Safety and efficacy of transurethral vaporization of the prostate using plasma kinetic energy: Long-term outcome

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INTRODUCTION

Benign prostatic hyperplasia (BPH) is a common health problem among the aged males. It may lead to an array of urinary voiding difficulties that negatively affect the quality of life (QOL) among older men.[1]

The conventional monopolar transurethral resection of the prostate (TURP) is still recommended as the gold standard surgical procedure for lower urinary tract symptoms (LUTSs) caused by BPH.[2]

Although many new endoscopic options developed for the treatment of BPH, there is a continuous effort to develop minimally invasive, efficacious, safer, and cost-effective treatment options. Bipolar plasma kinetic vaporization (PKVP) of the prostate possesses some of these properties.[3]

In 2009, the European Association of Urology (EAU) recommended transurethral PKVP as an alternative to the conventional monopolar TURP with promising initial reports of lower morbidity and similar efficacy and durability.[4]

Abstract

Objective: The objective of this study was to assess the long-term efficacy and safety of plasma kinetic vaporization (PKVP) of the prostate for symptomatic benign prostatic hyperplasia.

Patients and Methods: Twenty-one patients had been enrolled in this study at Al-Azhar University Hospitals to evaluate their long-term follow-up after PKVP. The outcome was evaluated using the International Prostate Symptom Score (IPSS), quality of life (QOL), peak urinary flow rate ($Q_{\text{max}}$), postvoiding residual (PVR) of urine, prostate volume, prostate-specific antigen (PSA) level, and long-term complications of the surgery.

Results: Preoperatively, IPSS was 22.14 ± 2.22, QOL score was 4.90 ± 0.54, $Q_{\text{max}}$ was 8.97 ± 2.49 ml/s, PVR was 138.5 ± 56.5 ml, prostate volume was 64.32 ± 11.16 ml, and PSA level was 4.18 ± 1.95 ng/ml. Two years' post-PKVP, IPSS decreased to 8.57 ± 5.55, QOL score decreased to 1.90 ± 1.22, $Q_{\text{max}}$ increased to 17.17 ± 7.91 ml/s, PVR decreased to 38.81 ± 59.54 ml, prostate volume decreased to 22.45 ± 7.22 ml, and PSA level decreased to 1.59 ± 0.74 ng/ml. One patient (4.8%) developed bulbar urethral stricture, 1 (4.8%) developed bladder neck contracture, and 1 (4.8%) developed meatal stenosis. Erectile dysfunction was reported by two out of 12 patients who were sexually potent before surgery, and retrograde ejaculation was reported by 10 patients (83%).

Conclusion: The present study has demonstrated satisfactory good efficacy and safety of PKVP on the long term.

Keywords: Benign prostatic hyperplasia, bipolar plasma kinetic vaporization, efficacy, long term outcome, safety
Several randomized studies showed that PKVP can achieve similar results to TURP in improving peak urinary flow rate ($Q_{\text{max}}$) and symptom scores in the short-term follow-up period.\textsuperscript{[8]}

Elhelali\textit{ et al.}, 2014\textsuperscript{[6]} had studied the short-term outcome of PKVP in a randomized controlled study comprised 60 patients at Al-Azhar University and concluded that the procedure is safe and effective after 6-month follow-up.

However, the assessment of long-term outcomes of PKVP is spare in the medical literature. Hence, the aim of this study was to assess the long-term efficacy and safety of PKVP of prostate for symptomatic BPH.

**RESULTS**

Follow-up of the 21 patients continued postoperatively for >2 years with a mean of 2.24 ± 0.55 years. Results were compared to the preoperative data.

The mean age of the studied patients was 62.81 ± 5.55 and 65.05 ± 5.40 years at preoperative and long-term follow-up period, respectively.

Table 1 shows a statistically highly significant difference between preoperative and long-term follow-up according to the IPSS, QOL, $Q_{\text{max}}$, PVR, prostate volume, and PSA ($P < 0.001$) [Figure 1]. It also showed statistically nonsignificant changes in $Q_{\text{max}}$ and QOL score at short- and long-term follow-up.

Long-term follow-up showed that one patient (4.8%) developed bulbar urethral stricture; the patient underwent internal optical urethrotomy with improvement of IPSS (from 19 to 9), $Q_{\text{max}}$ (from 2.8 to 15 ml/s), and PVR (from 159 ml to 40 ml).

One patient (4.8%) developed bladder neck contracture, but we lost contact with him and missed further follow-up.

One patient (4.8%) developed meatal stenosis; the patient underwent meatoplasty with improvement of IPSS (from 19 to 7) and $Q_{\text{max}}$ (from 7.3 to 16 ml/s).

