

Complications of Diode Laser in Endourological Procedures in Co-morbid Patients

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ABSTRACT

Objective: To determine safety of diode laser by studying post operative complications after endourological procedures in co-morbid patients.

Study Design: A descriptive study.

Place & Duration of Study: Shalamar hospital, Lahore from June 2009 to June 2012.

Materials and Methods: We studied post-operative complications (up to 3 months) in 3 groups (prostatic obstruction, bladder growths, urethral strictures) of total 180 patients with ASA III & IV. We assessed hematuria, UTI, abdominal pain, suprapubic discomfort, urinary retention, dysuria, incomplete procedure, cardiac or respiratory compromise, fluid overload, mortality, catheterization times and mean postoperative hospital stay

Results: In prostate group, mean age was 70.8 ± 8.6 years and follow-up period was 3 months. Complications were: mild transient haematuria in 65 (100%), creamy urine in 50 (77%), urinary tract infection in 25 (38.4%), dysuria in 16 (24.6%), retreatment required in 06 (9.2%), suprapubic discomfort in 3 (4.5%), TURP syndrome in 1 (1.5%) and significant hemorrhage requiring blood transfusion in 1 (1.5%). In urethral strictures, the complications were: microscopic hematuria in 80 (100%), urinary tract infection in 52 (65%) suprapubic discomfort in 9 (11.2%), dysuria in 6 (7.4%) mild transient hematuria in 5 (6.2%). In bladder growths, the complications were: mild transient haematuria in 30 (85.7%), creamy urine in 19 (54.2%), suprapubic discomfort in 18 (51.4%), dysuria in 9 (25.7%), urinary UTI in 8 (22.8%), ablation performed in two sittings in 1 (2.8%). No mortality in any group.

Conclusion: Diode laser is a safe and useful modality in patients with co-morbidities (ASA III and IV).

Key words: Diode laser, endourology, co-morbidity.

Introduction

Elderly patients with coexisting medical conditions undergoing complex or major surgery are high-risk. Range of surgery and patient-related factors including ischaemic heart disease, chronic obstructive pulmonary disease (COPD), advanced age, poor exercise tolerance determine the overall risk¹

Bleeding remains a concern in all endoscopic procedures, like morbidity and mortality for transurethral resection of prostate (TURP) have not changed for decades.^{2,3}

Potential advantages of laser therapy over traditional procedures include appreciably good hemostasis, decreased morbidity, minimal cardiac stress, and shorter hospital

stay.⁴

High-powered diode laser systems are available for endoscopic procedures.⁵ It has a compact size, easy portability, and a potential for lower capital and maintenance costs.³ The current system (Biolitec) allows a continuous wave mode to a flexible and customizable pulsing regime with side or bare end fire fibre. Diode laser has similar wavelength characteristics to the Nd: YAG laser (Neodymium:yttrium-aluminum-garnett), but scatters less in tissue, high simultaneous absorption in water and hemoglobin and it is postulated to combine high tissue ablative properties with good hemostasis with significantly lower energy consumption^{3,6}. Safety measures are similar to Nd: YAG laser.

Clinical data regarding safety of diode laser in endoscopic surgery is not frequently available.

Materials and Methods

We studied the post operative complications (up to 3 months) in 180 patients between

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June 2009 and June 2012 in Shalamar hospital, Lahore. Depending upon diagnosis, patients were divided into 3 groups (with Prostatic obstruction, bladder growths and urethral strictures) and complications in each group were studied.

In all cases of BPH, pharmacological treatment had been tried. Physical examination including digital rectal examination (DRE), Prostate specific antigen (PSA), abdominal ultrasound scan (trans-rectal scan only in case of disagreement between DRE and the abdominal ultrasound scan) were carried out for prostatic obstruction and bladder growth. Retrograde urethrogram was done for urethral strictures. All operations were done in spinal (60 %) or combined spinal/epidural, epidural alone or general anesthesia.)

