

Shockwave lithotripsy compared with ureteroscopic stone treatment for adults with ureteric stones: the TISU non-inferiority RCT

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and the Percutaneous nephrolithotomy, flexible Ureterorenoscopy and Extracorporeal shockwave lithotripsy for lower pole kidney stones (PUrE) randomised controlled trial, he was co-applicant on both and principal investigator at the site. James N'Dow was a member of the HTA General Board (2016–March 2019). Francis X Keeley is a member of the Boston Scientific (Marlborough, MA, USA) Advisory Committee and is assisting with the development of a new ureteroscope (Olympus Medical, Hamburg, Germany). Kath Starr reports grants from the NIHR HTA programme during the conduct of the study.

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Scientific summary

The TISU trial

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Scientific summary

Background

Urinary stone disease is very common, with an estimated prevalence among the general population of 2–3%. Ureteric stones are associated with severe pain as they pass through the urinary tract and have a significant impact on patients' quality of life (because they have a detrimental effect on patients' ability to work and because hospitalisation is often necessary). Most ureteric stones can be expected to pass spontaneously with supportive care; however, between one-fifth and one-third of patients require an intervention. The two standard active intervention options are shockwave lithotripsy and ureteroscopic stone treatment.

Objectives

The aim of this trial was to determine if, in adults with ureteric stones who were judged to require active treatment, shockwave lithotripsy is significantly inferior to or clinically effective or cost-effective compared with ureteroscopic stone treatment as the initial management option.

Methods

Design

A pragmatic, multicentre, non-inferiority, randomised controlled trial.

Setting

NHS secondary care units across the UK that had a high volume of patients presenting with ureteric stones and which had a lithotripter on site.

Participants

Adults (aged ≥ 16 years) with ureteric stones judged to require active treatment.

Intervention

Treatment following either the shockwave lithotripsy or the ureteroscopic stone treatment pathway.

Main outcome measures

Clinical

The main clinical outcome measure was the resolution of stone episode, defined as 'no further intervention required to facilitate stone clearance' up to 6 months from randomisation.

Economic

The main economic outcome measure was the incremental cost per quality-adjusted life-year gained at 6 months from randomisation. Quality-adjusted life-years gained were determined based on the responses to the EuroQol-5 Dimensions, three-level version (EQ-5D-3L) questionnaire.

Results

Clinical outcomes

In the shockwave lithotripsy arm, 67 out of 302 (22.2%) participants needed further treatment. In the ureteroscopic stone treatment arm, 31 out of 302 (10.3%) participants needed further treatment. The absolute risk difference was 11.4% (95% confidence interval 5.0% to 17.8%). The upper bound of the 95% confidence interval ruled out the prespecified margin of non-inferiority (which was set at 20%).

Economic evaluation

The base-case analysis showed that, on average, the mean cost of treatment was £809 lower (95% confidence interval £551 to £1061) for participants on the shockwave lithotripsy care pathway than for those on the ureteroscopic stone treatment care pathway, but that patients treated with shockwave lithotripsy gained 0.021 (95% confidence interval 0.010 to 0.033) fewer quality-adjusted life-years than those undergoing ureteroscopic stone treatment. The incremental cost per quality-adjusted life-year of shockwave lithotripsy was £39,311. This means that a decision-maker would save £39,311 for each lost quality-adjusted life-year, with 79% probability that shockwave lithotripsy would be considered cost-effective (this means that there is a higher chance that it is cost-effective).

Comparison with similar randomised trials

The clinical outcomes were similar to those seen in previous randomised trials. The economic outcomes, as they relate to the UK NHS, have not been evaluated in previous randomised trials.

Conclusions

Primary ureteroscopic stone treatment for ureteric stones that are clinically deemed to need intervention is more effective at clearing the stone, with less need for further interventions. However, the overall costs of ureteroscopic stone treatment are substantially higher than for shockwave lithotripsy, despite subsequent interventions being required more often in patients who are initially treated with shockwave lithotripsy. The difference in the primary clinical outcome was at a level that was low enough to suggest that all patients should be initially treated by shockwave lithotripsy, with patients progressing to ureteroscopic stone treatment if shockwave lithotripsy does not work. The potential cost savings associated with this approach could be substantial.

Implications for health care

Units delivering acute care to patients with ureteric stones should be able to deliver the shockwave lithotripsy treatment pathway initially, provided that they have urgent access to a lithotripter machine, with ureteroscopic stone treatment reserved for those who fail shockwave lithotripsy treatment or for whom shockwave lithotripsy is not suitable.

Recommendations for research

Reporting of stone trials would benefit from agreement on a core outcome set, which would ensure that the results of future trials are easier to compare. A condition-specific health-related quality-of-life tool should be developed.

Trial registration

This trial is registered as ISRCTN92289221.

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