

Radical prostatectomy outcomes of prostate cancer cases: Insights from a leading surgeon's experience in Azerbaijan

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Summary

Objective: Prostate cancer is a significant health concern worldwide and ranks as the 4th most frequent cancer among men in Azerbaijan. While robot-assisted laparoscopic radical prostatectomy is the preferred surgical technique in many countries, open retropubic radical prostatectomy (ORP) remains the primary treatment option in Azerbaijan due to limited access to robotic surgical systems. This study aims to analyze the outcomes of ORP in patients with local and locally advanced prostate cancer. **Methods:** We retrospectively evaluated 95 men who underwent extraperitoneal retropubic ORP for prostate cancer at our center between May 2020 and December 2023. Comprehensive data on patient demographics, preoperative parameters, surgical details, and postoperative outcomes were collected. Statistical analyses were conducted using IBM SPSS 27.0 software. **Results:** The mean age of the patients was 65.9 years. The median preoperative PSA level was 14.8 ng/mL, and lymph node enlargement was identified in 29.5% of patients. A rectal injury occurred in one patient (1.1%) as the only intraoperative complication. The mean intraoperative blood loss was 330 mL, and the median hospital stay was 6 days. A positive surgical margin was observed in 38.9% of cases. Diabetes mellitus and higher intraoperative blood loss were associated with prolonged hospital stays (≥ 7 days). Erectile dysfunction was reported in 52.6% of patients 6 months postoperatively, while urinary incontinence was observed in 2.2%.

Conclusions: ORP outcomes in Azerbaijan are comparable to those reported for laparoscopic and robot-assisted techniques in terms of perioperative and oncological results. Despite the absence of advanced surgical technology, ORP remains an effective treatment option for prostate cancer when performed by experienced surgeons.

KEY WORDS: Prostate cancer; Open radical prostatectomy; Azerbaijan.

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INTRODUCTION

Prostate cancer is a major health concern for men worldwide, remaining one of the most prevalent malignancies affecting this population. In Azerbaijan, prostate cancer has become increasingly common, ranking as the 4th most frequent cancer among men in 2022, with an incidence rate of 5.7% (1). Although prostate cancer treat-

ment has advanced over time, radical prostatectomy (RP) continues to be the standard surgical treatment for localized cases (2).

Over the past two decades, the surgical management of localized prostate cancer has undergone substantial changes. Open radical prostatectomy (ORP) has been largely replaced by laparoscopic radical prostatectomy (LRP) and robot-assisted laparoscopic radical prostatectomy (RALP) in many parts of the world (3). RALP, in particular, has emerged as the leading surgical technique, accounting for over 61% of RP cases in some regions (4). Despite these technological advancements, ORP remains a crucial procedure in regions with limited access to robotic surgical systems, such as Azerbaijan, where RALP is not yet available. The outcomes of ORP and minimally invasive techniques have been extensively studied. Generally, RALP is associated with reduced blood loss and shorter hospital stays but incurs higher costs compared to ORP. Both LRP and RALP have demonstrated favorable perioperative outcomes compared to ORP, with comparable long-term oncologic control (4). However, comprehensive studies examining ORP outcomes in the Azerbaijani population are lacking, and the effectiveness of this approach in early-stage prostate cancer within our region is not well documented.

In light of the absence of robot-assisted surgical methods in Azerbaijan and the scarcity of academic literature on prostatectomy outcomes for early-stage prostate cancer patients in this country, it is crucial to explore the experiences of surgeons proficient in the ORP technique. This study aims to address this gap by providing insights from the perspective of an experienced surgeon on ORP outcomes in Azerbaijan. We believe that sharing this experience will not only contribute valuable data to the limited academic literature on prostate cancer treatment in Azerbaijan but will also serve as a foundation for comparisons with international outcomes in prostate cancer surgery.

