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European Association of Urology

Platinum Priority – Review – Stone Disease

Editorial by XXX on pp. x–y of this issue

What are the Benefits and Harms of Ureteroscopy Compared with Shock-wave Lithotripsy in the Treatment of Upper Ureteral Stones? A Systematic Review

Tamsin Drake[a], *Nikolaos Grivas*[b,c], *Saeed Dabestani*[d], *Thomas Knoll*[e], *Thomas Lam*[f,g], *Steven Maclennan*[g], *Ales Petrik*[h,i], *Andreas Skolarikos*[j], *Michael Straub*[k], *Christian Tuerk*[l], *Cathy Yuhong Yuan*[m], *Kemal Sarica*[n,*]

[a] *Department of Urology, Royal Bournemouth Hospital, Bournemouth, UK;* [b] *Department of Urology, Hatzikosta General Hospital, Ioannina, Greece;* [c] *Department of Urology, The Netherlands Cancer Institute-Antoni van Leeuwenhoek Hospital, Amsterdam, The Netherlands;* [d] *Department of Urology, Skåne University Hospital, Malmö, Sweden;* [e] *Department of Urology, Sindelfingen-Boeblingen Medical Center, University of Tübingen, Sindelfingen, Germany;* [f] *Department of Urology, Aberdeen Royal Infirmary, Aberdeen, Scotland;* [g] *Academic Urology Unit, University of Aberdeen, Aberdeen, Scotland;* [h] *Department of Urology, Charles University, First Faculty of Medicine, Prague, Czech Republic;* [i] *Department of Urology, Hospital Ceske Budejovice, Czech Republic;* [j] *Second Department of Urology, Sismanoglio Hospital, Athens Medical School, Athens, Greece;* [k] *Department of Urology, Technical University Munich, Munich, Germany;* [l] *Department of Urology, Hospital of the Sisters of Charity, Vienna, Austria;* [m] *Division of Gastroenterology & Cochrane UGPD Group, Department of Medicine, Health Sciences Centre, McMaster University, Hamilton, Canada;* [n] *Department of Urology, Dr. Lutfi Kirdar Research and Teaching Hospital, Istanbul, Turkey*

Article info

Article history:
Accepted April 12, 2017

Associate Editor:
J.-N. Cornu

Keywords:
Shock wave lithotripsy
Ureteroscopy
Ureteral calculi
Urolithiasis

Abstract

Context: Extracorporeal shock wave lithotripsy (SWL) and ureteroscopy (URS), with or without intracorporeal lithotripsy, are the most common treatments for upper ureteric stones. With advances in technology, it is unclear which treatment is most effective and/or safest.
Objective: To systematically review literature reporting benefits and harms of SWL and URS in the management of upper ureteric stones.
Evidence acquisition: Databases including Medline, Embase, and the Cochrane library were searched from January 2000 to November 2014. All randomised controlled trials (RCTs), quasi-randomised controlled trials, and nonrandomised studies comparing any subtype or variation of URS and SWL were included. The primary benefit outcome was stone-free rate (SFR). The primary harm outcome was complications. Secondary outcomes included retreatment rate, need for secondary, and/or adjunctive procedures. The Cochrane risk of bias tool was used to assess RCTs, and an extended version was used to assess nonrandomised studies. Grading of Recommendations Assessment, Development, and Evaluation was used to assess the quality of evidence.
Evidence synthesis: Five thousand-three hundred and eighty abstracts and 387 full-text articles were screened. Forty-seven studies met inclusion criteria; 19 (39.6%) were RCTs. No studies on children met inclusion criteria. URS and SWL were compared in 22 studies (4 RCTs, 1 quasi-randomised controlled trial, and 17 nonrandomised studies). Meta-analyses were inappropriate due to data heterogeneity. SFR favoured URS in 9/22 studies. Retreatment rates were higher for SWL compared with URS in all studies but one. Longer hospital stay and adjunctive procedures (most commonly the insertion of a JJ stent) were more common when primary treatment was URS. Complications were

* Corresponding author. Department of Urology, Dr. Lutfi Kirdar Kartal Research and Training Hospital, Istanbul, Turkey. Tel. +90 216 441 39 00; Fax: +90 216 305 5110.
E-mail addresses: saricakemal@gmail.com, kemalsarica@superonline.com (K. Sarica).

http://dx.doi.org/10.1016/j.eururo.2017.04.016

reported in 11 out of 22 studies. In eight studies, it was possible to report this as a Clavien-Dindo Grade. Higher complication rates across all grades were reported for URS compared with SWL. For intragroup (intra-SWL and intra-URS) comparative studies, 25 met the inclusion criteria. These studies varied greatly in outcomes measured with data being heterogeneous.

