Systematic review and meta-analysis of transurethral resection of the prostate versus minimally invasive procedures for the treatment of benign prostatic obstruction

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CRD summary
The review compared minimally invasive procedures with standard transurethral resection of the prostate (TURP) for the surgical treatment of benign prostatic obstruction. Bipolar TURP versus standard TURP had similar improvements in symptom scores and urinary flow rates and reduced catheterisation duration, hospitalisation and clot retention rates. Review process and study quality limitations make the reliability of the authors' conclusions unclear.

Authors' objectives
To evaluate the efficacy and safety of minimally invasive procedures compared with standard transurethral resection of the prostate for surgical treatment of patients with benign prostatic obstruction.

Searching
MEDLINE In-Process and Other Non-Indexed Citations, MEDLINE (from 1950 to April 2008), EMBASE (from 1988 to April 2008), BIOSIS Previews (from 1995 to May 2008) and The Cochrane Library (issue 2, 2008) were searched for publications in any language; search terms were reported. Tables of contents of four urology journals (Urology, European Urology, Journal of Urology and British Journal of Urology International) were searched from 2007 to 2008. Relevant conference proceedings were searched from 2005 to 2007. The bibliography of each retrieved article and relevant reviews were handsearched. Conference abstracts not published as full articles were excluded.

Study selection
Randomised controlled trials (RCTs) that evaluated clinical efficacy and safety of three minimally invasive procedures (photoselective vaporisation of the prostate (PVP), holmium laser ablation of the prostate (HoLAP) and bipolar transurethral resection of the prostate (TURP)) compared with standard TURP for surgical treatment of patients with benign prostatic obstruction were eligible for inclusion.

Relevant outcomes included: change from baseline in International Prostate Symptom Score (IPSS); change in peak urinary flow rate (Q_{max}); length of postoperative hospital stay; length of postoperative catheterization; rate of postoperative bleeding requiring transfusion; rate of postoperative clot retention; reoperation rate; and TUR syndrome. Short-term follow-up was classed as up to 12 months and long-term follow-up as more than 12 months.

Most of the included studies compared bipolar TURP (most used Gyrus PlasmaKinetic; others used Olympus TURIS and Vista CTR) and standard TURP. A few studies compared PVP (80 watt or 60 watt KTP laser) and TURP. One study compared HoLAP (VersaPulse select holmium laser) with TURP. Mean age of patients was generally more than 60 years. Most patients had moderate to severe symptoms of benign prostatic obstruction using IPSS scores. Some studies excluded patients with acute or chronic urinary retention or those taking anticoagulants. Follow-up ranged from perioperative to 72 months; only two studies had a follow-up of more than 12 months.

The authors did not report how many reviewers performed study selection.

Assessment of study quality
Validity assessment was based on the method of Jadad and Schulz and allocation concealment criteria proposed by Hewitt et al. Criteria assessed were: study design; randomisation; blinding of patient, outcome assessors and the person who made the decision to remove the catheter post-operatively; withdrawals; drop-outs; allocation concealment; and whether the trial was multicentre. If a criterion was not addressed in an article then it was rated unclear.

The authors did not report how many reviewers performed the quality assessment.
Data extraction
For continuous outcomes, mean differences (MD) with 95% confidence intervals (CI) were calculated. For dichotomous variables, relative risks (RR) with 95% CI were calculated. Where standard deviations were not provided these were imputed as described by the Cochrane Collaboration.

The authors did not report how many reviewers performed data extraction. Authors were contacted for missing data.

Methods of synthesis
Relative risks and weighted mean differences (WMDs) were pooled using a random-effects model. Between-study heterogeneity was determined using $\chi^2$ and $I^2$ ($I^2>40\%$ was considered to indicate considerable heterogeneity). Separate analyses were performed for the three comparisons between PVP, HoLAP and bipolar TURP compared with standard TURP. Sensitivity analyses were performed for short-term (<12 months), 12 months and more than 12 months follow-up for some outcomes.

Results of the review
Twenty-one RCTs were identified (n=1,936, range 36 to 240). Withdrawals and drop-outs were described in six studies. Five studies had an appropriate randomisation method. Blinding was reported for subjects in two studies, the individual who removed the catheter in four studies and for outcome assessors in four studies. There was adequate allocation concealment in three studies. There was only one multicentre study.

