Effect of Perioperative Alpha1-Blocker on Non-Stented Ureteroscopic Laser Lithotripsy for Ureteric Stones

Thesis

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Dedication

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List of Abbreviations

Abb.	Full term
ARs	Adrenoceptors
COM	Calcium oxalate monohydrate
DFU	Digital flexible ureteroscope
DJ	Double “J'
Eau	European Association of Urology
EHL	Electrohydraulic
ESWL	*Extracorporeal shock wave lithotripsy*
FFU	Fiberoptic flexible ureteroscope
Fr	French
Fr	Frequency
FREDDY	Frequency doubled double-pulse neodymium:yttrium aluminum garnet
HiFr- LoPE	High frequency,low energy
Ho	Holmium
Hz	Hertz
J	Joule
KUB	A kidney, ureter, and bladder X-ray
LUTS	Lower urinary tract symptoms
MET	Medical expulsive therapy
PE	Pulse energy
PTFE	Polytetrafluoroethylene
UO	Ureteric orifice
URS	Ureterorenoscopy
URSL	Uretroscopic lithotripsy
UTI	Urinary tract infection
W	Watt
YAG	Yttrium-aluminium-garnet

INTRODUCTION

The urolithiasis is a common and increasing condition. The global mankind prevalence of urinary tract stones has been estimated to be between 2% to 20% and afflicting 13% of men and 7% of women. 20% of whole urinary stones are ureteral stones, where 70% of these ureteral stones are located in the distal portion of the ureters. If intervention is indicated, some investigators prefer uretroscopic lithotripsy (URSL), which is a single procedure and has been proven to achieve a higher success rate ***(Ketabchi and Mehrabi, 2014)***.

When the "difficult ureter" is encountered, one which the ureteroscope or access sheath is unable to be placed to the stone, some surgeons will employ active means of ureteral dilation to facilitate primary URS. Most commonly, balloon dilation of the ureter is employed as this method has been well studied and shown to be both safe and effective However, sequential dilation, a technique commonly employed for dilation of the urethra, can be utilized for ureteral dilation as well ***(Christopher et al., 2017).***

There are three important narrowings of the ureteric lumen; at the pelvi-ureteric junction, crossing the iliac vessels and at the vesico-ureteric junction. Instrumentation and stones may get held up at these sites ***(Dan and Tamsin, 2016).***

Three different subtypes of alpha 1 adrenoceptors (ARs) have been cloned, pharmacologically characterized and named alpha 1 A, alpha 1B, and alpha 1D, according to the indications

of the International Union of Pharmacology. In the proximal, the distribution of ARs was alpha 1d ≥ alpha 1b > alpha 1a.In the distal and middle ureter, the distribution of ARs was alpha 1d > alpha 1a > alpha 1b. Furthermore, the distal ureter expressed the highest alpha 1 AR mRNA gene, compared to other ureteral regions ***(Yasunori et al., 2007).***

Tamsulosin was chosen from among the available α-blockers because it is a combined α1A and α1-D selective adrenergic antagonist, considering studies that demonstrated the existence of α1A and α1-D adrenoceptor subtypes in the smooth muscle cells of the human ureter. Tamsulosin increases the urine bolus and intraureteral pressure above the stone. It also decreases peristalsis below the ureter, which consequently lowers intraureteral pressure in association with the decrease in basal and micturition pressure, even at the bladder neck; thus, it increases the chance of stone expulsion. Furthermore, the phasic peristaltic contractions also decrease in the obstructed ureter, which leads to an eventual decrease in the painful stimulus ***(Basri et al., 2013).***

Some randomized controlled clinical trials revealed significant disadvantages of ureteral stents after URSL in terms of lower urinary tract symptoms and pain. They demonstrated that stents did not improve stone free rate nor decrease the incidence of urinary tract infection, fever, unplanned medical visits, analgesia requirement and late postoperative complications. It seems that the placement of a ureteral stent after uncomplicated URSL is not necessary ***(Shen et al., 2011; Türk et al., 2018).***

AIM OF THE WORK

To assess the safety, efficacy and outcome of peri-operative alpha1 blockers on non-stented ureteroscopic laser lithotripsy for ureteric stones.

Chapter 1

URETEROSCOPY

The first ureteroscopy was done in 1912 by Young and McKay when they inserted a pediatric cystoscope into a dilated ureter of a child ***(Ankur et al., 2016).***

In 1956, Hopkins developed the ureteroscope by the invention of the rod lens cylinder system. This invention allowed scope diameters to be smaller and better light transmission ***(Basillote et al., 2004)***.

