

Surgical Management of Genitourinary Tuberculosis: our Experience and review of literature

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ABSTRACT:

Background: Genitourinary tuberculosis is one of the most common forms of extra-pulmonary tuberculosis. Owing to a myriad of clinical presentations and discrepancies in the diagnostic modalities, patients usually present late, which results in a high number of them requiring surgical intervention. The present study aims to retrospectively analyze the role of surgery in genitourinary tuberculosis.

Patients and method: All patients diagnosed with genitourinary tuberculosis at our centre between October 2017 and September 2019 were included in the study. The mode of presentation, duration of symptoms, investigations performed, treatment received, and follow-up were studied.

Results: Out of 25 patients diagnosed with genitourinary tuberculosis (GUTB), there were 15 (60%) males and 10 (40%) females. The mean age of presentation was 40.84 years. Nineteen (76%) patients underwent surgical intervention, and many patients required more than one surgical procedure. A reconstructive procedure was carried out in seven patients. At a median follow-up of 12 months, all patients did well, showing no relapse.

Conclusion: Surgery, along with antitubercular treatment, is the key to the management of GUTB presenting with structural damage. However, surgery can be ablative or reconstructive, depending on various factors discussed in the present study. This preserves or restores the optimal function of the genitourinary system affected by the mycobacterium bacilli.

KEYWORDS:

antitubercular treatment (ATT), extrapulmonary tuberculosis (EPTB), genitourinary system (GUS), genitourinary tuberculosis (GUTB), tuberculosis (TB)

ABBREVIATIONS

ATT – antitubercular treatment

CBNAAT – cartridge-based nucleic acid amplification test

CECT – contrast-enhanced computed tomogram

CT – computed tomography

DTPA – Diethylenetriaminepentaacetic acid

EPTB – extrapulmonary tuberculosis

GUS – genitourinary system

GUTB – genitourinary tuberculosis

HDN – hydronephrosis

HDUN – hydroureteronephrosis

HIV – human immunodeficiency virus

PUJ – pelvic ureteric junction

SPC – suprapubic catheter

TB – tuberculosis

VUJ – vesicoureteric junction

VUR – vesicoureteral reflux

WHO – World Health Organization

to grow and is silently taking several lives. Genitourinary tuberculosis (GUTB) is one of the most common forms of extrapulmonary tuberculosis (EPTB), often affecting kidneys via hematogenous transmission from the active or dormant foci in the lung [2]. Further it disseminates to other parts of the genitourinary system (GUS) through the urinary tract. Patients initially present with nonspecific lower urinary symptoms which usually leads to a delay in diagnosis. Meanwhile, the mycobacterium slowly destroys the urinary system by either a caseous or fibrosing reaction and more than 50% of patients require some surgical intervention in their lifetime [3]. The present study assessed the role of surgical intervention in the management of patients suffering from genitourinary tuberculosis. Preservation and restoration of a normal function requires both an ablative and a reconstructive procedure, the indications and various modalities of which are described in detail in the present study.

PATIENTS AND METHODS

Data was retrieved from the medical record department of our institute. All patients diagnosed with GUTB in the given period of 24 months were included in the study. Confirmatory diagnosis of GUTB was made on detection of mycobacterium from either acid-fast bacilli staining, LJ medium culture, or detection of mycobacterial DNA on cartridge-based nucleic acid amplification test (CBNAAT), or when a histopathological examination revealed a characteristic epithelioid granuloma or when a diagnosis was made after excluding all other possibilities in the presence of a strongly suggestive clinical history, radiological findings and raised ESR. Our

