A Prospective Randomized Comparative Study between Extracorporeal Shock Wave Lithotripsy and Rigid Ureteroscopy in Treatment of Mid-Ureteric Stones

Thesis

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بسم الله الرحمن الرحيم

وَقُلِ اعْمَلُواْ فَسَيَرَى اللّهُ عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ

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Dedication

My true love and warmest gratitude go last but not by any means least, to My Parents and all my family asking Allah to keep them always in a good health.

To My Wife who represents the entire world for me and always inspires me, asking Allah to bless her.

To My Beloved Daughter ***Mariam****, who I love most, hope the best in her life.*

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List of Abbreviations

Abb.	Full term
CT	*Computed Tomography*
EAU	*European Association of Urology*
eg.	*Example*
EHL	*Electrohydrolic lithotripsy*
ESWL	*Extracorporeal Shock Wave Lithotripsy*
FDA	*Food & Drug Administration*
HM	*Human model*
HU	*Hounsfield unit*
IVP	*Intravenous pyelography*
MET	*Medical Expulsive Therapy*
NSAIDs	*Non Steroidal Anti-inflammatory drugs*
PCNL	*Percutaneous nephrolithotomy*
PTFE	*Polytetrafluoroethylene*
SFR	*Stone Free Rate*
SW	*Shock wave*
SWL	*Shock wave lithotripsy*
UPJ	*Ureteropelvic junction*
URS	*Ureteroscopy*
US	*Ultrasonography*
UTIs	*Urinary Tract Infections*
UVJ	*Ureterovesical junction*
Wk	*Week*
Xray(KUB)	*Xray (Kidney, Ureter & Bladder)*
α1 AR antagonists	*α1 Adrenoceptor antagonists*

INTRODUCTION

Urinary stone disease or nephrolithiasis, the third most common disease of the urinary tract is a major health problem due to its high prevalence, incidence and recurrence. The lifetime incidence of kidney stones for men and women is approximately 13% and 7% respectively. Although stones may be asymptomatic, potential consequences include abdominal and flank pain, nausea and vomiting, urinary tract obstruction, infection, and procedure-related morbidity. Ureteral stones frequently cause renal colic and if left untreated can cause obstructive uropathy ***(Boyce et al., 2010).***

Technological advances and innovation by physicians have improved the endo-urological treatment of ureteric stones. Regardless of the location of the ureteric stone, access and definitive treatment is commonly achieved with a minimal risk of complications. Now a very few patients undergo surgery for stones in the kidneys or ureters. This is due to availability of less-invasive interventions, such as extracorporeal shock-wave lithotripsy (ESWL), ureteroscopic stone removal and percutaneous nephrolithotomy. Each of these options has advantages and disadvantages depending on the characteristics of the stone or stones such as size, number, location and composition as well as patient factors such as renal anatomy, body habitus and co-morbidities ***(Samplaski et al., 2009).***

ESWL revolutionized the management of calculi in the urinary tract. In 1980 first clinical application of ESWL in the management of kidney stone was done. It has become a safe and accepted method of treatment for urinary tract stones and has been approved by American Food and Drug Administration (FDA) in 1984 and recommended as a first-line treatment for mid ureteric calculi in several studies with success rate is reported to be 80-90%. It is a standardized procedure where stone free rates depend on the size, composition and the location of the stone as well as the type of the lithotripter ***(Ghimire et al., 2012).***

It's known that middle ureter is defined as the segment of ureter overlying the sacroiliac joint. The anterior position of middle ureter and the underlying bony pelvis make localization of middle ureteral stones problematic. Moreover, attenuation of shock-wave energy by the pelvic bone in the supine position may make shock-wave treatment less successful ***(Bozkurt et al., 2010).*** This situation representing challenge in some cases indicating the use of Ureteroscopy (URS) and there is no doubt about the success rate of it, but this requires anesthesia, hospitalization and may not always succeed and also there is chance of ureteral injury or perforation.

AIM OF THE WORK

A prospective randomized study to compare between extracorporeal shock-wave lithotripsy and semi rigid ureteroscopy in mid-ureteric stone treatment regarding efficacy, stone-free rate, retreatment rates, associated complications (intra-operative and post-operative), operative duration, hospital stay.

