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Urinary tract infections following laser prostatectomy: is there a need for antibiotic prophylaxis?

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Objective To evaluate the incidence of urinary tract infections (UTIs) after transurethral laser therapy of the prostate and the need for peri-operative antibiotics.

Patients and methods One-hundred and sixteen patients (mean age 65 years, range 51–85) with benign prostatic enlargement (BPE) were treated with a Nd:YAG laser, using either the TULIP device, the Urolase fibre or the Ultraline fibre. The incidence of voiding complaints, UTIs and the need for catheterization after treatment were assessed. The first 43 patients (Group I) received no antibiotics peri-operatively and the next 73 patients (Group II) received co-trimoxazole for 5 days.

Results The patients treated using the TULIP device had more urinary complaints after treatment than those treated using the Ultraline and Urolase fibres. In Group I, 48% of the patients developed a UTI and in Group II the incidence of UTIs decreased to 30% after treat-

ment. The incidence of UTIs was unrelated to the procedure performed. Although not statistically significant, peri-operative antibiotics tended to reduce the incidence of UTIs. Prolonged catheterization was correlated with the incidence of UTI. In Group I, patients who were treated using the Ultraline procedure had their catheter removed after a mean of 24 days, compared with 21 days for those treated with the Urolase and 19 days with the TULIP device. In Group II, the patients needed catheterization for a mean of 17 days following Ultraline treatment and 16 days following the Urolase procedure.

Conclusions Antibiotic prophylaxis tended to decrease the incidence of post-treatment UTIs. However, there was no clear association between the presentation and duration of complaints and the presence of UTIs.

Keywords Prostate, laser treatment, urinary tract infections, catheterization

Introduction

Urinary tract infection (UTI) and septicaemia are important sequelae of transurethral surgery. Significant controversy surrounds the use of prophylactic antibiotics in prostatic surgery. Septicaemia occurs in only 0–4% of patients undergoing transurethral resection of the prostate (TURP) [1]. Studies on the role of antibiotic prophylaxis have focused on the incidence of UTI and some have shown that antibiotic prophylaxis decreased the incidence of UTIs [2–5] whereas others reported no decrease [6–9]. In these studies UTIs occurred in 5–10% of patients even when antibiotics were used prophylactically. In a review, Chodak and Plaut concluded that no recommendations could be made regarding the use of prophylactic antibiotics [10].

Over the last 3 years transurethral laser therapy has been suggested as a new treatment modality for benign prostatic enlargement (BPE) [11–14]. Several devices have been developed and evaluated, amongst which the side-firing laser fibres are currently the most popular. At

low power, deep coagulation of the prostate can be achieved, whilst at high power direct tissue vaporization occurs. With our increasing experience of laser treatment, some patients apparently required prolonged periods of catheter drainage after treatment. Moreover, UTIs and epididymitis seemed to occur more frequently than in patients treated by TURP.

The aim of this study was to evaluate the incidence of UTIs after transurethral laser therapy of the prostate and the need for peri-operative antibiotics. Furthermore, we examined whether there was a correlation between the presentation of UTIs, the duration of catheterization and the complaints observed.

Patients and methods

Only those patients with sterile urine and undergoing transurethral laser prostatectomy were included in the study. Any patient with a UTI, urinary retention with an indwelling catheter or recent use of antibiotics within the 7 days preceding the operation were excluded. All pre-operative urine cultures were obtained by the mid-stream clean-catch method.

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Before treatment, the genitalia were cleaned with povidone-iodine solution and sterile water was used as the irrigation fluid. A suprapubic 16 Ch Foley catheter was inserted and the laser treatment performed using one of three techniques. With the TULIP device laser energy was applied, under ultrasonographic guidance, to the prostate, drawing lines from the bladder neck to the verumontanum and causing deep coagulation. The first 11 consecutive patients were treated with this device. After this study, a randomized study was performed, using two side-firing laser fibres under direct vision. The Urolase fibre also achieves deep coagulation by delivering energy at pre-determined areas of the prostate (2, 5, 7 and 10 o'clock positions). The Ultraline fibre enables vaporization of prostate tissue and treatment was performed by 'painting' the prostate. These techniques have been described in detail elsewhere [10–13].

