

## Outcomes of stenting after uncomplicated ureteroscopy: systematic review and meta-analysis

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### EDITORIAL by Wilson and Rix

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BMJ 2007;334:572-5

doi: 10.1136/bmj.39119.595081.55

### ABSTRACT

**Objective** To investigate the potential beneficial and adverse effects of routine ureteric stent placement after ureteroscopy.

**Design** Systematic review and meta-analysis of randomised controlled trials.

**Data sources** Cochrane controlled trials register (2006 issue 2), Embase, and Medline (1966 to 31 March 2006), without language restrictions.

**Review methods** We included all randomised controlled trials that reported various outcomes with or without stenting after ureteroscopy. Two reviewers independently extracted data and assessed quality. Meta-analyses used both fixed and random effects models with dichotomous data reported as relative risk and continuous data as a weighted mean difference with 95% confidence intervals. **Results** Nine randomised controlled trials (reporting 831 participants) were identified. The incidence of lower urinary tract symptoms was significantly higher in participants who had a stent inserted (relative risk 2.25, 95% confidence interval 1.14 to 4.43, for dysuria; 2.00, 1.11 to 3.62, for frequency or urgency) after ureteroscopy. There was no significant difference in postoperative requirement for analgesia, urinary tract infections, stone free rate, and ureteric strictures in the two groups. Because of marked heterogeneity, formal pooling of data was not possible for some outcomes such as flank pain. A pooled analysis showed a reduced likelihood of unplanned medical visits or admission to hospital in the group with stents (0.53, 0.17 to 1.60), although this difference was not significant. None of the trials reported on health related quality of life. Cost reported in three randomised controlled trials favoured the group without stents. The overall quality of trials was poor and reporting of outcomes inconsistent.

**Conclusions** Patients with stents after ureteroscopy have significantly higher morbidity in the form of irritative lower urinary symptoms with no influence on stone free rate, rate of urinary tract infection, requirement for analgesia, or long term ureteric stricture formation. Because of the marked heterogeneity and poor quality of reporting of the included trials, the place of stenting in the management of patients after uncomplicated ureteroscopy remains unclear.

### INTRODUCTION

Extracorporeal shock wave lithotripsy and ureteroscopy are the most common treatment for ureteric

stones. The routine placement of stents after the procedure is questionable.<sup>w1 w2</sup>

Main advantages are the prevention of ureteric obstruction, and renal pain that may develop as a result of ureteric oedema. Ureteric stents may cause urinary symptoms or morbidity, or both,<sup>1,2</sup> and complications such as migration, infection, pyelonephritis, breakage, encrustation, and stone formation.<sup>3</sup> Placement of ureteric stents also results in additional costs.

Ureteroscopy is now performed with small calibre endoscopes and better intracorporeal lithotripsy devices such as holmium laser so that most patients can be treated without ureteric dilation. As a result, the need for a postprocedural stent remains questionable.

We determined the evidence that outcome with routine ureteric stent placement after uncomplicated ureteroscopy is inferior to that without stent placement.

### METHODS

**Search strategy**—We obtained trials from the Cochrane renal group's specialised register of randomised controlled trials; the Cochrane central register of controlled trials 2006; Medline and PreMedline; Embase; reference lists of textbooks, review articles, and trials; and conference proceedings. Included randomised controlled trials had to compare stenting with no stenting after uncomplicated ureteroscopy in adults with a clinical diagnosis of ureteric stone who required intervention or who were undergoing diagnostic or therapeutic ureteroscopy for upper tract transitional cell carcinoma and had at least one of the predetermined outcomes of interest.

**Outcome measures**—Outcomes of interest were pain rated by patients on a validated scale, need for analgesia, lower urinary tract symptoms, unplanned medical visits or admission to hospital, complications related to the stent, return to normal physical activities, participants' satisfaction, health economics and health related quality of life.

**Quality assessment and data abstraction**—Two reviewers independently assessed study quality using the checklist developed for the Cochrane renal group. Discrepancies were resolved by discussion and arbitration by a third party if necessary. They assessed concealment of allocation, intention to treat analysis, completeness of follow-up, and blinding of investigators, participants, and outcome assessors. They

screened identified titles and abstracts independently. Potentially relevant trials were retained and the full text examined. The reviewers independently extracted data. When important data were not reported, we tried to contact the authors.

**Study characteristics and quantitative data synthesis**—Whenever possible, we classified studies by size and site of stones and type of ureteroscope and intracorporeal lithotripsy device used. When two or more studies reported on the same outcome we quantitatively combined results. We calculated relative risks for dichotomous data and weighted mean differences, for continuous data.

A fixed effects model was used unless there was evidence of substantial statistical heterogeneity, when we used a random effects model. **Statistical heterogeneity** of treatment effects between studies was formally tested with Cochran's test for heterogeneity ( $P < 0.1$ ). The  $I^2$  statistic was also examined. When we could not combine data quantitatively they were assessed qualitatively.

