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Review Article

Double-J Stent: Symptoms, Complications and Pharmacological Management

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ABSTRACT

Double-J (DJ) stents are commonly used to keep the ureter open and help protect kidney function when there is a blockage or after surgery. But they can sometimes cause symptoms like needing to urinate often, a sudden urge to urinate, pain in the side, and blood in the urine. If used for a long time, they may lead to problems such as infection, build-up of minerals around the stent, movement of the stent from its place, or breaking apart. Medication can help reduce these side effects. Drugs like alpha-blockers, such as Tamsulosin and Alfuzosin, and anticholinergics like Solifenacin and Tolterodine are most effective, especially when used together. Other medications like Mirabegron, Tadalafil, Pregabalin, and Sildenafil may also be helpful. Newer types of stents, like those coated with medicine or made to dissolve over time, are being developed to lower the risk of complications and make the experience more comfortable for patients.

INTRODUCTION

Kidney Overview :

The kidneys are bean-shaped organs located on either side of the spine, just below the rib cage. Their main role is to filter waste products, excess fluids, and toxins from the blood to form urine, while regulating electrolyte balance, blood pressure, red blood cell production, and acid-base equilibrium. Each kidney contains around one

million nephrons, the functional units responsible for filtration and reabsorption. Understanding kidney function is essential to appreciate the role of ureteral stents in managing urinary tract obstructions^[1].

The kidneys help control the amount of body fluids, their salt levels, the balance of acids and bases, and the levels of different minerals in the body. They also remove harmful substances. The process of filtering blood starts in the glomerulus, where about one-fifth of the blood entering the

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kidneys is filtered. Some substances, such as water, sodium, bicarbonate, glucose, and amino acids, are reabsorbed back into the body. The nephron is the basic building block and working unit of the kidney. Each adult human kidney has around 1 million nephrons, while a mouse kidney has only about 12,500. The kidneys also perform some functions that do not rely on the nephrons^[2]. If the natural path for urine flow gets blocked due to problems like kidney stones, tumors, or swelling after surgery, devices like the Double-J (DJ) stent are used to keep urine flowing and protect the kidneys from damage.

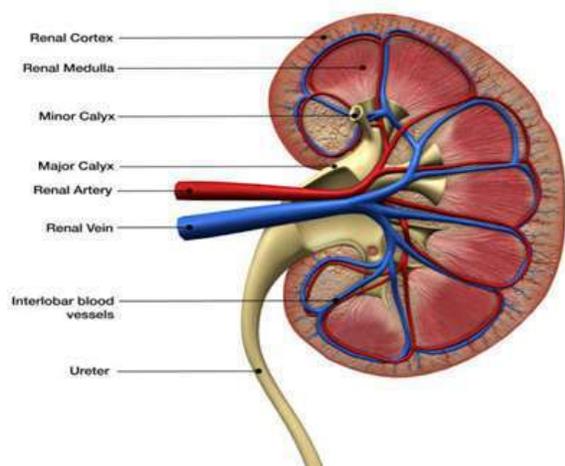


Figure No.1.T.S Of Kidney

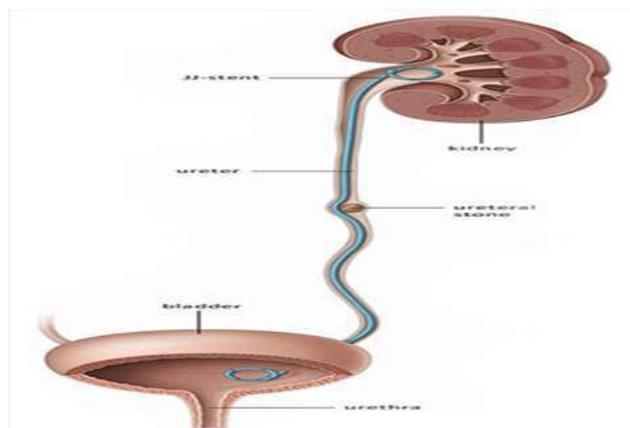


Figure No.2. Stone formation

DOUBLE J STENT :

