

Bilateral Subcapsular Orchidectomy as Surgical Castration: A Reasonable Aesthetic Alternative to Bilateral Total Orchidectomy in Patients with Metastatic Hormone-sensitive Prostate Cancer

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DOI: [10.36348/sjimps.2024.v10i01.008](https://doi.org/10.36348/sjimps.2024.v10i01.008)

| Received: 11.12.2023 | Accepted: 16.01.2024 | Published: 23.01.2024

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Abstract

Background: The study highlights the historical significance of bilateral orchidectomy as the traditional 'gold standard' for surgical androgen deprivation in treating advanced prostate cancer. The study presented aims to compare total orchidectomy and subcapsular orchidectomy, considering factors such as androgen ablation, disease progression control, and patient satisfaction. **Objective:** This study aims to compare the effectiveness and patient satisfaction of bilateral subcapsular orchidectomy and bilateral total orchidectomy treatment in managing hormone-sensitive metastatic prostate cancer. **Methods and materials:** In this prospective study of 18 months at North East Medical College Hospital, 40 participants with Metastatic Carcinoma of Prostate underwent bilateral orchidectomy, among them 20 subcapsular and 20 total orchidectomy. The research focused on evaluating the impact of these treatments on serum testosterone levels, serum PSA levels, employing as outpatient procedures and a 3-month follow-up, utilizing a satisfaction scoring scale. Data, including age, Gleason Grade Group, PSA, and testosterone levels at diagnosis & at 3-month follow-up were recorded and analyzed using IBM SPSS-21 software. **Result:** The study compared Bilateral Subcapsular Orchidectomy and Bilateral Simple Orchidectomy for Hormone-Sensitive Metastatic Carcinoma of Prostate in 40 patients. The highest frequency was in the 71-75 age group (30%), with a mean age of 66.67 ± 2.21 years. Gleason grade group 3 dominated (40%), followed by 2 (25%). Pre-operative PSA levels were 31.14 ± 1.27 ng/ml for Subcapsular and 35.21 ± 1.70 ng/ml for Total Orchidectomy, decreasing post-operatively to 8.25 ± 0.41 ng/ml and 7.32 ± 0.80 ng/ml, respectively. Pre-operative testosterone levels were 513.21 ± 3.01 ng/dl for Subcapsular and 498.40 ± 2.10 ng/dl for Total Orchidectomy, decreasing post-operatively to 21.14 ± 2.84 ng/dl and 16.90 ± 1.08 ng/dl, respectively, with non-significant p-values. Surgery related Satisfaction scores in the Follow-Up phase were significantly higher for Subcapsular Orchidectomy, 2.91 ± 0.31 comparing with Total Orchidectomy, 2.05 ± 0.45 . The results emphasize better patient satisfaction after subcapsular orchidectomy, while maintaining similar cancer control in the form of PSA and testosterone level changes. **Conclusion:** In conclusion, our study advocates for the reconsideration of bilateral subcapsular orchidectomy as a preferred method for surgical androgen ablation in metastatic prostatic carcinoma, offering comparable efficacy to traditional total orchidectomy approach while prioritizing patient satisfaction and psychological well-being. This suggests a potential paradigm shift in the landscape of cost-effective androgen deprivation therapy within the urological field.

Keywords: Bilateral orchidectomy, androgen deprivation therapy, subcapsular orchidectomy metastatic prostate cancer.

