



Research Paper

Outcome of Surgical Castration under Local Anesthesia for the Management of Carcinoma Prostate Patients with Bone Metastasis

- ^{1.} Dr. Siddiquir Rahman, Associate Professor, Department of Urology, Dhaka Medical College, Dhaka, Bangladesh
 - ^{2.} Dr. Sadia Rahman, MS (Urology)course, Phase-B, Dhaka Medical College, Dhaka, Bangladesh.
 - ^{3.} Dr. Dr Shahana Afroze, Director, Department of Urology, Islamic Mission Foundation. Dhaka. Bangladesh.
 - ^{4.} Dr. Asaduzzaman, Associate Professor and Head of Department of Urology, National Institute of Cancer Research and Hospital, Dhaka, Bangladesh
- Corresponding author:** Dr. Siddiquir Rahman, Associate Professor, Department of Urology. Dhaka Medical College, Dhaka, Bangladesh.

Abstract

Background: Prostate cancer is one of the most common malignancies among men worldwide and a leading cause of cancer-related mortality. Bone metastasis occurs frequently in advanced disease and is associated with severe pain, reduced quality of life, and increased morbidity. Bilateral orchiectomy remains an effective form of androgen deprivation therapy, particularly in resource-limited settings. Performing the procedure under local anesthesia may offer additional benefits by minimizing anesthetic-related risks and reducing healthcare costs.

Aim of the study: To evaluate the outcome, safety, feasibility, and patient satisfaction of surgical castration performed under local anesthesia in patients with carcinoma prostate with bone metastasis.

Methods: This cross-sectional analytical study was conducted in the Department of Urology of Dhaka Medical College Hospital in Bangladesh. A total of 45 patients with metastatic carcinoma prostate involving bone were included. Demographic, clinical, operative, and follow-up data were collected using a structured questionnaire. Bilateral orchiectomy was performed under local anesthesia. Outcome measures included operative time, changes in serum prostate-specific antigen (PSA), pain relief assessed by Visual Analogue Scale (VAS), postoperative complications, clinical response, hospital stay, and patient satisfaction. Data were analyzed using SPSS version 26.0, and a p-value <0.05 was considered statistically significant.

Result: The mean age of the patients was 71.4±7.8 years, with most patients (40.0%) aged 70–79 years. Hypertension (48.89%) and diabetes mellitus (33.33%) were the most common comorbidities. The spine was the most frequent site of bone metastasis (68.89%). Mean operative time was 26.8±6.4 minutes. Mean PSA levels decreased significantly from 124.5±68.2 ng/mL preoperatively to 9.8±8.4 ng/mL at 6 months (p<0.001). Similarly, mean VAS pain scores improved significantly from 7.8±1.2 to 2.4±1.0 during follow-up (p<0.001). Postoperative complications were minimal, and 82.22% of patients experienced no complications. At 6 months, 35.56% achieved complete clinical response and 55.56% showed partial response, resulting in an overall favorable response rate of 91.11%. Most patients (84.44%) were discharged on the same day. Patient satisfaction was high, with 46.67% being very satisfied and 35.56% satisfied with the procedure.

Conclusion: Surgical castration under local anesthesia is a safe, effective, and feasible treatment option for patients with metastatic prostate cancer involving bone. The procedure provides significant reduction in PSA levels and pain scores, demonstrates a high favorable response rate, allows early discharge, and achieves excellent patient satisfaction with minimal complications.

Keywords: Prostate cancer, Bone metastasis, Bilateral orchiectomy, Surgical castration, Local anesthesia, Androgen deprivation therapy, PSA, Pain relief.