The patients were discharged 1 day after treatment with the suprapubic catheter blocked. The patients were allowed to urinate spontaneously and the suprapubic catheter was removed when the patients were able to urinate adequately with a low post-voiding volume.

The first 43 patients (mean age 65 years, range 51–85), including those treated with the TULIP device, received no antibiotics peri-operatively (Group I) while the 73 patients (mean age 65 years, range 50–79 years) treated consecutively received co-trimoxazol peri-operatively for 5 days (Group II). In Group I, 13 patients were treated with the Ultraline fibre, 19 with the Urolase fibre and 11 with the TULIP device; in Group II, 31 were treated with the Ultraline fibre and 42 with the Urolase fibre.

Urine cultures were taken during the follow-up at 2 and 4 weeks and after removal of the catheter. Every UTI was treated when the organism was identified. Antibiotics were also given when the patient developed a fever $> 38^{\circ}\text{C}$, became clinically bacteraemic or devel-

oped a symptomatic UTI or epididymitis. The urine culture was considered to be infected when there were $> 10^5$ organisms/mL of a pure growth. Complaints were scored for their presence and duration, and scoring began on the day of discharge and continued until the patient was free of complaints.

Although the study was not randomized, a statistical analysis could be performed because the same inclusion criteria were used for both groups. The 11 patients treated with the TULIP device were all in Group I and were therefore omitted from the statistical analysis. A joint logistic regression analysis (SAS Procedure LOGISTIC) was applied to investigate the relationship between the the presence or absence of a UTI and antibiotic prophylaxis, type of laser and the duration of catheterization.

Results

After treatment, 21 patients (48%) in Group I and 22 patients (30%) in Group II developed a documented UTI. In Group I, eight (62%) patients treated with the Ultraline, nine (47%) with the Urolase and four (36%) with the TULIP procedure developed UTIs. In Group II, the incidence was 35% (11/31) in the Ultraline and 26% (11/42) in the Urolase group. The mean duration to catheter removal was 21 days (range 2–72) in Group I and 16 days (range 3–58) in Group II; with laser type, in Group I the mean durations were 24 days (Ultraline), 21 days (Urolase) and 19 days (TULIP). In Group II, the mean duration of catheterization was 17 days for the Ultraline and 16 days for the Urolase group. For Group I, in the group of patients with a positive urine culture, the catheter was removed after a mean of 24 days, while in the remaining patients the catheter was removed after 19 days; the results were similar for Group II (Table 1).

To investigate the influence of antibiotics, laser type and duration of catheterization on the probability of

Table 1 The average duration of catheterization, the type of procedure performed and the results of post-operative urine cultures in patients with (Group II) and with no peri-operative antibiotics (Group I)

Procedure	Duration of catheterization (days) (number of patients)		Total
	Positive culture	Negative culture	
<i>Group I</i>			
Ultraline	23 (8)	25 (5)	24 (13)
Urolase	28 (9)	15 (10)	21 (19)
TULIP	15 (4)	21 (7)	19 (11)
Total	24 (21)	19 (22)	21 (43)
<i>Group II</i>			
Ultraline	22 (11)	14 (20)	17 (31)
Urolase	19 (11)	15 (31)	16 (42)
Total	21 (22)	15 (51)	16 (73)

developing a UTI a logistic regression was performed. According to the likelihood-ratio test, the three regression variables combined were significant ($P=0.01$). Using the Wald test for each variable, there was no significant relation with laser type ($P=0.29$), but the probability of developing a UTI was significantly higher ($P=0.03$) with a longer duration of catheterization and although not significant ($P=0.07$) there tended to be a lower probability of developing a UTI with the use of antibiotics. Patients with a UTI had complaints for a mean of 45 days (range 6–149) and similarly, for patients with no UTI, the mean was 45 days (range 0–95) (Table 2). There was no clear relationship between the duration of the complaints, the type of complaints and the presence of UTIs. Table 3 shows the results of urine culture and the organisms cultured. Five patients

(12%) in Group I developed epididymitis compared with seven patients (10%) in Group II.