INTRODUCTION

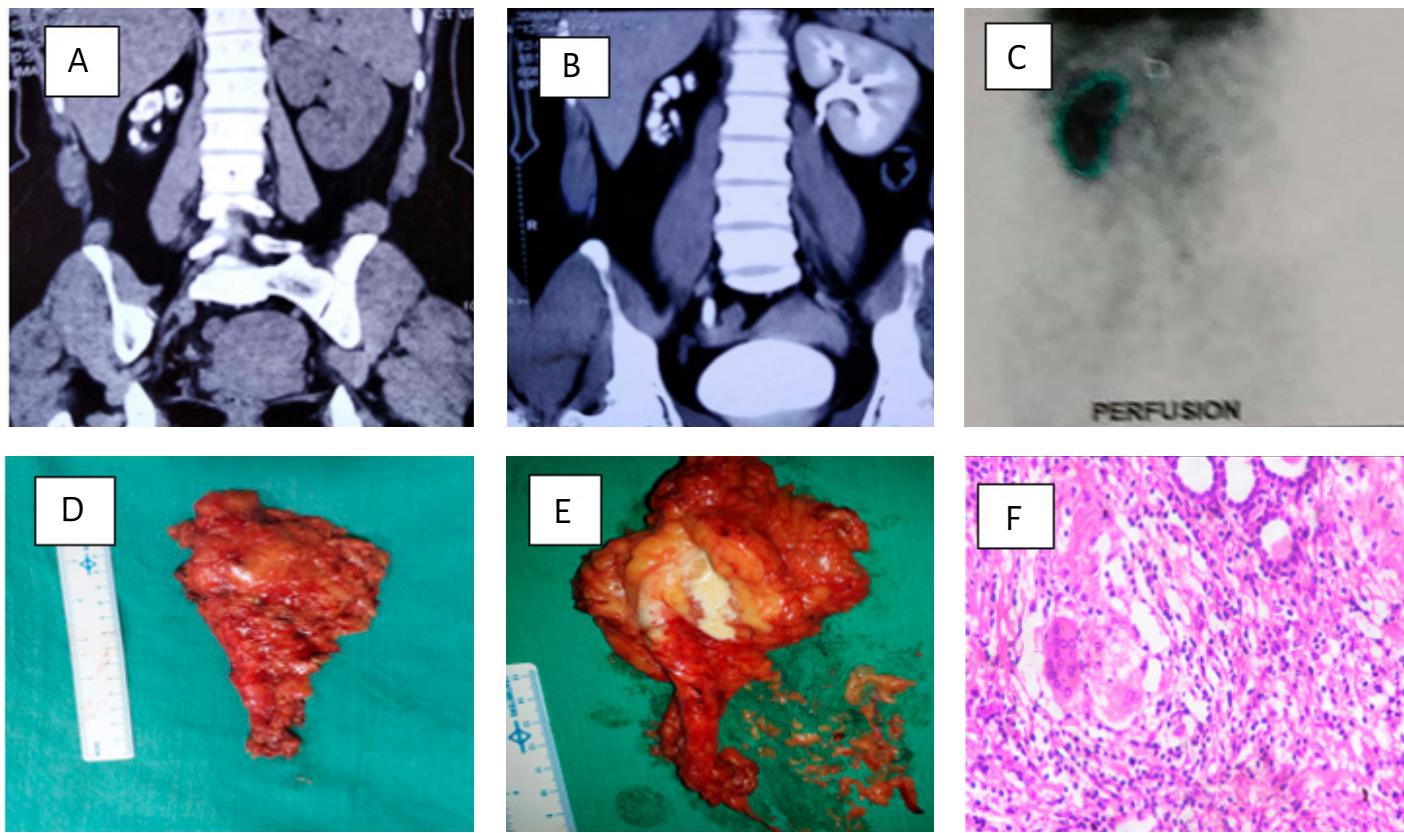
Tuberculosis, although a global disease, is one of the leading causes of health-related morbidity and mortality in India and other developing nations of Southeast Asia. World Health Organization (WHO) reported 2.69 million new cases with an annual incidence of 199 cases per 100000 population in 2018 in India [1]. Despite intense surveillance and monitoring, and supervised treatment with modern antimicrobial chemotherapy, the disease continues

Tab. I. Demographic and clinical profile.

PARAMETERS	VALUE (N=25)
Age (years)	Mean 40.84 (19–84)
Sex	Male 15 (60%) Female 10 (40%)
Time of initial presentation (months)	Mean (7.84) <6 months 9 (36%) >6 months 16 (64%)
Previous history of ATT	7 (28%)
Pulmonary TB	5
GUTB	1
Abdominal TB	1
Initial presentation (25)	
Flank pain	20 (80%)
Frequent urination	13 (52%)
Fever	3 (12%)
Haematuria	2 (8%)
Scrotal swelling	1 (4%)
Urethrocutaneous fistula	1 (4%)

Tab. II. Surgeries performed.