I. INTRODUCTION

Prostate cancer is one of the most common malignancies affecting men worldwide and represents a major public health concern due to its increasing incidence and substantial disease burden [1]. According to global cancer statistics, approximately 1.5 million new cases of prostate cancer and nearly 397,000 related deaths occur annually, making it the second most frequently diagnosed cancer and one of the leading causes of cancer-related mortality among men worldwide [1]. The growing burden of prostate cancer is largely attributed to demographic changes, particularly population aging and increased life expectancy, whereas enhanced screening and diagnostic practices have improved case detection rates [2]. Metastatic prostate cancer is characterized by the spread of malignant cells beyond the prostate gland, with bone being the most common site of distant metastasis [3]. Skeletal metastases occur in up to 80% of patients with advanced prostate cancer and are associated with severe pain, pathological fractures, spinal cord compression, reduced mobility, impaired quality of life, and increased mortality [4,5]. Bone metastasis is therefore considered a major determinant of morbidity in patients with advanced prostate cancer. The management of metastatic disease primarily aims to relieve symptoms, prevent skeletal-related complications, improve quality of life, and prolong survival [6,7]. The growth and progression of prostate cancer are largely dependent on androgen stimulation, particularly testosterone produced by the testes. Consequently, androgen deprivation therapy (ADT) remains the cornerstone of treatment for hormone-sensitive metastatic prostate cancer [8]. ADT can be achieved either medically through luteinizing hormone-releasing hormone (LHRH) agonists or antagonists, or surgically through bilateral orchiectomy [9]. Both approaches effectively reduce serum testosterone levels to castrate concentrations and provide disease control in the majority of patients with advanced prostate cancer [10]. Bilateral orchiectomy is associated with immediate reduction of circulating testosterone levels, resulting in symptomatic improvement, reduction of bone pain, decreased tumor activity, and improved patient comfort [11]. Furthermore, surgical castration eliminates the need for repeated injections, long-term follow-up for hormonal therapy administration, and the substantial financial burden associated with lifelong medical treatment [12]. Patients with metastatic prostate cancer are typically elderly and frequently have multiple comorbid conditions such as hypertension, diabetes mellitus, ischemic heart disease, chronic kidney disease, and chronic respiratory disorders [13]. These comorbidities may increase the risks associated with general or regional anesthesia. In such circumstances, performing bilateral orchiectomy under local anesthesia offers several important advantages [14]. Local anesthesia minimizes anesthetic-related complications, avoids airway manipulation, allows rapid postoperative recovery, shortens hospital stay, reduces healthcare costs, and can be safely performed even in patients who are poor candidates for general anesthesia. These benefits are particularly relevant in resource-limited healthcare settings where access to specialized anesthetic services may be restricted [15]. Therefore, the present study was undertaken to assess the outcome of surgical castration performed under local anesthesia in patients with carcinoma prostate with bone metastasis. The study aims to evaluate the effectiveness, safety, feasibility, and clinical benefits of this treatment modality in the management of advanced hormone-sensitive metastatic prostate cancer.

II. METHODOLOGY & MATERIALS

The prospective observational study was conducted in the Department of Urology of Dhaka Medical College Hospital in Bangladesh between 1st. January, 2025 to February 2026. The study population consisted of histopathologically confirmed carcinoma prostate patients with radiologically proven bone metastasis who underwent bilateral orchiectomy under local anesthesia. A total of 45 patients were included in the study using purposive sampling according to the selection criteria.

Inclusion Criteria:

- Histopathologically confirmed carcinoma prostate.
- Presence of bone metastasis confirmed by radiological investigations.
- Patients aged 50 years and above.
- Patients considered suitable for bilateral orchiectomy under local anesthesia.

Exclusion Criteria:

- Patients with localized or non-metastatic prostate cancer.
- Patients previously treated with surgical castration.
- Patients receiving hormonal therapy within the previous three months.
- Patients with severe coagulation disorders or active local infection at the operative site.

Ethical Considerations

Ethical clearance was obtained from the Institutional Review Board (IRB) of the concerned institution prior to the initiation of the study. Informed written consent was secured from all participants before enrollment, and the privacy and confidentiality of their information were maintained throughout the study period.

