Laser prostatectomy versus transurethral resection for treating benign prostatic obstruction: a systematic review
Hoffman R M, MacDonald R, Slaton J W, Wilt T J

CRD summary
This review concluded that results for improvements in urinary symptoms and flow slightly favour resection, although patients treated with lasers had fewer adverse events and shorter hospitalisation. The evidence presented appears to support the conclusions, but it is difficult to assess the reliability of the findings for symptoms and urinary flow because data were combined by meta-analysis without assessing heterogeneity.

Authors' objectives
The authors assessed the safety and efficacy of laser prostatectomy in comparison with transurethral resection (TUR) of the prostate, in men with symptomatic benign prostatic obstruction.

Searching
MEDLINE (1966 to June 2002), the Cochrane Library, the Cochrane Prostatic Diseases and Urological Cancers Group's register and the Science Citation Index were searched. The search terms were stated. The reference lists of identified studies and reviews were also checked. BJU International, The Journal of Urology, and Urology were manually searched from 1998 to June 2002. Studies in any language were eligible for inclusion.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) with 10 or more patients in each treatment group were eligible for inclusion.

Specific interventions included in the review
Studies that compared the efficacy and safety of laser prostatectomy with TUR were eligible for inclusion. The included studies used contact and non-contact laser, and hybrid techniques (including holmium laser, neodymium (Nd):YAG laser, endoscopic laser ablation, visual laser ablation, coagulation and vapourisation).

Participants included in the review
Studies of men with symptomatic benign prostatic obstruction were eligible for inclusion. In the included studies, the mean age was 67.4 years (range: 61 to 70.6) and the mean baseline peak urinary flow was 9.5 mL/second (range: 6.2 to 12.2). Some studies excluded men with urinary retention (defined variably across the studies). The included studies generally excluded men with extremely large prostates.

Outcomes assessed in the review
Studies that reported urinary symptoms and/or urinary flow data after at least 6 months' follow-up were eligible for inclusion. The primary outcome was improvement in urinary tract symptoms based on the American Urological Association symptom index, the International Prostate Symptoms Score and Madsen-Iversen, Boyarsky scale. The secondary outcomes included changes in peak and mean urinary flow. These outcomes were assessed at 6 and 12 months' follow-up. Other outcomes included hospital stay, duration of catheter insertion, adverse events, peri-operative mortality and reoperation rate.

How were decisions on the relevance of primary studies made?
Two authors independently selected the studies for inclusion.

Assessment of study quality
Validity was assessed using the adequacy of randomisation (adequate, inadequate, unclear), blinding of patients and
study personnel, and completeness of follow-up (see Other Publications of Related Interest). More than one author assessed validity.

Data extraction
Two authors independently extracted the following data: characteristics of the study and participants; allocation to treatment; duration and completeness of follow-up; clinical outcomes and adverse events. The data were extracted and analysed on an intention-to-treat basis.

Methods of synthesis
How were the studies combined?
The characteristics of the included studies were summarised. The results for hospital stay, duration of catheterisation and treatment failure were compared for all laser treatments combined versus TUR. A narrative synthesis was undertaken for data on hospital stay and duration of catheter placement. The data for symptoms and urinary flow were combined in meta-analyses after grouping studies according to the type of laser. For continuous variables, weighted mean differences (WMDs) and 95% confidence intervals (CIs) were calculated separately for data at follow-up and data for change from baseline. Dichotomous data were combined by estimating the weighted relative risks (RRs) and 95% CIs.

How were differences between studies investigated?
Differences in the treatment failure rates were reported separately for each type of laser treatment. Statistical heterogeneity was not formally assessed for RCTs included in the meta-analyses.

Results of the review
Sixteen RCTs (approximately 1,600 men) were included.

Study quality: 6 RCTs used adequate allocation concealment. In only one RCT was the outcome assessor blinded. The follow-up rates ranged from 53 to 97%.

Hospital stay (10 RCTs): compared with TUR, laser treatment reduced hospital stay by one to two days in all 10 RCTs. Duration of catheterisation: the results for laser versus TUR varied according to the type of laser.