METHODS

Study population and data collection

This study included men diagnosed with non-metastatic prostate cancer patients with T1-T3 tumors with or without lymph node involvement who underwent extraperi-

toneal retropubic ORP at our centers between May 2020 and December 2023. All procedures performed in the study involving human participants were in accordance with the 1964 Helsinki declaration and its later amendments. The study was approved by *State Security Service Scientific Research Center Ethics Board* (Decision no: ETEK: 24/03).

We collected comprehensive data on patients' baseline characteristics, including age, *body mass index* (BMI), comorbid diseases, smoking status, and family history of prostate cancer. Preoperative parameters such as serum *prostate-specific antigen* (PSA) levels, prostate volume (measured via transrectal ultrasound or magnetic resonance imaging), imaging results, and needle biopsy findings were recorded.

Surgical technique

All surgeries were performed using the open extraperitoneal retropubic approach, aiming to preserve urinary continence. This technique was performed by an experienced surgeon following the standardized procedure described in the literature (5). After placing the patient in the supine position, a midline incision was made from the pubic symphysis to the umbilicus. The extraperitoneal space was developed, and the prostate was carefully dissected, with an emphasis on preserving the neurovascular bundles whenever feasible, depending on the tumor's location and size. Hemostasis was meticulously maintained throughout the procedure, and the dorsal vein complex was controlled using ligatures and sutures. The bladder neck was dissected carefully to maintain its integrity, and the prostate was removed en bloc. Bilateral pelvic lymph node dissection was performed in patients with a higher risk of lymph node involvement. The urethrovesical anastomosis was completed using interrupted sutures. A drain was placed in the pelvic cavity, and a urinary catheter was left in place for postoperative management.

Intraoperative and postoperative data

During the surgery, data on the anesthesia method, duration of the operation, and estimated intraoperative blood loss were recorded. Any intraoperative complications were documented. Postoperative follow-up included monitoring for complications, such as bleeding, infection, or urinary leakage, as well as the duration of the hospital stay. All prostatectomy specimens were examined by experienced pathologists, and pathological parameters such as Gleason score, surgical margin status, lymphovascular and/or perineural invasion, and lymph node involvement were assessed. Serum PSA levels were measured at 3 months to evaluate early biochemical recurrence. *Erectile dysfunction* (ED) was assessed six months postoperatively using an Azerbaijani translation of the third question from the International Index of Erectile Function, which inquired, "In the past 6 months, how often was your erection firm enough for penetration during sexual activity?". Erectile function was considered adequate if erections were sufficient for intercourse more than 50% of the time.

Statistical analysis

Statistical analyses were performed using IBM SPSS 27.0 software. Descriptive characteristics were presented as

frequency (%), mean \pm SD, or median (range). Normal distribution of continuous variables was assessed using visual and analytical methods. Chi-square or Fisher's exact test compared categorical groups. Student t-test or Mann-Whitney U test compared independent continuous variables, while paired sample t-test or Wilcoxon test analyzed dependent variables. A p-value $<$ 0.05 was considered statistically significant.

RESULTS

The mean age of the 95 patients included in the study was 65.9 ± 6.4 years (range: 52-83). The basic clinical characteristics of the patients are summarized in Table 1. The preoperative median PSA level was 14.8 ng/mL (range: 0.2-145), and the prostate volume was 55 mL (range: 28-

Table 1.
Baseline patient characteristics.

Characteristics	Total 95 patients *
Age (years)	65.9 \pm 6.4
BMI (kg/m ²)	26.7 \pm 1.7
Comorbidities	
Diabetes mellitus	34 (35.8)
Coronary artery disease	29 (30.5)
Cholelithiasis	7 (7.4)
Artificial mitral valve	6 (6.3)
Asthma	5 (5.3)
Renal stone	4 (4.2)
Heart failure	3 (3.2)
COPD	3 (3.2)
Inguinal hernia	3 (3.2)
Others	12 (12.6)
Smoking	37 (38.9)
Family history of prostate cancer	31 (32.6)

* Findings are presented as n (%) or mean \pm standard deviation.
BMI: Body mass index; COPD: Chronic obstructive pulmonary disease.