Surgical Procedure

After proper preoperative evaluation and obtaining informed consent, all patients underwent bilateral simple orchiectomy under local anesthesia. The procedure was performed under aseptic conditions in the operating room. Local infiltration anesthesia was administered using 1% lignocaine around the spermatic cord and scrotal incision site. A small scrotal incision was made, and both testes were delivered sequentially. The spermatic cords were ligated and divided, followed by removal of the testes. Hemostasis was ensured, and the incision was closed in layers using absorbable sutures. Patients were monitored postoperatively for immediate complications and were discharged on the same day or after a short hospital stay depending on their clinical condition.

Data Collection

After obtaining informed written consent, data were collected using a predesigned structured data collection form. Sociodemographic and clinical information, including age, residence, occupation, comorbidities, duration of symptoms, Eastern Cooperative Oncology Group (ECOG) performance status, and sites of bone metastasis, were recorded at baseline. All enrolled patients underwent bilateral orchiectomy under local anesthesia following standard aseptic precautions. Operative characteristics, including operative time were documented. Patients were subsequently followed up at 1 month, 3 months, and 6 months after surgery. Serum prostate-specific antigen (PSA) levels were measured preoperatively and at each follow-up visit to assess treatment response. Pain intensity was evaluated using the Visual Analog Scale (VAS). Postoperative complications, duration of hospital stay, and clinical outcomes, including complete response, partial response, and disease progression, were also recorded and analyzed.

Statistical Analysis

Statistical analysis was performed using SPSS version 26.0. Descriptive statistics were used to summarize the data, with continuous variables reported as mean $\pm$ standard deviation and categorical variables reported as frequency and percentage. Changes in PSA levels and VAS scores during follow-up were compared with baseline values using paired t-test. A p-value of less than 0.05 was considered statistically significant.

III. RESULT

A total of 45 patients were included in this study. The mean age of the patients was 71.4 ± 7.8 years, with the majority belonging to the 70–79 years age group (40.0%), followed by 60–69 years (35.56%). Most participants were from rural areas (62.22%), while 37.78% resided in urban settings. Regarding occupation, farmers constituted the largest group (35.56%), followed by businessmen (22.22%), retired individuals (17.78%), service holders (15.56%), and others (8.89%). Hypertension was the most common comorbidity, affecting 48.89% of patients, followed by diabetes mellitus (33.33%), ischemic heart disease (17.78%), COPD (8.89%), and chronic kidney disease (6.67%). Approximately one-quarter of the patients (24.44%) had no documented comorbidity (Table 1). The majority of patients (42.22%) had symptom duration between 6 and 12 months. According to ECOG performance status, nearly half of the participants (46.67%) were classified as Grade 2, followed by Grade 3 (28.89%) and Grade 1 (24.44%). Bone metastases most frequently involved the spine (68.89%), followed by the pelvis (55.56%), ribs (31.11%), and femur (22.22%) (Table 2). The mean operative time was 26.8 ± 6.4 minutes. More than half of the procedures (51.11%) were completed within 21–30 minutes (Table 3). Changes in serum PSA levels and pain scores following surgical castration are presented in Table 4. The mean preoperative PSA level was 124.5 ± 68.2 ng/mL, which declined significantly to 41.3 ± 25.8 ng/mL at 1 month, 16.7 ± 12.1 ng/mL at 3 months, and 9.8 ± 8.4 ng/mL at 6 months after surgery (all $p < 0.001$). Similarly, the mean preoperative Visual Analogue Scale (VAS) pain score of 7.8 ± 1.2 decreased significantly to 4.9 ± 1.4 at 1 month, 3.2 ± 1.1 at 3 months, and 2.4 ± 1.0 at 6 months postoperatively (all $p < 0.001$) (Table 4). The majority of patients (82.22%) experienced no complications. Among those who developed complications, scrotal pain was the most common adverse event (15.56%), followed by scrotal edema (6.67%) (Table 5). Complete clinical response was achieved in 35.56% of patients, while 55.56% demonstrated a partial response. Disease progression was observed in only 8.89% of cases. Overall, a favorable response was achieved in 91.11% of patients. Regarding postoperative hospitalization, most patients (84.44%) were discharged on the same day of surgery, whereas 15.56% required a 24-hour hospital stay (Table 6). Nearly half of the participants (46.67%) reported being very satisfied with the procedure, while 35.56% were satisfied (Figure 1).