Treatment failure requiring reoperation: laser increased treatment failure in comparison with TUR; the RR was 5.7 (95% CI: 2.2, 14.6).

Non-contact lasers versus TUR.
The statistical significance of differences in urinary tract symptoms varied according to whether mean change or follow-up data were used. Compared with TUR, non-contact laser significantly reduced urinary symptom scores when change data were used; the WMD using change data (3 RCTs) was -2.5 points (95% CI: -4.24, -0.70). There was no significant difference between non-contact laser and TUR when follow-up scores were used; the WMD using follow-up data (4 RCTs) was 0.21 (95% CI: -2.28, 2.70).

TUR increased peak urinary flow in comparison with non-contact laser. The increase was significant using change data and showed a trend using follow-up data; the WMD using change data for laser versus TUR (3 RCTs) was 3.18 mL/second (95% CI: 1.47, 4.89); the WMD using follow-up data (4 RCTs) was 2.64 mL/second (95% CI: 0.53, 4.75).

Contact lasers versus TUR. TUR showed a trend towards improving symptoms in comparison with Nd:YAG lasers; the pooled mean symptom score at follow-up (2 RCTs) was -2.08 points (95% CI: -4.51, 0.36). There was no significant difference in peak urinary flow at follow-up between Nd:YAG and TUR or in peak flow rate; the WMD (4 RCTs) was 1.91 mL/second (95% CI: -0.21, 4.02). There was no significant difference in urinary symptoms at follow-up between holmium laser and TUR; the WMD was 0.10 points (95% CI: -1.88, 2.08). Holmium laser improved urinary flow at follow-up; the WMD (1 RCT) was -4.80 mL/second (95% CI: -8.79, -0.81).
Hybrid lasers versus TUR.

TUR improved symptoms in comparison with hybrid laser; the decrease in mean symptom scores was 67% (95% CI of actual score: 20.5, 6.8) with hybrid laser versus 71% (95% CI in actual score: 20.3, 5.8) with TUR. There were insufficient data to calculate the WMDs in urinary symptom scores. There was no significant difference in peak urinary flow at follow-up between hybrid laser and TUR; the WMD was 1.53 (95% CI: -1.13, 4.19).

Adverse events.

Most RCTs did not completely report adverse events.

Laser treatments generally reduced morbidity and complications. TUR increased transfusions (RR 25.0, 95% CI: 5.9, 100) and strictures (RR 2.3, 95% CI: 1.3, 3.8) compared with laser. However, there were no significant differences between laser and TUR for erectile dysfunction, retrograde ejaculation, transurethral resection syndrome, epididymitis/orchitis, clot retention or urinary incontinence. Laser treatment increased urinary retention (RR 2.3, 95% CI: 1.4, 3.9) and dysuria (RR 3.6, 95% CI: 1.0, 13.1). Non-contact laser increased urinary tract infections (RR 2.2, 95% CI: 1.0, 4.9).

No treatment-related deaths were reported.

Authors' conclusions

Improvements in urinary symptoms and flow slightly favour resection, although laser treatments had fewer adverse events and shorter hospitalisation.

CRD commentary

The review question was clear in terms of the study design, intervention, participants and outcomes. Several relevant sources were searched, the search terms were stated and studies in any language were eligible. No attempt was made to locate unpublished studies, thus raising the possibility of publication bias.

Two reviewers independently selected the studies and extracted the data and more than one reviewer assessed validity; this reduced the potential for bias and errors. Validity was assessed using validated criteria and limitations of the included studies were discussed in the text. Relevant information on the included studies was tabulated. The data were extracted on an intention-to-treat basis, but the authors did not report the methods used for missing data. The studies were combined in a meta-analysis, but statistical heterogeneity was not formally assessed. It is therefore unclear whether a meta-analysis was always appropriate. The evidence presented appears to support the authors' conclusions.

Implications of the review for practice and research

Practice: The authors stated that laser treatment can be used as an alternative to TUR, but no specific guidance was stated.

Research: The authors stated that there is a need for larger RCTs, which assess a wide range of outcomes and adverse events, to determine the role of laser surgery.

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