SURGERY OF THE URINARY TRACT

Urologic Surgery, Urology

The branch of surgeries which are performed on diseases of the urinary tract system and the reproductive organs.

⚠️ Risk factor ♂ Male & Female

About Surgery of the urinary tract

Surgery of urinary tract include any type of surgery, which is performed not only on diseases of the urinary tract, but partly on reproductive system. The organs under the domain of urologic surgery include the kidneys, adrenal glands, ureters, urinary bladder, urethra (Pic. 1). There is also the male reproductive organs (testes, epididymis, vas deferens, seminal vesicles, prostate, and penis), which is included in urologic field.

With the advent of minimal invasive surgery, urinary tract surgery has moved to the forefront in regards to innovation and instrumentation in its use compared to open surgery without jeopardizing functional outcomes.

Surgery of urinary tract include endourology, laparoscopic surgery, minimally invasive robotic surgery, urologic oncology, neurourology, andrology, reconstructive surgery and female urology.

Endourology

Endourology is the branch of urology that deals with the closed manipulation of the urinary tract. It has lately grown to include all minimally invasive urologic surgical procedures.

As opposed to open surgery, endourology is performed using small cameras and instruments inserted into the urinary tract. Most of the urinary tract can be reached via the urethra (a structure that has the sole purpose of conducting urine from the bladder to the outside), enabling prostate surgery, surgery of tumors of the urothelium (the lining of the urinary tract), stone surgery, and simple urethral and ureteral (a structure that connects kidneys and the bladder) procedures.

Laparoscopy

With increasing experience in the laparoscopic environment, efforts are now directed at further minimizing the number of incisions while maintaining the basics tenets of laparoscopic surgery. This focus has led surgeons to perform traditional laparoscopic surgery through a single incision.

Another new method of laparoscopic surgery is robot-assisted surgery. Robot-assisted surgery is mainly used for the surgery of the prostate, kidney, and ureter.

The Da Vinci Surgical System (Pic. 2), is designed and built with the intent that robots will assist surgeons during procedures. This surgical tool is a laparoscopic surgery robot, with 3-4 robotic arms for operation. This system combines the advantages of robotics with the skills of surgeons. A surgeon will sit at a machine with two hand devices in which the surgeon inserts their fingers. The surgeon will look through a 3D High Definition screen which conveys video of the surgery. By moving their fingers, the surgeon can control the arms of the operating system.

With Prostate Cancer for example during a conventional procedure, the surgeon would have to make a big
incision himself, lots of blood, big scars, and long recovery times. But now, thanks to robotic surgery, the three
to four robotic arms will pin-point key areas, and use lasers to get the job done.

Urologic oncology

Urologic oncology concerns the surgical treatment of cancerous genitourinary diseases such as cancer of the
prostate, adrenal glands, bladder, kidneys, ureters, testicles, and penis, as well as the skin and subcutaneous
tissue and muscle and fascia of those areas (that particular subspecialty overlaps with dermatological oncology
and related areas of oncology).
Most urologic oncologists in western countries use minimally invasive techniques (laparoscopy or endourology,
robotic-assisted surgery) to manage urologic cancers amenable to surgical management.

Neurourology

Neurourology concerns nervous system control of the genitourinary system, and of conditions causing
abnormal urination.
Neurological diseases and disorders such as a stroke, multiple sclerosis, Parkinson’s disease, and spinal cord
injury can disrupt the lower urinary tract and result in conditions such as urinary incontinence (any accidental
or involuntary loss of urine from the bladder), detrusor overactivity (uncontrolled contraction of the bladder
wall), urinary retention (an inability to completely empty the bladder), and detrusor sphincter dyssynergia
(dyscoordination of the detrusor muscles of the bladder and the external urethral sphincter muscles).

Andrology

Andrology focuses on the male reproductive system. It is mainly concerned with male infertility, erectile
dysfunction and ejaculatory disorders. Surgery in this field includes fertilization procedures, vasectomy
reversals, and the implantation of penile prostheses. Vasectomies may also be included here, although most
urologists perform this procedure.