The first ureteroscope was rigid with a diameter of 12 French and was 50 cm long and had two channels (optic and working). It was produced by Perez-Castro and Karl Storz in 1980 ***(Rassweiler, 2006)***.

In 1989, the rigid ureteroscope was replaced by semi-rigid ureteroscope which allow flexion up to inches from the vertical axis without image distortion ***(Basillote et al., 2004).***

The past decades have witnessed dramatic changes in ureteroscopy, which has led to evolution of this methodology to become a routine procedure in many urological centers world-wide, especially for the treatment of urolithiasis ***(Petrisor et al., 2014).***

A. Types and designs of ureteroscope:

Rigid ureteroscope is not used nowadays while flexible and semi-rigid ureteroscopes are used in many centers worldwide ***(Somani et al., 2017).***

1. Semirigid ureteroscopes:

Their high-density fiberoptic bundles are encased within a semi-rigid metal sheath. This technology allows more space for working channel by narrowing the optical component space ***(Basillote et al., 2004).***

Table (1): Technical characteristics of semi-rigid ureteroscopes ***(Petrisor et al., 2014).***

Manufacturer and model	Number and diameter of channels	Tip diameter	Outer diameter	Length of shaft	Optical system
Olympus (Germany)					
OES Pro	Single: 4.2F	6.4F	7.8F	33 cm or 43 cm	Fibre-optic
OES Pro	Single: 6.4F	8.6F	9.8F	43 cm	Fibre-optic
OES 4,000	Dual: 2.4F and 3.4F	NA	7.5F	43 cm	Fibre-optic
EndoEye video ureteroscope	Single: 4.2F	8.5F	9.9F	43 cm	Digital (CCD)
Richard Wolf (Germany)					
The Needle	Single: 3F	4.5F	6.5F	31.5 cm or 43 cm	Fibre-optic
The Ultrathin	Single: 4F	6F	7.5F	33 cm or 43 cm	Fibre-optic
The D.O.C.	Dual: 4F and 2.4F	6.5F	8.5F	33 cm or 43 cm	Fibre-optic
KARL STORZ Endoskope (Germany)					
MICHEL Uretero-Renoscope	Dual: 3F and 2.3F	9F	9.5F or 12F	43 cm	Fibre-optic
Uretero-Renoscope	Single: 4.8F	6.5F	7F or 9.9F	34 cm or 43 cm	Fibre-optic
Uretero-Renoscope	Single: 5F	7F	8F or 12F	34 cm or 43 cm	Fibre-optic
Uretero-Renoscope	Single: 6F	8F	9.5F or 12F	34 cm or 43 cm	Fibre-optic
Uretero-Renoscope	Dual: 3.4F and 2.4F	7F	7F or 8.4–9.9F	34 cm or 43 cm	Fibre-optic

The tip of semi-rigid ureteroscope can be circular or tapered oval tip. The latter allows ureteric dilatation as it passes proximally ***(Basillote et al., 2004).***

In another design, the tip is smooth and triangular. This design facilitates introduction of the tip of the ureteroscope into the ureteral orifice. **(Fig. 1)** ***(Basillote et al., 2004).***

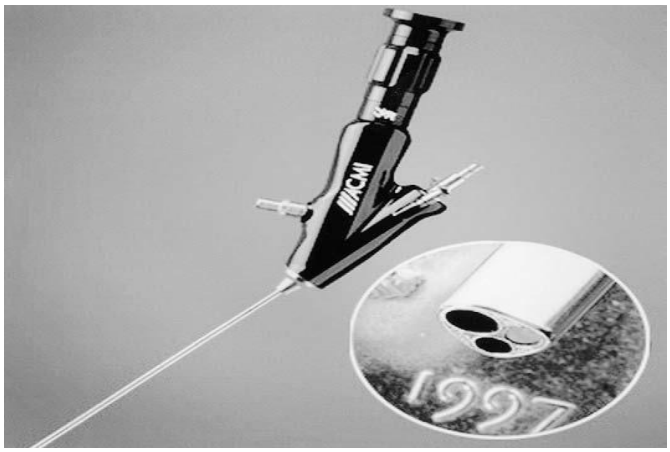

Fig. (1): Semirigid ureteroscope with triangular tip ***(Basillote et al., 2004)***.

Also, there are single and dual channel. The dual channel ureteroscope has one channel for irrigation and another for working instrument. So, using laser in the small channel allows better irrigation through the wider channel ***(Basillote et al., 2004)***.

2. Flexible ureteroscopes:

Their use is mainly for upper ureter and renal pelvis ***(Painter and Francis, 2001).***