Chapter 1

ANATOMY OF URETER

Gross anatomy of the ureter:

Anatomically the ureter is divided into abdominal, pelvic, and intramural segments. The abdominal parts of the ureters are related to the retroperitoneum throughout their course, each ureter runs inferiorly as a narrow continuation of its renal pelvis at the UPJ, passing over the pelvic brim at the bifurcation of the common iliac artery. They then run along the lateral wall of the pelvis to enter the urinary bladder. In adults, the ureter is 22 to 30 cm in length with a diameter of 1.5 to 6 mm, from the back, the surface anatomy of the ureter corresponds to a line joining a point 5 cm lateral to the L1 spinous process and the posterior superior iliac spine. There are three constrictions in each ureter; at its junction with the renal pelvis (UPJ), where it crosses the iliac vessels, and during its passage through the wall of the urinary bladder (intramural ureter) or ureterovesical junction ***(Figure 1).*** These areas are potential sites of obstruction by ureteral calculi. The bifurcation of the common iliac vessels is used intraoperatively as a landmark to identify the ureter ***(Elkoushy and Andonian, 2016).***

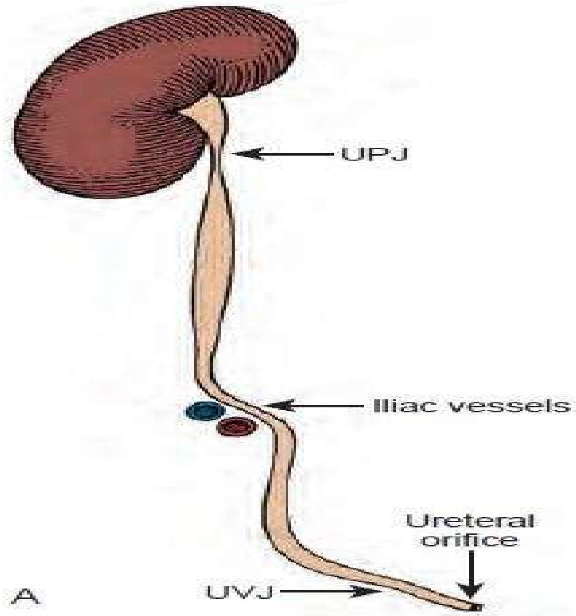

Figure (1): The ureter demonstrating sites of normal functional or anatomic narrowing at the ureteropelvic junction (UPJ), the iliac vessels, and the ureterovesical junction (UVJ) ***(Elkoushy and Andonian, 2016).***

The right ureter starts behind the descending part of the duodenum, where it is crossed by the gonadal vessels, which is called “water under the bridge.” The left ureter is covered at its origin by the initial part of the jejunum. The gonadal vessels cross the left ureter after running parallel to it for a small distance. The ureter then runs downward and laterally toward the ischial spine on the lateral pelvic wall along the anterior border of the greater sciatic notch, dorsally accompanied by the internal iliac artery and its visceral branches and the venous plexuses as well. It is still closely related to the posterior parietal peritoneum. At the ischial spine, the ureter turns medially to descend in the endopelvic fascia with branches of the hypogastric nerves. At the lateral wall of the pelvis, this part of the ureter crosses the obturator artery, vein, and nerve ***(Elkoushy and Andonian, 2016).***

In males, the vas deferens loops medially over this part while the ureter passes the ampulla of the vas deferens and the seminal vesicles just before it enters the bladder ***(Elkoushy and Andonian, 2016).***

In females, the descending part of the pelvic segment of the ureter courses posterior to the ovary to be the posterior boundary of the ovarian fossa. The ureter then passes through the base of the broad ligament and swings in a convex curve to cross under the uterine vessels “water under the bridge” in a sagittal direction approximately 1.5 to 2 cm adjacent to the supravaginal part of the uterine cervix. The terminal ureter runs forward, accompanied by the neurovascular bundle of the bladder and passes the anterior vaginal fornix just before entering the bladder. This close proximity of the ureter to the uterine vessels is the cause of ureteral injuries during gynecologic procedures. In the case of vaginal surgery, there is a high risk for injury especially for the left ureter that crosses the anterior vaginal fornix closer than the right ureter ***(Elkoushy and Andonian, 2016) (Figure 2).***