Table 1: Pre- and post-operative (6 months and 2 years) data of the patients

|                      | Preoperative | Short-term results (6 months) | Long-term results (2 years) | $P_1$  | $P_2$  |
|----------------------|--------------|------------------------------|----------------------------|--------|--------|
| IPSS                 | 22.1±2.22    | 5.29±3.73                    | 8.57±5.55                  | <0.001 | 0.013  |
| QOL score            | 4.90±0.54    | 1.38±1.24                    | 1.90±1.22                  | <0.001 | 0.086  |
| $Q_{\text{max}}$ (ml/s) | 8.97±2.49 | 19.94±4.12                   | 17.17±7.91                 | <0.001 | 0.163  |
| PVR (ml)             | 138.5±56.5   | 3.57±14.24                   | 38.81±59.54                | <0.001 | 0.013  |
| Prostate volume (g)  | 64.32±11.16  | -                            | 22.45±7.22                 | <0.001 |        |
| PSA (ng/ml)          | 4.18±1.95    | -                            | 1.59±0.74                  | <0.001 |        |

\begin{footnotesize}
1IPSS: International Prostate Symptom Score, QOL: Quality of life, PVR: Postvoiding residual, PSA: Prostate-specific antigen, SD: Standard deviation, $Q_{\text{max}}$: Peak urinary flow rate
\end{footnotesize}
Retention occurred once for one patient who was catheterized for 5 days. Later, the patient improved on medical treatment. None of the 21 patients underwent reoperations. Urinary tract infection reported by 3 (14.3%) patients which was mild infection resolved with oral antibiotics. Erectile dysfunction was reported by two patients (16%) of 12 patients who were sexually potent before PKVP, and retrograde ejaculation was reported by 10 patients (83%).

**DISCUSSION**

BPH is the most common cause of LUTS in aged males. Many new treatment options are available today to manage these BPH-related symptoms. Based on symptoms severity and BPH-related complications, an individualized decision between watchful waiting, medical therapy, minimally invasive therapy, TURP, and open prostatectomy can be made.[7]

According to the EAU Guidelines, the classical monopolar TURP still represents the gold standard therapeutic approach in cases of average size BPH (between 30 and 80 mL) with the indication for surgery.[8]

The development of bipolar vaporization and resection systems in the last decade has become more important because they allow removal of tissue using an iso-osmotic...
saline solution and may provide improved surface coagulation during resection without requiring a return electrode applied to the skin.\[9\]

Many studies reported experience and satisfactory results with PKVP comparable with TURP early after treatment. Our study showed satisfactory results on the long term.

Our study showed highly significant improvement in the mean IPSS and the mean $Q_{\text{max}}$ at 2 years of follow-up in comparison with the preoperative data. These results were comparable with many recent studies. In agreement with our study, Martis et al.\[10\] reported that the mean IPSS decreased from 18 preoperatively to 5 at 24 months of follow-up and the mean $Q_{\text{max}}$ increased from 8.5 ml/s preoperatively to 22 ml/s at 24 months of follow-up.

The study of Geavlete et al.\[8\] reported that the mean IPSS decreased from 24.3 preoperatively to 5.0 at 18 months of follow-up and the mean $Q_{\text{max}}$ increased from 6.6 ml/s preoperatively to 23.7 ml/s at 18 months of follow-up. Koca et al.\[3\] reported that the mean IPSS decreased from 21 preoperatively to 7.6 at 36 months of follow-up and the mean $Q_{\text{max}}$ increased from 6 ml/s preoperatively to 14.4 ml/s at 36 months of follow-up.

Our study showed highly significant improvement in the mean QOL score and the mean PVR at 2 years of follow-up in comparison with the preoperative data. In agreement with our study, Geavlete et al.\[8\] reported that the mean QOL score decreased from 4.3 preoperatively to 1.0 at 18 months of follow-up, and the mean PVR decreased from 91 ml preoperatively to 29 ml at 18 months of follow-up. Kranzbühler et al.\[11\] reported that the mean QOL score decreased from 4.0 preoperatively to 1.0 at 1 year of follow-up and the mean PVR decreased from 87 ml preoperatively to 11 ml at 1 year of follow-up.

In agreement with our results, Geavlete et al.\[8\] demonstrated that 0.6% of the patients in the PKVP group developed bladder neck contracture and 4.7% of the patients developed urethral stricture at 18 months of follow-up. Kranzbühler et al., 2013\[11\] demonstrated that three patients (3.6%) out of 83 patients who have undergone PKVP procedure developed urethral stricture and 4 patients (4.8%) had developed bladder neck sclerosis after 12 months of follow-up.

In contrast to our study, Kaya et al.\[9\] showed that no bladder neck stricture, urinary incontinence, or mental stenosis was reported by patients underwent PKVP at 2 years of follow-up.

Urinary tract infection was reported only in three patients (14.3%) at 2 years’ follow-up. In agreement with our study, Reich et al.\[12\] demonstrated that urinary infection with significant bacteriuria occurred in three men (10%) and none of them developed fever.

In this study, long-term follow-up showed that two of them (16%) developed erectile dysfunction. Retrograde ejaculation was reported by 10 of them (83%). In agreement with our results, Kaya et al.\[9\] reported that erectile dysfunction was found in three patients (12%) after PKVP and retrograde ejaculation was reported by 14 patients (56%) after 3 years of follow-up. Koca et al.\[3\] reported that five patients (22%) out of 22 patients underwent to PKVP procedure developed erectile dysfunction (22%) while retrograde ejaculation was reported by 13 patients (59%) at 3 years of follow-up.

This study is a prospective study with long-term follow-up. The small sample size is the limitation of this study, so longer period of follow-up and larger number of studied patients are recommended for better evaluation of the durability of the safety and efficacy of the PKVP.

**CONCLUSION**

Bipolar PKVP is a promising new technique for the treatment of BPH; it proved good efficacy and safety on long-term results.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

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