Review – Benign Prostatic Obstruction

Photoselective Vaporisation of the Prostate Using 80-W and 120-W Laser Versus Transurethral Resection of the Prostate for Benign Prostatic Hyperplasia: A Systematic Review with Meta-Analysis from 2002 to 2012

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Abstract

Context: Photoselective vaporisation (PVP) of the prostate is being used increasingly to treat symptomatic benign prostatic hyperplasia, due to the associated lower morbidity. Holmium laser enucleation of the prostate was considered to be the treatment with the highest evidence; however, evidence for PVP has dramatically increased recently.

Objective: To conduct a systematic review and meta-analysis of level 1 evidence studies to determine the effectiveness of PVP versus transurethral resection of the prostate (TURP) for surgical treatment of benign prostatic hyperplasia. Outcomes reviewed included perioperative data, complications, and functional outcomes.

Evidence acquisition: Biomedical databases from 2002 to 2012 and American Urological Association and European Association of Urology conference proceedings from 2007 to 2011 were searched. Trials were included if they were randomised controlled trials, had PVP as the intervention, and TURP as control. Meta-analysis was performed using a random effects model.

Evidence synthesis: Nine trials were identified with 448 patients undergoing PVP (80 W in five trials and 120 W in four trials) and 441 undergoing TURP. Catheterisation time and length of stay were shorter in the PVP group by 1.91 d (95% confidence interval [CI], 1.47–2.35; \( p < 0.00001 \)) and 2.13 d (95% CI, 1.78–2.48; \( p < 0.00001 \)), respectively. Operation time was shorter in the TURP group by 19.64 min (95% CI, 9.05–30.23; \( p = 0.003 \)). Blood transfusion was significantly less likely in the PVP group (risk ratio: 0.16; 95% CI, 0.05–0.53; \( p = 0.003 \)). There were no significant differences between PVP and TURP when comparing other complications. Regarding functional outcomes, six studies found no difference between PVP and TURP, two favoured TURP, and one favoured PVP.

Conclusions: Perioperative outcomes of catheterisation time and length of hospital stay were shorter with PVP, whereas operative time was longer with PVP. Postoperative complications of blood transfusion and clot retention were significantly less likely with PVP; no difference was noted in other complications. Overall, no difference was noted in intermediate-term functional outcomes.

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1. Introduction

Lower urinary tract symptoms (LUTS) in men are commonly due to bladder outflow obstruction secondary to benign prostatic hyperplasia (BPH) [1]. By the end of the seventh decade, nearly 60% of the Baltimore Longitudinal Study of Aging cohort had some degree of clinical BPH [2], and with the aging male population, it can be expected to increase [3]. Long-term complications of untreated bladder outflow obstruction include detrusor failure, renal failure, recurrent urinary tract infections, urinary retention, bladder diverticula, and bladder stones [4]. The most widely performed surgical treatment for patients with moderate to severe LUTS secondary to BPH has been transurethral resection of the prostate (TURP). Recent guidelines also support the use of TURP for the treatment of BPH [5,6]. However, there is still significant morbidity associated with TURP, and the retreatment rate after 5 yr is between 3% and 14% [7].

Photoselective vapourisation of the prostate (PVP) is a side-firing laser prostatectomy and has been commercially available for the last 10 yr, in the form of an 80-W laser initially, then a 120-W laser, and currently a 180-W laser. The technique has been refined during these 10 yr as the technology has improved. The 532-nm wavelength laser passes through a fluid medium and is absorbed by haemoglobin, leading to better coagulation during vapourisation [8]. PVP has already been shown to be an efficient and safe alternative to TURP in anticoagulated patients [9,10]. It has no risks of transurethral resection (TUR) syndrome because the irrigation used is saline rather than glycine. The ablative and coagulative characteristics of PVP are at a virtual optimum. PVP presents several potential advantages over TURP including reduced bleeding, absence of TUR syndrome, and shorter duration of hospitalisation [9–12] due to its safety profile. Thus PVP offers the promise of a minimally invasive alternative to standard care whilst providing similar efficacy with reduced risk of complications.

