Cost-Effectiveness of Anti-Retropulsion Devices for Ureteroscopic Lithotripsy

Michal Ursiny and Brian H. Eisner*,†

From the Kidney Stone Center, Massachusetts General Hospital, Harvard Medical School, Boston, Massachusetts

Abbreviations and Acronyms

SWL = shock wave lithotripsy

Accepted for publication November 12, 2012.

Study received institutional review board approval.

Supported by an Endourological Society grant (MU).

* Correspondence: Department of Urology, GRB 1102, 55 Fruit St., Boston, Massachusetts 02114 (telephone: 617-726-3512; FAX: 617-726-6131; e-mail: beisner@partners.org).

† Financial interest and/or other relationship with Boston Scientific, PercSys, Olympus ACMI and Ravine Group.

Purpose: We evaluated the cost-effectiveness of anti-retropulsion devices used during ureteroscopic lithotripsy.

Materials and Methods: A decision analysis model was constructed to compare the cost-effectiveness of ureteroscopic lithotripsy with vs without an anti-retropulsion device. The risk of stone retropulsion was determined from published data in the English language literature. Expected value calculations were used to determine whether the additional cost of a device would be cost-effective to prevent secondary procedures used to treat retropulsed stones. Device cost was determined using the average cost of all commercially available devices.

Results: It became cost-effective to use an anti-retropulsion device at or above a 6.3% retropulsion rate. The weighted probability of retropulsion with vs without an anti-retropulsion device was 98.1% vs 83.7%. The estimated costs of secondary procedures needed to treat retropulsed stones were $5,290 for shock wave lithotripsy and $6,390 for ureteroscopy. Average device cost was $278. Thus, the average additional cost of ureteroscopic lithotripsy with vs without an anti-migration device would be $384 vs $952.

Conclusions: It is cost-effective to use an anti-retropulsion device at a retropulsion rate of greater than 6.3%.

Key Words: ureter, ureteral calculi, ureteroscopy, lithotripsy, disposable equipment

Ureteroscopic lithotripsy is a common first line treatment for ureteral stones that fail to pass spontaneously and a second line treatment for SWL failure.[1] In recent years reports have demonstrated increasing success and decreasing complication rates for this procedure.[2] Stone migration or retropulsion remains a concern, that is the cephalad movement of stone fragments toward the upper ureter or kidney as a result of lithotripsy. Stone retropulsion has been reported using all current lithotrites.[3–5]

Stone migration may lead to increased operative time to capture retropulsed stone fragments, increased costs when the operator must switch from a semirigid to a flexible ureteroscope to find a retropulsed fragment at a more proximal location, and increased secondary procedures for retropulsed stone fragments of clinically significant size.[6–9] In addition, in the laboratory setting preventing stone retropulsion increased fragmentation efficiency and resulted in more rapid stone fragmentation.[10,11]

Several commercially available anti-retropulsion devices can be used to prevent cephalad stone migration during ureteroscopic lithotripsy. They include the Stone Cone™ Nitinol Urological Retrieval Coil, BackStop® Gel,

0022-5347/13/1895-1762/0
THE JOURNAL OF UROLOGY®
© 2013 by American Urological Association Education and Research, Inc.
http://dx.doi.org/10.1016/j.juro.2012.11.085
Vol. 189, 1762-1766, May 2013
Printed in U.S.A.

NTrap® Stone Entrapment and Extraction Device, and Accordion® Stone Management Device. Studies using each device have been reported. Overall results show that all devices decrease stone migration compared to ureteroscopic lithotripsy done without the devices.[4,12–15] We determined whether using anti-retropulsion devices for ureteroscopic lithotripsy would be cost-effective.