Discussion

Transurethral resection of the prostate is the most common operation for bladder outlet obstruction and is one of the most frequently performed operations in men 65 years or older [15]. Amongst other new, less invasive treatments for BPE, transurethral laser treatment of the prostate has become available recently. The first report on the use of lasers to treat BPE were presented by Costello *et al.* [16]. In two recent papers reporting laser ablation of the prostate with different techniques [11,17] it was concluded that the outcome of treatment was excellent and that the morbidity after treatment was minor. However, the majority of patients had voiding complaints, possibly due to UTIs. On the other hand, a difference in the severity of complaints was noted when different techniques were used. It was thought that these differences might not be related to the presence of an infection.

No standard exists in the urological community regarding the use of prophylactic antibiotics for TURP. The reported incidence of UTI in patients undergoing TURP ranges from 2.3 [18] to 42% [19]. In several studies [5,20,21] prophylactic antibiotics were recommended and Childs [22] stated that TURP should be classified as a contaminated procedure, with a 20% risk of infection, and also recommended prophylaxis. To define the prevalence of prostatic bacterial infection, Gorelick *et al.* conducted a study in which tissue from patients undergoing prostatectomy was submitted for quantitative bacterial tissue culture [23]. These data showed a significant prevalence (21%) of prostatic infection in patients undergoing prostatic surgery.

In patients with a sterile pre-operative urine culture, no peri-operative antibiotics are administered for TURP in our department. When transurethral laser therapy became available, it was also decided that peri-operative antibiotics would not be used in these patients. However, during follow-up many patients had irritative complaints for several days to weeks after treatment and the incidence of UTIs seemed high.

In the present study, evaluation of the patients treated without peri-operative antibiotics showed that 48% of them developed a UTI. Indeed, compared with the incidence seen after TURP (mean 10–20%), this percentage is high. Three factors were evaluated to explain this high incidence; the presence of necrotic tissue after the procedure, the presence of an indwelling catheter and prolonged catheterization. Moreover, relationships between the complaints and the presence of a UTI were examined.

Table 2 Post-operative complaints and the presence of urinary tract infection in patients with (Group II) and with no (Group I) peri-operative antibiotics

	Urinary tract infection		
	Yes	No	Total
<i>Group I</i>			
Number of patients	21	22	43
Complaints number [%]			
Frequency	15 (71)	12 (55)	27 (64)
Dysuria	16 (76)	12 (55)	28 (65)
Haematuria	16 (76)	12 (55)	28 (65)
Pain	7 (33)	5 (23)	12 (28)
<i>Group II</i>			
Number of patients	22	51	73
Complaints (number [%])			
Frequency	12 (55)	23 (45)	35 (48)
Dysuria	10 (46)	22 (43)	32 (44)
Haematuria	16 (73)	36 (71)	52 (71)
Pain	8 (36)	11 (22)	19 (26)

Table 3 Results of urine cultures

Bacteria	Group I	Group II
<i>Escherichia coli</i>	4	3
<i>Klebsiella pneumoniae</i>	4	0
<i>Staphylococcus aureus</i>	4	2
<i>Enterococcus faecalis</i>	3	5
<i>Acinetobacter baumannii</i>	2	1
<i>Proteus mirabilis</i>	2	0
<i>Citrobacter freundii</i>	1	1
<i>Enterobacter spp</i>	1	0
<i>Klebsiella oxytoca</i>	1	1
<i>Pseudomonas spp</i>	1	3
Coagulase -ve <i>Staphylococcus</i>	0	1
<i>Staphylococcus epidermidis</i>	1	5

The incidence of UTI was highest in the Ultraline-treated group, followed by the Urolase and the TULIP groups. However, adjusted for the use of prophylactic antibiotics and the duration of catheterization, there were no significant differences between those treated with the Ultraline and Urolase fibres. The discrepancy in the incidence of UTIs for the three procedures was not related to the type of laser fibre but to the duration of catheterization. All three techniques create extensive necrotic tissue, caused by coagulation. Thus the prostate turns into an ideal culture medium for bacteria, which may already be present in the prostate, as demonstrated by Gorelick *et al.* [23].