A double J stent is a flexible, tubular device commonly used in urology to maintain the flow of

urine from the kidney to the bladder. Its mechanism of action involves the following:

1. **Insertion:** The stent is inserted into the ureter, typically through the bladder, and is designed with two "J" shaped ends—one at the kidney and one at the bladder. The ends curl around the renal pelvis and bladder, securing the stent in place.
2. **Relief of Obstruction:** It serves to bypass any obstruction in the ureter (e.g., kidney stones, strictures, or tumors) by maintaining an open passageway for urine to flow from the kidney to the bladder.
3. **Prevention of Backflow:** The "J" shaped loops at both ends prevent the stent from migrating and ensure the urine flow direction is maintained.
4. **Drainage and Healing:** It allows the kidney to drain effectively while any underlying condition (like a stone or injury) heals. This reduces the risk of infection or damage to the kidney caused by urine buildup (hydronephrosis).

In essence, the stent functions as a temporary conduit to preserve kidney function and prevent further complications.

What a DJ stent does & when it's used :

A soft "J-curved" tube placed from kidney → bladder to bypass ureteral blockage, protect the ureter after procedures, and maintain drainage. Common indications: post-ureteroscopy/laser lithotripsy, obstructing stones, edema/stricture, malignancy-related obstruction, infection with obstruction, pregnancy-related obstruction^[3].

How long should it stay in ?

After uncomplicated ureteroscopy (URS): contemporary AUA-aligned evidence supports

~3–7 days of stenting; very short dwell times (≤ 4 days) can increase ED visits around removal in non-prestented patients, so ≥ 5 days is commonly recommended.

Not every URS needs a stent: emerging data (AUA 2025 highlight) supports stent omission after uncomplicated URS for renal stones < 1.5 cm^[4].

Upper bound to avoid encrustation: risk rises notably beyond 4–6 weeks, with most references urging replacement or removal by 3 months and never > 6 months. Forgotten stents carry major risk.

TYPES :

Types of Stents:

Several varieties exist depending on material and purpose:

1. Double J Coated stents – Maintain urine flow.
2. Metallic stents – long-term use in malignant obstruction.
3. Biodegradable stents – dissolve over time, avoiding removal.
4. Migrated double J stents – becomes nonfunctional and may cause complications.
5. Drug-eluting stents – release drugs locally (antibiotics, anti-inflammatories).
6. Modified stents – newer designs for better comfort.



Figure No.3. Double J Coated stents



Figure No.4. Metallic stents



Figure No.5. Biodegradable stent

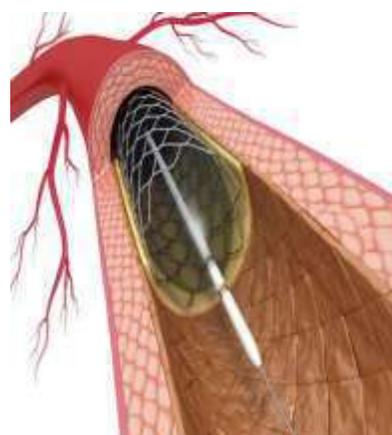


Figure No.6. Drug eluting stent



Figure No.7. Migrated Double J Stent

INDICATIONS :

DJ stents are placed in numerous situations. They are mainly used to relieve urinary obstruction caused by stones, tumors, or strictures. They are also commonly used after urological procedures like pyeloplasty, ureteroscopy, or kidney transplantation to keep the ureter open while it heals. In emergencies or when patients are not fit for major operations, stents act as temporary solutions to maintain urine flow^[5]. They are helpful in cases of ureteral injury during surgery, in controlling infection where drainage is required, and in pregnant women with obstructing stones, where surgical options are limited. Patients receiving radiotherapy or those with malignancies also benefit from stents to prevent narrowing of the ureter.