We used 980 nm Diode laser (Biolitec, Germany) with 1000 μ m core optical fibers (side-fire), 600 μ m end fire with a spot diameter of 1 mm. The output power ranged from 50 W to 140 W during the surgery. The mean applied energy was 130 ± 70 kJ. Vapo-resection (Coagulation and resection of bigger prostates, vaporization and sample collection for small lesions) was performed using laseroscope / resectoscope of 26 Fr. The strictures were dealt with by vaporizing the tissue when passing, using the contact technique or non-contact mode depending on the characteristics of the tissue. Saline solution was used as irrigation during ablation and 1.5% Glycine during sample collection.

The antibiotic prophylaxis consisted of three intravenous doses of 1g of Cefoperazone /Sulbactam , at induction, at 12 and 24 hrs post operative period respectively. Patients needing anticoagulation were switched over to Enoxaprin 4000 i.u. sub cutaneous injection before the procedure. All procedures were performed by a single experienced surgeon with a dedicated team. In post operative period, patients were

assessed for transient, significant haemorrhage needing transfusion, microscopic hematuria, urinary tract infection, abdominal or flank pain, suprapubic discomfort, urinary retention, dysuria, incomplete procedure, cardiac or respiratory compromise, fluid overload , mortality, catheterization times and mean postoperative hospital stay. Patients were discharged from the hospital within 48 hours when urine was bloodless.

Inclusion Criteria:

Patients from all age groups needing endoscopic laser treatment for BPH, bladder growths, and urethral strictures having

1. Co-morbidities
 - a. altered renal function, (Creatinine > 2.0)
 - b. COPD
 - c. bleeding / clotting disorders with international normalization ratio (INR) >1.5
 - d. myocardial dysfunction, ejection fraction up to 30%)
2. American society of Anesthesiologists (ASA) grade III and IV
3. Refused surgical treatment due to high risk

Exclusion criteria:

Patients with ASA grade I & II

Follow up:

Follow up intervals postoperatively in out patient clinic were within 5 days for removal of catheter, 15 days, one month, 2 month and 3 months. Any clinical event, adverse effects and additional interventions or repeat surgery was noted.

For cases of ablation of prostate and bladder growths, follow up intervals were within 5 days for removal of catheter (upto 7 days for some cases of bladder growths), 15 days, one month, 2 month and 3 months.

In case of urethral strictures, the catheter was removed depending upon the severity of the condition and were followed upto 3 months.

Results

Prostate Group: Mean age of patients was 70.8 ± 8.6 years. One patient having prostate >260 gms developed significant post operative haemorrhage and needed transfusion. The patients having prostates >100 gms developed retention within 1 week and were re-operated. Dysuria was moderate, disappeared in all cases by symptomatic treatment within the following two weeks. UTI was noted in patients having indwelling catheter for >3 months. Patient with TURP syndrome was readmitted and electrolyte imbalance was corrected. Further results are in Table I.

Stricture Urethra group: Microscopic hematuria and gross hematuria both settled within 24 hrs in all patients. Post operative infection was noted in already infected urine which settled by two weeks antibiotics followed by suppressive dose. Further results are in Table II.

Bladder Growth group: Urinary retention occurred only in cases of indwelling catheter >3 months. Creamy urine lasted for 2-3 months and settled. Dysuria persisting up to 2 weeks was noted in widespread bladder tumours. Further results are in Table III.

Table I. Complications in prostate group (n= 65)

Complication	number of patients	Percentage
Transient hematuria (settled within 4 hrs)	65	100
Sloughy (creamy) urine	50	77
urinary tract infection	25	38.4
Dysuria	16	24.6
urinary retention requiring re-operation	6	9.2
Suprapubic discomfort	3	4.5
Syndrome of fluid absorption	1	1.5
Significant blood loss needing transfusion	3	4.5
Incomplete procedure	0	0
Mortality	0	0

Table II. Complications in Urethral Stricture (n = 80)