The presence of an indwelling catheter may support the incidence of UTIs. In those patients treated without prophylactic antibiotics, the mean time to catheter removal was 21 days. In cases of infection, the catheter was removed at a mean of 24 days while in the remaining patients the catheter was removed a mean of 5 days earlier. Patients with a prolonged indwelling catheter are susceptible to infection with mixed cultures of organisms [4,24]. In the 73 patients receiving prophylactic antibiotics a similar trend occurred; the mean duration of catheterization was 16 days, but was 21 days in infected and 15 days in the uninfected patients.

From the logistic regression analysis, it is concluded that this higher incidence of UTIs may be explained partly by a longer duration of catheterization. Recently, Costa presented results of a randomized study to evaluate whether antibacterial prophylaxis is useful in laser ablation of the prostate [25]. In agreement with the present study, 50% of the patients in a group receiving no prophylaxis developed bacteriuria. In patients receiving a single-dose regimen of a difluoroquinolone, bacteriuria developed in only 10%, whereas 5% of those receiving a multi-dose regimen developed bacteriuria during follow-up. In contrast to the present study, the median duration of catheterization was only 2–3 days; this may explain the difference in the results. On the other hand, infections may impair wound healing in the prostatic fossa and thus result in a need for prolonged catheterization. Although peri-operative antibiotics decreased the incidence of UTIs after treatment, the incidence of UTIs remained at 30%.

After laser treatment, significant epididymitis occurred in patients in both Group I and II. However, the incidence of epididymitis after TURP should not be underestimated. Epididymitis has been recognized as a complication of prostatic surgery for many years. Most urologists believe that the route of infection is through the lumen of the vas, and the incidence of epididymitis was estimated at 5–10% [26]. Possibly, urethral catheterization has only an indirect effect on the incidence

of epididymitis, by potentiating urinary infection. Because of the morbidity caused by epididymitis, any means which decreases the incidence of epididymitis should be employed.

In the present study there was no evident relation between the presence or duration of complaints after laser treatment and the incidence of UTIs (Table 2). Therefore, one cannot rely on the complaints presented by these patients to determine whether a UTI is present and causing the complaints. However, the duration of complaints and the type of procedure performed were associated. In an earlier phase, it was noted that voiding complaints and perineal discomfort were more pronounced in the TULIP group than in the Urolase group [11] and that this difference may be explained by the different procedure performed. During the insertion of the TULIP device, more tissue trauma may be caused than with other techniques. Moreover, the TULIP device requires a 48 F balloon to be filled with 0.1–0.2 MPa of pressure, which may cause a commisurotomy and stretching of the capsule of the prostate. Finally, patients treated with the Ultraline procedure may have more complaints than those treated with the Urolase because a larger area of the prostate surface is treated, sometimes very close to the bladder neck. Compared to the TULIP group, the patients treated with the Ultraline fibre had fewer complaints.

The high incidence of UTIs after laser prostatectomy may have many causes. There was a poor relationship between complaints and the presence of UTIs. There is a paucity of reliable indicators to identify pre-operatively patients that will develop complaints post-operatively, or will have a UTI. The major cause seems to be prolonged catheterization, but currently it is impossible to predict which patients will develop an infection. Peri-operative antibiotics tended to reduce post-laser UTIs, though there was no relation with the type of procedure performed. However, because few patients were treated within each group, firm conclusions cannot be made.

Because of the high rate of infection found in the present study and the decrease in infection in the subsequent group of patients with peri-operative antibiotics, we have decided to proceed with laser therapy under prophylactic antibiotics (co-trimoxazole 960 mg twice daily for 5 days). When considering the routine use of antibiotics the potential disadvantages must be considered, including added costs, selection of resistant organisms and allergic reactions. If antibiotics are administered, for how long should they be continued and which antibiotic drug should be chosen? These questions need to be answered in a randomized (placebo) controlled study. Furthermore, laser therapy of the prostate should be modified so that the need for (prolonged) catheterization is reduced.

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