## RESULTS

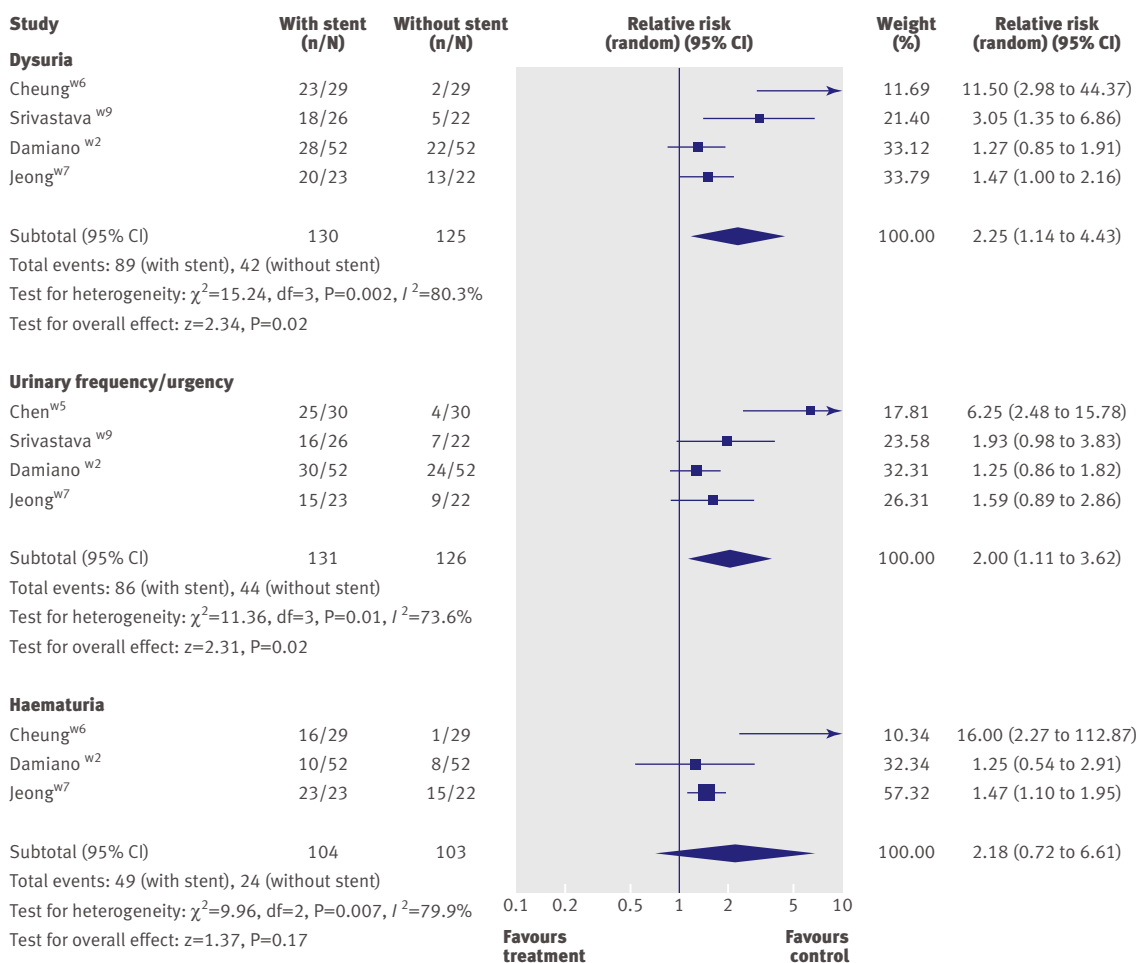
Of 34 potentially relevant studies, nine trials reporting on 831 participants met the inclusion criteria and were included in the review<sup>w1-w9</sup> (see bmj.com).

Most of the included trials failed to meet our quality criteria because of lack of information rather than explicit reporting of methods that did not conform to the criteria. The trial designs were heterogeneous with regard to ureteroscope sizes, intracorporeal lithotripsy devices, postoperative analgesia, and outcome assessment and reporting. Only one trial reported on blinding (see bmj.com).

## Patients' outcomes

**Patients' pain scores**—Five trials measured pain scores at variable intervals after the procedure.<sup>w1 w2 w5 w6 w9</sup> Two trials reported no significant difference in pain scores within three days of the procedure between the groups,<sup>w5 w9</sup> whereas one trial favoured those without stents within three days of the procedure.<sup>w2</sup> There was evidence of substantial heterogeneity between studies for pain scores between both immediate (within or at three days) and delayed (seven days) postoperative periods. Because of the large degree of heterogeneity we could not pool data.