There have been nine randomised controlled trials (RCTs) of PVP compared with TURP, the current standard of care [13–21]. To date there have been six reviews of randomised data [22–27]; however, these have not included all of the recently published data. The objective of this analytic study was to conduct a systematic review and meta-analysis of level 1 evidence studies to determine the safety and efficacy of PVP versus TURP for surgical treatment of LUTS secondary to BPH. Outcomes reviewed included perioperative data, short- and long-term complications, and functional outcomes.

2. Evidence acquisition

2.1. Study criteria

All randomised controlled studies of patients treated surgically for symptomatic LUTS using PVP and TURP were included in this systematic review. A minimum follow-up of 6 mo was required for the control (TURP) and interventional arm (PVP). The intervention studied was PVP, which was performed with either an 80-W laser or a 120-W laser. Due to the absence of sufficient RCTs and direct comparative studies between 80-W and 120-W lasers, these were considered to be similar interventions, and results were combined as such. Studies that used a hybrid laser technique (e.g., both side-firing and end-firing lasers) or experimental laser <80 W in the intervention arm were excluded.

2.2. Search strategy

RCTs were identified by searching the electronic databases of EMBASE, Medline, and the Cochrane Central Register of Controlled Trials (2002 to February 2012). There were no language restrictions. The medical subject headings and keywords used for the Medline search included, but were not limited to, prostatectomy, transurethral resection of the prostate, laser surgery, photoselective vapourisation, and GreenLight. The search strategy was modified as required for each electronic database. Attempts were made to identify unpublished trials by searching the annual conference proceedings of the American Urological Association and the European Association of Urology for the last 5 yr (2007–2011). In addition, the reference lists of selected articles were checked for any additional studies.

2.3. Selection of trials, data extraction, and methodological quality assessment

Trials were selected based on meeting the prespecified inclusion criteria. Abstracts identified were deemed eligible after independent review by two authors. The full-text article was retrieved for any trial that appeared to meet the inclusion criteria. Data were independently extracted by two reviewers and entered into an Excel spreadsheet according to the prespecified outcome measures. Authors of all trials were contacted to obtain missing data. Authors who responded are listed in the acknowledgements section.

An assessment of methodological quality was made according to the Jadad scale. This scale assesses the criteria of randomisation, sequence generation, blinding, withdrawals, and dropouts [28].

2.4. Outcome measures

The outcomes assessed included perioperative variables and both efficacy and safety measures. The perioperative variables assessed were operative time, catheterisation time, and duration of hospitalisation. Safety outcome measures assessed were blood transfusions, TUR syndrome, clot retention, urinary retention, infection, macroscopic bleeding, unplanned readmission, unplanned reoperation, and bladder neck contracture or meatal stenosis or urethral stricture. For efficacy, the outcomes assessed were maximum flow rates ($Q_{\text{max}}$), symptom scores (International Prostate Symptom Score [IPSS]), and postvoid residual volume (PVR). These outcome measures were analysed at 12-mo follow-up and compared with baseline data.
2.5. **Statistical analysis**

Statistical analysis was performed using RevMan v.5.1.4. Where possible, meta-analysis was performed to generate summary statistics. For continuous outcomes, the weighted mean difference was calculated, along with the 95% confidence interval (CI) and \( p \) value. For binary outcomes, a summary risk ratio (RR) and its 95% CI were calculated. Statistical significance was defined as \( p < 0.05 \). A random effects model was used because significant heterogeneity was expected. Trial heterogeneity was assessed by visual inspection of forest plots, and statistical heterogeneity was assessed by chi-square tests and the \( I^2 \) statistic. Due to inconsistent data reporting, meta-analysis was not possible for all studies, especially when analysing functional outcomes.

3. **Evidence synthesis**

Nine trials, with a total of 889 patients, were included in this systematic review (Fig. 1). Table 1 summarises the characteristics of the included studies. The median sample size was 100 patients (range: 20–155). The duration of follow-up varied from 6 to 36 mo. The technology used for PVP included both the 80-W laser (five trials) and the 120-W laser (four trials). No RCT utilising the recently launched XPS laser setting was found in the literature search. Two trials included only patients with larger prostates [20,21].

Formal critical appraisal using the Jadad scores (Table 2) suggested that the risk of bias was low in four studies, moderate in two studies, and high in three studies.