Table 1: Baseline characteristics of study participants (n=45)

Variables	Frequency (n)	Percentage (%)
Age (years)		
50–59	5	11.11
60–69	16	35.56
70–79	18	40.00
≥ 80	6	13.33
Mean $\pm$ SD	71.4 ± 7.8	

Residence		
Rural	28	62.22
Urban	17	37.78
Occupation		
Farmer	16	35.56
Businessman	10	22.22
Service holder	7	15.56
Retired	8	17.78
Others	4	8.89
Comorbidity		
Hypertension	22	48.89
Diabetes mellitus	15	33.33
Ischemic heart disease	8	17.78
Chronic kidney disease	3	6.67
COPD	4	8.89
No comorbidity	11	24.44

Table 2: Clinical characteristics of the patients (n=50)

Variables	Frequency (n)	Percentage (%)
Duration of Symptoms (months)		
<6	11	24.44
6–12	19	42.22
>12	15	33.33
ECOG Performance Status		
Grade 1	11	24.44
Grade 2	21	46.67
Grade 3	13	28.89
Site of Bone Metastasis		
Spine	31	68.89
Pelvis	25	55.56
Ribs	14	31.11
Femur	10	22.22

Table 3: Operative characteristics (n=50)

Operative Time (minutes)	Frequency (n)	Percentage (%)
≤20	13	28.89
21–30	23	51.11
>30	9	20.00
Mean ± SD	26.8 ± 6.4	

Table 4: Changes in serum PSA and pain relief following surgical castration (n=50)

Follow-up Period	Mean ± SD	p-value
PSA (ng/mL)		
Preoperative	124.5 ± 68.2	N/A
1 month	41.3 ± 25.8	<0.001
3 months	16.7 ± 12.1	<0.001
6 months	9.8 ± 8.4	<0.001
VAS Score		
Preoperative	7.8 ± 1.2	N/A
1 month	4.9 ± 1.4	<0.001
3 months	3.2 ± 1.1	<0.001
6 months	2.4 ± 1.0	<0.001

Table 5: Postoperative complications among participants (n=50)

Complications	Frequency (n)	Percentage (%)
Scrotal pain	7	15.56
Scrotal edema	3	6.67
Hematoma	2	4.44
Wound infection	2	4.44
Urinary retention	1	2.22
No complications	37	82.22

Table 6: Outcome of surgical castration (n=50)

Outcome at 6-months	Frequency (n)	Percentage (%)
Complete clinical response	16	35.56
Partial response	25	55.56
Disease progression	4	8.89
Overall favorable response	41	91.11

