

# Long-Term Results of Interstitial Laser Coagulation for the Treatment of Benign Prostatic Obstruction

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## Abstract

**Objectives:** Long term data on the outcome of interstitial laser coagulation for the treatment of sub vesical obstruction due to benign prostatic enlargement have been rarely published. Our long-term outcome data are presented and the technique of interstitial laser coagulation is critically evaluated.

**Methods:** We carried out an evaluation of the outcome of consecutive interstitial laser coagulation procedures between 1999 and 2004. Follow-up was done by questionnaires sent to the outpatient urologists and by telephone interviews of patients.

**Results:** 68 patients were treated with ILC. Follow up was available for 66 patients (97%). Mean follow up was 41 months, 40 of 66 patients have been voiding spontaneously after ILC treatment (61%). Mean residual urine volume of these patients at the time of follow up was 25 ml (0-120 ml). Mean Qmax at the time of follow-up was  $11.1 \pm 4.5$  ml/sec. 16 patients have needed a secondary procedure for bladder outlet obstruction (TURP in most of these) and have been catheter-free since that. 10 patients remained on catheter drainage. A history of high residual urine volume or urinary retention was identified as predictor for treatment failure.

**Conclusion:** Interstitial laser coagulation can be used in selected patients with multiple comorbidities for the treatment of benign prostatic hyperplasia.

**Keywords:** Prostatic hyperplasia; Laser coagulation

## Introduction

Interstitial laser coagulation (ILC) has been introduced for the treatment of benign prostatic enlargement (BPE). The effectiveness of this treatment has been addressed in different studies [1-5]. There are also prospective randomized trials comparing ILC to Transurethral Resection of the Prostate (TUR-P). However this trials do not have long follow-up periods [3,6,7].

ILC has been proposed for different patient groups (young patients who would like to preserve their sexual function, patients with bleeding disorders). Yet, the place of this technique in comparison to the gold standard of TUR-P or other minimal invasive techniques (e.g. thermotherapy or ablative laser techniques) has not been clearly defined [8].

In this analysis we present our experience and long term follow up data of treatment of benign prostatic enlargement with interstitial laser coagulation. The aim of this study was to determine if ILC is a feasible treatment option for patients presenting with multiple comorbidities or bleeding disorders caused by thrombocyte dysfunctions or warfarin medication. The secondary aim of this study was to determine risk factors for treatment failure and to obtain long term follow-up data.

## Methods

A retrospective analysis of 68 consecutive patients treated with ILC between 1999 and 2004 was carried out. Data collection was done using patient charts, discharge letters and documentation from the operation room. We determined patient age, patient history, indication for performance of ILC instead of TUR-P, preoperative urine analysis, preoperative uroflowmetry, prostate volume, preoperative residual urine volume and preoperative IPSS. Perioperative parameters were collected including operation time and number of laser applications in total and per prostate lobe respectively.

Patients were treated with ILC using an Indigo Laser Optic 830e Treatment System. Patients were admitted to the hospital one day before surgery. Informed consent for the procedure was obtained

one day before surgery according to German legal requirements. Treatment was done in spinal anesthesia. Patients received an antibiotic prophylaxis of ciprofloxacin 250 mg twice daily beginning the day before surgery and continuing during hospital stay and postoperatively for at least 5 days. Before laser coagulation, urethrocystoscopy was performed and a suprapubic cystostomy was inserted. Then the laser probe was inserted under visual guidance and the application was initiated with a wavelength of 800-850 nm and sustained for three minutes with overlapping temperature ranges and a preset maximum temperature of 85°C. Further applications were done in the same way.

Postoperatively patients were discharged from the hospital with a suprapubic cystostomy the day after surgery. Residual urine volume determinations and uroflow measurements were done by the outpatient urologist who was advised to remove the suprapubic cystostomy not before two weeks postoperatively.

Follow-up was done by questionnaires sent to the outpatient urologists and by telephone interviews of patients. It was determined if patients could void spontaneously at the time of follow-up or were on catheter drainage. Furthermore it was inquired about uroflow parameters, pharmacotherapy and second operations because of voiding difficulties after ILC.

By statistical analysis the predictive factors for positive outcome of the operation were determined. Time until treatment failure was determined and univariate and multivariate analyses by Kaplan-Meier-

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Plots with Log-Rank-Tests and Cox-Proportional-Hazards-Analyses were done. Treatment failure was defined as re-insertion of a catheter or second operation because of insufficient voiding. Medical therapy with alpha-blockers was not considered a treatment failure because most patients received this medication during the time of follow-up for different time periods. The significance level was set at  $p < 0.05$ . Statistical calculations were done using the MedCalc®-Software.

## Results

Between 1999 and 2004 we treated 68 consecutive patients with ILC. The indications for performing ILC in all of these patients were high age, comorbidity with an increased risk of perioperative complications during TUR-P or anticoagulant medications, respectively. The most important comorbidities including cardiac diseases and coagulation problems are given in Table 1. Mean patient age was  $73.4 \pm 9.8$  years. Mean prostate volume was  $47.1 \pm 23.2$  ml (range 10 ml to 110 ml).