MATERIALS AND METHODS

We constructed a decision analysis model using TreeAge 3.5 (TreeAge Software, Williamstown, Massachusetts) to compare the cost-effectiveness of ureteroscopic lithotripsy with vs without an anti-retropulsion device. To complete the decision analysis, several data points were obtained, including the stone-free rate of lithotripsy with and without anti-migration devices, costs of devices and costs of secondary procedures that are commonly used to treat clinically significant retropulsed stone fragments. Outcome probabilities were derived from the peer reviewed literature. We performed a PubMed® search to identify all articles published in the English language that described ureteroscopic lithotripsy using any anti-retropulsion device. Data were included in analysis only if the study included a comparison group, ie if the study compared ureteroscopic lithotripsy with and without an anti-retropulsion device. Data from series without a control group were excluded.

Outcome probabilities for ureteroscopic lithotripsy with anti-retropulsion devices were available for certain commercial products in the peer reviewed literature, including the NTrap, lidocaine jelly, Stone Cone and BackStop.[4,12–15] These outcome probabilities included pneumatic and laser lithotripsy. The results of all device studies were pooled.

We constructed the decision analysis model to test 2 possible treatments, that is ureteroscopic lithotripsy with an anti-retropulsion device vs ureteroscopic lithotripsy without an anti-retropulsion device. For each treatment option retropulsion was considered the failing condition and no retropulsion was the successful condition. The primary end point to determine device success was the stone-free rate compared to that of controls, ie ureteroscopic lithotripsy without an anti-retropulsion device. The average hospital cost of anti-migration devices was $278 and each was obtained from the manufacturer (see table).

SWL and ureteroscopy were identified as secondary procedures that would be the standard of care for clinically significant retropulsed stone fragments. The costs of SWL and ureteroscopy were estimated using Medicare reimbursement scales for outpatient procedures based on CPT or HCPCS (Healthcare Common Procedure Coding System) codes. For each code Medicare professional and Medicare technical reimbursement were obtained through the urology and hospital billing offices. Surgeon fees, anesthesia costs, average procedure time, imaging and outpatient procedures were considered.

A decision tree was constructed that included costs and probabilities. Expected value calculations were used to determine whether the initial added cost of a device was cost-effective for preventing secondary procedures to retrieve retropulsed stones.

Baseline Assumptions

We made certain baseline assumptions. 1) Ureteroscopy with pneumatic or holmium/YAG laser lithotripsy was the initial treatment. 2) Patients who experienced a retropulsion event would undergo a secondary procedure to treat the retropulsed residual stone. 3) Of patients who required a secondary surgical procedure 50% would undergo extracorporeal SWL and 50% would undergo ureteroscopy. 4) Outcome probabilities of ureteroscopic lithotripsy with device use were pooled among NTrap, lidocaine jelly, Stone Cone and BackStop. 5) The average cost of using a device was pooled among NTrap, Stone Cone, Accordion and BackStop. The hospital purchase price was provided by the product manufacturers.

RESULTS

Costs and Stone-Free Rate

The table shows individual device costs and an anti-migration device average estimated cost of $278. The estimated costs of secondary procedures needed to treat retropulsed stones were $5,290 for SWL and $6,390 for ureteroscopy. The weighted probability of retropulsion with vs without an anti-retropulsion device was 98.1% vs 83.7%. By subtraction the stone retropulsion rate with vs without a device was 1.9% vs 16.3%.

Estimated cost of anti-retropulsion devices and associated stone-free rates

	Wang et al[13]	Zehri et al[14]	Desai et al[15]	Lee et al[12]	Rane et al[4]	Av
Device	NTrap	Lidocaine jelly	Stone Cone	NTrap	BackStop	
No. controls	57	25	20	68	34	—
No. devices	56	25	23	76	34	—
Lithotripsy type	Pneumatic	Pneumatic	Pneumatic	Laser	Laser	—
Ureteral site	Upper	—	—	Upper	Upper	—
% Stone-free rate:						
Control	84.2	72.0	70.0	89.7	87.8	80.7
Device	100.0	96.0	100.0	98.7	93.9	97.7
Cost ($)	215	—	241	215	378	278

Download English Version:

https://daneshyari.com/en/article/3864769

Download Persian Version:

https://daneshyari.com/article/3864769

Daneshyari.com