Bipolar versus monopolar transurethral resection of the prostate: intraoperative and postoperative result analysis


ABSTRACT

Objective: To analyze the possible advantages of bipolar and conventional monopolar transurethral resection of the prostate during surgical intervention for prostatic hyperplasia in both the intraoperative and immediate postoperative periods.

Methods: A cross-sectional analytical study was carried out on 15 patients operated on with Gyrus ACMI bipolar resector and 15 with monopolar resector.

Results: Mean age was 67.4 years in the monopolar group and 68.1 years in the bipolar group. Bleeding during the cutting was classified as moderate-abundant in 86% of patients in the monopolar group vs 46% in the bipolar group (P < 0.05). Clotting capacity was very good-excellent in 100% of the monopolar group vs 7% in the bipolar group (P < 0.05). The degree of fragment adherence to the resecting blade was moderate-abundant in 100% of the monopolar group vs 20% of the bipolar group (P < 0.05). There was no statistical significance in the remaining variables compared.

Conclusions: In the authors’ experience, bipolar transurethral resection of the prostate presents with less fragment adherence and bleeding during cutting thus

RESUMEN

Objetivo: Analizar las posibles ventajas que ofrece la Resección Transuretral Prostática Bipolar frente a la Resección Transuretral Prostática Monopolar o convencional durante la intervención quirúrgica por hiperplasia prostática, tanto en el periodo transoperatorio como en el posoperatorio inmediato.

Método: Estudio descriptivo analítico en 15 pacientes que fueron intervenidos con resector bipolar Gyrus ACMI y 15 con resector monopolar.

Resultados: La edad media fue de 67,4 años en el grupo monopolar frente 68,1 años en el grupo bipolar; el volumen ecográfico prostático fue de 58,8 cc vs 49,6 cc. El sangrado durante el corte se calificó como moderado-abundante en 86% monopolar vs 46% bipolar (p < 0.05). La capacidad de coagulación fue notable-excelente en 100% del tratamiento monopolar vs 7% en el bipolar (p < 0.05). El grado de adherencia de fragmentos al asa fue moderado-abundante en 100% monopolar vs 20% bipolar (p < 0.05). No hubo diferencias significativas en el resto de las variables comparadas.

Conclusiones: En nuestra experiencia, la resección transuretral de próstata bipolar presenta menor adherencia de...
improving intraoperative visibility for the surgeon. Both procedures present with similar postoperative results.

**Key words:** transurethral resection of the prostate, bipolar, monopolar, Mexico.

**INTRODUCTION**

There are numerous treatments available to patients presenting with obstructive urinary symptoms secondary to prostatic hyperplasia that include conservative management, pharmacological therapy, transurethral resection and open prostatectomy. Despite the ever-increasing use of medical treatments a significant proportion of patients still require surgical treatment.\(^1\)

Even with the advances in minimally invasive therapy, transurethral resection of the prostate (TURP) continues to be the criterion standard for those prostate adenomas that can be resected in approximately one hour due to their volume. One of the instruments designed to reduce TURP morbidity is the bipolar scalpel. It cuts and establishes hemostasis at the same time, using physiological solution for irrigation. Working with this solution instead of hypoosmolar solutions (glycine) reduces the possibility of TUR syndrome.\(^2\,3\)

This syndrome is the result of fluid absorption that then causes dilutional hyponatremia and fluid intoxication. During the endourological procedure one of the functions of liquid irrigation is to improve visibility. Fluid pressure should be equal to or greater than that caused by resected tissue bleeding. In turn, liquid passes over open capillaries entering the bloodstream and causing a hypervolemic state with dilutional hyponatremia.\(^3\)

At the same time TURP frequently requires extended transurethral catheterization and variable hospital stay in addition to being associated with distinct complications such as bleeding, urinary incontinence, erectile dysfunction and bladder neck stenosis.\(^1\,3\,6\)

The objective of the present study is to analyze possible advantages of bipolar (Gyrus) TURP over conventional monopolar TURP during surgical intervention for prostatic hyperplasia and in immediate postoperative period.

**METHODS**

A randomized (one-to-one) prospective study was carried out on 30 patients during the time frame of August 2008 to January 2009. Patients had been diagnosed with benign prostatic hyperplasia (BPH) and presented with ultrasound (US) prostate volume between 20 and 80 cc. A group of fifteen patients were operated on with conventional monopolar resector, 26 F sheath and 30° optic using glycine solution. Another group of 15 patients were operated on with Bipolar Gyrus ACM® resector, 200 W generator and 80-100 V coagulation voltage, 26 F sheath, 30° optic using continuous irrigation with physiological solution.