PROCEDURE DONE	N=25
Major Surgery (19)	
Reconstructive	7 (28%)
Augmentation–cystoplasty	2
Uretero-ureterostomy	2
Boari flap	1
Ureteroneocystostomy	1
Supratrigonal cystectomy with ileal conduit	1
Ablative (12)	
Simple nephrectomy	12 (48%)
Minor surgery	9 (36%)
Unilateral/Bilateral DJ stenting	3
Percutaneous nephrostomy	3
Transurethral bladder biopsy	1
Percutaneous drainage of perinephric abscess	2

**Fig. 1.** A 27-year-old female presented with a right flank pain. (A) right calcified contracted kidney (non-contrast CT); (B) right non-functioning kidney (CT Urogram); (C) non-perfusion of the right kidney in DTPA renogram; (D) right nephrectomy specimen; (E) kidney full of pus; (F) histopathology showing epithelioid granuloma.

of 25 patients diagnosed, 19 (76%) underwent major corrective or ablative surgery. The follow-up protocol included evaluation of the patient at 15 days following surgery, then at one month, 3 months and 6 months, and then every 6 months for 2 years.

RESULTS

A total of 25 patients were diagnosed and treated for GUTB in the study period. The mean age was 40.84 years and there were 15

(60%) males and 10 (40%) females. The most common presenting complaints were flank pain (80%) followed by frequent urination (52%), fever (12%), and haematuria (8%). Most of the patients were symptomatic for more than six months before they sought medical advice (Tab. I.). Evidence of mycobacterium was obtained in only 17 (68%) patients by AFB staining, culture or CBNAAT. The most common organ involved was kidney (56%), followed by ureter, bladder, and epididymis. Seven (28%) patients had a previous history of antitubercular treatment (ATT) and one patient had a coexisting infection with human immunodeficiency virus (HIV).

