The long-term results of transurethral vaporization of the prostate using plasmakinetic energy

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OBJECTIVE

To assess the long-term efficacy and the safety of plasmakinetic vaporization of prostate (PKVP, Gyrus Medical Ltd., Bucks, UK) against standard transurethral resection of the prostate (TURP) for symptomatic prostatic obstruction.

PATIENTS AND METHODS

Of 75 patients admitted to our clinic with symptomatic prostatic obstruction between 2001 and 2003, 40 who were randomized to undergo either TURP or PKVP, and who had returned for the follow-up, were included in this study. All treated patients completed the 36-months of follow-up; 25 had had PKVP and 15 a standard TURP. After surgery the treatment outcome was evaluated using the International Prostate Symptom Score (IPSS), maximum urinary flow rate (Q_{max}) and long-term complications of surgery.

RESULTS

The two groups had similar baseline characteristics. The improvement in both groups was statistically significant for the IPSS and Q_{max} at 24 and 36 months vs the baseline values ($P < 0.05$). The mean (SD) IPSS decreased from 21 (3.4) to 7.1 (1.5) and 7.6 (1.4) after PKVP and from 22 (3.8) to 5.2 (1.1) and 5.7 (1.2) after TURP, at 24 and 36 months, respectively. The mean Q_{max} for the both groups increased significantly from baseline values at 2 and 3 years, respectively, at 20.8 (2.4) and 21.8 (3.1) mL/s after TURP, which was statistically significantly better than after PKVP, at 12.5 (2.1) and 14.4 (2.6) mL/s, respectively ($P < 0.05$). Although three patients (12%) in the PKVP group had TURP at 14, 20 and 36 months, respectively, for residual adenoma tissue, one patient had an additional operation after TURP. Bulbar urethral strictures occurred in one patient in each group, requiring internal optical urethrotomy. Erectile dysfunction was reported by three patients after PKVP (12%) and by two of 15 after TURP who were potent before surgery ($P > 0.05$). The retrograde ejaculation rates in patients with erectile function were similar in both groups (56% and nine of 15, respectively; $P > 0.05$). In the PKVP and TURP groups, 12 (48%) and nine of 15 patients were satisfied overall.

CONCLUSIONS

Although early results showed that PKVP was a good alternative technique among the minimally invasive methods for surgically managing prostatic obstruction, the clinical outcome of PKVP in the long term was not comparable to the results after TURP.

KEYWORDS

prostatic hyperplasia, transurethral prostatectomy, bipolar plasma kinetic vaporization

INTRODUCTION

TURP remains the reference standard among the operative treatments for BPH [1], but the considerable morbidity rate associated with TURP [2,3] has led to the development of several less invasive technologies to relieve prostatic obstruction. Although there was promising short-term efficacy in many studies [4–6], because there are few studies with a long-term follow-up, no final conclusion can be made about the long-term efficacy of these minimally invasive treatments, and the main concern with these treatments seems to be the durability of efficacy.

Recently, plasmakinetic vaporization of the prostate (PKVP), using bipolar electrosurgical technology, had less morbidity and seemingly comparable results to TURP in the early and short-term follow-up [7–10]. We recently reported that PKVP can achieve similar results to TURP in improving the peak urinary flow rate (Q_{max}) and symptom scores in the short-term [11]. However, to our knowledge, there have been no data from randomized controlled trials on the durability of PKVP beyond 3 years. Thus we compared the long-term efficacy and safety of PKVP against conventional TURP for symptomatic prostatic obstruction.

PATIENTS AND METHODS

Of 75 patients with symptomatic BPH, 40, who had either PKVP or TURP (PKVP 25, TURP 15) were available for follow-up at 36 months. Patients with LUTS suggestive of BPH admitted to the outpatient clinic of our institution had a routine physical examination with a complete blood count, urine analysis, serum creatinine and PSA level measurement. All completed the IPSS, and had uroflowmetry using a standard system, with a minimum accepted urinary volume of 150 mL.