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INTRODUCTION

The traditional 'gold standard' for surgical androgen deprivation is bilateral total orchidectomy. This uncomplicated surgical procedure can be performed

efficiently, and it is even feasible under local anesthesia [1]. Patients with symptomatic metastasis show significant improvement after bilateral orchidectomy [2]. As the growth of prostate cancer is maintained by

Citation: Mohammad Hasibul Islam, N I Bhuiyan, Md. Abdullah Al Mamun, Ranen Biswas, Tasnim Alam Manzer, Md. Sayeef Ullah Sujan (2024). Bilateral Subcapsular Orchidectomy as Surgical Castration: A Reasonable Aesthetic Alternative to Bilateral Total Orchidectomy in Patients with Metastatic Hormone-sensitive Prostate Cancer. *Saudi J Med Pharm Sci*, 10(1): 47-52.

testosterone, the management of metastatic prostate cancer has witnessed a substantial response to androgen deprivation. Ever since the pivotal work of Huggins and Hodges in 1941, demonstrating the beneficial impact of androgen deprivation through surgical castration or estrogen administration on the progression of metastatic prostate cancer, androgen-deprivation therapy (ADT) has consistently served as the cornerstone in the treatment of advanced prostate cancer up to the present day. In current era, this can be achieved by medical castration using LHRH agonist or surgical castration by removing testosterone-producing tissues of testes [3]. Either method of castration can be added with oral antiandrogen for complete androgen blockage. Though costly LHRH agonists are widely used in the modern world for metastatic carcinoma of the prostate because of non-invasiveness, body contour maintenance, and also pharmaceutical company's widespread marketing; it can cause "flare phenomenon", drug-related side effects; whereas bilateral orchidectomy remains a valid alternative for lower and middle-class candidates for its cost-effectiveness, quick response and avoidance of drug adverse effects [4]. The subcapsular orchidectomy serves as one of the methods for androgen ablation and controlling disease progression in individuals with advanced prostatic carcinoma. This procedure is designed to achieve the same therapeutic goals while concurrently preserving the cosmetic appearance of the scrotum, thus elevating patient psychology as an alternative of total orchidectomy [5]. In this current study, we have undertaken a comparison between bilateral total orchidectomy and bilateral subcapsular orchidectomy, evaluating serum testosterone level as the extent of hormonal deprivation, serum PSA level as cancer control status, and patient satisfaction level as psychological acceptance.

METHOD AND MATERIALS

A total of 40 participants diagnosed with Metastatic Carcinoma of Prostate were included in this prospective comparative study conducted at North East Medical College Hospital, Sylhet, over the period from April 2022 to September 2023, spanning 18 months. We divided patients into two groups: 20 patients were allocated in each group using odd-even serial. The eligible participants with odd serial underwent total orchidectomy and with even serial, subcapsular orchidectomy, as mainstay of their hormone-sensitive metastatic prostate cancer management. The study specifically focused on evaluating the impact of these treatments on Serum Testosterone levels and Serum PSA levels. Pre-operative assessments of serum PSA and serum testosterone were conducted for each patient.

Bilateral orchidectomy procedures were conducted under local anesthesia, achieved through skin

infiltration with 2% xylocaine. The spermatic cord received local anesthetic infiltration just below the external ring of the inguinal canal. In the operating theater, patients in supine position, scrotum was opened by a scrotal median raphe incision, exposing the testis and the spermatic cord on one side initially. For total orchidectomy, the spermatic cord was divided through avascular planes, followed by removal of the testis and distal spermatic cord. The remaining pedicles were secured with vicryl 2 sutures. In case of subcapsular orchidectomy, a vertical incision was made along the free border of the tunica albuginea of the testis, revealing inner testicular parenchyma, primarily composed of Leydig cells and seminiferous tubules. The testicular parenchymal tissue was dissected from the inner wall of the tunica albuginea, and separated at the testicular hilum by diathermy. Any residual tissue on the inner side of the tunica albuginea was carefully removed, along with hemostasis with diathermy. The capsule was subsequently sutured back with a continuous 3-0 vicryl. The procedure (total or subcapsular orchidectomy) was then replicated on the other side through the same skin incision, and then scrotal wall was closed in 2 layers using 3-0 vicryl including scrotal skin. Then local dressing with coconut pressure bandage, and a scrotal support was applied.