Reconstructive urology

Reconstructive urology is a highly specialized field of urology that restores both structure and function to the
genitourinary tract.

Prostate procedures, full or partial hysterectomies (removal of uterus), trauma (auto accidents, gunshot
wounds, industrial accidents, straddle injuries, etc.), disease, blockages (e.g., urethral strictures), and
occasionally, childbirth, can necessitate reconstructive surgery. The urinary bladder, ureters (the tubes that
lead from the kidneys to the urinary bladder) and genitalia are other examples of reconstructive urology.

Female urology

Female urology is a branch of urology dealing with overactive bladder, pelvic organ prolapse (the herniation of
the pelvic organs), and urinary incontinence.

Symptoms
- urinary incontinence
- pelvic organ prolapse
- overactive bladder
- erectile dysfunction
- lower back pain
- pain behind the pubic bone
- blood in urine
- undescended testes
- vesicourethral reflux (the retrograde flow of urine from the bladder into the ureter)
- undevoloped genitalia
- pain while urinating
- nocturnal urinating
- inability to urinate
- fever

Associated diseases
- kidney failure
- kidney cancer
- kidney stones
- ureter obstruction
- bladder stones
- incontinence
- prostate cancer
- benign prostate hyperplasia (a noncancerous increase in size of the prostate)
- ambiguous genitalia

Complications

- recurrence of the stricture
- laceration (irregular tear-like wounds caused by some blunt trauma)
- transection (a cross section)
- rupture of ligation
- leakage of urine or contrast media
- infection
- urinary incontinence (symptoms of incontinence often improve over time with strengthening exercises)
- urinary retention requiring intermittent catheterization to completely empty the urinary bladder
- erectile dysfunction
- loss of penile sensation, decreased tactile sensation of the penile shaft and corona
- retrograde ejaculation (occurs when semen, which would, in most cases, be ejaculated via the urethra, is redirected to the urinary bladder)
- changes in ejaculation, and decrease in intensity of orgasm
- referred pain
- urinary fistula (an abnormal opening in an organ of the urinary tract or an abnormal connection between a urinary tract organ and another nearby organ)
- urinary urgency
- urine spraying
- hematoma
- external bleeding (from the suture line(s))
- bleeding from the internal suture lines (bloody discharge from the urethra)

Female

The female genital and urinary tracts are anatomically closely related. Therefore, the potential for injury to the urinary system must always be considered when operating on the genital system.

Bladder injuries are the most frequent urologic injury inadvertently caused by surgeons. Ureteric injuries are often not recognized immediately and have the potential to be life-threatening. If not treated these injuries may result in permanent kidney damage or removal of a kidney.

The incidence of these complications varies worldwide. Obstetrics injuries occur mainly in grand multiparous women. The commonest procedure that results in injury is hysterectomy.

Male

In males the most common risk factors of fertility problems are vasectomy, and urinary tract infection which can be result of sexually transmitted diseases.

Protection with condoms during sex can be prevention of sexually transmitted infection because inflammation of any part of urinal tract, sometimes leads to operative solution.

How it can affect fertility

Operation which have impact on fertility varies depending of sex.

One of the possible threat in males is surgery of prostate, urinary bladder and urethra. All of them can caused retrograde ejaculation or erectile dysfunction (the inability to get and maintain an erection). Any surgery of genitourinary tract of male can lead to inflammation. The most dangerous for fertility is orchitis (inflammation of testicles). Special case is restoration of fertility after vasectomy. The procedure, which can help is called
Vasectomy reversal.

Surgeries of woman’s genitourinary tract are not strictly associated with infertility. One field of female urology is specialized on genital prolapse (occurs when there is descent of one or more of the pelvic organs including the uterus, bladder, rectum, small or large bowel, or vaginal vault) which must be removed if woman wants to become pregnant in the future.

Retrograde ejaculation

Retrograde ejaculation occurs when semen, which would, in most cases, be ejaculated via the urethra, is redirected to the urinary bladder. Normally, the sphincter of the bladder contracts before ejaculation forcing the semen to exit via the urethra, the path of least resistance.

Males with retrograde ejaculation are not irreversibly infertile because sperms are presented in urine and it is possible to isolate them with the help of assisted reproduction techniques.