Table 2.
Preoperative characteristics.

Characteristics	Total 95 patients *
PSA (ng/mL)	14.8 (0.2-145)
Prostate volume (mL)	55 (28-110)
Lymph node enlargement	28 (29.5)
Needle biopsy results	
ASAP	22 (23.2)
Adenocarcinoma	73 (76.8)
Gleason score	
4 (2+2)	4 (5.5)
5 (2+3)	2 (2.7)
6 (3+3)	33 (45.2)
7 (3+4)	4 (5.5)
7 (4+3)	13 (17.8)
8 (4+4)	16 (21.9)
9 (4+5)	1 (1.4)
Hemoglobin level (g/dL)	14.6 \pm 1.6

* Findings are presented as n (%), mean \pm standard deviation or median (min-max).
ASAP: Atypical small acinar proliferation, PSA: Prostate-specific antigen.

110). Lymph node enlargement was detected on imaging in 28 patients (29.5%). Prostate needle biopsy identified *atypical small acinar proliferation* (ASAP) in 22 patients (23.2%) and prostate adenocarcinoma in 73 patients (76.8%). Among those with prostate adenocarcinoma, the Gleason score on preoperative biopsy was ≤ 6 in 53.4% of cases, 7 in 23.3%, and ≥ 8 in 23.3% (Table 2). Intraoperative parameters and postoperative short-term surgical outcomes are presented in Table 3. One patient

Table 3.
Intraoperative parameters and postoperative surgical outcomes.

Parameters	Total 95 patients *
Anesthesia method	
General	87 (91.6)
Epidural	8 (8.4)
Duration of surgery (min)	160 (120-230)
Intraoperative blood loss (mL)	330 (150-600)
Intraoperative complication	1 (1.1)**
ICU admission	1 (1.1)**
Postoperative hemoglobin level (g/dL)	13.1 \pm 0.9
Postoperative complication	0 (0.0)
Hospital stay (days)	6 (5-14)

* Findings are presented as n (%), mean \pm standard deviation or median (min-max).
** A patient experienced a rectal injury, which was repaired intraoperatively, and was subsequently monitored in the ICU for one day.
ICU: Intensive care unit.

Table 4.
Comparison of baseline and perioperative characteristics of patients with and without a hospital stay of ≥ 1 week.

	Hospital stay *		
	< 7 days (n = 49)	≥ 7 days (n = 46)	
Age (years)	66.6 \pm 6.2	65.1 \pm 6.6	0.267
BMI (kg/m ²)	26.5 \pm 1.5	27.0 \pm 1.8	0.202
Comorbidities			
Diabetes mellitus	12 (24.5)	22 (47.8)	0.018
Coronary artery disease	13 (26.5)	16 (34.8)	0.383
Cholelithiasis	4 (8.2)	3 (6.5)	1.000
Artificial mitral valve	3 (6.1)	3 (6.5)	1.000
Asthma	1 (2.0)	4 (8.7)	0.195
Renal stone	3 (6.1)	1 (2.2)	0.618
Heart failure	1 (2.0)	2 (4.3)	0.609
COPD	2 (4.1)	1 (2.2)	1.000
Inguinal hernia	2 (4.1)	1 (2.2)	1.000
Others	6 (12.2)	6 (13.0)	0.907
Smoking	20 (40.8)	17 (37.0)	0.700
Preoperative hemoglobin level (g/dL)	14.9 \pm 1.8	14.4 \pm 1.4	0.101
Anesthesia method			0.477
General	46 (93.9)	41 (89.1)	
Epidural	3 (6.1)	5 (10.9)	
Duration of surgery (min)	160 (120-220)	160 (130-230)	0.067
Intraoperative blood loss (mL)	310 (150-510)	345 (150-600)	0.004
Intraoperative complication	0 (0.0)	1 (2.2)	0.484
Postoperative hemoglobin level (g/dL)	13.3 \pm 1.0	12.9 \pm 0.8	0.138