Data of age, Gleason Grade Group of prostate biopsy, serum PSA and testosterone level before both types of orchidectomy were recorded. During the 3-month follow-up, patients were requested to rate their satisfaction level specifically about the surgery with a scale of 1–5 using a simple, well-understandable satisfaction level scale with facial expression emoji(s), where 1 indicates very poor satisfaction or gross dissatisfaction, 2 stands for poor satisfaction or dissatisfaction, 3 for average satisfaction, 4 for good, and 5 for excellent satisfaction. This conversion allows for a more streamlined and consistent approach to assessing aesthetic satisfaction in alignment with the satisfaction score scale provided (Figure 1). Additionally, measurements of PSA and testosterone levels were documented at the third month, coinciding with the administration of the questionnaire. According to the guidelines set forth by the European Association of Urology, irrespective of the specific methods employed for androgen deprivation therapy, the definition of castrate level of testosterone for metastatic prostate cancer remains consistent, which is <20 ng/dL. Quantitative or continuous data was presented with mean and standard deviation and qualitative data or categorical data was presented with as proportions or frequency. Categorical variables were analyzed using the χ^2 and Fisher's exact tests, as applicable. Parametric paired and unpaired continuous data was analyzed using paired and unpaired t-tests, respectively. All analyses were done using the IBM SPSS-21 software package.



Fig 1: Post-operative Surgery related Satisfaction Score scale

Inclusion and Exclusion: Patients with biopsy proven prostate cancer and features of metastatic disease opting for bilateral orchidectomy were recruited into the study from the Urology and Oncology OPD and Wards, with the diagnosis of advanced disease made on clinical (evidence of local advancement on rectal examination and clinical features of metastases), biochemical (prostate-specific antigen [PSA] level) and radiologic

grounds (in chest X-ray and whole body bone scan). Patients excluded from the study were those underwent TURP, those on 5 α -reductase inhibitors and those that were already on any other form of androgen deprivation therapy before opting for orchidectomy.

RESULT

Table1: Demographical data of patients. (n=40)

Age	Frequency	Percentages
51-55	3	7.5%
56-60	4	10%
61-65	7	17.5%
66-70	5	12.5%
71-75	12	30%
76-80	9	22.5%
Mean \pm SD	66.67 \pm 2.21	

Table 1 displays the demographical characteristics of 40 patients enrolled in the study comparing Bilateral Subcapsular Orchidectomy and Bilateral Simple Orchidectomy for Hormone-Sensitive Metastatic Ca-Prostate. The age distribution is presented

in five-year intervals, revealing a diverse range with the highest frequency observed in the 71-75 age group (30%). The mean age \pm standard deviation (SD) is 66.67 \pm 2.21 years.