Hospital Stay		
Same-day discharge	38	84.44
24-hour stay	7	15.56

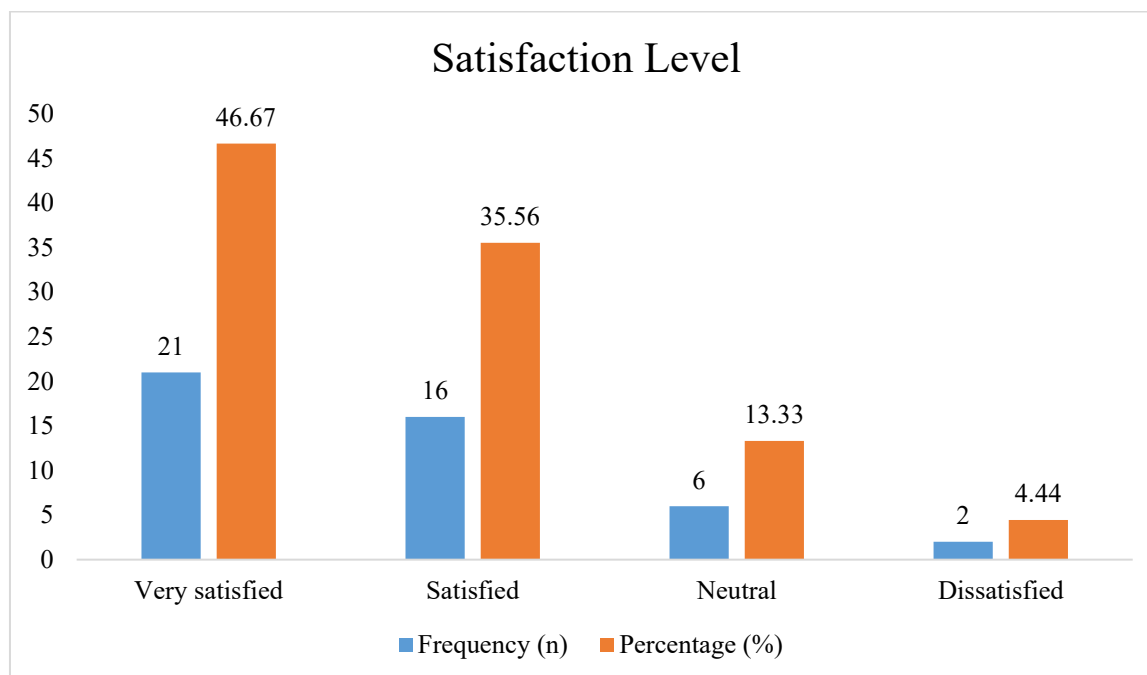


Figure 1: Patient satisfaction with procedure under local anesthesia (n=50)

IV. DISCUSSION

Carcinoma of the prostate is one of the most common malignancies among elderly men, and a substantial proportion of patients in developing countries present at an advanced stage with bone metastasis, resulting in significant morbidity, pain, reduced quality of life, and increased healthcare burden [16]. The present study evaluated the outcomes of bilateral surgical castration performed under local anesthesia in patients with metastatic carcinoma prostate with bone metastasis. The mean age of the study population was 71.4 ± 7.8 years, with the majority of patients (75.56%) aged 60 years or above. This finding is consistent with the established epidemiology of prostate cancer, which predominantly affects older men. Similar studies on metastatic prostate cancer have reported median ages ranging from 67 to 79 years among patients undergoing androgen deprivation therapy or surgical orchiectomy [17]. The predominance of elderly patients in the present study reflects the age-related increase in prostate cancer incidence and progression. Most participants were from rural areas (62.22%), and farmers constituted the largest occupational group (35.56%). This demographic pattern may reflect delayed healthcare-seeking behavior, limited access to specialized urological services, and lower awareness regarding prostate cancer screening in rural populations. Consequently, many patients present with advanced disease and metastatic complications, particularly skeletal involvement [18]. Hypertension (48.89%) and diabetes mellitus (33.33%) were the most common comorbid conditions observed in this study. Advanced prostate cancer patients are typically elderly and frequently have multiple chronic illnesses. The presence of these comorbidities may increase the risks associated with general or regional anesthesia, making local anesthesia an attractive alternative. The successful use of local anesthesia in the present series highlights its suitability for high-risk patients who may not tolerate more extensive anesthetic techniques [19,20]. Regarding disease characteristics, most patients had symptoms for 6 months before diagnosis, and nearly half exhibited ECOG Grade 2 performance status. Bone metastases were most commonly located in the spine (68.89%), followed by the pelvis (55.56%). These findings are in agreement with previous reports indicating that the axial skeleton, particularly the vertebral column and pelvis, represents the most frequent site of metastatic spread in advanced prostate cancer because of its rich venous plexus and bone marrow environment [21,22]. One of the notable findings of the study was the short operative duration. The mean operative time was only 26.8 ± 6.4 minutes, and more than half of the procedures were completed within 21–30 minutes. Earlier studies have similarly reported that bilateral orchiectomy under local anesthesia is a simple and rapid procedure that can often be performed in an outpatient setting. Bapat et al. described subcapsular orchiectomy under local anesthesia as a straightforward, effective, and well-tolerated technique, while other investigators have emphasized its feasibility as a day-care procedure [23]. The relatively short operative time observed in the present study further supports its practicality and efficiency. The most important outcome of the present study was the significant reduction in serum PSA levels following surgical