All anticoagulated patients were excluded from the study as well as patients presenting with neurogenic bladder and those suspected of or diagnosed with prostate adenocarcinoma. Platelet antiaggregant medication was suspended two weeks prior to surgery in those patients receiving it. All patients were given a single intravenous dose of 400 mg ciprofloxacin as antibiotic prophylaxis immediately before beginning procedure. Resection technique was the same in all patients: once the presence of bladder tumor was discarded prostate resection with the Nesbit technique was performed. When procedure was completed hemostatic revision was carried out, fragments were extracted with an Ellik evacuator, and 3-way 22 F Foley catheter was put in place. Balloon was inflated with 40 cc physiological solution and there was continuous irrigation at 1000 cc of injectable water every 2 hours.

The study was carried out by 2 surgeons. Each of them filled out a questionnaire at the end of each surgery
to subjectively evaluate 5 parameters: resector cutting capacity (excellent-very good-good-bad), intraoperative visibility (excellent-very good-good-bad), coagulation capacity (excellent-very good-good-bad), degree of fragment adherence to resecting blade (very abundant-abundant-moderate-scarce-none) and bleeding during cutting (very abundant-abundant-moderate-scarce-none).

In addition resection time, volume resected, days of wash, days with catheter, hospital stay in days, hematocrit reduction, transfusion necessity, serum sodium reduction and episodes of acute urine retention after bladder catheter removal were all evaluated.

Results were analyzed with the STATA-IC-10-2008 statistical pack, license INTERMED-08-191-0531-ECE, and with programs that were developed in the authors’ hospital. Student $t$ test was used to contrast means and percentages were compared using non-parametric tests and chi-square test. Differences were considered to be significant when $P < 0.05$.

### Results

Table 1 shows the distribution of both groups. Data for each resector is described. Mean age for the monopolar group was 67.4 years and for the bipolar group was 68.1 years. Mean US volume for the monopolar group was 58.8 g and 49.6 g for the bipolar group. Mean PSA was 5.7 ng/mL for the monopolar group and 6.1 ng/mL for the bipolar group.

Table 2 summarizes intraoperative characteristic results with each resector. Cutting capacity was classified as excellent-very good in 100% of cases in the monopolar group and as excellent-very good in 93% of cases in the bipolar group ($P > 0.05$) (Image 1). Intraoperative visibility was classified as excellent-very good in 73% of cases in the monopolar group and as excellent-very good in 86% of the bipolar group, and $P < 0.05$ (Image 2). There was significant difference in favor of the bipolar resector in relation to degree of fragment adherence to resecting blade and was classified as

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**Table 1. Patient characteristics of both groups.**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Bipolar</th>
<th>Monopolar</th>
<th>Mean ± Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>USG volume (g)</td>
<td>68.1 ± 9.5</td>
<td>67 ± 8.94</td>
<td></td>
</tr>
<tr>
<td>Volumen ecográfico (g)</td>
<td>49.6 ± 17.1</td>
<td>58.8 ± 14.6</td>
<td></td>
</tr>
<tr>
<td>PSA (ng/mL)</td>
<td>6.1 ± 3.05</td>
<td>5.7 ± 3.8</td>
<td></td>
</tr>
<tr>
<td>Preoperative hematocrit (%)</td>
<td>42.01 ± 2.96</td>
<td>43.9 ± 4.2</td>
<td></td>
</tr>
<tr>
<td>Preoperative serum sodium (mEq/L)</td>
<td>139.9 ± 3</td>
<td>143 ± 3.39</td>
<td></td>
</tr>
</tbody>
</table>

In all variables $P > 0.05$.

**Table 2. Intraoperative variable results.**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Bipolar</th>
<th>Monopolar</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutting capacity (excellent-very good)</td>
<td>93.30%</td>
<td>100%</td>
<td>&gt; 0.05</td>
</tr>
<tr>
<td>Intraoperative visibility (excellent-very good)</td>
<td>86.60%</td>
<td>73.30%</td>
<td>&gt; 0.05</td>
</tr>
<tr>
<td>Degree of fragment adherence to blade (abundant-moderate)</td>
<td>7%</td>
<td>100%</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Bleeding during cutting (abundant-moderate)</td>
<td>20%</td>
<td>100%</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Bleeding during cutting (moderate-abundant)</td>
<td>46.60%</td>
<td>86.60%</td>
<td>&lt; 0.05</td>
</tr>
</tbody>
</table>

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**Image 1.** Cutting capacity in both groups.

**Image 2.** Intraoperative visibility.
abundant-moderate in 100% of cases in the monopolar group and only 20% of cases in the bipolar group and $P < 0.05$ (Image 3). In contrast, significant results were obtained in favor of the monopolar resector in regard to coagulation capacity and was classified as excellent-very good in 100% of cases in the monopolar group and 7% of cases in the bipolar group and $P < 0.05$ (Image 4). Bleeding during cutting was classified as abundant-moderate in 86% of cases in the monopolar group and a favorable 46% of cases in the bipolar group with $P < 0.05$ (Image 5).