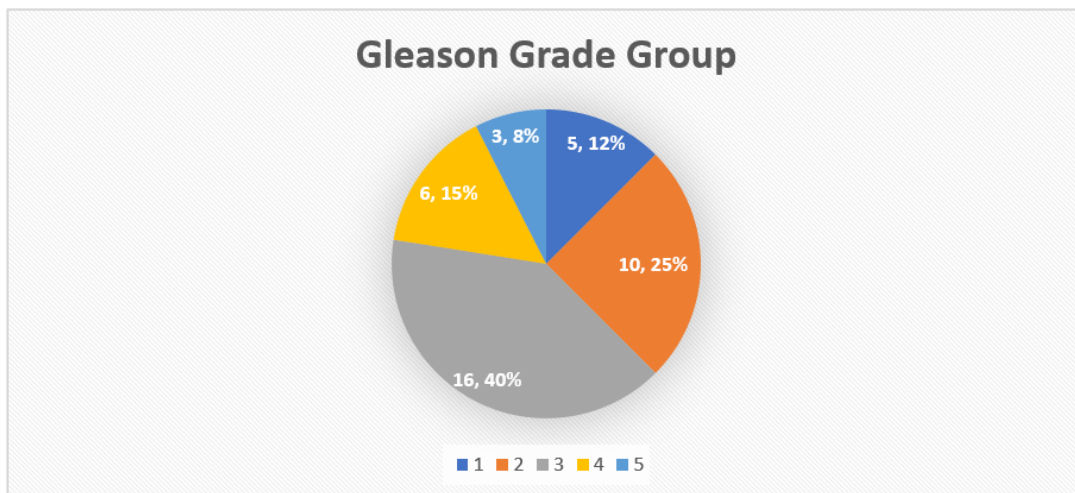


Fig 2: Distribution of Gleason Grade Group in Hormone-Sensitive Metastatic Ca-Prostate Patients (n=40)

Figure 2 presents the distribution of Gleason grade group among patients with Hormone-Sensitive Metastatic Ca-Prostate. The Gleason grading system categorizes the aggressiveness of prostate cancer based on histological examination, from which grade group

was created according to European Association of Urology (EAU) guideline. In this cohort, Gleason grade group 3 dominates with 40.0%, followed by 2 with 25.0%, 4 with 15.0%, and 1 with 12.0% and 5 with 8.0%.

Table 2: Serum PSA values (ng/ml)

Category	Subcapsular	Total Orchidectomy	P value
Pre-operative	8.3- >100	10.9- >100	0.112
Mean±SD	31.14±1.27	35.21±1.70	
Post-operative	3.7-19.3	2.9-22.6	0.111
Mean±SD	8.25±0.41	7.32±0.80	

Table 2 presents serum PSA values (ng/ml) in two categories: Pre-operative and Post-operative, for both Subcapsular and Total Orchidectomy procedures. In the Pre-operative stage, the Subcapsular procedure exhibits a range of 8.3- to >100, with a mean±SD of 31.14±1.27, while the Total Orchidectomy procedure shows a range of 10.9- to >100, with a mean±SD of

35.21±1.70. The associated P value is 0.112. Post-operatively, the Subcapsular procedure displays a range of 3.7 to 19.3, mean±SD of 8.25±0.41, and a P value of 0.111. For the Total Orchidectomy procedure, the range is 2.9 to 22.6, mean±SD is 7.32±0.80, and the P value is 0.111.

Table 3: Serum testosterone values (ng/dl)

Category	Subcapsular (n=20)	Total Orchidectomy(n=20)	P-Value
Pre-operative	274.2-968.5	238.3-896.4	0.101
Mean±SD	513.21±3.01	498.40±2.10	
Post-operative	13.4-38.7	11.3-31.0	0.131
Mean±SD	21.14±2.84	16.90±1.08	

Table 3 present serum testosterone values (ng/dl) for two categories: Pre-operative and Post-operative, comparing Subcapsular and Total Orchidectomy procedures. In the Pre-operative stage, the Subcapsular procedure shows a range of 274.2 to 968.5, mean±SD of 513.21±3.01, while the Total Orchidectomy procedure exhibits a range of 238.3 to 896.4, mean±SD

of 498.40±2.10. The associated P value is 0.101. Post-operatively, the Subcapsular procedure displays a range of 13.4 to 38.7, mean±SD of 21.14±2.84, and the Total Orchidectomy procedure ranges from 11.3 to 31.0, with mean±SD of 16.90±1.08. P value for post-operative comparison is 0.131.

Table 4: Satisfaction score (scale of 1–5)

	Subcapsular (n=20)	Total Orchidectomy(n=20)	P-Value
Follow Up	3-5	1-4	0.01
Mean±SD	2.91±0.31	2.05±0.45	

Table 4 presents Satisfaction scores on a scale of 1 to 5 for two categories: Subcapsular and Total Orchidectomy, each with a sample size of 20. The scores are reported specifically for the follow-up at 3-months. In this context, individuals who underwent the Subcapsular procedure reported a mean satisfaction score of 2.91±0.31, while those who underwent Total Orchidectomy reported a lower mean satisfaction score of 2.05±0.45 with a significant p-value of 0.01.