* Findings are presented as n (%), mean \pm standard deviation or median (min-max).
BMI: Body mass index; COPD: Chronic obstructive pulmonary disease.

experienced a rectal injury, which was repaired intraoperatively; this patient was monitored in the ICU for one day. No other postoperative complications or deaths occurred. Postoperative hemoglobin levels showed a significant decrease compared to preoperative levels (14.6 \pm 1.6 g/dL vs. 13.1 \pm 0.9 g/dL; $p < 0.001$). The median hospital stay was 6 days (range: 5-14). A comparison between patients with a hospital stay of < 7 days ($n = 49$) and those with a stay of ≥ 7 days ($n = 46$) is shown in Table 4. Patients with a hospital stay of ≥ 7 days had a higher incidence of diabetes mellitus (47.8% vs. 24.5%; $p = 0.018$) and greater median intraoperative blood loss (345 mL [range: 150-600] vs. 310 mL [range: 150-510]; $p = 0.004$). In the postoperative pathological examination, a positive surgical margin was observed in 37 patients (38.9%), and the Gleason score was ≤ 6 in 27.4%, 7 in 55.8%, and ≥ 8 in 16.8% of cases. For patients with a preoperative ASAP diagnosis ($n = 22$), the postoperative Gleason score was ≤ 6 in 63%, 7 in 27.3%, and ≥ 8 in 9.1% (Figure 1). Regarding those with a preoperative Gleason score ≤ 6 , 23.1% remained at ≤ 6 postoperatively; for patients with a preoperative Gleason score of 7, 64.7% retained a score of 7; and for those with a preoperative Gleason score of ≥ 8 , 47.1% remained at ≥ 8 postoperatively (Figure 2).

Figure 1.
Distribution of postoperative Gleason scores among patients initially diagnosed with atypical small acinar proliferation based on preoperative needle biopsy.

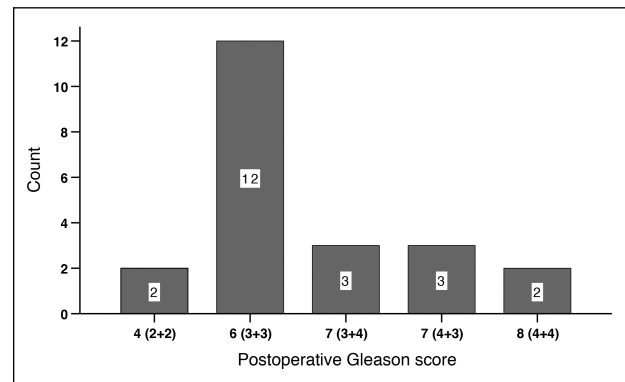
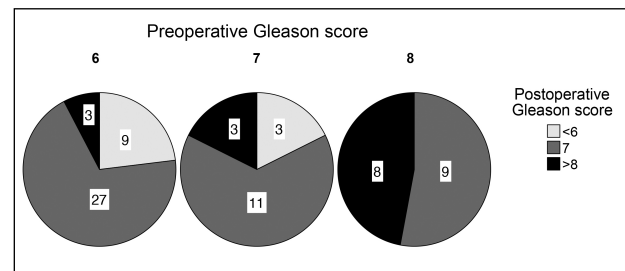


Figure 2.
Comparison of preoperative and postoperative Gleason scores in patients diagnosed with prostate adenocarcinoma via preoperative needle biopsy.



