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Short Note

Current Situation of Semirigid Ureteroscopy in the Treatment of Urolithiasis

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INTRODUCTION

The first published description of a ureteroscopy was made in 1980 by Perez-Castro *et al.*, [1] Since then, ureteroscopy (URS) has made a long and fast road to the present time; from a dilated ureter in 1980 to the miniaturized URS and micro-URS of today, from inspection for diagnosing to treatment and from bare hands to medical devices.

This fascinating development of ureteroscopy, it could be summarized in several subjects of interest:

- Technological advances in imaging systems and scopes.
- Stone fragmentation devices and laser approaches
- Anti-retropulsion devices
- Postoperative care

TECHNOLOGICAL ADVANCES IN IMAGING SYSTEMS.

Camera

The camera is the central focus of any endoscopic equipment. The requirements for endoscopic camera systems could be centered on maximum and precise resolution and natural color rendition.

This technology comprise sensors in 1-chip and 3-chip technology, CCD and CMOS sensors. Large sensors can be used in a camera head while uniquely small sensors form the basis of distal "chip-on-the-tip" application.

Light Sources

Thera are two principal types of light sources: LED and xenon.

LED light sources offer many benefits for users:

1. LED light sources have a very long life time and they virtually never need replacing.

2. The LED lamps are very efficient, i.e. power consumption is low and very little heat is generated in the device.

3. They are virtually inaudible. This feature makes an important contribution to improved working conditions in the operating room.

4. The light color of the LED light sources is very constant and similar to the light generated by xenon lamps, i.e. also suitable for new, digital endoscopic cameras.

Xenon

The high color temperature, similar to day light (a bluish light) of xenon light is also ideal for new, digital endoscopic cameras, in its two varieties: 100 and 300 watt xenon light.

Fluoroscopy

Probably, the key of the modern C-Arms of fluoroscopy is the latest generation of flat screen detectors. They are are more sensitive and faster. Their sensitivity allows a lower dose of radiation for a given picture quality than film, improving differentiation on anatomical structures. They are lighter, far more durable, smaller in volume, more accurate, and have much less image distortion than image intensification detectors and can also be produced in larger sizes. It offers up to 25% larger coverage of the urinary tract than standard image intensifiers, and hence, decreased need for intraoperative movements (larger field of vision).

TECHNOLOGICAL ADVANCES IN URETEROSCOPES

Miniaturization of the ureteroscopes

All suppliers of endoscopic equipment have developed ultrathin ureteroscopes ranging between 6.5 - 4.5 Fr. The main consequence of miniaturizedsemirigid ureterorenoscopes is that the intramural ureter do not require dilation. And the extreme consequence of the miniaturization isMicro-URS, a new approach to the ureter based on the microperc device and attempts to reduce the ureteral damage caused by conventional instrumentation [2]. Probably, the most advanced ureteroscope commercially available nowadays is a semirigid video ureteroscope with a "chip-on-the-tip" technology (EndoEye URS Olympus). The result is a digital quality image in a semirigid scope

Intracorporeal Lithotripsy Systemsand Laser Approaches

Holmiun: YAG laser is the gold standard from at least 10 years ago because of its effectiveness in the fragmentation of stones of any composition and excellent security profile. It is a solid state laser operating at a wavelength of 2140 nm, in pulsed mode with a pulse duration of 250 to 350 micro-seconds. The mechanism of laser lithotripsy is an elongated cavitation bubble generating a weak shock wave and through a photothermal mechanism causes vaporization of the Stone [3-5]. The laser fibers available in the market are 200, 365, 400, 550, and 1000 microns. Another less expensive method of stone breakage is pneumatic lithotripsy (and its use is limited to semirigid endoscopes due to its rigid probes). Its main features are:

- Independent effect of stone composition
- Simultaneous suction and lithotripsy
- Efficacy and safety
- Risk of stone retropulsion

A hot topic in the Endourology is how do we break up stones. We must break up piece by piece and basketing or dusting. May be the answer is as stone requires. We could divide these requirements in laser fragmentation in two types:

Stone location

- **Kidney** (larger stones) where the speed is important but, at the same time, the kidney is resistant.
- **Ureter**, where caution is important because its fragility.