After a kidney transplant, placing a stent in the ureter can help to create a better seal between the ureter and the bladder, which helps prevent and reduce urine leakage. This leakage can cause narrowing and blockages^[6]. A study that looked at five controlled trials showed that using a stent during the connection has fewer problems. Because the ureter has specific features in this situation, the stent used should be much shorter. Also, there is not a clear best time to take out the stent after the transplant. Most studies suggest keeping it in for around 2 to 4 weeks^[7].

MECHANISM OF ACTION :

A double-J (DJ) stent works primarily as an internal scaffold that maintains ureteral patency and a low-pressure drainage pathway from the renal pelvis to the bladder. The curled “J” tips anchor the stent at both ends, while multiple side ports allow urine to bypass luminal narrowing from edema, stones, clots, or strictures. By giving urine an alternate channel, the stent reduces intrapelvic pressure, limits ureteral wall collapse

during the inflammatory phase, and protects against hydronephrosis and reflux-related renal damage. Contemporary reviews also note a “pressure-dissipation” effect: even when the native ureter is spasming or partially kinked, flow is redistributed through the stent lumen and ports, smoothing pressure spikes and preserving glomerular filtration^[8].

A double-J stent acts like an internal support structure that keeps the ureter open and allows urine to flow smoothly from the kidney's pelvis to the bladder. The J-shaped ends of the stent help hold it in place at both ends, while small side holes let urine pass around any blockages caused by swelling, stones, clots, or narrowed areas. This alternate path helps lower pressure inside the kidney, prevents the ureter walls from collapsing during inflammation, and guards against kidney damage from swelling or backflow^[9]. Recent studies also mention that the stent can help distribute pressure more evenly: even if the ureter is twisted or spasming, urine can still flow through the stent, reducing sudden pressure increases and keeping the kidneys working properly.

SYMPTOMS :

Although life-saving, DJ stents can cause troublesome symptoms, often grouped under the term “stent syndrome.” Patients frequently complain of urinary urgency, frequent urination, painful urination, or the feeling of incomplete bladder emptying. Pain is common and may be felt in the flank, lower abdomen, bladder area, or groin, especially after urination. The presence of blood in urine (hematuria) is also seen in many cases, varying from mild to noticeable^[10]. These discomforts may disturb sleep, limit daily activities, and reduce overall quality of life during the period the stent remains inside.



Lower urinary tract symptoms (frequency, urgency), pain (flank, suprapubic), hematuria, dysuria, activity/work impairment; less commonly infection, encrustation, migration, fracture. Risk of encrustation increases with time in situ, prior stone disease, small stent diameter, pregnancy^[11].

Common Symptoms :

1. **Urinary symptoms :** Frequency (going often) Urgency (strong, sudden urge to void)
2. **Nocturia** (waking at night to urinate) Incomplete emptying sensation, Dysuria (burning or pain while urinating)
3. **Pain :** Flank pain (from reflux of urine up the stent during voiding) Suprapubic pain (lower abdominal/bladder area) Urethral discomfort (from distal coil irritation)
4. **Hematuria:** Blood in urine (mild, usually intermittent; worsens with activity)
5. **Lower urinary tract symptoms (LUTS):** Irritative symptoms resemble those of overactive bladder. Sometimes mimics urinary tract infection (though cultures may be sterile)^[13].

COMPLICATIONS :

If not properly managed, DJ stents can cause several issues. One common problem is infection, which happens when bacteria grow and form a sticky layer on the stent. This can result in urinary tract infections, kidney infections, or even serious blood infections. Mechanical issues are also common, such as the stent moving up or down, being placed incorrectly, getting twisted, or breaking. Having the stent for a long time can lead to the buildup of minerals, which may form stones. Research shows that the longer the stent stays in place, the higher the risk of this happening. More serious but less common problems include stents that are forgotten, which can cause kidney damage, repeated infections, or large stone

growth. In very rare cases, the stent might even move into the blood vessels^[14].