The procedure includes adjustment of the osmolarity (the measure of solute concentration per unit volume of solvent) of the patient’s urine by drinking water. The small amount of antegrade-produced ejaculate is collected in a plastic beaker, while the retrograde fraction of the ejaculate needs to be urinated immediately into a jar with culture medium containing human serum albumin to dilute the urine.

Finally, the urine/medium mixture has to be centrifuged, resuspended and filtrated on the glass wool column where sperms are separated. When the sperm is isolate than it could be injected directly into the egg (which is maintained from woman by transvaginal oocyte retrieval). The following procedure is in vitro fertilization (IVF).

Erectile dysfunction

It is characterized by the regular or repeated inability to obtain or maintain an erection during sexual intercourse. Even with an erection problem, a man may still have sexual desire and be able to have an orgasm and to ejaculate. But without erection, the semen cannot be inserted to the vagina naturally so the conception is not possible.

Only option is to use methods of assisted reproduction such as insemination or IVF.

Orchitis

Orchitis could cause azoospermia (no sperm in semen), most likely due to testicular tissue necrosis (a kind of cell death).

Substantial necrotic changes seen in Sertoli cells (a nurse cell of the testicles that helps in the process of sperm development) contribute to impaired spermatogenesis (development of sperms) by loss of function in supporting the dependent germ cells.

Vasectomy reversal

During vasectomy, the male vas deferens are severed and then tied/sealed in a manner so as to prevent sperm from entering into the seminal stream (ejaculate) and thereby prevent fertilization.

Vasectomy reversal is a term used for surgical procedures that reconnect the male reproductive tract after interruption by a vasectomy. Two procedures are possible at the time of vasectomy reversal: vasovasostomy (vas deferens to vas deferens connection) and vasoepididymostomy (epididymis to vas deferens connection). Although vasectomy is considered a permanent form of contraception, advances in microsurgery have improved the success of vasectomy reversal procedures. The procedures remain technically demanding and expensive, and may not restore the pre-vasectomy condition.

Prognosis

Different types of illnesses require different approaches. All of them can have impact on future fertility or even
sterility. Fortunately, modern techniques and progress in medicine can solve these complications and the conception is still possible.

**Retrograde ejaculation**

Infertility resulting from retrograde ejaculation erectile dysfunction may be solved by methods of assisted reproduction such as insemination and IVF.

**Azoospermia**

Azoospermia which is caused by orchitis is associated with very low levels of fertility or even sterility, but many forms are amenable to medical treatment.

**Vasectomy reversal**

Additional factors must be considered prior to vasectomy reversal. The availability of a trained microsurgeon must certainly be taken into consideration. Without a microsurgeon skilled in both vasovasostomy as well as vasoepididymostomy available to perform the procedure, vasectomy reversal should not be undertaken and couples may be better served with sperm retrieval and IVF. Furthermore, men who have any evidence of a decline in fertility and spermatogenesis may be poor candidates for vasectomy reversal.

The definition of success after vasectomy reversal must be carefully evaluated when counseling patients regarding outcomes.

Understandably, most authors advocate for “patency” to be the marker of success, and this number is often inappropriately quoted to patients as the “success rate” of vasectomy reversal. Although return of sperm to the ejaculate is clear evidence that the obstruction has been eliminated, and using this definition, vasectomy reversal can have impressive success rates of 44-97%. Closer examination of the published literature and actual definition of success, however, is warranted.

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**Find more about related issues**

**Diagnoses**

**Orchitis**

An inflammation of the testes, involving swelling and heavy pains.

Learn more at: [www.fertilitypedia.org/therapy/diag/orchitis](http://www.fertilitypedia.org/therapy/diag/orchitis)

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**Gallery**

**Pic**

Components of urinary tract.

**Components of the Urinary System**

- Kidney
- Ureter
- Bladder
- Urethra

**Pic**

The surgeon will use the master controls just below display, while moving his hands, the machine effortlessly translates the movements of the hands, fingers, and wrists into precise real-time movements of the surgical instruments while inside the patient.
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