Stone composition

- **Hard stones:** monohydrate calcium oxalate, uric acid, cistine, are usually broken up in fragments
- **Other stones**: struvite, dihydrate calcium oxalate, could be dusted

Lasering In the Ureter

The endourologist must follow a list of rules:

1. Always, or whenever posible, you should use safety wire

2. Lithotripsy should be started at low power: 0,5-1 J/5-10 Hz

3. Basket should be used with caution, because the ureteral stones are always bigger than they appear.

Therefore, dusting, from the periphery to the core of the stone is the ideal situation. But many times, the result is large fragments for basketing or using forceps.

The Near Future of Holmiun Lasers

The fragmentation rates for long and short pulse durations at identical power settings remain at a comparable level. Longer holmium laser pulse duration reduces stone pushback. Therefore, longer laser pulses may result in better clinical outcome of laser lithotripsy and more convenient handling during clinical use without compromising fragmentation effectiveness [6]. But some times, the oldest is best… And, we shouldn´t ignore the use of the forceps because they are a principal part of our armamentarium.

Anti-Retropulsion Devices

Figure 1 classifies the diferent anti-retropulsion devices.

Stone cone (Boston Scientific Corporation™) is designed to prevent the stone migration during lithotripsy, to increase the stone fragmentation efficiency and resistant to holmium laser energy. As well as, it facilitates a safe extraction of stone fragments by sweeping of the fragments.

Ntrap (Cook Medical™**)** is used to entrap and extract urinary calculi and minimize stone migration during intracorporeal lithotripsy.

The **Accordion** Stone Management Device (PercSys™**)** is a micro-catheter that combines a film occlusion to prevent retrograde stone fragment migration and facilitate fragment removal

Xen X (Rocamed) is a very thin and flexible mesh structure that is constructed as an integral part of a guidewire. It combines guide-wire and stone retention functionalities as a two-in-one product

The Back Stop Gel (Boston Scientific Corporation™) is a water-soluble polymer that forms a plug in the ureter. It is reverse thermosensitive, meaning at room temperature it is a soft, injectable gel and at body temperature it increases in viscosity to form a plug. It is designed to prevent stone migration during ureteroscopy

Escape Basket (Boston Scientific Corporation™) allows a side-by-side approach, facilitating control and independent manipulation of both the basket and holmium laser fiber

CLINICAL ADVANCES

Advancing in the Indications

We can classify the indications of the ureteroscopy (Table 1) in classical indications, such as distal ureteral stones and may be proximal stones and advanced indications, as upper calyx renal stones, in a context of a endoscopic combined intrarenal surgery or when retropulsion occurs.

Postoperative Care

Patients after semirigid URS do not require special postoperative care, which is why the procedure is performed on an outpatient basis in many countries (day case surgery) [7,8]. We have plenty scientific evidence on the lack of necessity of stenting after Ureteroscopy [9-14], but in a day-case surgery context, this statement is relative. And maybe, one stent ensures the absence of obstructive complications due to fragments or edema.

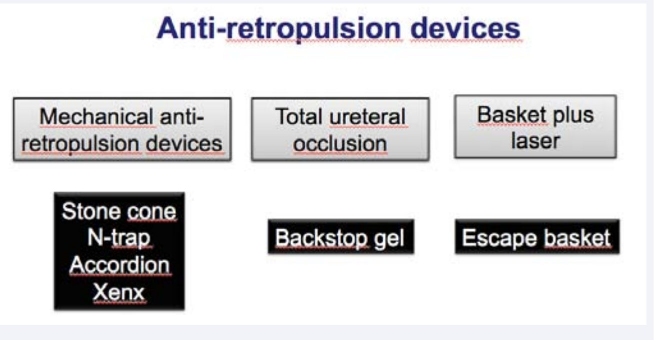

Figure 1 Clasification of the anti-retropulsion devices.

