Photoselective vaporization versus transurethral resection of the prostate for benign prostatic hyperplasia: a meta-analysis

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CRD summary
The review concluded that photoselective vaporisation and transurethral resection of the prostate had comparable functional outcomes in benign prostatic hyperplasia. Vaporisation had better safety outcomes. Transurethral resection had shorter surgery and lower reoperation risk. The review was generally well conducted but limitations in the evidence base, potential publication bias and substantial heterogeneity mean the authors’ conclusions should be considered tentative.

Authors’ objectives
To compare the effectiveness and safety of photoselective vaporisation with transurethral resection of the prostate in patients with benign prostatic hyperplasia.

Searching
MEDLINE (from 1966), EMBASE (from 1980) and Cochrane Central Register of Controlled Trials (CENTRAL) (from 1977) were searched without language restriction; limited search terms were reported. Conference abstracts from meetings of relevant professional organisations were searched.

Study selection
Randomised controlled trials (RCTs) that compared photoselective vaporisation with transurethral resection of the prostate in patients with benign prostatic hyperplasia were eligible for the review. Conference abstracts that were not published as full articles were excluded.

In the included studies, the mean age of participants ranged from 64 to 70 years and mean prostate volume ranged from 33cc to 88cc (one study only accepted patients with a prostate volume between 70cc and 100cc). Mean prostate specific antigen levels ranged from 1.7 to 3.6ng/mL (where reported). Laser vaporisation was either 80 or 120 watts. In one study, laser vapourisation was performed by urologists who had undertaken fewer than five prostatectomies. Follow-up ranged from six to 36 months. Studies were published between 2008 and 2011.

Two reviewers independently selected studies for the review. Disagreements were resolved by consultation with a third reviewer.

Assessment of study quality
Studies were assessed for quality using the Cochrane risk of bias tool. Criteria included sequence generation, allocation concealment, blinding, incomplete data and selective reporting. Each criterion was scored as low risk of bias, unclear risk of bias or high risk of bias. Where patients and assessors were both blinded, blinding was considered low risk of bias.

The authors did not state how many reviewers assessed studies for quality.

Data extraction
Data were extracted on the outcomes to allow calculation of risk ratios (RRs) for dichotomous data and mean differences (MDs) for continuous data, together with 95% confidence intervals (CIs).

Two reviewers independently extracted data for the review on a standard form. Disagreements were resolved by discussion with a third reviewer.

Methods of synthesis
Study results were combined in meta-analyses and summary effect risk ratios (RR) and mean differences (MD), each with 95% confidence intervals, were calculated using a Mantel-Haenszel fixed-effects model (where no heterogeneity
was identified) or a Mantel-Haenszel random-effects model was used (where heterogeneity was identified). Heterogeneity was assessed by the $\chi^2$ test and quantified by the $I^2$ value ($I^2>50\%$ was considered evidence of heterogeneity). Publication bias was assessed by inspection of funnel plots. Sensitivity analyses were undertaken by removing individual studies sequentially and assessing the impact on results.

**Results of the review**

Five trials (435 patients, range 20 to 120) were included in the review. All trials addressed incomplete data and were free of selective reporting. Four trials had adequate sequence generation. Two trials had blinding. One trial had adequate allocation concealment.

**Functional results:** There was no evidence of a significant difference between groups for International Prostate Symptom Score or maximum flow rate at six, 12 and 24 months follow-up. Significant heterogeneity in findings was identified at six months follow-up; sensitivity analysis suggested that the heterogeneity was associated with prostate volume.

**Complications:** Compared with resection, laser vaporisation was associated with a reduced risk of capsule perforation (RR 0.08, 95% CI 0.01 to 0.63; $I^2=0\%$; two RCTs), transurethral resection syndrome (RR 0.17, 95% CI 0.03 to 0.94; $I^2=0\%$; three RCTs), blood transfusion (RR 0.09, 95% CI 0.02 to 0.39; $I^2=0\%$; four RCTs) and clot retention (RR 0.13, 95% CI 0.04 to 0.38; $I^2=0\%$; two RCTs) but an increased risk of reoperation (RR 3.64, 95% CI 1.07 to 12.35; $I^2=0\%$; two RCTs). There was no evidence of a significant difference in the risk of other complications (acute urinary retention or urethral or bladder neck stenosis) between groups.

**Other outcomes:** Compared with resection, laser vaporisation was associated with a longer operation time (MD 14.53 minutes, 95% CI 0.38 to 28.69; $I^2=93\%$; four RCTs) but a shorter duration of catheterisation (MD -40.12 minutes, 95% CI -51.62 to -28.62; $I^2=80\%$; four RCTs) and shorter duration of hospital stay (MD -2.24 days, 95% CI -2.78 to -1.71; $I^2=84\%$; three RCTs). Sensitivity analysis suggested that the 120 watt laser reduced the difference in operation time when compared with resection to seven minutes; this difference was still significantly different. Sensitivity analysis suggested that larger prostate volume may have influenced the higher rate of reoperation with laser treatment.

**Authors’ conclusions**

Photoselective vaporisation and transurethral resection of the prostate had comparable functional outcomes in patients with benign prostatic hyperplasia. Vaporisation had better safety outcomes but transurethral resection had shorter operation time and lower risk of reoperation. Further long-term RCTs were needed.

**CRD commentary**

The review addressed a clear research question supported by appropriate inclusion and exclusion criteria. Relevant sources were searched without language restrictions. The restriction to published articles risked publication bias. Formal assessment of publication bias by inspection of funnel plots was unlikely to be useful given the limited number of trials identified. Adequate methods were used to select studies for the review and extract data which minimised the chances of reviewer error and bias; the authors did not state how many reviewers assessed studies for quality.

A valid tool was used to assess studies for risk of bias and scores were presented for the individual domain scores on this tool. The authors acknowledged that there was a high risk of bias in the included studies and that the number of participants was limited. Synthesis of the studies and assessment of heterogeneity was appropriate. Substantial heterogeneity was identified for some analyses and the authors appropriately displayed results using a random-effects model and attempted to explain the heterogeneity by undertaking sensitivity analyses. There were insufficient studies to investigate how differences in laser power influenced results.

The review was generally well conducted but limitations in the evidence base, potential publication bias and substantial heterogeneity mean that the authors’ conclusions should be considered tentative.

**Implications of the review for practice and research**

**Practice:** The authors did not state any implications for practice.

**Research:** The authors stated that further well-designed multicenter RCTs with long-term follow-up were needed to adequately evaluate the role of photoselective vaporisation. Studies should focus on laser vaporisation with 120 watt...
power, prostates larger than 80cc and should investigate lower urinary tract symptoms, detrusor pressure, bladder outlet obstruction and adverse sexual events.

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