3.1. **Perioperative outcomes**

Perioperative outcomes are summarised in Table 3. Operative time was shorter in the TURP group by 19.64 min (95% CI, 9.05–30.23; \( p = 0.0003 \)) for all included studies; however, catheterisation time and length of hospital stay were shorter in the PVP group, for all included studies, by 1.91 d (95% CI, 1.47–2.35; \( p < 0.00001 \)) and 2.13 d (95% CI, 1.78–2.48; \( p < 0.00001 \)), respectively.

3.2. **Postoperative complications**

Table 4 lists the postoperative complications analysed. In the PVP groups, there was no incidence of TUR syndrome, and only one patient required a blood transfusion (RR: 0.16;
Table 1 – Characteristics of included studies

<table>
<thead>
<tr>
<th>Author</th>
<th>n</th>
<th>Laser</th>
<th>Mean prostate volume, ml (SD)</th>
<th>Follow-up, mo</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>PVP, W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Al-Ansari et al. [16]</td>
<td>120</td>
<td>120 W</td>
<td>61.8 (22.0)</td>
<td>60.3 (20.0)</td>
</tr>
<tr>
<td>Bouchier-Hayes et al. [17]</td>
<td>119</td>
<td>80 W</td>
<td>38.8 (NR)</td>
<td>33.4 (NR)</td>
</tr>
<tr>
<td>Capitán et al. [15]</td>
<td>100</td>
<td>120 W</td>
<td>51.3 (14.7)</td>
<td>53.1 (13.8)</td>
</tr>
<tr>
<td>Horasanli et al. [20]</td>
<td>76</td>
<td>80 W</td>
<td>86.1 (8.8)</td>
<td>88.0 (9.2)</td>
</tr>
<tr>
<td>Lukacs et al. [13]</td>
<td>139</td>
<td>120 W</td>
<td>50.5 (16.5)</td>
<td>50.1 (14.8)</td>
</tr>
<tr>
<td>Pereira-Correia et al. [14]</td>
<td>20</td>
<td>120 W</td>
<td>43.4 (NR)</td>
<td>47.0 (NR)</td>
</tr>
<tr>
<td>Sarica and Altay [21]</td>
<td>60</td>
<td>80 W</td>
<td>89.1 (4.0)</td>
<td>91.8 (3.6)</td>
</tr>
<tr>
<td>Schwartz et al. [18]</td>
<td>100</td>
<td>80 W</td>
<td>32.0 (NR)</td>
<td>36.0 (NR)</td>
</tr>
<tr>
<td>Skolarikos et al. [19]</td>
<td>155</td>
<td>80 W</td>
<td>NR</td>
<td>NR</td>
</tr>
</tbody>
</table>

NR = not reported.

Table 2 – Jadad score

<table>
<thead>
<tr>
<th>Author</th>
<th>Study design</th>
<th>Design of RCT</th>
<th>Adequate sequence generation</th>
<th>Blinding</th>
<th>Withdrawals and dropouts described</th>
<th>Overall Jadad score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al-Ansari et al. [16]</td>
<td>RCT</td>
<td>NR</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>3</td>
</tr>
<tr>
<td>Bouchier-Hayes et al. [17]</td>
<td>RCT</td>
<td>Equivalence</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>3</td>
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<tr>
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<td>RCT</td>
<td>NR</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>3</td>
</tr>
<tr>
<td>Horasanli et al. [20]</td>
<td>RCT</td>
<td>NR</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>1</td>
</tr>
<tr>
<td>Lukacs et al. [13]</td>
<td>RCT</td>
<td>Noninferiority</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>3</td>
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<tr>
<td>Pereira-Correia et al. [14]</td>
<td>RCT</td>
<td>NR</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>2</td>
</tr>
<tr>
<td>Sarica and Altay [21]</td>
<td>RCT</td>
<td>NR</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>1</td>
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<tr>
<td>Schwartz et al. [18]</td>
<td>RCT</td>
<td>NR</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>2</td>
</tr>
<tr>
<td>Skolarikos et al. [19]</td>
<td>RCT</td>
<td>NR</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>1</td>
</tr>
</tbody>
</table>

NR = not reported.