The urological criteria for inclusion were a Q_{max} of <10 mL/s or obstructive pressure-flow study, severe LUTS requiring surgical treatment, based on the IPSS and a prostate volume of <60 mL. Exclusion criteria were known neurogenic bladder, prostate cancer, urethral stricture and previous prostate surgery.

The patients who completed 3 years of follow-up after PKVP or TURP, and who had returned for the follow-up, were included in the study. For the surgery, spinal anaesthesia was used in all patients in both groups. A 26 F continuous-flow resectoscope was used for

TURP. PKVP was done using a plasmakinetic 27 F resectoscope with a plasmakinetic loop electrode of the Plasma Kinetic Management System (Gyrus Medical Ltd, Bucks, UK), including a bipolar electrosurgical device used endoscopically to instantly remove the obstructing prostate tissue by vaporization, with saline irrigation, as described previously [9].

All patients in both groups were compared using the changes in IPSS, Q_{max} and safety variables for each technique. Values between groups were compared using the Mann–Whitney *U*-test, and descriptive variables compared (percentage, median, mean and SD), with $P < 0.05$ taken to indicate a significant difference.

Variable	PKVP	TURP	P
Number of patients	25	15	
Mean (range) age, years	67.2 (58–78)	66 (53–74)	>0.05
Mean (SD):			
Prostate volume, mL	50 (2)	51 (1)	>0.05
Baseline			
IPSS	21 (3.4)	22 (3.8)	>0.05
Q_{max}, mL/s	6 (3.1)	6 (2.3)	>0.05
2-year follow-up			
IPSS	7.1 (1.5)	5.2 (1.1)	<0.05
Q_{max}, mL/s	12.5 (2.1)	20.8 (2.4)	<0.05
3-year follow-up			
IPSS	7.6 (1.4)	5.7 (1.2)	<0.05
Q_{max}, mL/s	14.4 (2.6)	21.8 (3.1)	<0.05
n (%):			
Secondary surgery	3 (12)	1	<0.05
Urethral stricture	1 (4)	1	>0.05
ED	3 (12)	2	>0.05
Retrograde ejaculation	14 (56)	9	>0.05
Satisfied overall	12 (48)	9	>0.05

TABLE 1
The patients' characteristics before surgery and at 2 and 3 years of follow-up, comparing the PKVP and TURP groups

RESULTS

There were no significant differences between the baseline characteristics for each group (Table 1); all treated patients completed the 3-year follow-up and all were analysed at both 2 and 3 years. The IPSS significantly improved at both follow-up intervals from the baseline values for both groups ($P < 0.05$; Table 1). The improvement in IPSS was significantly better in patients after TURP than after PKVP at 2 years ($P < 0.05$). The mean IPSS decrease was similar in both groups at 3 years.

The mean Q_{max} for both groups increased significantly from baseline values at both follow-up intervals ($P < 0.05$; Table 1); the mean Q_{max} after TURP was statistically significantly better than that after PKVP ($P < 0.05$).

While three patients (12%) in the PKVP group had a TURP at 14, 20 and 36 months after surgery, for residual adenomatous tissue, only one patient after TURP had additional surgery, for residual prostatic tissue ($P < 0.05$). Bulbar urethral strictures occurred in one patient in each group, requiring internal optical urethrotomy ($P > 0.05$). There was no bladder neck stricture in any patients of either group, and no urinary incontinence was reported by patients in either group.

Erectile dysfunction (ED) was reported in three patients after PKVP (12%) and in two after TURP, of those who were potent before surgery ($P > 0.05$). The retrograde ejaculation rates in patients with erectile function were similar in both groups (Table 1; $P > 0.05$).

At the end of the follow-up patients were asked whether they were satisfied overall with the procedure they had had; the degree of satisfaction was categorized as 'satisfied' or 'dissatisfied'. In the PKVP group, 12 patients (48%) were satisfied, and in the TURP group, nine of 15 were satisfied.