Preoperatively 37/68 patients (54.4%) presented with an indwelling catheter because of a history high residual urine volume.

In patients without indwelling catheter preoperative mean residual urine volume was  $75 \text{ ml} \pm 69.1 \text{ ml}$  (0 to 200 ml). Mean preoperative uroflow (Qmax) was  $8.5 \pm 5.4 \text{ ml/sec}$ . Mean preoperative IPSS was  $20 \pm 6$ . Mean preoperative prostate volume was  $47.1 \text{ ml} \pm 23.2 \text{ ml}$  (10 ml to 110 ml).

Mean operative time was  $52.4 \text{ min} \pm 19.7 \text{ min}$  (20 min to 95 min).

Mean total number of applications was  $8.1 \pm 2.8$ . The right prostate lobe received mean  $3.4 \pm 1.4$  applications, the left lobe  $3.5 \pm 1.5$  applications. Perioperative complications were minor. In two cases postoperative bleeding with clot retention occurred. Operative clot evacuation and coagulation was necessary in these two cases. Patients were discharged from the hospital with a suprapubic cystostomy as described.

Follow up was available for 66 patients (97%). Mean follow up was 41 months, ranging from 1 to 76 months. 40 of 66 patients have been voiding spontaneously after ILC treatment. Mean residual urine volume of these patients at the time of follow up was 25 ml (0-120 ml). Mean Qmax at the time of follow-up was  $11.1 \pm 4.5 \text{ ml/sec}$ . 16 patients have needed a secondary procedure for bladder outlet obstruction (TURP in most of these) and have been catheter-free since that. 10 patients remained on catheter drainage. In all of these cases extensive thermal alterations of the urothelium with significant necrotic tissue and bladder neck stenosis were encountered.

Of the 40 patients who have been voiding spontaneously after ILC treatment 26 were still alive at the time of follow up. 5 of these patients were on pharmacotherapy with either alpha-blockers, finasteride or both of them. Of these 26 patients 22 reported satisfaction with the result of the operation (85%). Mean IPSS in these patients was  $11.3 \pm 5.2$ .

The retreatment rate after complete follow up did not reach 50%. However a high proportion of patients received retreatment within the first year (Figure 1). In a univariate analysis we identified factors influencing the retreatment rate. A history of urinary retention proved to separate significantly a group with a higher retreatment rate from another group with lower retreatment rate (Figure 2). Age, prostate volume, total number of applications and number of applications per ml prostate volume did not influence the retreatment rate.

Also in a multivariate analysis only a history of urinary retention

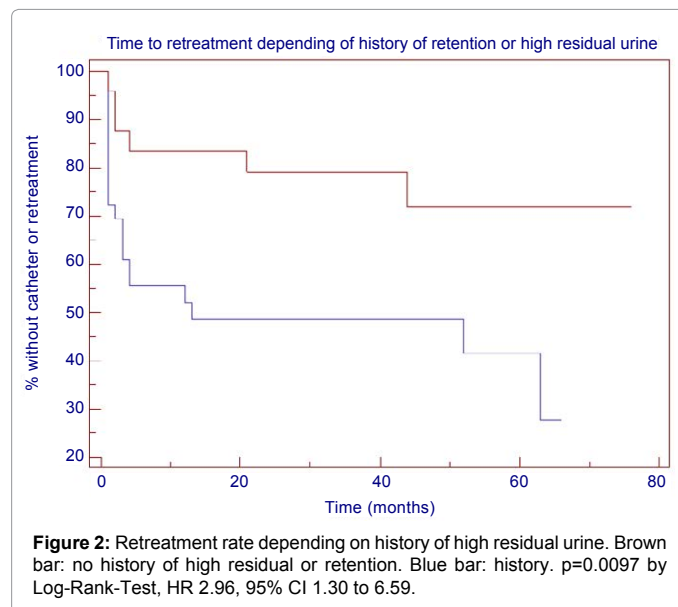
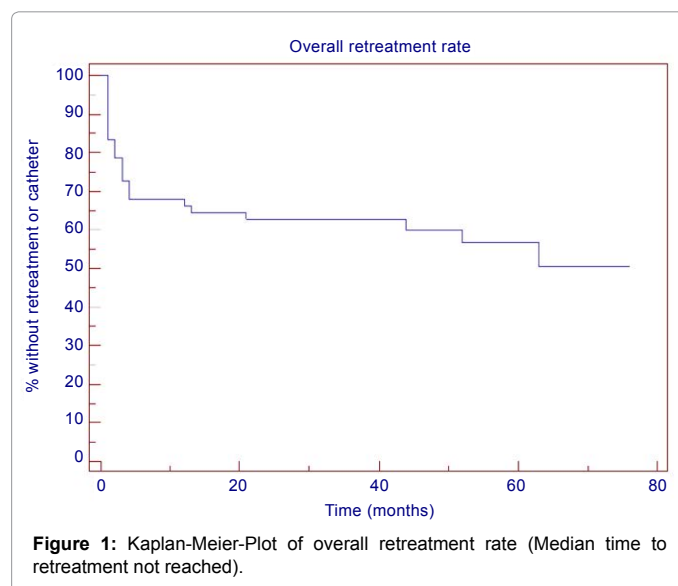
was identified as significant predictor of treatment failure ( $p=0.0320$ , Table 2).