Table 3 summarizes variables analyzed in the postoperative period. No significant difference were found in relation to days of wash (1.13 vs 0.96) with $P > 0.05$; days with bladder catheter (7.2 vs 8.5) (catheterization was prolonged due to the necessity to admit patients for treatment of other urological disorders, and so study patients were released with transurethral catheter that was removed in consultation once urine was clear); hospital stay was evaluated in days (1.4 vs 1.2). No differences were found in relation to hematocrit reduction after surgery (4.1 points vs 3.4 points) or serum sodium reduction (2.8 mEq/L vs 0.7 mEq/L). No patient required blood transfusion nor were there any cases of TUR syndrome. There was one episode of acute urine retention after transurethral catheter removal in the monopolar group that was managed with catheter repositioning and removal 24 hours later. Further retention did not present in
that patient. Clot evacuation had to be carried out on a patient in the monopolar group 24 hours after surgery.

One patient from the bipolar group presented with a prostate volume of 80 cc and a change to monopolar resection had to be made due to bipolar resector inadequate clotting.

**DISCUSSION**

The goals of BPH therapy are to improve quality of life, reduce symptoms and minimize secondary effects. Different treatment options include conservative treatment, pharmacological therapy, minimally invasive procedures, and surgery. Different factors determine treatment options such as urinary symptom relevance, age, patient self-sufficiency and status, among others. Even though the need for surgery has been on the decline for the past few years and different medical treatments have been described, TURP continues to be the criterion standard among minimally invasive procedures. TURP mortality remains under 0.25%. However, currently 2 intraoperative complications are common: blood loss, with a 2.5-8.6% transfusion rate, and TUR syndrome present in 2% of cases if resection time is greater than 90 minutes and 0.5% if it is less than that amount of time.2,11,12

New resection equipment with bipolar energy attempts to avoid this morbidity by carrying out cutting and hemostasis at the same time through the use of physiological solution as continuous irrigation liquid. The present authors analyzed variables that can have repercussions in TURP duration and quality, such as fragment adherence to the resecting blade and bleeding during cutting. The evaluation of these two variables favored the bipolar resector while the monopolar resector demonstrated a distinct advantage in relation to coagulation capacity. The fact that bipolar energy offers simultaneous cutting and clotting probably reduces clotting capacity in and of itself. Even so, it is important to mention that the monopolar equipment showed the advantage in this capacity. This subjective classification was carried out by two different surgeons. One episode of acute urinary retention presented in the monopolar group after transurethral catheter removal.

Different reports have evaluated the bipolar resector. In 2005 Starkman et al. reported on a series of 43 patients in whom transurethral catheter was removed at a mean 1.8 days in the bipolar group and a mean 3.2 days in the monopolar group. Four out of eighteen patients that underwent TURP with monopolar resector presented with urine retention as did 3 out of 25 patients that underwent TURP with bipolar resector. Abascal Junquera et al. (2006) reported on a series of 45 in whom transurethral catheter was removed in 3.1 days in the monopolar group and in 2.92 days in the bipolar group. Acute urine retention presented in only 1 patient in the monopolar group. There were no significant differences in hematocrit or serum sodium reduction. Marco de Sio et al. (2006) reported on a series presenting significant differences in relation to catheterization duration: catheter was removed at 72 hours in patients with bipolar resection and at 100 hours in the monopolar group. No patients presented with urine retention and no differences were found in relation to hematocrit and serum sodium reduction. These last two groups presented differences in relation to surgery duration when compared with the present study, most likely due to prostate volume of this study’s patients. It is also important to mention that 5% of tissue resected with Gyrus bipolar equipment was vaporized, thus presenting with lower volume at the time of resected material evaluation.10,13

Henry S.S. Ho et al. (2007) presented results of 100 patients in the comparison of monopolar vs bipolar resector. Two groups were formed, one of 52 patients and the other of 48. Both groups presented with similar results in regard to surgery duration, amount of resected tissue and hemoglobin reduction. There were only significant differences in serum sodium reduction and 2 patients presented with TUR syndrome.14

In the present study, the change in serum sodium and hematocrit was not significant. No patient presented with serum sodium under 135 mEq/L prior to surgery, which reduced risk of presenting with irrigation liquid reabsorption syndrome. The results of the present study show the bipolar resector to be equivalent to the conventional monopolar resector in reference to the intra- and postoperative variables studied. Certain advantages for both groups are suggested due to the small number of cases, therefore it is recommendable to increase the number of patients in order to determine the existence of significant differences.

**CONCLUSIONS**

In the present authors’ experience TURP with Gyrus bipolar resector offered better coagulation during cutting and less fragment adherence to the resecting blade, enabling the surgeon to carry out a simpler resection. Even so, the monopolar resector was shown to be advantageous with respect to coagulation when considered alone. Postoperative results were similar in the two groups.
Acuña-López JA, et al. Bipolar versus monopolar transurethral resection of the prostate: intraoperative and postoperative result analysis

BIBLIOGRAPHY