



Stone Disease

Cost-Effectiveness of Medical Expulsive Therapy Using Alpha-Blockers for the Treatment of Distal Ureteral Stones

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Article info

Article history:

Accepted September 10, 2007

Published online ahead of
 print on September 18, 2007

Keywords:

Kidney stones
 Ureteral stones
 MET
 Cost analysis

Abstract

Objective: Medical expulsive therapy (MET) has recently emerged as an efficacious and safe option for the initial management of ureteral stones. The objective of this study was to assess the cost-effectiveness of MET compared with conservative therapy for the treatment of ureteral stones using international cost data from the United States and four European countries.

Material and methods: A decision analysis model was built with the use of TreeAge Pro 2004 software with linear success rate assumptions. The likelihood of spontaneous passage of ureteral stones according to their size and location was estimated with the use of data derived from a published meta-analysis. The estimated cost of ureteroscopy (URS) in the United States (\$4973) was based on the mean cost of 121 consecutive cases performed at a large metropolitan hospital. URS costs for other countries were obtained from a published international survey. The cost of tamsulosin (\$2.08 per day), currently the most commonly used medical expulsive agent, was estimated as a mean of the costs obtained from two national pharmacy chains. MET and conservative therapies were compared with the use of one-way and two-way sensitivity analyses.

Results: In the United States, MET using tamsulosin resulted in a \$1132 cost advantage over observation. MET maintained its cost advantage even in countries where the cost of URS is much lower than in the United States. Two-way sensitivity analysis showed that MET remained cost-effective even with very low rates of spontaneous passage, minimal benefit of MET, or low cost of URS.

Conclusion: MET is a cost-effective strategy for the management of distal ureteral stones—even those with a low rate of spontaneous passage—providing another incentive for initial “facilitated observation” before embarking on surgical intervention.

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1. Introduction

The lifetime prevalence of stone disease in the United States has been estimated at 13% for adult men and 7% for adult women, with a peak incidence between the ages of 20 and 60 yr. Indeed, more than 1% of working-age adults were treated for a stone in the year 2000 [1]. It is estimated that total annual expenditure on stone disease that year was nearly \$2.1 billion, including \$971 million for inpatient services, \$607 million for physician office and hospital outpatient services, and \$490 million for emergency room services [2], values that are almost certainly underestimated.

The optimal management of ureteral calculi depends on a variety of factors such as stone location and size, equipment availability, cost, patient preference, and surgeon experience. The likelihood of spontaneous passage is inversely related to stone size and improves the more distal the stone is located in the ureter at the time of diagnosis (Table 1) [3]. The majority of small distal ureteral stones will pass spontaneously [4]; consequently, a trial of conservative therapy is indicated if pain can be adequately controlled and there is no evidence for infection.

Cost-effective treatment regimens aimed at resolving ureteral stones while minimizing cost are highly desirable. Medical expulsive therapy (MET) has been demonstrated in a number of randomized controlled trials (RCTs) to facilitate ureteral stone passage, diminish time to expulsion, and reduce the need for analgesics [5,6]. However,

the cost-effectiveness of this treatment strategy, compared with simple observation, has not been established. We hypothesized that, if MET can increase the likelihood of stone passage and reduce the number of ureteroscopy (URS) procedures needed, then it might be cost-effective. The objective of our study was to compare the cost of observation versus MET for ureteral stones in five different countries.

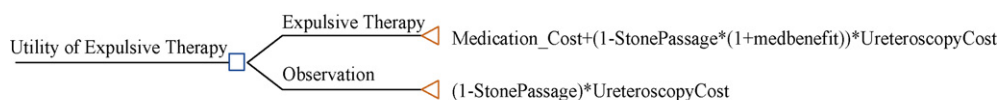
2. Materials and methods

2.1. Decision model

A decision analysis model was built to compare the cost of MET and initial observation for distal ureteral stones (Fig. 1). Decision trees were constructed with the use of TreeAge Pro 2004 software with linear success rate assumptions. The base case analysis was a patient with a distal ureteral stone who was a good candidate (no associated urinary infection or fever, well-controlled pain, tolerating oral intake) for either observation or MET. We assumed that patients who did not require emergent admission to the hospital would be managed on an outpatient basis and given an opportunity to pass their stone spontaneously. This assumption is consistent with recent findings in the Urologic Diseases of America project in which most patients with stones in the United States were managed on an outpatient basis [7]. Those patients who did not pass their stones were assumed to undergo an outpatient ureteroscopic procedure. For each arm of the model, the likelihood of spontaneous stone passage and the cost associated with treatment (observation or MET) and failure (need for URS) was utilized.

Table 1 – Spontaneous stone passages reported in the literature, according to stone size and location

	N	Spontaneous passage rate for stones < 5 mm	Spontaneous passage rate for stones ≥ 5 mm	Spontaneous passage rate for proximal stones	Spontaneous passage for distal stones
Ueno et al [24]	520	78–100%	0–35%	N/A	N/A
Segura et al [4]	N/A	N/A	N/A	29–98%	71–98%
Morse et al [25]	378	N/A	N/A	22%	71%
Hubner et al (meta-analysis) [3]	2704	38% (<4 mm)	1.2% (>6 mm)	12%	45%
Coll et al [26]	172	76–87%	25–60%	48%	75–79%



Medication_Cost: Cost of medication

StonePassage: Likelihood of spontaneous stone passage

Medbenefit: Increased likelihood of spontaneous stone passage

UreteroscopyCost: Cost of ureteroscopy

Fig. 1 – Decision analysis model. Model comparing the overall cost of observation versus medical expulsion therapy.

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