castration. Mean PSA decreased from 124.5 ± 68.2 ng/mL preoperatively to 41.3 ± 25.8 ng/mL at one month, 16.7 ± 12.1 ng/mL at three months, and 9.8 ± 8.4 ng/mL at six months ($p < 0.001$ for all comparisons). PSA is a well-recognized surrogate marker of tumor activity in prostate cancer, and its marked decline reflects effective androgen deprivation and disease control. Previous studies have consistently demonstrated substantial reductions in PSA levels following bilateral orchiectomy, confirming its effectiveness in achieving rapid hormonal suppression and disease response [17]. Pain relief was another major benefit observed in this study. The mean VAS score decreased significantly from 7.8 ± 1.2 preoperatively to 2.4 ± 1.0 at six months. Bone metastasis is one of the leading causes of morbidity in advanced prostate cancer, often resulting in severe pain and impaired quality of life. The observed reduction in pain scores likely reflects the beneficial effect of androgen deprivation on metastatic tumor burden. Improvement in skeletal pain following orchiectomy has been reported in previous studies and remains an important indicator of clinical response among patients with metastatic disease [6]. The postoperative complication rate was low. More than four-fifths of the patients (82.22%) experienced no complications. Scrotal pain was the most frequent adverse event (15.56%), followed by scrotal edema (6.67%), while hematoma and wound infection occurred in only 4.44% each. No life-threatening complications were encountered. Similar studies have reported low complication rates following orchiectomy, with overall surgical complications ranging from 3% to 10% [24]. The findings of the present study therefore reinforce the safety profile of the procedure when performed under local anesthesia. Clinical outcomes at six months were highly encouraging. Complete clinical response was achieved in 35.56% of patients, while 55.56% demonstrated partial response, resulting in an overall favorable response rate of 91.11%. Disease progression was observed in only 8.89% of cases. These findings suggest that surgical castration remains an effective modality for controlling advanced prostate cancer. Contemporary evidence indicates that surgical castration provides oncological outcomes comparable to medical androgen deprivation therapy while offering advantages in terms of cost-effectiveness and treatment compliance [17]. An additional strength of the present study was the short hospital stay. Most patients (84.44%) were discharged on the same day of surgery, and the remaining patients required only a 24-hour stay. Earlier studies have similarly shown that orchiectomy under local anesthesia can be performed safely in an outpatient setting with rapid postoperative recovery [25]. Reduced hospitalization not only improves patient convenience but also decreases healthcare costs and resource utilization. Patient satisfaction was remarkably high, with 46.67% reporting being very satisfied and 35.56% satisfied with the procedure. Overall satisfaction exceeded 80%. These findings are consistent with previous reports demonstrating favorable patient acceptance of orchiectomy performed under local anesthesia. Studies evaluating outpatient orchiectomy have reported high satisfaction levels owing to reduced perioperative discomfort, shorter recovery periods, and avoidance of general anesthesia [24].

Limitations of the study:

- The study lacked a comparison or control group, making it difficult to directly compare the effectiveness and safety of surgical castration with alternative treatment modalities.
- Clinical response was evaluated primarily through PSA levels, pain scores, and short-term clinical outcomes, without detailed assessment of quality of life.

V. CONCLUSION AND RECOMMENDATIONS

This study demonstrates that bilateral surgical castration performed under local anesthesia is a safe, effective, and feasible treatment option for patients with metastatic carcinoma prostate involving bone metastasis. The procedure was associated with significant reductions in serum PSA levels and pain scores during follow-up, a high rate of favorable clinical response, minimal postoperative complications, short hospital stay, and high patient satisfaction. Given its simplicity, low cost, and favorable safety profile, surgical castration under local anesthesia may serve as an important treatment modality, particularly in resource-limited settings. Further multicenter studies with larger sample sizes and longer follow-up periods are recommended to validate these findings and evaluate long-term outcomes.

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