Complication	number of patients	Percentage
Microscopic hematuria	80	100
urinary tract infection	52	65
Suprapubic discomfort	9	11.2
Dysuria	6	7.4
Transient mild hematuria (for <24 hrs)	5	6.25
Significant hemorrhage	0	0
urethral perforations	0	0
Incomplete procedure	0	0
Mortality	0	0

Table III. Complications in bladder growths n = 35

Complication	number of patients	Percentage
Hematuria mild transient (<24 hrs)	30	85.7%
Sloughy (creamy) urine	19	54.2 %
Suprapubic discomfort	18	51.4 %
Dysuria	9	25.7 %
urinary tract infection	8	22.8 %
Incomplete procedure requiring second sitting	1*	2.8 %
Significant blood loss needing transfusion	0	0
urinary retention requiring re-operation	0	0
Mortality	0	0

Table IV. Mean Hospital stay and catheterization time

Procedure	catheterization time(days)	hospital stay(days)
Ablation of prostate (65)	4 ± 2	2
Resection of bladder growth (35)	4 ± 2.5	1.5
Urethrotomy (80)	2.5 ± 1	1

Discussion

Use of laser for the treatment of BPH and bladder tumours is the most commonly used alternative to TUR to decrease morbidities.^{7,8} For Nd:YAG, laser, it required longer catheterization periods because of the longer time required for expelling the necrotic tissue. Reports of long term results with KTP laser are limited.⁹ We removed catheter within 3 days because of effective coagulation and hemostasis except for prostatic obstruction with indwelling catheter for > 3months or complicated strictures of posterior and bulbar urethra.

Rapid vaporization and hemostasis is possible by diode laser.^{9,10,11} We easily obtained tissues of prostate and bladder growths for biopsy. The architectural pattern in resected tissue was well maintained for histopathological evaluation. An ex vivo study showed that diode laser has a higher tissue ablation capacity than KTP laser, and shorter operative time.⁹ Using vapo-resection technique, we obtained clean sharp cuts with almost blood-less field.

W. Cecchetti et al obtained a bloodless sharp cut and easy vaporization with minimum carbonization and edema in 22 cases. They found diode laser a good compromise between absorption and coagulative effects on the tissue.¹¹

Seitz et al treated 10 patients with BPH with diode laser. Ten patients were followed up at 1 month and 8 patients were followed up at 6 and 12 months. No serious postoperative haematuria was reported.¹² We found, mild transient hematuria in almost all patients which settled within 4 hours.

Erol et al (2009) studied 47 patients with diode laser prostatectomy. The commonest complication was mild-moderate irritative symptoms (23%) which resolved within the first two weeks. A late bleeding complication (requiring hospitalisation) was encountered in one patient at 4 weeks.

Mean operative time was 53 minutes.¹³

Chen et al (2010) treated 55 patients of BPH. They reported 10 patients with transient dysuria. Acute urinary retention in two men was resolved by removal of sloughed tissue via TURP. Two patients underwent TURP due to insufficient vaporisation or regrowth of prostatic tissue (reoperation rate 7%).

The three studies (Seitz et al; Erol et al; Chen et al) reported no serious intraoperative complications or postoperative haematuria. Lengths of hospital stay were 4.7 (SD 2.3) days in Seitz et al (2007) and 2.8 (SD 1.8) days in Chen et al (2010).^{12,14} In our study, almost all patients were discharged within 48 hours after surgery. Clemente Ramos and Luis Miguel evaluated¹⁵ diode laser treatment of BPH, focused on the peri-operative morbidity. They found prostate vaporization effective with minimal morbidity.¹⁵

The application of lasers in treating urologic disorders has gained widespread clinical acceptance in multiple surgical indications.¹⁵ Safety has also been demonstrated in patients with large prostates and patients receiving anti coagulant therapy or in retention.¹⁶

Conclusion

The early results showed a virtually bloodless surgery with sharp cut. With acceptable complication rate, diode laser is relatively safe and useful modality in patients with co-morbidities (renal failure, Chronic obstructive pulmonary disease, myocardial dysfunction, (ASA III & IV).

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