## Discussion

The effectiveness of ILC for treatment of benign prostatic

Disease or condition	n	%
Cardiac insufficiency NYHA II and more	32	47.0
Coronary heart disease	23	33.8
Coumarine therapy	18	26.4
Diabetes mellitus	16	23.5
Thrombocytopenia	9	13.2
ASA score	n	%
ASA 1	0	0.0
ASA 2	34	50.0
ASA 3	34	50.0
ASA 4	0	0.0

Table 1: Most frequent comorbidities and ASA scores.



Covariate	SE	P	HR	95% CI of Exp(b)
Age	0.0241	0.4966	1.0165	0.9699 to 1.0654
Total applications	0.2288	0.1159	0.6978	0.4466 to 1.0903
History of retention	0.6093	0.0320	0.2708	0.0825 to 0.8885
Operative time	0.0152	0.9978	1.0000	0.9707 to 1.0301
Prostate volume	0.0324	0.1149	1.0525	0.9880 to 1.1212

**Table 2:** Cox proportional hazards analysis of predictive factors for treatment failure.

obstruction has been addressed in different studies. In this paper we report our experience with ILC and our long term results. Our hypothesis was that ILC is a good treatment option for people with high comorbidity. This patient group usually needs to become free of a transurethral catheter which causes clinically significant problems like recurrent infections, bleeding or frequent dislocation. The main criterion of success for this patient group thus is to achieve the ability to void spontaneously with an acceptable amount of residual urine volume. Furthermore a reduction of irritative symptoms and frequency seems to be of importance as well as the prevention of recurrent urinary tract infections and bleeding. Improvement of uroflow parameters seems of less importance although it normally is connected to success parameters like residual urine volume.

Our data are comparable to data presented in the literature. Mean IPSS in our analysis decreased from 20 to 11.3 points and mean Qmax increased from 8.5 to 11.1 ml/sec during long term follow-up. Daehlin et al. [9] reported a decrease of median IPSS from 22 to 13 points and an increase of Qmax from 8.6 to 10.2 ml/sec.

Our patient cohort contains 37 patients who had a transurethral catheter preoperatively. Of these 37 patients only 16 were able to void spontaneously after ILC. This is a primary success rate of 43%. 12 of these 37 patients needed a secondary TURP, 8 remained on catheter drainage and one was lost to follow up. In our analysis of predictive factors the history of high residual urine volume was a predictor for treatment failure. Thus patients with high residual urine volume who have received a catheter before ILC are not good candidates for this procedure. These data question the results of Nishizawa et al. [10], who described a successful treatment of patients presenting with acute urinary retention with ILC. This discrepancy might be explained by the fact that we did use ILC for patients who had a transurethral catheter because of a longer history of urinary retention and patients with quite recent urinary retention were underrepresented.

Regarding other factors of possible treatment failures we did not find any factor to be predictive. Advanced age has not to be considered as a negative factor according to our data. In our patient cohort even a patient with 91 years was treated successfully. However these results have to be interpreted with caution because the Kaplan-Meier-Plot does show a tendency towards a higher rate of retreatment among older patients.

Two studies on ILC explicitly addressed the question of predictive factors for treatment failure [4,11]. Muschter et al. [11] in a rather large analysis did not find any predictive factors. Terada et al. [4] identified an age of 71 years or older and percentage decrease of QOL at three months as independent significant postoperative parameters. Residual volume preoperatively was not identified as significant parameter. However our data are plausible considering the fact that increased residual urine volume often is connected to impaired detrusor function.

Finally it seems surprising that the number of treatments per ml prostate volume does not influence the outcome. Probably treatment success depends more upon the right positioning of the laser probe

then upon the mere number of applications. Interestingly also prostate size does not predict treatment failure. The highest prostate volume treated successfully in our analysis amounted to 110 ml and had a follow up of 71 months.

During the last years new treatment options for the BPS syndrome have been introduced. Above all new laser techniques have gained more acceptances due to their high efficacy and low complication rate. Nowadays we can use ablative techniques with laser vaporization or laser coagulation techniques like ILC. The drawback of coagulation techniques obviously is that necrotic tissue is removed over a longer period of time after the initial procedure [12]. This can cause irritative symptoms or recurrent urinary tract infections. In our analysis we did not collect data on early infection rates or irritative symptoms directly after ILC. But in our experience and in the literature they were quite frequent early after the procedure [13].

Taken into consideration the modest results of ILC presented in our analysis it seems difficult to support further use of this technique except in very selected patient groups [9,14].

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