Table 1: Classify the indications of the ureteroscopy.

Classical Indications	Advanced Indications
Distal ureteral stones	Upper calyx renal stones • ECIRS • if pus back occurs
Proximal ureteral stones • Anti-retropulsion devices • *Ad hoc* laser settings	

In conclusion, since its introduction in 1980, ureteroscopy has been used for diagnosing and treating a wide range of urological diseases, but especially urinary lithiasis. The continued development have resulted in miniaturized scopes that combined with refinements in ureteroscopic technique allow to optimize success with reduced morbidity.

REFERENCES

1. Pérez-Castro Ellendt E, Martínez-Piñeiro JA. [Transurethral ureteroscopy. A current urological procedure]. Arch Esp Urol.1980; 33: 445-460.
2. Caballero JP, Galán JA, Verges A, Amorós A, Garcia-Segui A. Micro-ureteroscopy: Initial experience in the endoscopic treatment of pelvic ureteral lithiasis. Actas Urol Esp. 2015; 39: 327-331.
3. Dushinski JW, Lingeman JE. High-speed photographic evaluation of holmium laser. J Endourol. 1998; 12: 177-181.
4. Wollin TA, Denstedt JD. The holmium laser in urology. J Clin Laser Med Surg. 1998; 16: 13-20.
5. Vassar GJ, Chan KF, Teichman JM, Glickman RD, Weintraub ST, Pfefer TJ, et al. Holmium: YAG lithotripsy: photothermal mechanism. J Endourol. 1999; 13: 181-190.
6. Bader MJ, Pongratz T, Khoder W, Stief CG, Herrmann T, Nagele U, et al. Impact of pulse duration on Ho: YAG laser lithotripsy: fragmentation and dusting performance. World J Urol. 2015; 33: 471-77.
7. Paez A, Redondo E, Linares A, Rios E, Vallejo J, Sanchez-Castilla M. Adverse events and readmissions after day-case urological surgery. Int Braz J Urol. 2007; 33: 330-338.
8. Taylor AL, Oakley N, Das S, Parys BT. Day-case ureteroscopy: an observational study. BJU Int. 2002; 89: 181-185.
9. Cevik I, Dillioglugil O, Akdas A, Siegel Y. Is stent placement necessary after uncomplicated ureteroscopy for removal of impacted ureteral stones?. J Endourol. 2010; 24: 1263-1267.
10. Damiano R, Autorino R, Esposito C, Cantiello F, Sacco R, de Sio M, et al. Stent positioning after ureteroscopy for urinary calculi: the question is still open. Eur Urol. 2004; 46: 381-387.
11. Byrne RR, Auge BK, Kourambas J, Munver R, Delvecchio F, Preminger GM. Routine ureteral stenting is not necessary after ureteroscopy and ureteropyeloscopy: a randomized trial. J Endourol. 2002; 16: 9-13.
12. Denstedt JD, Wollin TA, Sofer M, Nott L, Weir M, D'A Honey RJ. A prospective randomized controlled trial comparing nonstented versus stented ureteroscopic lithotripsy. J Urol. 2001; 165: 1419-1422.
13. Shao Y, Zhuo J, Sun XW, Wen W, Liu HT, Xia SJ. Nonstented versus routine stented ureteroscopic holmium laser lithotripsy: a prospective randomized trial. Urol Res. 2008; 36: 259-263.
14. Pengfei S, Yutao L, Jie Y, Wuran W, Yi D, Hao Z, et al. The results of ureteral stenting after ureteroscopic lithotripsy for ureteral calculi: a systematic review and meta-analysis. J Urol. 2011; 186: 1904-1909.

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