

YotiCurl Ureteral Stent

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Overview

Ureteral/kidney stones are a very common disease, affecting millions. In some cases, the stones may cause an obstruction that requires inserting a single-use ureteral stent to maintain urine flow. Ureteral stents cause substantial discomfort in most patients, mostly due to their anchors in the bladder and kidney, with more than 80% of the patients reporting pain affecting daily activities. Prof. Berkowitz and Dr. Shilo designed a new stent that alleviates patient discomfort and can be easily inserted and removed. The prototype was successfully tested in an animal (pig) model.

The Need

Ureteral/kidney stones are a frequent disease estimated to affect between 10-15% of the population in the USA and worldwide. Its global occurrence continuously rises, most likely due to the Western diet and lifestyle. In the USA (as in the rest of the world), ureteral stones represent a significant healthcare burden, with an estimated US\$5.3 billion in annual direct and indirect costs. Stones cause various medical hazards and pain to the patient. The classic symptoms of obstructing stones – severe flank pain, nausea, and vomiting – occur when a kidney stone travels from the kidney down to the ureter, blocking the normal flow of urine through the ureter.

Small ureteral stones are often treated conservatively with designated medications. Non-conservative options include non-intrusive ultrasound-based therapy and the more common method of endoscopic removal of stones – ureteroscopy. The current common practice in the case of a blocking stone, prior to and/or after endourological intervention to remove the stone, is to insert a (single-use) ureteral stent (usually a double-J – pigtail stent) along the ureter to maintain urine flow and reduce stress on the kidney.

Ureteral stents are thin, flexible tubes, usually composed of polymer or metal. One end of the device is placed in the urinary bladder, while the other end remains in the kidney. Ureteral stents cause substantial discomfort in most patients, mostly due to the presence of the anchors (pigtails) in the bladder and kidney. Specifically, a recent study noted that 78% of patients reported irritation-causing voiding symptoms, and more than 80% reported pain affecting daily activities. Moreover, currently used stents do not actively encourage stone remobilization.

The Solution

Prof. Berkowitz and his collaborator, Dr. Yaniv Shilo, developed a novel stent design that alleviates patient discomfort, can be easily inserted and removed, and possibly encourages stone mobilization and migration to the bladder.

Technology Essence

The innovative device is intended for single use, allowing drainage of the kidney when the ureter is (fully or partially) blocked by a stone present in the ureter/kidney. The stent design alleviates patient discomfort encountered by most double-J and pigtail stents (and similar designs) and is inserted and removed easily. Furthermore, the stent design may encourage stone mobilization to the bladder, which would remove the need for surgery. The new stent represents a major improvement to the currently used ones in terms of significantly reducing patient discomfort.

Currently-used double-J stents are inserted and removed easily; the new design enjoys the same benefits as currently employed medical practices. The use of such single-use stents to treat the problem of kidney stones in the ureter is enormous; on a daily basis; around the world. Prototype stents with the new design are synthesized readily.

Applications and Advantages

Applications

- Ureteral stents to treat kidney stones
- Ureteral stents for additional applications, including pre- and post-surgery on the urinary tract and to alleviate benign and malignant ureteral obstructions

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Advantages

- Significantly reduces patient discomfort
- Easily inserted and removed
- May encourage stone remobilization and free migration to the bladder, eliminating the need for surgical removal of the stone.

Development Status

Initial tests in a live animal (pig) model demonstrate the ease of insertion and emplacement, full functionality, no stent migration, no apparent discomfort or inflammation, and a satisfactory histological analysis.

Market Opportunity

Epidemiological data reveal that the prevalence of stone disease is increasing, indicating that demand for ureteral stents is likely to increase. It is estimated that kidney stones affect 1 in 11 people in the USA. The market for ureteral stents is driven primarily by the increasing numbers of cases of kidney stones, presumably owing to various factors attributed to Western diets; high usage of animal protein, salt, and vitamin supplements; as well as a sedentary lifestyle and global climate warming.

References

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