

MANAGEMENT OF BLADDER STONE WITH HOLMIUM-YAG LASER AT KARDINAH HOSPITAL TEGAL

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ABSTRACT

Objective: Transurethral lithotripsy using Holmium-YAG laser has been reported to be beneficial in breaking up bladder stones with large size (>4cm in diameter) with lower risk of mucosal injury and hematuria. The aim of this study is to evaluate the utilization of Holmium-YAG laser for the management of bladder stones at Kardinah General Hospital, Tegal. **Material & Methods:** This is a cross-sectional study conducted from January 2017 to March 2017. Patient's demography, which included age, sex, length of surgery, stone size, and laser's energy count were recorded. **Results:** We included 120 patients in this study. Mean of patients age in this study was 51.93 years old with age range were 41-85 years old. Most of the patients were male (109 vs 11) with a mean size of stone 25.09 ± 3.04 mm. Length of surgery ranges from 15 to 75 minutes and mean energy of the laser 28.99 ± 19.34 kJ. There was 100% stone's clearance following surgery with no major complication occurred. **Conclusion:** Holmium-YAG laser is effective in managing bladder stones at Kardinah General Hospital particularly for large size stones. Length of surgery and energy of laser used depend on the stone size in which bigger stone size is associated with longer surgery time and bigger laser energy needed.

Keywords: Bladder stones, holmium-YAG laser, length of surgery, Kardinah General Hospital.

ABSTRAK

Tujuan: Litotripsi transuretra dengan menggunakan Holmium-YAG laser dilaporkan memberikan hasil yang baik untuk memecahkan batu buli ukuran besar (>4cm) dengan kecenderungan cedera mukosa dan hematuria yang lebih kecil. Kami melakukan evaluasi terhadap penggunaan Holmium YAG-laser dalam manajemen batu buli di RSUD Kardinah Tegal. **Bahan & Cara:** Penelitian ini menggunakan metode cross sectional, dimulai dari Januari hingga Maret 2017. Analisa sesuai demografi pasien yaitu usia, jenis kelamin, lama operasi, ukuran batu dan jumlah energi. **Hasil:** Sampel pada penelitian ini berjumlah 120 pasien. Rerata usia pada subjek penelitian ini adalah 51.93 tahun dengan rentang usia rentang usia 41-85 tahun. 109 pasien adalah laki-laki, 11 pasien adalah perempuan. Hasil mean ukuran batu pada subjek penelitian ini adalah 25.09 ± 3.04 mm. Operator melakukan operasi dengan rentang waktu operasi 15 hingga 75 menit. Jumlah energi laser yang digunakan untuk memecahkan batu bervariasi; rerata energi 28.99 ± 19.34 KJ. Pasca operasi, tidak ada komplikasi mayor dan 100% stone clearance. **Simpulan:** Holmium YAG laser sangat efektif digunakan dalam pengelolaan batu buli di RSUD Kardinah terutama untuk batu buli dengan ukuran besar. Lama operasi dan jumlah energi yang digunakan tergantung dari ukuran batu buli. Semakin besar ukuran batu buli, semakin besar jumlah energi dan lama operasi.

Kata Kunci: Batu buli, holmium-YAG laser, lama operasi, RSUD Kardinah Tegal.

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INTRODUCTION

Lithotripsy using the Holmium laser is one of the modalities in the management of urinary tract stones, which uses several methods: electrohydraulic (EHL), ultrasonic, pneumatic lithotripsy, and other lasers such as pulsed dye and Q-switched Nd-YAG.¹⁻³ In addition, some trials reported the use

of Holmium-YAG laser resulting in good stone clearance and minimal mucosal injury of organs in the urinary tracts.⁴⁻⁸

In developed countries, bladder stone composes 5% from all urinary tract stones.⁹ Open surgery is an effective modality in bladder stone clearance. However, the patient morbidity is high. Therefore, the endourology procedure is preferred

due to its less morbidity and effective results. Chemolysis may be used to destroy struvite stones with surgery as adjuvant therapy. Extracorporeal shock-wave lithotripsy (ESWL) is an invasive minimal procedure and has been reported to have good stone free rate (72-99%). Nevertheless, cystoscopy is still needed to evacuate the stone remnants.^{10,11}

Transurethral lithotripsy using Holmium-YAG laser has been reported to give good results in destroying large bladder stone (>4cm) with minimal mucosal injury and minimal hematuria.^{4,6,11} In this study, we evaluate the use of Holmium-YAG laser in the management of bladder stone in Kardinah General Hospital, Tegal.

OBJECTIVE

This study aimed to know the profile of patients with large bladder stone that was treated with Holmium-YAG laser at Kardinah General Hospital, Tegal.

MATERIAL & METHODS

This study used cross sectional design. This study was conducted at Kardinah General Hospital,

Tegal from January until March 2016. The data for this research was taken from patient's medical records. Patients with bladder stones and underwent lithotripsy using Holmium-YAG laser at Kardinah General Hospital, Tegal from 2011 until 2015 were recorded. Subjects who fulfilled the inclusion and exclusion criteria in the population are included as samples. Excluded criteria include incomplete medical record and patients with bladder stones who underwent procedures other than lithotripsy using Holmium-YAG laser. Descriptive analyses were performed on the patient's age, gender, duration of surgery, stone size, and amount of Holmium-YAG laser energy that was used to destroy the stone. Analytic statistics were performed using independent samples t-test. All statistical analyses were performed using SPSS 20.0.