One trial reported a significantly higher pain score at four weeks in those with stents,<sup>w3</sup> whereas two trials reported no significant difference at two and 12 weeks after the procedure.<sup>w1 w2</sup> In two studies the reported data were not suitable for inclusion in



**Fig 1** | Lower urinary tract symptoms in patients with and without stents after ureteroscopy

the meta-analysis,<sup>w3 w4</sup> with both trials reporting a higher pain score in participants with stents. In one other trial the method of pain measurement was not clear,<sup>w7</sup> though it reported no significant difference in pain perception between groups.

**Requirement of analgesia**—Four trials reported on the requirement for analgesia.<sup>w1 w6-w8</sup> None found any significant difference in the proportion of participants who required analgesia after ureteroscopy with or without stents.

Two trials gave data suitable for meta-analysis.<sup>w4 w7</sup> There was no difference in use of analgesics between the two groups (relative risk 1.03, 95% confidence interval 0.73 to 1.47).

**Lower urinary tract symptoms**—Eight trials reported on lower urinary tract symptoms at various lengths of follow-up.<sup>w1-w7 w9</sup> Combined analysis of four studies that reported urinary frequency or urgency showed a higher rate in participants with stents (2.00, 1.11 to 3.62; fig 1). There was also a higher rate of haematuria (2.18, 0.72 to 6.61) and dysuria (2.25, 1.14 to 4.43) in those with stents. Data from three trials also showed higher rates of lower urinary tract symptoms in those with stents.<sup>w1 w3 w4</sup>

**Urinary tract infections**—The pooled analysis from three trials (210 participants)<sup>w2 w6 w9</sup> showed no significant difference between the two groups (1.09, 0.48 to 2.47). One trial reported significantly more pyuria in the initial postoperative period in those with stents. This resolved and there was no significant difference between groups by day 28.<sup>w5</sup>

**Unplanned medical visits and admission to hospital**—Of the participants in seven trials, 7% (34/483) required unplanned medical visits or admission to hospital.<sup>w2-w6 w9</sup> Most participants were managed conservatively, except in three trials in which 9/134 patients required another stent.<sup>w2-w4</sup>

The pooled analysis showed a reduced likelihood of unplanned medical visits or admissions to hospital in the patients with a stent (0.53, 0.17 to 1.60; fig 2). One study reported a significantly higher rate of unplanned admission in the patients without stents,<sup>w2</sup> attributed to the use of a pneumatic intracorpor-

al lithotripsy device, which leaves larger residual fragments compared with the holmium:YAG laser used in other studies. The only other trial that used similar sources of energy did not report a significant difference in the two groups of participants.<sup>w9</sup>

**Return to physical activity**—One trial reported no significant difference in the reported return to normal physical activities between the groups (25 (83%) v 24 (80%) at day one after the procedure).<sup>w5</sup>

**Efficacy outcomes**

**Ureteric strictures/stone free rate**—Of the nine trials, six reported on the rate of ureteric stricture formation.<sup>w1-w3 w6 w8 w9</sup> There was no difference in the proportion of participants developing strictures with or without stents. None of the trials reported significant differences in the stone free rates between participants with or without a stent.

**Health related quality of life**

One of the trials asked those who received a stent whether they would prefer to undergo ureteroscopy without placement of a stent if they needed one in the future.<sup>w9</sup> Around two thirds of participants in the stented group said they would prefer not to have stents after any future ureteroscopy.

**Health economics**

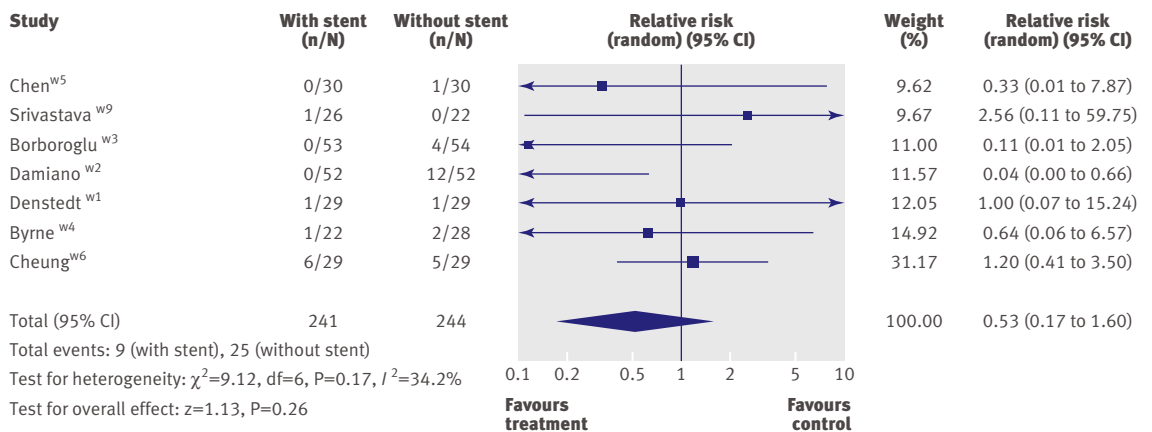
Three studies reported on the cost per patient with or without a stent.<sup>w4 w8 w9</sup> Costs were higher for the group with stents, but methods used to estimate costs were not well described and it is unclear how appropriate any of the costs estimates were and whether any were transferable to other settings.

