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Original Research Article

A prospective comparative study of intravesical chemotherapy versus immunotherapy in non-muscle invasive bladder cancer

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ABSTRACT

Background: Non-muscle invasive bladder cancer (NMIBC) constitutes a significant proportion of urothelial malignancies. The optimal choice between intravesical chemotherapy and immunotherapy remains debatable, particularly regarding efficacy and recurrence rates. To prospectively compare the efficacy of intravesical chemotherapy and immunotherapy in NMIBC patients in terms of recurrence, progression, and therapy-related complications.
Methods: A randomized controlled trial was conducted on 56 NMIBC patients from March 2023 to March 2025 at GSVM Medical College, Kanpur. Patients were assigned to either intravesical chemotherapy (Arm A: Gemcitabine/Mitomycin C) or immunotherapy (Arm B: Bacillus Calmette-Guérin–BCG). They were followed for 9 months with regular cystoscopic evaluation. Clinical outcomes including recurrence and complications were analyzed.
Results: Recurrence was significantly lower in the immunotherapy group compared to chemotherapy ($p<0.001$). Histological subtype and tumor stage correlated with recurrence. Most recurrences occurred after 9 months. The immunotherapy group also showed a higher rate of bladder irritation and LUTS.
Conclusion: Intravesical BCG immunotherapy is superior in reducing recurrence compared to chemotherapy in NMIBC, although it is associated with increased local side effects. Larger, multicenter studies with extended follow-up are warranted.

Keywords: Non-muscle invasive bladder cancer, BCG, Gemcitabine, Mitomycin C, Intravesical therapy, Recurrence

INTRODUCTION

Bladder cancer is the 10th most common cancer worldwide, with non-muscle invasive bladder cancer (NMIBC) accounting for approximately 75% of newly diagnosed urothelial carcinomas.[1,2] While transurethral resection of bladder tumor (TURBT) remains the standard initial treatment, recurrence rates are high, necessitating adjuvant intravesical therapy.[3]

Among these, intravesical Bacillus Calmette-Guérin (BCG) immunotherapy and chemotherapeutic agents such as Gemcitabine and Mitomycin C have been widely used.[4] This study aims to compare their efficacy in preventing recurrence and progression in patients with NMIBC.

METHODS

Study design

The study was prospective randomized controlled trial.

Study place

The study was done at GSVM Medical College & JK Cancer Institute, Kanpur.

Study duration

The study period was from March 2024–March 2025.

Ethics approval

Ethics committee approval was granted on 16/01/2024 with reference number EC/BMHR/2024/42.

Participants

56 patients, aged >18 years with biopsy-confirmed NMIBC (Ta/T1±CIS) were enrolled after ethical clearance and informed consent.

Statistical analysis

The statistical analysis of all results was performed using SPSS version 23 and the outcomes are given below.

Exclusion criteria

Patients with muscle-invasive disease or lympho-vascular space invasion or micro papillary disease, those receiving systemic therapy for carcinoma bladder or are on current or prior pelvic radiotherapy within five years. Pregnant or lactating females or refusing to contraception, those symptomatic urinary tract infections or bacterial cystitis. Patients with metastatic carcinoma bladder or with deranged liver or kidney function tests and with history of malignancy of any other organ systems within five years

Patients who cannot hold instillation for more than one hour (overactive bladder). Patients who cannot tolerate intravesical dosing or surgical treatment. All were excluded from the study.

Interventions

Arm A (chemotherapy)

Intravesical Gemcitabine (two grams in 50 ml) or Mitomycin C weekly for eight weeks, then every three months for up to one year.

Arm B (immunotherapy)

Intravesical BCG 50 mg in 50 ml of sterile saline instilled into a bladder through a catheter and held for two hours; done weekly for six weeks (induction) and maintenance on a three-weekly course, very six months for 2 years.

Follow-up & outcomes

Cystoscopy was performed at three, six and nine months to assess recurrence, progression or complications. Adverse events were recorded using standardized reporting.

RESULTS

Demographics & baseline data

Mean age

45.91 years (SD ±12.17); 73.2% male.

Most common stage

Ta (53.5%).

Predominant histology

Papillary urothelial carcinoma (58.9%), with most common location being the trigone (Table 2)

Treatment allocation

Gemcitabine: 24 patients, Mitomycin C: 17 patients, BCG: 15 patients

Recurrence

No recurrence at 3 or 6 months in either group (Cystoscopy findings-Figure 2). At 9 months: 18 patients had recurrence-13 in the chemotherapy group, 5 in the immunotherapy group. Recurrence was significantly lower in BCG-treated patients ($p<0.001$) (Table 3).

Complications

BCG group had more cases of dysuria, cystitis-like symptoms, and mild fever. Chemotherapy group had fewer side effects, mostly limited to transient hematuria and local irritation. This multivariate analysis indicates that, even after adjusting for age, tumour stage and histopathological type, the treatment modality remains a significant predictor of recurrence. In particular, immunotherapy with BCG is associated with dramatically lower odds of recurrence compared to chemotherapy. Additionally, older age and having squamous cell carcinoma appear to increase the risk of recurrence.

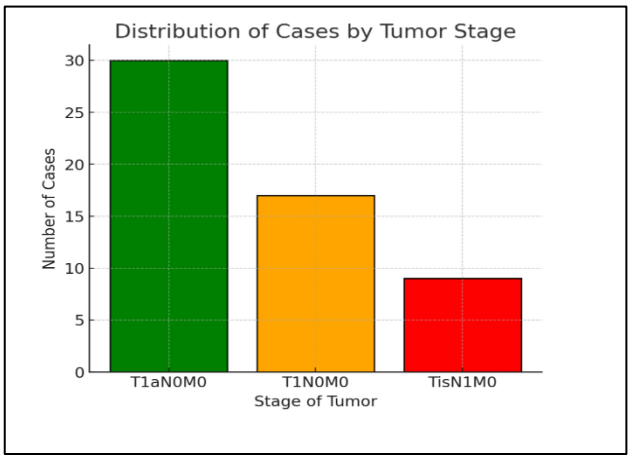

Figure 1: Distribution of cases by tumour stage.