Conclusions: Compared with SWL, URS was associated with a significantly greater SFR up to 4 wk but the difference was not significant at 3 mo in the included studies. URS was associated with fewer retreatments and need for secondary procedures, but with a higher need for adjunctive procedures, greater complication rates, and longer hospital stay.

Patient summary: In this paper, the relative benefits and harms of the two most commonly offered treatment options for urinary stones located in the upper ureter were reviewed. We found that both treatments are safe and effective options that should be offered based on individual patient circumstances and preferences.

1. Introduction

Optimal management of urinary tract stones located in the proximal part of the ureter has been controversial for a long period of time, with the clinical introduction of minimally invasive treatment approaches making the decision-making process more complex than ever [1–3]. Bringing the patient(s) to a completely stone-free status with limited or no morbidity is the ultimate goal, and to achieve that, in addition to stone (size and location) and patient-related factors (quality of life, length of hospital stay, and analgesic requirement), the surgeon's experience and the availability of particular technologies are the crucial factors that should be considered on an individual basis. Among the available management alternatives, currently both extracorporeal shock wave lithotripsy (SWL) and ureteroscopy (URS) are the most commonly applied procedures [4,5], with varying success and complication rates reported in the literature.

Because of its noninvasive and practical nature, SWL has been the preferred therapeutic option [6–8], but its success depends on the location of the treated stone(s), with greater success in the management of proximal ureteral calculi. The success rates tend to decrease for distal stones, while stones treated in an emergency setting have a high success rate, similar to those treated with delayed lithotripsy [6–12]. However, the clinical introduction of URS has significantly changed the treatment concepts for ureteral stones. As a result of the accumulated experience and clinical use of thinner and/or flexible instruments, nowadays the vast majority of ureteral calculi can be treated with URS as well as SWL [3,13,14].

The advantage of the endoscopic approach is the adequate and immediate decompression of the obstruction in one session with significantly higher stone-free rates when compared with SWL [3,13,14]. Concerning the complications, traditionally, ureteroscopic techniques have been associated with greater complication rates than SWL (9–11% vs 4%) [13]. However, the use of small-calibre, semirigid, and flexible ureteroscopes combined with holmium:ytrrium-aluminium-garnet (Ho:YAG) laser disintegration have improved the stone-free rates and decreased the risk of severe complications.

The objective of this review was to determine the benefits and harms of URS compared with SWL in the treatment of upper ureteric stones in children and adults.

2. Evidence acquisition

2.1. Search strategy

We conducted a systematic review in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analyses statement [15] and the Cochrane Handbook for Systematic Reviews of Interventions [16]. Medline, Embase, and Cochrane controlled trials databases and clinicaltrial.gov were searched between January 2000 and November 2014 for all relevant, English-language publications. This search was supplemented by manually searching the reference list of The European Association of Urology (EAU) Guidelines on Urolithiasis and by discussion with relevant trialists and organisations. The search strategy is published elsewhere [17].

Following deduplication, two review authors (N.G. and T.D.) independently screened the titles and abstracts of the identified records for eligibility. The full text or abstract from congress proceedings of all potentially eligible records were retrieved and scrutinised independently by two review authors using a standardised form, linking together multiple records of the same study. In the case of any incompletely reported data, study authors were contacted. Any disagreements were resolved by discussion or by consulting a third review author (S.D.).

2.2. Types of study design included

All randomised controlled trails (RCTs) and quasi-randomised controlled trials (QRCTS) comparing any subtype or variation of URS and SWL were included. Comparative nonrandomised studies (NRSs) were excluded, unless they had more than 10 patients per study arm. Noncomparative studies (eg, single-arm case series) were excluded. Only studies published from the year 2000 onwards were included to reduce the influence of general changes in medical procedures on the results. Furthermore, only English language studies, either published in peer-reviewed

Please cite this article in press as: Drake T, et al. What are the Benefits and Harms of Ureteroscopy Compared with Shock-wave Lithotripsy in the Treatment of Upper Ureteral Stones? A Systematic Review. Eur Urol (2017), http://dx.doi.org/10.1016/j.eururo.2017.04.016