DISCUSSION

Although TURP has been the reference standard for the surgical treatment of BPH for decades, there are several disadvantages, e.g. prolonged catheterization, use of monopolar energy, longer training, risk of haemorrhage and a risk of TUR syndrome [1]. Thus, many minimally invasive procedures have been designed as an alternative option to this standard method [4–6]. The short-term results for some minimally invasive treatments are promising, but the long-term durability remains uncertain.

Recently, TUR and vaporization of the prostate with bipolar energy (PKVP) was introduced as a technical modification of TURP. As the bipolar electrosurgical equipment simultaneously vaporises tissue and controls bleeding, resulting in a clear operative field, and eliminates risk of TUR syndrome, it provides a new option among minimally invasive surgical treatments for BPH. It is also claimed to be easier to master [7,8].

Many studies reported experience and satisfactory results with PKVP, comparable with TURP, early after treatment [7–10]. Our randomized controlled trial with 1 year of follow-up also showed very good results, as an alternative to conventional TURP, with shorter catheterization and hospitalization times [11]. PKVP, with improved vision during surgery, was suggested especially in a highly selected group of patients at high risk, e.g. with cardiac pacemakers or bleeding disorders.

Data from randomized controlled trials of the durability beyond 3 years for BPH therapies are rare [12]. Recently, it was shown in a large-scale study that the overall incidence of a secondary procedure associated with the initial TURP was 5.8%, 12.3% and 14.7% at 1, 5 and 8 years of follow-up [13]. In case of PKVP, the higher ablative energy and larger resectoscope were plausible reasons for the risk of strictures of the urethra and meatus [10]. Even though our short-term results [11] showed that the overall incidence of a secondary procedure associated with initial PKVP was comparable to that after TURP, the incidence of re-operation after PKVP for residual adenomatous tissue at 3 years of follow-up was 12%, vs 1 of 15 for TURP. Bulbar urethral strictures occurred in one patient in each group, requiring internal optical urethrotomy, and no urinary incontinence was reported in any patients of either group.

Although the IPSS improved significantly and was statistically significantly better at 3 years of follow-up than baseline values for both groups, contrary to the short-term results, the improvement in IPSS was significantly better after TURP than PKVP.

The incidence of ED after TURP for BPH is still debated; it was reported to occur in 4–35% of patients and to be associated with age or pre-existing ED [14–16]. Various suggestions were made as to the origin of this condition (e.g. cavernosal nerve damage, fibrosis and thrombosis of the cavernosal arteries, or psychological changes due to ejaculatory failure or urethral sphincter insufficiency), but no conclusive determination was reported [15–17]. The only study comparing watchful waiting with TURP showed a 20% lower rate of ejaculatory failure in the untreated group, but showed no increase in the prevalence of ED after TURP, which was monitored for up to 3 years after surgery [18]. The incidence of newly reported ED after TURP was 12% [19]. While some minimally invasive surgical approaches were found to be similarly associated with a high risk of ejaculatory dysfunction, mainly retrograde ejaculation [20], others resulted in a lower rate of ED and retrograde ejaculation than TURP [21]. The present results were also comparable with those in previous studies, with ED reported in three patients after PKVP (12%) and two of 15 after TURP. The retrograde ejaculation rates for patients with erectile function were similar in both groups.

The use of a vaporization loop only might be a handicap as it precludes delicate tissue removal due to its shape, and provides no tissue for histopathological examination. Although in the present study we used a vaporization loop, recently we also started to use a resection loop, not only for tissue removal for histopathological examination, but also for delicate tissue resection with the resection loop, especially the around the verumontanum and apex. Tissue sampling with a resection loop after vaporization does not increase the likelihood of detecting carcinoma.

In conclusion, despite having good short-term results as a minimally invasive technique for the surgical management of BPH, the clinical outcome of PKVP in the long-term was not comparable with the results after TURP. A longer-term follow-up with larger study groups is required.

CONFLICT OF INTEREST

None declared.

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Abbreviations: **PKVP**, plasmakinetic vaporization of the prostate; $\mathbf{Q_{max}}$, maximum urinary flow rate; **ED**, erectile dysfunction.