Table 3 – Perioperative outcomes

<table>
<thead>
<tr>
<th>Outcome</th>
<th>PVP, n</th>
<th>TURP, n</th>
<th>Mean difference</th>
<th>95% CI</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation time, min</td>
<td>259</td>
<td>252</td>
<td>19.64</td>
<td>9.05-30.23</td>
<td>0.0003</td>
</tr>
<tr>
<td>Catheterisation time, d</td>
<td>303</td>
<td>293</td>
<td>1.91</td>
<td>1.47-2.35</td>
<td>&lt;0.00001</td>
</tr>
<tr>
<td>Length of hospital stay, d</td>
<td>253</td>
<td>243</td>
<td>2.13</td>
<td>1.78-2.48</td>
<td>&lt;0.00001</td>
</tr>
</tbody>
</table>

PVP = photoselective vaporisation of the prostate; TURP = transurethral resection of the prostate.

1 Favours TURP.

2 Favours PVP.

Table 4 – Postoperative complications

<table>
<thead>
<tr>
<th>Outcome</th>
<th>No. of studies</th>
<th>No. of participants</th>
<th>No. of events</th>
<th>Effect of estimate risk ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood transfusion</td>
<td>7</td>
<td>716</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>TUR syndrome</td>
<td>4</td>
<td>405</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Clot retention</td>
<td>2</td>
<td>229</td>
<td>3</td>
<td>23</td>
</tr>
<tr>
<td>Urinary retention</td>
<td>4</td>
<td>421</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Infection</td>
<td>3</td>
<td>312</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Macroscopic haematuria</td>
<td>4</td>
<td>455</td>
<td>16</td>
<td>28</td>
</tr>
<tr>
<td>Unplanned readmission</td>
<td>3</td>
<td>345</td>
<td>9</td>
<td>16</td>
</tr>
<tr>
<td>Unplanned reoperation</td>
<td>6</td>
<td>651</td>
<td>25</td>
<td>12</td>
</tr>
<tr>
<td>Meatal stenosis, or urethral stricture, or bladder neck contracture</td>
<td>5</td>
<td>492</td>
<td>14</td>
<td>20</td>
</tr>
</tbody>
</table>

TUR = transurethral resection.

Effect estimate <1 favours photoselective vaporisation of the prostate.

* p value = 0.003.

† p value = 0.0003.
95% CI, 0.05–0.53; \( p = 0.003 \) (Fig. 2). Furthermore, fewer patients experienced clot retention in the PVP group (RR: 0.14; 95% CI, 0.05–0.40; \( p = 0.0003 \)). No differences were noted in urinary retention, infection, macroscopic haematuria, unplanned readmissions, unplanned reoperations, or the composite end point of meatal stenosis or urethral stricture or bladder neck contracture.

### 3.3. Functional outcomes

Because not all studies reported 12-mo data sufficiently to perform a meta-analysis, only three studies were included; no differences were noted in \( Q_{\text{max}} \) and IPSS scores (Figs. 3 and 4). Sufficient data were not available to conduct a meta-analysis on PVR data. Overall, seven of nine studies found no differences in urinary flow rates \( (Q_{\text{max}}) \) and symptom scores (IPSS) at final follow-up; two studies favoured TURP (Table 5a and 5b). One study showed a significantly lower PVR in the PVP group at final follow-up (Table 5c).

### 3.4. Discussion

Meta-analysis of the randomised data evaluating PVP versus TURP found that PVP has a more desirable perioperative profile. Length of catheterisation was markedly shorter in the PVP group. Hospital stay was also shorter following PVP.

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**Fig. 2** – Blood transfusions. CI = confidence interval; M-H = Mantel-Haenszel [test]; PVP = photoselective vaporisation of the prostate; TURP = transurethral resection of the prostate.

**Fig. 3** – Maximum flow rate. CI = confidence interval; PVP = photoselective vapourisation of the prostate; SD = standard deviation; TURP = transurethral resection of the prostate.

**Fig. 4** – International Prostate Symptom Score. CI = confidence interval; PVP = photoselective vapourisation of the prostate; SD = standard deviation; TURP = transurethral resection of the prostate.
The economic advantages of a shorter hospital stay should be evaluated in conjunction with the longer operative time and overall costs of the laser. Operation time was almost 20 min longer in the PVP group. This is likely to shorten with increased experience and confidence in the manual handling of the technology.

