obesity or severe cardiovascular comorbidities; Previous surgical interventions on the bladder, prostate, anterior abdominal wall, or intestines; Unsatisfactory outcomes following previous non-surgical or minimally invasive treatments (e.g., hyperthermia, thermotherapy, laser therapy); True or false recurrences of the disease; Long-term failure of conservative management, including pharmacotherapy; Coexistence of adenoma with chronic prostatitis or prostatic calculi.

Materials and Methods

The study included 50 patients with BPH who were hospitalized for elective surgical treatment.

Inclusion criteria:

- Clinically and instrumentally confirmed BPH;
- Severe lower urinary tract symptoms;
- Prostate volume greater than 40 cm³.

Patient distribution:

Group I (HoLEP) — 25 patients;

Group II (TURP) — 25 patients.

The following parameters were evaluated:

- Intraoperative blood loss;
- Requirement for blood transfusion;
- Duration of bladder catheterization;
- Early postoperative complications (bleeding, acute urinary retention, infectious complications);
- Length of hospitalization.

Table 1. General characteristics of patients (n50)

Parameter	HoLEP (n=25)	TURP (n=25)
Mean age, years	66,4 ± 5,8	67,1 ± 6,2
Prostate volume, cm ³	78,6 ± 18,4	72,3 ± 16,9

Preoperative IPSS	22,8 ± 3,4	23,1 ± 3,6
Qmax, mL/s	7,2 ± 1,9	6,9 ± 2,1
residual urine, mL	110 ± 35	118 ± 40

Table 1 presents the clinical and demographic characteristics of the patients included in the study. Both groups were comparable in terms of baseline parameters. The mean age of patients in the HoLEP group was 66.4 ± 5.8 years, while in the TURP group it was 67.1 ± 6.2 years. The prostate volume was slightly larger in patients who underwent HoLEP ($78.6 \pm 18.4 \text{ cm}^3$) compared with the TURP group ($72.3 \pm 16.9 \text{ cm}^3$).

The severity of lower urinary tract symptoms, assessed by the preoperative IPSS, was high in both groups and did not differ significantly (22.8 ± 3.4 and 23.1 ± 3.6 , respectively). The values of maximum urinary flow rate (Qmax) and post-void residual urine volume also showed no significant intergroup differences, indicating clinical homogeneity of the study groups.

Results of the study

Postoperative complications were observed in 6 patients (24%) in the HoLEP group, compared with 13 patients (52%) in the TURP group.

Table 2. Early postoperative complications (n50)

Complication	HoLEP (n=25)	TURP (n=25)
Gross hematuria	2 (8%)	4 (16%)
Urinary tract infection	1 (4%)	3 (12%)
Orchiepididymitis	0 (0%)	2 (8%)
Acute urinary retention	1 (4%)	2 (8%)
TUR syndrome	0 (0%)	1 (4%)
Temporary stress urinary incontinence	2 (8%)	1 (4%)

Table 2 illustrates the frequency and pattern of early postoperative complications depending on the surgical method used. Complications were less frequent in the HoLEP group than in the TURP group. The most common complications after HoLEP were transient macroscopic hematuria, observed in 2 patients (8%), and temporary stress urinary incontinence, also seen in 2 patients (8%). Urinary tract infection and acute urinary retention were observed in single cases.

In the TURP group, the complication rate was higher. Macroscopic hematuria occurred in 4 patients (16%), infectious-inflammatory complications in 3 patients (12%). Orchiepididymitis was diagnosed in 2 patients (8%) who underwent TURP. TUR syndrome was observed in one case (4%). These findings indicate a higher risk of complications following transurethral resection of the prostate.

Table 3. Urine culture pathogens

Pathogen	HoLEP (n=25)	TURP (n=25)
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Escherichia coli	1 (4%)	3 (12%)
Klebsiella pneumoniae	0 (0%)	2 (8%)
Enterococcus faecalis	1 (4%)	2 (8%)
Pseudomonas aeruginosa	0 (0%)	1 (4%)
Negative culture	23 (92%)	17 (68%)

Table 3 presents the results of urine culture in the early postoperative period. In the HoLEP group, a positive urine culture was detected in 2 patients (8%), with Escherichia coli and Enterococcus faecalis being the most frequently isolated pathogens. In the vast majority of cases (92%), the urine culture was negative.

In the TURP group, the frequency of positive cultures was significantly higher, reaching 32%. Among the identified pathogens, Escherichia coli and Klebsiella pneumoniae predominated, while Enterococcus faecalis and Pseudomonas aeruginosa were less common. The higher incidence of bacteriuria in the TURP group correlated with an increased rate of infectious-inflammatory complications, including the development of orchiepididymitis.

Table 4. Postoperative Outcomes

Parameter	HoLEP (n=25)	TURP (n=25)
Duration of catheterization, days	1,5 ± 0,4	3,2 ± 0,6
Hospitalization, days	3,1 ± 0,7	5,4 ± 1,1
Blood transfusion	0	2 (8%)

Table 4 demonstrates differences in the postoperative course between the groups. The average duration of bladder catheterization after HOLEP was 1.5 ± 0.4 days, which is almost twice as short compared to the TUR group (3.2 ± 0.6 days). A similar trend was observed regarding the length of hospitalization: 3.1 ± 0.7 days after HOLEP versus 5.4 ± 1.1 days after TUR. ($p < 0.05$)

The need for blood transfusion occurred only in patients after TUR of the prostate (2 cases, 8%), whereas no patient in the HOLEP group required a transfusion. This confirms the more pronounced hemostatic effect of laser enucleation of the prostate.

Discussion

The obtained data indicate the advantages of HOLEP compared to TUR, particularly regarding the frequency of bleeding and the duration of postoperative recovery. The use of a holmium laser provides effective hemostasis, which is especially important in patients with concomitant cardiovascular diseases and those receiving anticoagulant therapy.

Despite its effectiveness, TUR is associated with a higher risk of intra- and postoperative complications, including water intoxication syndrome and pronounced macroscopic hematuria.

Conclusion

Holmium laser enucleation of the prostate is a safe and effective surgical method for the treatment of BPH, outperforming TUR in terms of postoperative complications and recovery time. HOLEP can be considered the preferred method, particularly in patients at high risk of

bleeding. Perhaps only for the operating surgeon, who “tours” the patient intraoperatively and then discharges them within 24 hours for outpatient follow-up while the patient’s ordeal only begins thereafter. Many such patients subsequently face persistent dysuria, incomplete urination, or a spectrum of postoperative complications, including gross hematuria, intravesical bleeding, post-TURP prostatitis, cystitis, orchiepididymitis, acute or chronic pyelonephritis, urinary incontinence, urethral stricture, and bladder neck sclerosis, among others.

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