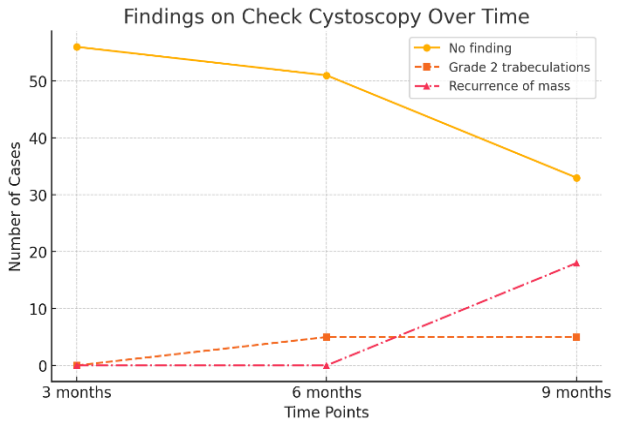

Figure 2: Check cystoscopy findings over a period of nine months.

Table 1: Distribution of case according to age of the patient (n=56).

Age of the patient (in years)	Number of cases
30	14
31-40	4
41-50	23
51-60	9
61 years and above	6
Mean age (SD)	45.91 (12.17)
Range	22-66

Table 2: Distribution of cases according to location of tumor (n=56).

Location of tumor	Number of cases
Trigone	22
Right posterolateral	24
Left posterolateral	9
Neck of bladder	1

Table 3: Recurrence can be summarized in the following 2×2 contingency.

Treatment type	Recurrence (yes)	No recurrence	Total
Immunotherapy (BCG)	0	15	15
Chemotherapy (Gemcitabine+Mitomycin C)	18	23	41

Table 4: Tabular summary of complications.

Complication	Count	%
No complication	18	32.1
Mild dysuria	8	14.3
Skin rash over inguinal region	9	16.1
Suprapubic pain	9	16.1
BCG cystitis	7	12.5
Cystitis with dysuria	5	8.9
Total	56	100

DISCUSSION

Urinary bladder carcinoma management has evolved significantly over the past decades, with an increasing focus on optimizing treatment strategies for locally advanced disease. Several studies as Shariat et al have explored the post TURBT management of NMIBC.[5] Intravesical therapy whether chemotherapy or immunotherapy is better, has been explored by many studies. Study done by Kamat et al is a Phase III KEYNOTE-676 randomized control study of BCG and Pembrolizumab for recurrent NMIBC, which was in accordance to the study.[6] Koya et al concluded the high incidence of local, self-limiting, relatively minor side effects.[7] Ng et al further reiterated the predominance of males in bladder cancer, also that surgery was done beforehand for histopathological confirmation.[8] Thus, patients treated with BCG (immunotherapy) showed no recurrence at nine months whereas those with intravesical chemotherapy had a 43.90% recurrence rate.

Although BCG appears to be the most effective in preventing tumour recurrence but still, has a higher complication rate, whereas Mitomycin C has the lowest complication rate, making it potentially safer option for patients concerned about side effects.

Limitations

Single-center study, small sample size, follow-up limited to 9 months. Long-term data and molecular markers could refine treatment algorithms in the future.

CONCLUSION

The study was a prospective comparative study conducted in the Department of General Surgery, GSVM Medical College, Kanpur. All post TURBT, histologically diagnosed cases of non-muscle invasive bladder cancer (NMIBC) with no physical or radiological evidence of metastatic disease, were taken for the study and randomly allocated to intravesical instillation of Chemotherapy (Gemcitabine/ Mitomycin C) and immunotherapy (BCG). Although no initial findings seen at first three months, tumour recurrence observed in 18 cases at nine months with a subset experienced side effects including rash, dysuria and BCG related cystitis. Regular long-term surveillance with cystoscopy is crucial for detecting early recurrence. The significant recurrence rate by nine months suggests the need for more aggressive monitoring or alternative treatment strategies for high-risk cases.

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

REFERENCES

1. Porten SP, Leapman MS, Greene KL. Intravesical therapy for non-muscle invasive bladder cancer: A critical review. Curr Urol Rep. 2023;24(1):10-8.
2. Lammers RJ, Witjes WP, Janzing-Pastors MH. Intravesical gemcitabine versus mitomycin C in recurrent superficial bladder cancer: a randomized phase III study. Eur Urol. 2024;66(2):258-64.
3. Huncharek M, Muscat J, Kupelnick B. Intravesical chemotherapy for superficial transitional cell carcinoma of the bladder: A meta-analysis of randomized trials. J Clin Epidemiol. 2023;53(7):676-80.
4. Lee HW, Seo GH, Ku JH. Clinical efficacy of neoadjuvant intravesical mitomycin-C therapy immediately before TURBT. Urology. 2020;136:121-7.
5. Shariat SF, Lotan Y, Karakiewicz PI. Outcomes of intravesical therapy for bladder cancer: Review of literature. Cancer. 2023;98(12):2560-71.
6. Kamat AM, Lamm DL. Bacillus Calmette-Guerin immunotherapy for bladder cancer. Urol Clin North Am. 2023;20(2):261-9.
7. Koya MP, Simon MA, Soloway MS. Complications of intravesical therapy for urothelial cancer of the bladder. J Urol. 2006;175(6):2004-10.
8. Ng K. The etiology of bladder cancer. Exon Publ. 2022;2:23-8.

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