PVP was shown to have a better safety profile. TUR syndrome is completely removed from the list of complications of PVP because the fluid medium used is saline rather than glycine. Patients in the PVP group were 84% less likely to require blood transfusion in the immediate postoperative period. Fewer incidents of clot retention were reported in the PVP group. A potential advantage of PVP over TURP is the ability to undergo surgery despite anticoagulation or antiplatelet agents due to the substantially lower risk of bleeding [8–10,12]. This can be attributed to the coagulative properties of the 532-nm laser. At a cellular level, laser energy is delivered through saline and absorbed by haemoglobin inside prostatic tissue. The rapid heating of intracellular water allows

<table>
<thead>
<tr>
<th>Author</th>
<th>Follow-up, mo</th>
<th>Mean Q\textsubscript{max}, ml/s</th>
<th>PVP</th>
<th>F/U</th>
<th>TURP</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al-Ansari et al. [16]</td>
<td>36</td>
<td>6.9</td>
<td>17.2</td>
<td>6.4</td>
<td>19.9</td>
<td>NS</td>
</tr>
<tr>
<td>Bouchier-Hayes et al. [17]</td>
<td>12</td>
<td>8.8</td>
<td>18.6</td>
<td>8.9</td>
<td>19.4</td>
<td>0.49</td>
</tr>
<tr>
<td>Capitán et al. [15]</td>
<td>24</td>
<td>8.0</td>
<td>18.9</td>
<td>3.9</td>
<td>22.0</td>
<td>0.66</td>
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<tr>
<td>Horasanli et al. [20]</td>
<td>6</td>
<td>8.6</td>
<td>13.3</td>
<td>9.2</td>
<td>20.7</td>
<td>0.02</td>
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<tr>
<td>Lukacs et al. [13]</td>
<td>12</td>
<td>7.8</td>
<td>16.7</td>
<td>7.8</td>
<td>16.8</td>
<td>0.71</td>
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<tr>
<td>Pereira-Correa et al. [14]</td>
<td>24</td>
<td>10.0</td>
<td>20.5</td>
<td>6.4</td>
<td>18.6</td>
<td>0.38</td>
</tr>
<tr>
<td>Sarica and Altay [21]</td>
<td>12</td>
<td>NR</td>
<td>19.0</td>
<td>9.3</td>
<td>22.0</td>
<td>NS</td>
</tr>
<tr>
<td>Schwartz et al. [18]</td>
<td>11</td>
<td>NR</td>
<td>18.3</td>
<td>9</td>
<td>22.0</td>
<td>NS</td>
</tr>
<tr>
<td>Skolarikos et al. [19]</td>
<td>12</td>
<td>NR</td>
<td>18.3</td>
<td>9</td>
<td>22.0</td>
<td>NS</td>
</tr>
</tbody>
</table>

**Table 5 – Systematic review of functional outcomes: (a) maximum flow rate; (b) International Prostate Symptom Score; (c) postvoiding residual volume**

F/U = follow-up; IPSS = International Prostate Symptom Score; PVP = photoselective vapourisation of the prostate; PVR = postvoid residual; NR = not reported; NS = Not significant (p value not reported); TURP = transurethral resection of the prostate.

1 = Favours TURP.

r = Favours PVP.

S° = Statistically significant in favour of TURP (p value not reported).

* Reported as median not mean.
photothermal vapourisation. Due to the short optical penetration of the 532-nm beam, laser power is confined to a superficial layer of prostatic tissue [29]. In terms of urinary retention, infection, macroscopic haematuria, unplanned readmission, unplanned reoperation, or the composite end point of meatal stenosis or urethral stricture or bladder neck contracture, no differences were noted between PVP and TURP at 12-mo follow-up.

Only three studies were able to be included in the meta-analysis of functional outcomes, which demonstrated no significant difference between the two interventions at 12 mo. Seven RCTs reported no statistically significant difference in functional outcomes between PVP and TURP at final follow-up [13–19]. However, these studies do show an improvement within each treatment arm in terms of Q max and IPSS. One study showed a statistically significant lower PVR in the PVP group; however, this is of minimal or no clinical significance (27.0 ml with PVP vs 50.4 ml with TURP). Average prostate volume in these studies ranged from 32 ml to 60 ml.