PVP versus standard TURP: (three RCTs)

Results were not pooled due to differences in study design. Only one of three studies (80W laser) found a significantly larger decrease in IPSS from baseline for TURP versus PVP (MD -8.0, 95% CI -5.1 to -10.9) and a significantly larger decrease in $Q_{\text{max}}$ from baseline for TURP versus PVP (MD -6.8mL/sec, 95% CI -3.0 to -10.6) after follow-up of six months. This study was of patients with large prostates. Both RCTs that used 80W lasers had significantly lower lengths of catheterization and lower lengths of hospital stay for PCP versus TURP (follow-up of six and 12 months); one study found a significantly lower risk of postoperative clot for PVP versus TURP (RR 0.12, 95% CI 0.03 to 0.49). Other results were reported but significance was not clear.

HoLAP versus standard TURP: (one RCT)

There were no significant differences in IPSS score, $Q_{\text{max}}$ or in complication rates at 12 months for HoLAP versus TURP. There was a shorter mean catheterisation time and hospital length of stay for HoLAP versus TURP (significance not reported).

Bipolar TURP versus standard TURP: (17 RCTs)

There was no significant difference in change in IPSS from baseline (scale zero to 35) (10 studies) or change in $Q_{\text{max}}$ from baseline (nine studies) over short-term (<12 months) follow-up or at 12 months follow-up for bipolar TURP versus standard TURP (seven studies for both analyses). For the one study with follow-up of more than 12 months, there was a marginally significant benefit for TURP versus bipolar TURP for change in IPSS score (MD -2.90, 95% CI -0.84 to -4.96) and a significant benefit for TURP versus bipolar TURP for change in $Q_{\text{max}}$ (MD -7.40, 95% CI -5.59 to -9.21).

There was a significant benefit for bipolar TURP versus standard TURP for length of catheterisation (WMD -0.78 days, 95% CI -0.46 to -1.10; 12 studies, $I^2=95\%$), length of hospital stay (WMD -0.66 days, 95% CI -0.14 to -1.19; eight studies; $I^2=97\%$), clot retention requiring bladder washout (RR 0.42, 95% CI 0.26 to 0.71; 10 studies; $I^2=0\%$) and TUR syndrome (RR 0.23, 95% CI 0.07 to 0.79; 14 studies $I^2=0\%$).

There were no significant differences between bipolar TURP and standard TURP for postoperative bleeding requiring transfusion (12 studies) or reoperation rate (five studies).

Authors' conclusions
There were benefits in perioperative and postoperative outcomes up to 12 months for minimally invasive procedures compared with standard transurethral resection of the prostate for surgical treatment of patients with benign prostatic obstruction. Surgical treatment with bipolar TURP resulted in a similar improvement in symptom scores and urinary flow rates while reducing the duration of catheterisation and hospitalisation and rates of clot retention, but results were limited by short-term follow-up.

**CRD commentary**
The review addressed a well-defined question in terms of participants, interventions, study design and relevant outcomes. Relevant databases were searched in any language. The search identified many studies published as abstracts alone and these were excluded; therefore, it was clear that relevant studies had been omitted. Publication bias was not assessed. Study quality was assessed using suitable criteria and most of the included RCTs were small and of relatively poor quality. The authors did not report whether efforts were made to reduce error and bias in study selection, data extraction and validity assessment. Relevant study details were reported, but fuller patient details could have been provided. Statistical heterogeneity was assessed and there was evidence for heterogeneity with some outcomes. The statistical method used for meta-analysis seemed appropriate. The sensitivity analyses reported provided the basis for some recommendations for future research.

Potential limitations that arose from the review process, the poor quality of included studies and a limited number of studies of PVP and HoLAP made the reliability of the authors' conclusions unclear.

**Implications of the review for practice and research**
**Practice:** The authors suggested that interventions with a lower risk of bleeding complications may be beneficial for patients taking anticoagulants, but that this needed further investigation.

**Research:** The authors identified a need for multicentre RCTs with high methodological quality and long-term follow-up (>12 months) to better define the role for PVP, HoLAP and bipolar TURP in treatment of benign prostatic obstruction. Longer term outcomes should include the need for reoperation or to re-institute medical therapy. Specific patient populations should be investigated as different techniques may individually be more appropriate for patients with large or small prostate size, patients in urinary retention and patients taking anticoagulants (where an intervention with a lower risk of bleeding complications may be beneficial). Cost-effectiveness and quality of life should be investigated.

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