Forgotten Double-J Stent and Encrustation The buildup of crystals on forgotten stents is a major issue because it can lead to repeated urinary tract infections, blood in the urine, blockages in the urinary tract, and even kidney failure. Like how bacteria can grow on stents, the likelihood of encrustation also increases the longer the stent stays in place. The causes of encrustation are many and include factors such as the type of urine, the material of the stent, its surface texture, design, how long it's been in the body, the acidity or alkalinity of the urine, how the urine flows, and the presence of bacteria that produce urease^[15]. The process of encrustation is very complex, and today, there are no known materials that completely prevent crystal buildup.

PHARMACOLOGICAL MANAGEMENT :

Medications are often given to help patients feel more comfortable and better tolerate the presence of a stent. Alpha-blockers such as Tamsulosin and Alfuzosin help relax the smooth muscles in the ureter and bladder neck, which can ease pain and urinary symptoms. Anticholinergic medicines like Solifenacin and Tolterodine are used to control bladder spasms and reduce irritation. Studies have shown that using both types of medication together is most effective in reducing discomfort. Other useful treatments include Mirabegron, which helps with bladder-related symptoms, and Tadalafil, a PDE-5 inhibitor that improves urine flow and lessens pain. Some research also suggests that drugs like Pregabalin and Sildenafil may provide extra support in managing discomfort caused by a DJ stent^[16].

ALTERNATIVES TO D J STENT

1. Ayurvedic treatment

Ayurveda doesn't use mechanical devices like stents, but it focuses on natural therapies to restore normal urine flow, reduce inflammation, dissolve stones, and rejuvenate the urinary system. Ayurveda offers a holistic perspective focusing on addressing the underlying causes of such conditions, potentially minimizing the need for interventions like stent placement^[17].

- a. **Panchakarma Therapies** : Uttar basti and basti therapy are used for detoxification and to improve urinary tract function.
- b. **Herbal remedies** : Ayurveda utilizes diuretic and lithotriptic herbs like Gokshura, Punarnava, Varuna, and Pashanabheda to help dissolve stones and improve urinary flow.

2. Yoga and Lifestyle

Yoga poses like Anjaneyasana, Vajrasana, Mandukasana, and Baddha Konasana can strengthen pelvic floor muscles, improve circulation, and help manage urinary symptoms. Adequate hydration, regular exercise, and stress management are also emphasized^[18].



Figure No.8. Anjaneyasana



Figure No.9. Bhujangasana



Figure No.10. Setu Bandhasana



Figure No.11. Pawanmuktasana

3. Homeopathic treatment

- Tablets/ Mother Tinctures of Berberis vulgaris Q, Syrup
- Sarsaparilla Syrup
- Cystone drops.

RECENT ADVANCES :

Continuous research has led to many improvements in stent technology. Now, hydrophilic and anti-biofilm coatings are commonly used to lower the chance of bacteria sticking to the stent and to make it more comfortable for patients. Drug-eluting stents, which can release antibiotics or anti-inflammatory medicines directly at the site, are a big advancement in preventing infections and irritation^[19]. Biodegradable stents, which break down naturally after a set time, offer a promising option to avoid needing another procedure to remove them. Newer stent designs are being developed to make the stent less uncomfortable and to improve drainage. Metallic stents are becoming more popular for managing long-term blockages related to cancer. To solve the issue of forgotten stents, doctors are working on magnetic-

tip stents and digital tracking tools to make removal safer and easier^[20].

CONCLUSIONS

Double-J stents are still a key tool for dealing with blockages in the urinary tract. They help protect the kidneys, ease pain from blockages, and aid in recovery after surgery or injury. However, staying with a stent for too long can cause discomfort and sometimes lead to problems. That's why it's important to remove the stent on time, have regular check-ups, talk to patients about what to expect, and use newer stent technologies. As new materials and medicines become more available, the future of stent treatments looks better than ever for keeping patients safe, making treatments work well, and improving overall results.

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