DISCUSSION

For advanced prostatic carcinoma, palliative hormone therapy, specifically androgen ablation, stands out as the optimal treatment choice. Medical castration causes long-term regular financial burden to patients' families due to high cost especially in other than the western world, where medical insurance is not widely available and people mostly live in a low or mid-socio-economic condition, whereas orchidectomy comes as a rescuer with one-time expenditure. But though bilateral orchidectomy, a long-established method of surgical castration, has traditionally offered effective hormonal ablation for patients with advanced prostatic carcinoma, contemporary trends reveal a departure from this

procedure due to concerns related to compromised aesthetics and the adverse psychological impact arising from an empty scrotum [6]. Our study was designed to compare the similarity of bilateral subcapsular orchidectomy with total orchidectomy in degree of androgen deprivation along with the patient's psychological acceptance of that specific procedure. In our study, the age distribution is presented in five-year intervals, revealing a diverse range with the highest frequency observed in the 71-75 age group (30%). The mean age ± standard deviation (SD) is 66.67±2.21 years. The Gleason grading system categorizes the aggressiveness of prostate cancer based on microscopic examination. Gleason grade groups were created from Gleason score and by categorizing Gleason grade according to EAU guidelines. In this cohort, Gleason grade group 3 dominates with 40.0%, followed by 2 with 25.0%, 4 with 15.0%, and 1 with 12.0% and 5 with 8%. In the Pre-operative phase, the mean PSA levels were 31.14±1.27 ng/ml for subcapsular and 35.21±1.70 ng/ml for total orchidectomy, with a p-value of 0.112, which signify similar cancer progression in both groups. In the Post-operative phase, the mean PSA levels decreased statistically similarly in both groups to 8.25±0.41 ng/ml for subcapsular and 7.32±0.80 ng/ml for total

orchidectomy, and the P-value is 0.111. In current study, in the Pre-operative phase, the mean testosterone levels were 513.21 ± 3.01 ng/dl for subcapsular and 498.40 ± 2.10 ng/dl for total orchidectomy, with a non-significant p-value of 0.101. In post-operative state, the mean testosterone levels dropped to 21.14 ± 2.84 ng/dl for subcapsular and 16.90 ± 1.08 ng/dl for total orchidectomy, and the p-value remained non-significant at 0.131, indicating though subcapsular orchidectomy arm has slightly but insignificantly higher post-orchidectomy testosterone level, statistically it is parallelly effective as total orchidectomy in hormonal ablation. In a study, it was reported that, the median testosterone level following bilateral orchidectomy was 15 ng/dl. They defined a castrate level as < 20 ng/dl (1 nmol/L), which was been traditionally < 50 ng/dl [7]. In our study, all patients in both groups fulfilled the traditional definition, but few failed to achieve below 20 ng/dl at 3-month postoperative follow-up. This would be further reduced by a longer follow-up or adding antiandrogens (testosterone receptor blocking medication), which is widely practiced. In another study, the initial study to document the testosterone levels in 40 patients with prostate cancer who underwent bilateral orchidectomy utilized a radioimmunoassay technique. The researchers discovered median total serum testosterone values of 21 ng/dl and 16 ng/dl at one month and one-year post-orchidectomy, respectively [8]. Another study shows, in the 2001 edition of the prostate cancer guidelines, the NCCN suggested contemplating orchidectomy or incorporating an oral antiandrogen when a patient's serum testosterone level reached 120 ng/dl while undergoing LHRH agonist monotherapy [9]. We validate the observations made by others, indicating that postoperative testosterone levels exhibit similarity following both total and subcapsular orchidectomy with exception in some studies [10-13]. Post traumatic stress disorder (PTSD), a psychological disturbance, typically manifests within three months of a traumatic event, often persisting for more than a month and, in some cases, subsiding after several years. The diagnosis of cancer, undergoing severe morbid surgeries, loss of organs, adjuvant chemotherapies or radiotherapies, disturbances in body image due to treatments, and the persistent fear of cancer recurrence or progression during outpatient clinic visits can induce enduring trauma for patients [14]. Different types of scoring systems are available to evaluate psychological trauma caused by surgery, also by any organ amputation. But instead of those complex systems, an easily understandable emoji included simple scoring systems were used in this study to compare patients' satisfaction levels directly related to specific surgery by questionnaire for both categories of orchidectomy as assessment of psychological impact of empty scrotum or something present in scrotum by scoring between 1-5, where 5 is excellent satisfaction. In current research, in the subcapsular group, the mean Satisfaction Score was 2.91 ± 0.31 , with a range of 3-5, whereas in the total orchidectomy group, the mean Satisfaction Score was 2.05 ± 0.45 , with a range from 1 to