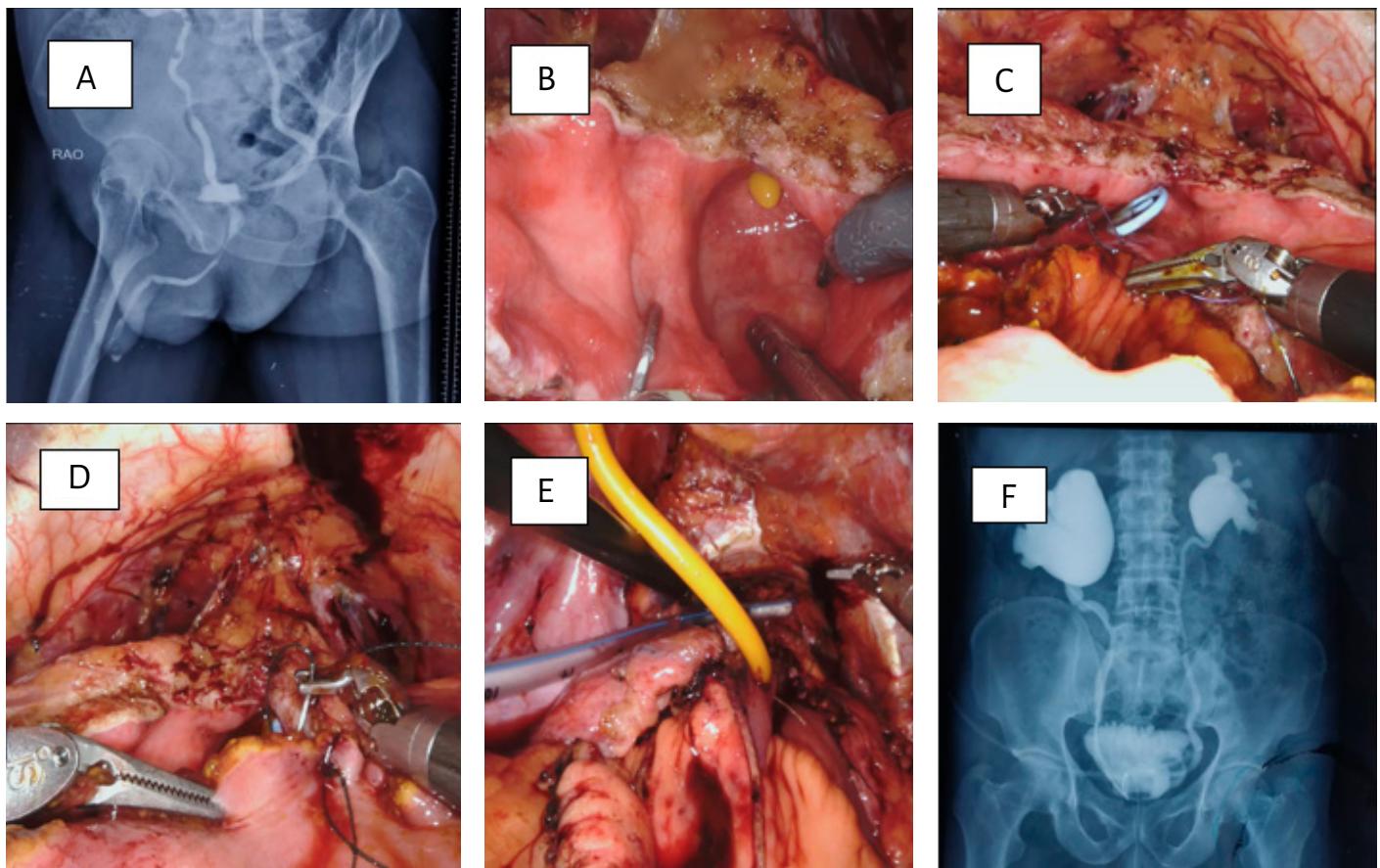


Fig. 2. Robot-assisted augmentation ileocystoplasty. (A) small capacity “thimble bladder” with bilateral VUR; (B) bivalved bladder; (C) posterior vesico-intestinal anastomosis; (D) anterior vesico-intestinal anastomosis; (E) SPC placement in the augmented bladder, and (F) post-operative cystogram at 3 weeks.

All patients were started on the induction phase of a modern chemotherapy regimen (rifampicin, isoniazid, pyrazinamide and ethambutol) just after diagnosis and received at least 6–8 weeks of treatment before proceeding to any elective surgery. Nineteen (76%) patients underwent surgery, including 12 with a simple nephrectomy (Fig. 1.) for various reasons and 7 with a reconstructive procedure (Tab. II.). Live bacilli were detected in three (25%) of the nephrectomy specimens. In the reconstructive consortium, two patients had robot-assisted laparoscopic augmentation ileocystoplasty, two underwent uretero-ureterostomy, one patient had ureteric re-implantation for a lower ureteric stricture, while one underwent suprarectal cystectomy with ileal conduit and another had a robot-assisted Boari flap ureteroneocystostomy (Fig. 1., 2.).

Nine (36%) patients had minor surgical procedures, like percutaneous drainage in six and transurethral biopsy of the bladder for diffuse bladder wall thickening in one patient. Two patients presented to emergency department with features of sepsis, and after stabilization, a contrast-enhanced computed tomography (CECT) scan of the abdomen and pelvis was done, which revealed fornecal rupture with perinephric collection. Initially, a percutaneous drain was placed but neither of the patients showed signs of improvement and they started deteriorating after a few days. Both patients underwent simple nephrectomy in an emergency setting and the final histopathology revealed tuberculosis of the kidney.

Predictors for nephrectomy noted here were multiple blocked calyx, multiple ureteric stricture with small intrarenal pelvis, diffuse renal calcification, no parenchymal enhancement on contrast

imaging and no urine output after percutaneous nephrostomy placement. The elective nephrectomies were done after documenting the differential function of that moiety to be less than 15% on the diethylenetriaminepentacetate (DTPA) renogram.

DISCUSSION

Combination chemotherapy with isoniazid, rifampicin, pyrazinamide, ethambutol, and streptomycin is the first-line standard of care for cases of tuberculosis. The principle of chemotherapy in GUTB is not different from a newly diagnosed smear-positive pulmonary tuberculosis, as it has been shown that bacillary count in renal tuberculosis (TB) is approximately equal to a cavitary pulmonary TB (10^7 – 10^9) [4]. Optimal duration of treatment in case of GUTB is still a debate as there is no randomized control trial available to date addressing this, but most of the national and international guidelines universally recommend 6 months of standard treatment, same as in newly diagnosed smear-positive pulmonary tuberculosis (category 1) [5].

Due to a delay in diagnosis or due to the natural course of the disease in which fibrosis occurs during healing on ATT, many of these patients present with an irreversible deformity of GUS. In this scenario, reconstructive surgery is indicated to restore the normal or near-normal function of the urinary system. In patients with mild to moderate hydroureteronephrosis (HDUN) or hydronephrosis (HDN) due to vesicoureteric junction (VUJ), ureteric, or pelvic ureteric junction (PUJ) stricture, DJ stenting may be done to maintain

the patency of the urinary tract. Later on, after completion of 6–8 weeks of chemotherapy, re-evaluation by the same initial imaging is recommended to know the disease progression; if there is no sign of improvement or signs of deterioration then the patient should be counselled for definitive surgical treatment i.e. ureteric reimplantation, ureteroneocystostomy, ureteroureterostomy, pyeloplasty, ileal ureter or external diversion wherever indicated [6, 7]. A peculiar situation is that of multiple phantom calyces wherein DJ stenting might not be effective for drainage of the blocked calyces, which would necessitate the placement of a percutaneous nephrostomy [8, 9].