Lymph node metastasis was confirmed in 40.9% of patients with preoperative lymph node enlargement, compared to 6.6% of those without lymph node enlargement ($p < 0.001$). Detailed postoperative pathological outcomes

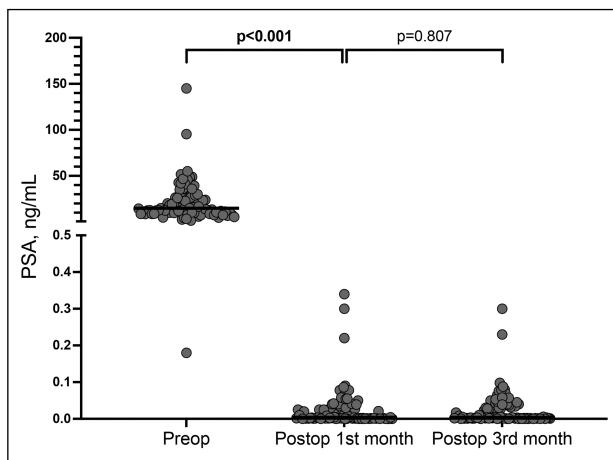
Table 5.
Postoperative pathological outcomes.

Parameters	Total 95 patients *
Surgical margin positivity	37 (38.9)
Proximal	10/37 (27.0)
Distal	12/37 (32.4)
Both	15/37 (40.5)
Gleason score	
4 (2+2)	2 (2.1)
6 (3+3)	24 (25.3)
7 (3+4)	30 (31.6)
7 (4+3)	23 (24.2)
8 (4+4)	7 (7.4)
8 (5+3)	1 (1.1)
9 (4+5)	7 (7.4)
9 (5+4)	1 (1.1)
Lymphovascular invasion	57 (60.0)
Perineural invasion	72 (75.8)
Number of lymph nodes removed	8 (2-15)
Metastatic lymph node	15 (15.8)
Number of metastatic lymph nodes (n = 15)	2 (1-11)

* Findings are presented as n (%) or median (min-max).

are provided in Table 5. The preoperative median PSA level of 14.8 ng/mL (range: 0.2-145) decreased to 0.0030 ng/mL (range: 0.0001-0.34) at the first postoperative month and remained stable at 0.0032 ng/mL (range: 0.0001-0.3) by the third postoperative month (Figure 3). While ED was present in 21.1% of patients before surgery, it was detected in 52.6% of patients 6 months after surgery. Two (2.2%) patient developed urinary incontinence during postoperative follow-up.

Figure 3.
Changes in prostate-specific antigen (PSA) levels measured preoperatively, as well as at the 1st and 3rd months postoperatively.



DISCUSSION

Our study provides a comprehensive analysis of the outcomes of ORP in men with local and locally advanced prostate cancer, offering valuable insights into the experi-

ences of a high-volume center in Azerbaijan. While the adoption of LRP and RALP has grown rapidly worldwide, ORP continues to be a relevant surgical option, especially in settings where advanced technology is not available. Our study showed a median operative time of 160 minutes, comparable to the duration observed in LRP as reported by Çelen *et al.* (6), where experience contributed to reduced operative times. Our study had only one intraoperative complication (1.1%), which involved a rectal injury, consistent with the low complication rates reported in experienced centers performing ORP (7). Studies involving large ORP series have reported that mean intraoperative blood loss can range from 500 mL to over 2 liters (8). This variation is influenced by factors such as the surgical technique, whether nerve-sparing procedures are performed, the surgeon's level of experience, and the duration of the surgery (9). The intraoperative blood loss in our study was 330 mL, which was reported as 372 mL in a 2-year prospective LRP series by Leitao *et al.* (10). This suggests that while minimally invasive techniques offer some perioperative advantages, ORP remains a viable option, particularly when performed by an experienced surgeon. The mean hospital stay for ORP in our cohort was comparable to that reported for minimally invasive techniques in other studies (10). Our analysis revealed that patients with diabetes mellitus and those with higher intraoperative blood loss experienced prolonged hospital stays. Therefore, meticulous perioperative management is essential to minimize complications and optimize recovery following ORP.