4. The p-value associated with this comparison is 0.01, statistically significant. This clearly state that, participants aesthetically accepted subcapsular orchidectomy better because of presence of testis like feel within scrotum instead of an empty bag. There was noticeably none was dissatisfied (score 1 or 2) after subcapsular orchidectomy. A study also utilized similar satisfaction scoring system, showed better satisfaction in subepididymal & subcapsular orchidectomy than total orchidectomy with score of 4.0, 2.7 & 1.8, respectively [6]. A study analyzed and compared health related quality of life, phantom testis syndrome (PTS) & PTSD and also concluded subcapsular orchidectomy produce less psychological side effects than total orchidectomy and similar to LHRH agonist [15]. But one study used different types of Quality of life scoring system, didn't find any difference [5]. Though this concern is much more evident in young male, as a different study shows that PTS was detected in 12.3% of men, with a mean age of 28, who underwent ipsilateral inguinal orchidectomy [16]. A similar study observed PTS in 53% of the patients with a mean age of 35.2 ± 9.3 [17]. Attempts have been made to enhance testis volume through the utilization of autologous tunica vaginalis grafts in conjunction with subcapsular orchidectomy. However, this approach has proven to be labor-intensive and linked with suboptimal patient satisfaction [18]. To give an acceptable good volume to scrotum, another modification has been evolved, named subepididymal orchidectomy, which is claimed to do better cancer control in their study than subcapsular orchidectomy [6]. Alternative techniques include the use of intracapsular fibrofatty tissue grafts, polytetrafluoroethylene paste, or testicular prostheses to mimic the natural appearance of the testis [19-21]. Each modification has its own benefits and drawbacks. At the end, this study successfully presented the bilateral subcapsular orchidectomy as good valid alternative of total orchidectomy without compromising oncological principles.

CONCLUSION

Based on the findings of our prospective randomized study, we assert that bilateral subcapsular orchidectomy is equally effective as bilateral total orchidectomy in achieving castration, demonstrating a notable advantage in securing the highest patient satisfaction and acceptance while mitigating the adverse psychological impact associated with an empty scrotum. This is also a single-time surgical alternative of hormone therapy, thus minimising financial burden. Consequently, we advocate for a timely reassessment within the urological community, urging a shift from the conventional total orchidectomy procedure as the gold standard for surgical androgen deprivation therapy. Instead, we propose the consideration of bilateral subcapsular orchidectomy as a preferable method to attain androgen ablation in metastatic prostatic carcinoma, emphasizing both clinical efficacy and enhanced patient well-being.

Limitations of the study: The study's limitations include the relatively small sample size of 40 participants and the restriction to a single medical center. This is not a randomized controlled trial (RCT). Other alternative methods of hormonal ablation were not compared. Additionally, the study does not explore long-term outcomes beyond the 3-month follow-up period, warranting further research to establish the sustained effectiveness and patient satisfaction associated with different treatment modalities.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethical Committee.

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