

Ultrasound is a cost-effective and non-invasive imaging modality that has been shown to be effective for the diagnosis of testicular, epididymal and vas deferens TB [533-537]. Ultrasound examination may also allow for the identification of parenchymal masses, cavities, mucosal thickening of the collecting system and bladder, stenosis and consecutive obstruction of the collecting system, vesicoureteral reflux, and calcifications [538]. In female GUTB patients US may identify ovarian masses, intrauterine thickening and calcifications [539].

Intravenous urography aids in the identification of renal and ureteral TB, but lacks specificity. Approximately 10-15% of patients may have normal findings on IVU [540, 541]. The most common findings on IVU are hydrocalycosis, hydronephrosis or hydroureter due to stricture, autonephrectomy and urinary calcifications [542-544].

In recent years CT and MRI have largely replaced IUV. The most common findings on CT are parenchymal scarring, hydrocalycosis, hydronephrosis or hydroureter due to stricture, and thickening of the renal pelvis, ureter and bladder walls [542-544]. In TB of the seminal vesicles and vas deferens CT imaging can show enlarged heterogeneously enhancing seminal vesicles with possible wall thickening, contraction, and intraluminal or wall calcifications [545, 546]. Prostate TB appears as a low attenuating and marginally enhancing cystic mass, which is indistinguishable from a non-TB prostatic abscess [547]. In female GUTB the fallopian tubes are most frequently affected area and present with enlargement, hydrosalpinx, pyosalpinx, and wall thickening, with calcification on CT [548].

Magnetic resonance imaging has low sensitivity for the diagnosis of GUTB in the early stages of the infection [549]. As an imaging modality MRI is useful in patients in whom CT is contraindicated, including patients with renal failure or contrast hypersensitivity reactions or those who wish to avoid exposure to radiation. Renal and ureteral abnormalities are comparable to those described for CT findings and must be distinguished from acute pyelonephritis [539, 550]. Epididymitis and testicular TB appears as a diffusely enlarged epididymis or testis with heterogeneous high T2 signal due to fibrosis and calcification [546]. Multiparametric MRI of the prostate distinguishes between the nodular or diffuse patterns of prostate TB [551].

Female GUTB has a wide range of appearances on HSG affecting the fallopian tubes, endometrium and uterus [552, 553]. Tubal obstruction is the most common finding with HSG [553]. In addition, deformity of the uterine cavity can be observed, such as a T-shaped and Dwarfed uterus, resulting from abnormal scarring and fibrosis [552]. As the disease progresses this process can potentially lead to a complete obliteration of the uterine cavity referred to as Netter syndrome [554].

3.16.3 **Medical Treatment**

The WHO recommends a daily six month regimen for treatment of newly diagnosed extrapulmonary TB, including an intensive phase of two months with isoniazid, rifampicin, pyrazinamide, and ethambutol, followed by a continuation phase of four months with isoniazid and rifampicin [555]. For the treatment of multi-drug resistant (MDR) TB (i.e. resistance to rifampicin and isoniazid) an individualised treatment regime should be applied with at least five effective tuberculosis medicines during the intensive phase, including pyrazinamide and four core second-line tuberculosis medicines [556].

3.16.4 **Surgical treatment**

Combination drug therapy is the first-line treatment for GUTB. However, in more than 50% of patients ablative, endoscopic or reconstructive surgery is required due to the destructive nature of the infection coupled with a delay in initial diagnosis [557-559]. In 26.9% of cases of diagnosed GUTB there is a non-functioning unilateral kidney and in 7.4%, renal failure [559].

In the largest observational study of 4,288 GUTB patients a total of 2,364 different surgical procedures were carried out of which 948 were reconstructive [560]. In a retrospective series of 241 patients who underwent surgery for GUTB, a total of 128 reconstructive procedures were done in which 30.29% of patients had bladder augmentation [561]. A retrospective single-centre study of 128 patients reported renal units in the reconstruction group had 5.44-fold longer survival than the permanent diversion group suggesting that when feasible renal reconstruction may be better for renal function preservation [562]. Reconstructive surgery may include augmentation cystoplasty, uretero-ureterostomy, ureteroneocystostomy, ureteral reimplant, pyeloplasty, ureterocalicostomy and ileal ureter or external diversion, where indicated [563].

There is limited evidence with regard to the optimum surgical approach. Minimally invasive options, have been reported as feasible and safe strategies, comparable to open surgery [564-568]. In addition, the optimal timing for surgery is controversial. A delay of two to six weeks up to nine months after the initiation of medical treatment has been proposed to allow for a reduction in active inflammation and stabilisation of the TB lesions [549].

Due to lack of high-quality evidence for surgical treatment of GUTB, the Panel is unable to give a recommendation on surgical treatment at this point in time. Patients with GUTB should be assessed on an individualised bases, and the decision to operate should be made depending on the location, extent of disease progression and damage to the genitourinary system.