# بسم الله الرحمن الرحيم


MONA MAGHRABY

# شبكة المعلومات الجامعية

# التوثيق الالكتروني والميكروفيلم

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# جامعة عين شمس

# التوثيق الإلكتروني والميكروفيلم

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علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

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***MONA MAGHRABY***

# Comparative Study between Pneumatic and Holmium Laser Lithotripsy in Treatment of Ureteric Stones

Thesis

Submitted for Partial Fulfillment of Master Degree in Urology

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# List of Abbreviations

| Abb. | Meaning |
|---|---|
| ANOVA | A one-way analysis of variance |
| BMI | Body mass index |
| BUN | Blood urea nitrogen |
| CBC | Complete blood count |
| CRP | C-reactive protein |
| CTUT | Computed tomography urinary tract |
| EHLs | Electrohydraulic lithotriptors |
| ESFR | Early stone free rate |
| ESWL | Extra corporeal shock wave lithotripsy |
| HFU | Hounsfield unit |
| Ho: YAG | Holmium: yttrium aluminum garnet |
| KUB | Kidney-ureter-bladder |
| LL | Laser lithotripsy |
| LSFR | Late stone free rate. |
| MET | Medical expulsive therapy |
| NCCT | Non-contrast-enhanced computer tomography |
| NSAIDs | Nonsteroidal anti-inflammatory drugs |
| PCNL | Percutaneous nephrolithotomy |
| PH | Primary hyperoxaluria |
| PLs | Pneumatic lithotriptors |
| PS | Physical status |
| PTFE | Polytetrafluoroethylene |
| RIRS | Retrograde intrarenal surgery |
| RTA | Renal tubular acidosis |
| SD | Stander deviation |
| SFRs | Stone free rates |

# List of Abbreviations Cont...

| Abb. | Meaning |
|---|---|
| SPSS | Statistical Program for Social Science |
| ULs | Ultrasonic lithotriptors |
| UPJ | Ureteropelvic junction |
| URS | Ureterorenoscope |
| US | Ultrasound |
| UVJ | Ureterovesical junction |

# INTRODUCTION

Urolithiasis is a very common and complex disease which needs a lot of researches to understand its epidemiology, pathogenesis, and management ***(Johnson et al., 1979)***.

Urinary tract stone disease incidence differs between countries due to genetic, dietary and climatic factors. Incidence varies from 1 – 20 %. And lifetime prevalence differ between male and female (12% and 6% respectively) ***(Trinchieri et al., 2003).***

Urinary stones may be found at any part of urinary tract (kidney, ureter, bladder and even urethra). Stone site and other factors affect the decision to choose a treatment modality. The treatment modalities for stones in upper ureter and kidney are extra corporeal shock wave lithotripsy (ESWL), ureterorenoscope (URS), percutaneous nephrolithotomy (PCNL) and open or laparoscopic surgery ***(Tiselius et al., 2001)***.

Technological improvement in tools of retrograde intrarenal surgery (RIRS) as flexible, semirigid ureteroscopes and lithotripsies improves techniques and successes of RIRS ***(Wickham, 1993)***.

Ureterorenoscope is a less invasive modality of treatment that used for ureteric or renal stones. It may be used antegrade or retrograde. Nowadays semirigid ureteroscope can be used to treat all ureteric stones but flexible ureteroscope is preferred due to improvement in its technology, quality and tools ***(Troy et al., 2004)***.

Stones that can't be extracted directly by forceps and baskets must be disintegrated by lithotripsies. There are many types of lithotripsies as Electrohydraulic lithotripsy, Pneumatic lithotripsy, Ultrasonic lithotripsy and laser lithotripsy each have their advantages and disadvantages ***(Santa-Cruz et al., 1998)***.

Laser is abbreviation to Light Amplification by Stimulated Emission of Radiation. Laser energy is absorbed and converted to heat producing its effect. Laser lithotripsy used in urology since 1990s. Complications of laser lithotripsy with ureterorenoscope are generally due to the technique itself but not the laser, however ureteral perforation noted ***(Parsons et al., 1966)***.

Holmium: yttrium aluminum garnet (Ho: YAG) laser is the most commonly used laser for lithotripsy nowadays. It has photothermal mechanism of action and its energy absorbed by water ***(Vassar et al., 1999)*** with wavelength 2140 nm and tissue penetration 400 μm ***(Van Iersel et al., 1996)***.

It is the preferred laser as it is the most effective. Ho: YAG laser is used with all ureteroscopes as it has small fibers. It can fragment all stones with different compositions and hardness (HFU) in all sites of urinary tract. Also it has the advantages of less need to anti-migration devices ***(Sofer et al., 2002)***.

Ho: YAG laser not only used for urinary tract lithotripsy but also used for treatment of various urological ***(Yamada et al., 2003; Yamada et al., 2001; Krambeck et al., 2010)*** and non-urological diseases ***(Ponsky et al., 2001; Teichman et al., 2001)*** as it cases cutting and coagulation to tissues at the same time.

Laser settings or techniques are an important issue of researches as with increased pulse energy many disadvantages appear.

Stone dusting is to convert stone to tiny fragments or dust by decreasing energy and varying frequency to allow these tiny fragments to pass spontaneously.

Laser fibers are damaged with energy > 1 J due to thermal effect ***(Vassar et al., 1999; Spore et al., 1999).*** Fragment size is a challenging problem to urologists as it correlate or affect stone free rates (SFRs), as small fragment size result in high SFRs ***(Sea et al 2012)***. Stone retropulsion or migration increases with high energy.

Several studies were done using different laser settings. But all suggest that energy < 1 J result in small fragment size, decrease migration and decrease laser fiber damage ***(Vassar et al., 1999).***

# AIM OF THE STUDY

The aim of this study was to compare the efficacy & safety of holmium laser and pneumatic lithotripsy used in the ureteroscopic treatment of ureteral stones.