Patients with a polar mass lesion, a lesion distant from the hilum, or focal calcification not responding to ATT may be considered for partial nephrectomy [10]. Traditionally, nephrectomy is indicated in non-functioning or poorly-functioning symptomatic renal TB or asymptomatic kidney complicated by hypertension, diffuse calcification or coexisting renal cell carcinoma. Nephrectomy for asymptomatic patients with a cicatrized kidney is still under debate. In a study by Kerr et al., the authors showed that despite urine being sterile following chemotherapy, 50% of patients still harboured active bacilli in the nephrectomy specimen which could reactivate later. They recommend nephrectomy in all asymptomatic non-functioning kidneys to avoid the reactivation of the dormant foci [11]. Considering chances of reactivation, we too are of the opinion that all non-functioning tuberculous kidneys should be removed as recommended by other Indian experts as well [12].

Isolated tubercular involvement of the ureter is rare. In the study by Sinha et al. of 73 patients with tubercular stricture, about 90% of patients had either kidney or bladder involvement and 37% of patients had non-salvageable kidney at presentation. The reconstruction for such ureters depends on the functioning status of the kidney and bladder [13]. The authors report the long-term success rate of 90%, 59%, and 59% for open repair, balloon dilation, and DJ stenting respectively. In the present series, none of the patients was managed solely with balloon dilation or DJ stent.

There are two types of tubercular bladder encountered in the clinics, one with active tuberculosis with a capacity of around 150–200 mL, and the other one – a small contracted or commonly referred to as the thimble bladder [14]. Reconstructive surgery of the bladder is recommended in case of grossly distorted anatomy which is incompatible with the normal function of GUS. The goal of bladder augmentation is to increase the bladder capacity in order to retain urine for a reasonable time period and create a low-pressure system. Creation of a low-pressure voiding system effectively prevents upper tract damage by ameliorating vesicoureteric reflex and complications arising from secondary infections

of the upper tract [15]. Although various bowel segments have been used for bladder augmentation, from the stomach to the colon, most of the authors report excellent outcomes with the ileum [16, 17]. Gupta et al. proposed bladder augmentation for a capacity of less than 100 mL [14]. Though augmentation is sufficient in most of the patients, it may not ameliorate symptoms in a very small fibrosed bladder. Augmentation in such patients may be surgically challenging and patients may have persistent pain due to nerve entrapment by a cicatrized bladder, hence construction of an orthotopic neobladder is recommended in these patients if the capacity is found to be less than 15–20 mL [14–18].

In the modern era, surgery in cases of GUTB is increasingly being used to prevent terminal loss of GUS. Earlier it was done in only 10% of all cases, which increased up to 56% in recent times, probably because of technological advancements in the form of minimally invasive surgery and also because we are probably more aware and wiser now about the pathogenesis and disease progression in case of GUTB [19]. Probably for the same reason, the tables have turned and more reconstructive procedures are being performed as compared to ablative surgeries. In the largest observational study of 4288 patients by Mochalova et al., a total of 2364 different procedures were done in which 948 were reconstructive [20]. In a large retrospective series of 241 patients who underwent surgery for GUTB, a total of 128 reconstructive procedures were done in which 30.29% (73) of patients had bladder augmentation [21]. Laparoscopy is the current standard of care for the reconstruction or ablation of GUS. However, it is technically more demanding in cases of GUTB because of intense inflammatory reaction and dense fibrosis around the urinary tract [22]. Recently, favorable outcomes have been reported on with robot-assisted surgery in GUTB and other reconstructive surgeries of GUS, with a short learning curve [23]. In the present series, ten robot-assisted procedures encompassing six simple nephrectomies and four reconstructive surgeries were done. This study has attempted to highlight the role of surgery in the management strategy of GUTB, and the upcoming role of the robotic platform for management of such difficult to perform cases. We acknowledge that the small sample size and retrospective nature are the limitations of the present study.

CONCLUSION

Surgery, along with medical treatment with modern antimicrobial chemotherapy, can effectively restore the normal functioning of the genitourinary system in certain selected patients. The reconstructive procedures are tedious but when performed meticulously, can produce excellent results and give a new life to patients suffering from genitourinary tuberculosis.

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