RESULTS

There were 120 patients included in this study. The mean age of subjects was 51.93 years old with age range 41-85 years old. One hundred and nine patients were male, 11 patients were female. Mean and median of stone size were 25.53 mm \pm 7.44 mm and 25 mm, respectively. The operator conducted the surgery with duration range from 15

Table 1. Subject's baseline data.

Variable	n (%)	Mean \pm SD
Age (year)		51.93 \pm 4.59
Sex		
Male	109 (90.8%)	
Female	11 (9.2%)	
Stone size (mm)		25.53 \pm 7.44
Duration of surgery (min)		35.83 \pm 7.34
Energy (kJ)		28.99 \pm 19.34

SD = standard deviation.

Table 2. Relationship between stone size, duration of surgery, and the amount of Holmium-YAG laser energy among our subjects.

Stone size in mm	stone <3 cm	stone >3 cm
Duration of surgery in minutes (Mean \pm SD)	34.76 \pm 5.23	65.23 \pm 4.64
Amount of energy in kJ (Mean \pm SD)	28.31 \pm 20.9	80.23 \pm 3.73
p value	0.023	<0.001

SD = standard deviation.

until 75 minutes. The amount of laser energy used to destroy the stone was variable; mean energy $28.99 \text{ kJ} \pm 19.34$ (Table 1). Following surgery, there were no major complications and stone clearance was 100%.

The mean duration of surgery to destroy the stone with size $<3 \text{ cm}$ was 34.76 ± 5.23 minutes with mean energy $28.31 \pm 20.9 \text{ kJ}$. Meanwhile, for stones larger than $>3 \text{ cm}$: the mean duration of surgery and the amount of energy was 65.23 ± 4.64 minutes and 80.23 ± 3.73 , respectively (Table 2).

DISCUSSION

In Indonesia, as one of the countries with urinary tract stones endemic, the incidence of bladder stone is strongly related to diet and nutrition.^{12,13} Bladder stone can be formed primarily and secondarily. Secondarily formed bladder stone is frequent in developed countries due to the infra-vesical obstruction in male 40 years old above.^{11,14}

The management of bladder stone is variable and there is no consensus that suggests the best modality for therapy. Open surgery is started to be abandoned and only conducted for large bladder stone and patients that will undergo prostatectomy or diverticulectomy simultaneously. Extracorporeal Shockwave Lithotripsy (ESWL) is a minimal invasive procedure and reported to have good stone free rate (72-99%). However, if the fragments of stone are big, cystoscopy is still needed to evacuate the stone.^{10-11,15}

Kara and Douenias et al., in their study suggested that Holmium YAG laser (transurethral lithotripsy) can be used in the management of bladder stone 3 cm .^{4,13} In our study, the mean stone size was 25.09 mm . Nevertheless, the maximum stone size evacuated was 46 mm . This was consistent with literature, if compared to the study by Nameirakpam in India, mean stone size was smaller (mean stone size 3 cm).¹⁶ Male was more frequent as a subject due to their relation with infra-vesical obstruction. The mean patient age in this study was 51.93 years old (related to the incidence of infra-vesical obstruction due to Benign Prostatic Hyperplasia (BPH) that increases at ≥ 40 years old).

If stone size, duration of surgery, and amount of energy used to destroy the stone were compared, the results are clinically and statistically significant (p -value 0.023 and <0.001 respectively). For stone size $>3 \text{ cm}$, the mean duration of surgery and amount of energy used to destroy the stone was $34.76 \pm 5.23 \text{ SD}$ (minutes) and $28.31 \pm 20.9 \text{ SD}$ (kJ)

respectively. The higher amount of energy and longer duration of surgery was found for bladder stone $>3 \text{ cm}$; mean duration of surgery and amount energy to destroy the stone: 65.23 ± 4.64 minutes and 80.23 ± 3.73 (kJ) respectively. The duration of surgery with the use of Holmium YAG-laser lithotripsy was correlated with stone size and rigor.¹⁷

In our study, the mean duration of surgery was 35.83 minutes with positive correlation between stone size and duration of surgery. The mean amount of energy that was used in this descriptive study was 28.99 kJ . Mean that was obtained was bigger than the study conducted than Taari et al., which described that the amount of energy used was 6.5 kJ . This was due to the smaller stone size that was destroyed ($4\text{-}14 \text{ mm}$).¹⁸ Therefore, Holmium-YAG laser was effective in the management of bladder stone in Kardinah General Hospital, Tegal, especially for large bladder stone. The duration of surgery and the amount of energy needed depends on the bladder stone size. The larger the stone size, the higher amount of energy and longer duration of surgery.

CONCLUSION

Holmium-YAG laser is effective in managing bladder stones at Kardinah General Hospital, particularly for large size stones. Length of surgery and energy of laser used depends on the stone size in which bigger stone size is associated with longer surgery time and bigger laser energy needed.

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