The operation time (minutes), a key cost driver, was consistently longer in the group with stents (weighted mean difference 5.37, 95% confidence interval 2.37 to 8.36,  $I^2=0$ ).<sup>w1-w6 w9</sup>

**DISCUSSION**

**Principal findings**

We found that stenting after ureteroscopy is associated with increased lower urinary tract symptoms such as



**Fig 2 | Unplanned medical visits or admission to hospital in patients with and without stents after ureteroscopy**

**WHAT IS ALREADY KNOWN ON THIS TOPIC**

Stenting after ureteroscopy may lead to undesirable lower urinary tract symptoms with limited benefits to patients

**WHAT THIS STUDY ADDS**

Stent placement after ureteroscopy results in considerable morbidity in the form of irritative lower urinary tract symptoms

It does not seem to influence stone free rate, rate of urinary tract infection, requirement for analgesia, or long term ureteric stricture formation

The role of stenting in uncomplicated ureteroscopy remains unclear

dysuria and frequency or urgency. We evaluated the benefits, harms, and costs of stenting after uncomplicated ureteroscopy, most commonly for the management of ureteric stones. Unplanned medical visits and admissions to hospital were more common in the group without stents, though the differences were not significant. Further research is needed as the present level of evidence is based on trials with marked clinical heterogeneity. The definition of “uncomplicated ureteroscopy” varied between studies and we could not ascertain whether there was a difference in post-operative pain.

We found no significant difference between the groups with and without stents in the need for postprocedural analgesia, urinary tract infection, stone clearance rates, and ureteric stricture development. These outcomes, however, were not reported consistently across the studies. None of the trials reported on health related quality of life. No trials investigated the impact of stent design and material on outcome, especially as related to quality of life.

One randomised study showed no difference in the impact on patients' quality of life between ureteric stents composed of firm or soft polymer.<sup>4</sup> This trial, however, did not have a control group of participants without stents. In a non-randomised study, up to 80% of participants experienced urinary symptoms and pain associated with indwelling ureteric stents, which interfere with daily activities and result in a reduced quality of life.<sup>1</sup> Chen et al reported return to normal physical activity in 80% of participants on the day after the procedures in both groups.<sup>5</sup>

There was a higher cost associated with use of ureteric stents, but none of the trials reported on the cost effectiveness of this intervention.

**Limitations**

*Lack of definition of uncomplicated ureteroscopy*—Because of a lack of standardisation of the definition of “uncomplicated ureteroscopy,” the decision not to insert a stent can be difficult. This was evident from the included trials. This decision is often affected by the technique, technology used, and experience of the operating surgeon.

*Performance and reporting of studies*—There was a lack of standardisation of outcome measures, length

of trial, and duration of stenting. The use of preprocedural antibiotics, trial design, stent material, patient population, assessment of health related quality of life, pain and cost-effectiveness data were all inconsistent. Overall the general quality of trials was poor. See [bmj.com](http://bmj.com).

**Implications for practice**

As stent placement after ureteroscopy seems to cause undesirable lower urinary tract symptoms maybe it should not be a standard practice. There are, however, many unanswered questions, and any recommendations would be potentially flawed because of a lack of standardisation of outcome measures, marked clinical heterogeneity, withdrawal after randomisation, imprecision in measurement of outcomes (large confidence intervals), and poor reporting of published clinical trials. Research efforts should now be concentrated on higher quality, more rigorous randomised trials.

This review was conducted with substantial support and advice from the members of Cochrane Incontinence Group, Aberdeen. The health services research unit is core funded by the Chief Scientist Office of the Scottish Executive Health Department.

**Contributors:** See [bmj.com](http://bmj.com).

**Funding:** None.

**Competing interests:** None declared.

**Ethical approval:** Not required.

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**Accepted:** 10 January 2007

*Endpiece***Heredity**

What a prodigious thing it is that within the drop of semen which brings us forth there are stamped the characteristics not only of the body form of our forefathers but of their ways of thinking and their slant of mind. Where can that drop of fluid lodge such an infinite number of forms? How does it transmit these resemblances in so casual and random a manner that the great grandson is like his great grandfather, the nephew like his uncle?

Michel de Montaigne (1533-1592),  
*The Essays: A Selection*

**Submitted by** John Spencer, psychiatrist, Kangaroo Valley, New South Wales, Australia