Two RCTs report a significant difference in functional outcomes in favour of TURP at final follow-up [20,21]. Horasanli et al. and Sarica and Altay both reported significantly inferior Q max, IPSS, and PVRs following PVP [20,21]. It must be noted that these two studies assessed PVP versus TURP in larger prostates, >70 ml and 80 g, respectively, and utilised the 80-W laser. Horasanli et al. reported that the prostate volume reduction was significantly lower in the PVP group. Reoperation rate within 6 mo of PVP was 17.9% [20]. It has been suggested that lack of experience and proper technique led to poor outcomes in the Horasanli et al. study [30]. However, the level of training and experience with PVP amongst operators in this study is unknown. Although there have been case series reporting favourable outcomes following PVP on much larger glands (>100 ml) [31–33], no randomised data exist for PVP versus TURP for larger prostates.

The rapidly developing nature of the technology has meant that most of the evidence regarding efficiency and morbidity has come from short- to midterm prospective nonrandomised studies [10,11,34–42]. The laser fibre was initially commercialised as an 80-W laser, was subsequently improved to the 120-W laser, and then to the current laser at 180 W. These improvements have led to reduced operating times due to increased vapourisation with the higher powered devices. There have been systematic reviews of TURP versus alternative minimally invasive techniques; however, these reviews do not include most of the recently published RCTs comparing commercially available PVP and TURP in their analysis [22–27]. All have suggested that PVP is a promising alternative to TURP but have stated the need for further research including multicentre randomised trials. This meta-analysis combines data from nine recent RCTs and has shown that PVP is a reasonable alternative to TURP with regard to short-term perioperative outcomes. There is a clear reduction in perioperative morbidity and complications when PVP is utilised compared with TURP. Further long-term follow-up (such as 5-yr follow-up data) is needed for functional outcomes.

It is prudent to consider the cost effectiveness of new and developing surgical therapies. Using a Markov model to consider future care pathways, it has been shown that transurethral vapourisation of the prostate is less costly than TURP [43]. This is further supported by the demonstrated decrease in hospital stay. However, further cost analysis is required, taking into account associated morbidity, follow-up requirements, PVP training costs, and utility function. Only then can a meaningful conclusion regarding economic benefits and their impact on health budgets be made.

This study is limited by the paucity of long-term data, heterogeneity of available data, and the lack of randomised trials for the currently available 180-W laser. Data reporting was inconsistent and hence data pooling was not always possible, especially for reporting functional outcomes. All authors were contacted and requested to provide non-published data to facilitate greater and more in-depth meta-analysis. Only one author provided extra data that limited meta-analysis, especially for functional outcomes. Follow-up beyond 1 yr had a high attrition rate, and adequate analysis of follow-up after 12 mo was not possible due to small sample sizes. Only two studies blinded study personnel. Variable surgical experience with laser technology of the surgeons participating in the studies also had an impact on some outcomes. Separate data analysis of the 80-W and 120-W laser was difficult due to the paucity of available data. Hence despite the well-known shortcomings and subsequent improvements to the laser, these have been considered as a similar intervention for the purpose of meta-analysis. To overcome these deficiencies in the literature, further multicentre randomised studies must be carried out with sound methodology and long-term follow-up. More studies are also required to determine the effect of variations in power settings and laser wavelength on outcomes.

4. Conclusions

We have identified nine randomised trials utilising the 80-W or 120-W laser that compared PVP with TURP. Perioperative outcomes of catheterisation time and length of hospital stay were shorter with PVP; operative time was longer with PVP. Postoperative complications of blood transfusion and clot retention were significantly less likely with PVP, and no difference was noted in the complications of urinary retention, infection, bleeding, unplanned readmission, unplanned reoperation, or TUR syndrome. No difference was noted in the intermediate term with regard to functional outcomes, although heterogeneous reporting of results limited formal meta-analysis for functional outcomes. The study is limited by heterogeneous reporting of data, lack of data for the 180-W laser, and a high attrition rate beyond 1-yr follow-up.

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