The positive surgical margin rate in our study was 38.9%, which is somewhat higher than the 23.7% reported by Çelen *et al.* (6) for LRP but comparable to the rates reported in other ORP studies (3, 7). In comparing ORP outcomes with LRP and RALP, several studies have reported similar oncological results (11, 12). For instance, Ficarra *et al.* (13) found no significant differences in positive surgical margin rates between ORP, LRP, and RALP, suggesting that all three techniques can provide effective cancer control when performed by experienced surgeons. Furthermore, the positive surgical margin rates in our study were comparable to those reported for minimally invasive techniques (14).

This indicates that with adequate surgical expertise, ORP can achieve effective oncologic control, even in the absence of advanced technology.

The median life expectancy after curative treatment for prostate cancer exceeds 10 years (15). As a result, it is vital to optimize long-term functional outcomes to enhance the postoperative quality of life for these men. The most frequent long-term complications following surgery are ED and urinary incontinence, both of which can significantly diminish patients' quality of life. Pompe *et al.* (16) found that the rate of functional erections significantly decreased after ORP. While 78.4% of patients had functional erections at baseline, this dropped to 33.6% at 3 months post-surgery. Gradual improvement was seen, reaching 44.7% at 12 months, 51.1% at 24 months, and 52.6% at 36 months. While 78.9% of our patients described effective erection before the operation, this rate decreased to 47.4% 6 months after the operation. Incontinence is often the most challenging and dis-

trussing complication associated with RP for both patients and clinicians. Studies have reported postoperative continence rates ranging from 80% to 97% in contemporary surgical cases (7). In our series postoperative continence rate was 97.8%.

When considering cost-effectiveness, ORP continues to have an advantage over RALP, particularly in low-resource settings. Therefore, in countries like Azerbaijan, where robotic technology is not yet available, ORP remains an essential, effective, and cost-efficient option. However, to ensure access to modern medical practices, companies offering robot-assisted surgical technologies should actively collaborate with our country. The expanding comprehensive health insurance system aims to enhance patient access to advanced treatments and improve overall health outcomes.

A preoperative diagnosis of ASAP is known to be associated with varying rates of postoperative prostate cancer detection. In one study, 42% of cases with a pathological diagnosis of ASAP were later confirmed to have prostate cancer (17). In another study, among 71 patients diagnosed with ASAP, 25 underwent pelvic bilateral lymphadenectomy and nerve-sparing RP immediately after the diagnosis (18). Remarkably, all 25 were confirmed to have adenocarcinoma in the final pathology, as verified by an independent review pathologist.

In our cohort, 22 patients (23.2%) had preoperative needle biopsy results consistent with ASAP, with the diagnosis confirmed through repeat biopsies. The decision to perform radical prostatectomy in these cases was driven by suspicious rectal exam findings and rising PSA levels. Radical surgery was undertaken after detailed discussions with patients about the potential benefits and risks. Interestingly, all of these cases resulted in a postoperative diagnosis of prostate cancer. In cases where ASAP is detected on biopsy, a comprehensive assessment that includes clinical, laboratory, and radiological findings is crucial. Additionally, treatment decisions should take into account patient preferences, life expectancy, quality of life, and the psychological burden of the diagnosis.

An important point to mention is that more than half of the patients in our cohort diagnosed with prostate cancer through preoperative biopsy had a Gleason score of 6 or lower. However, due to the widespread negative perception of a cancer diagnosis in our society, active surveillance is not commonly accepted. It also lacks sufficient support within the Ministry of Health's regulations. This explains why RP was performed in these patients, despite their low Gleason scores. Furthermore, the *European Association of Urology* (EAU) guidelines for active surveillance are somewhat limited due to the lack of data from prospective randomized controlled trials (19). When deciding between active surveillance and radical surgery, it's crucial to consider the patient's psychosocial status, anxiety levels, and societal views.

CONCLUSIONS

In conclusion, our study provides valuable insights into the outcomes of ORP for prostate cancer in a setting without access to advanced laparoscopic or robotic techniques. The findings underscore the importance of sur-

geon experience in achieving favorable outcomes and demonstrate that ORP remains a viable, effective, and potentially cost-efficient treatment option for prostate cancer.

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