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Cost Analysis of Metallic Stents for Chronic Ureteral Obstruction: A Multicenter Study

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Abstract

Introduction: Metallic and polymer ureteral stents are used to manage chronic ureteral obstruction. In general, metallic stents are more costly than polymer stents but they are changed less frequently. We examined the overall costs of using these stent types at 2 institutions.

Methods: We identified all patients in whom a metallic stent was placed at 2 academic institutions between July 2007 and July 2013. We calculated the average time to stent exchange or failure and the overall cost of metallic and polymer stent use. Costs included those associated with materials, operating room services, anesthesia and other expenses.

Results: We identified 86 patients in whom a total of 230 metallic stents were placed. Time to stent failure or exchange of a metallic stent was 7.4 months. The per unit cost of a polymer stent and a metallic stent was $121 and $887, respectively. The average annual cost of unilateral and bilateral metallic stents was $7,859.43 and $9,296.37, respectively. For a unilateral polymer stent that was changed every 3 months the yearly cost was $16,342. For bilateral polymer stents that were changed every 3 months the cost was $16,826 per year. If unilateral and bilateral polymer stents were changed every 6 months, the costs were $8,171 and $8,413, respectively.

Conclusions: Our findings suggest that because metallic stents are changed less frequently than polymer stents, the annual expense associated with treating patients with chronic ureteral obstruction can be decreased by using metallic stents.

Key Words: ureter, polymers, stents, self expandable metallic stents, costs and cost analysis

Upper urinary tract obstruction arising from malignant and benign causes is a frequent clinical dilemma for the practicing urologist. There are several options for treatment, including percutaneous nephrostomy tube placement, ureteral stenting or surgical repair. There is a myriad of ureteral stents available on the market today. The Resonance® metallic ureteral stent, which has been in use for several years, has been shown to be an effective treatment

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for benign and malignant chronic ureteral obstruction.[1,2] It is the only FDA (Food and Drug Administration) approved metal stent in the United States. The metallic stent is a high tensile strength, flexible coil that resists extrinsic compression. One of the primary benefits of the metallic stent is that it is approved to last up to 12 months. On the other hand, polymer stents require more frequent changes because of encrustation or failure.

One disadvantage of the metallic stent is that it is more costly than the polymer alternative.[3] However, it is largely unknown whether the decreased need for stent exchanges associated with metallic stents offers health care systems an overall cost savings. Several groups have attempted to answer this question but they used hospital charges rather than actual cost data.[3,4] Charge data have been shown to highly vary among institutions and they may be an unreliable marker of true cost.[5]

We build on this prior body of work by comparing the true costs associated with the use of metallic and polymer stents. These findings have direct implications for providers, hospitals and health care systems interested in reducing the per capita costs of treating patients with chronic ureteral obstruction.

Methods

Patient Population

We identified all patients in whom a metallic stent was placed at 2 academic institutions between July 2007 and July 2013. These patients had obstruction due to benign or malignant causes and all had a metal ureteral stent or stents placed. These procedures were done in the operating room using anesthesia under fluoroscopic guidance and the cases required standard perioperative care.

Our algorithm for ureteral obstruction is to initially place a polymer stent. This allows us to test stent tolerability and check for appropriate stent sizing. If the patient tolerates the stent well, at the next scheduled stent change we switch it to a metal stent of the same length. Metal stents were changed at 12 months for the first change. If the stent looked clean with no encrustation, the stent changes were stretched to a maximum of 18 months.

Cost Data

Data were obtained through chart review and recorded in a computerized database. Data points included type of obstruction, prior management of obstruction, number of metal stent changes, laterality, stent failure and time to stent change or failure. Patients who died during the study period were grouped into the category of stent failure to make sure that they were included in analysis and avoid skewing the data in our favor. We also grouped time to stent failure and stent exchange together to determine an accurate life of a metal stent.

For the cost analysis detailed cost information was available from the billing department of one of us (BFS). Costs included operating room, anesthesia, medications, fluoroscopy and the ureteral stent for fiscal year 2013. Notably, in our calculations we did not use hospital charge data but rather the actual cost information. For metal stent calculations this was actual cost data from actual operations. Costs were based on average costs of unilateral and bilateral procedures. We did not differentiate between benign or malignant obstruction. Polymer stent calculations were estimated based on the metal stent exchange data except for the cost of the stent.

Statistical Analysis

The primary outcome was annual cost. We first calculated the failure and death rates, and the overall duration of metallic stents in our cohort. Using those results in combination with our cost data we calculated annual costs. For polymer stent cost we used stent changes at 3 and 6 months. For metal stent costs we used the average life of a metal stent in our cohort, which was 7.4 months, for our cost calculations.

Results

In our cohort of 86 patients a total of 230 stents were placed, that is 2.67 per patient, during our 6-year study period. In our previous analysis we found that mean age was 66 years and 29% of the patients were male. Obstruction was bilateral in 24 patients (28%), benign in 40 (47%) and malignant in 46 (53%). Maximum followup was 67 months (5.58 years) and median followup was 16 months. Stent failure occurred in 21 patients (24%), 30 (35%) died during the study period and 13 (15%) were lost to followup. Stent failure was defined as worsening hydronephrosis or worsening creatinine. Median time to death or stent failure was 20 months. Time to stent failure or to exchange of a metallic stent was 7.4 months.[6]

Table 1 lists the cost breakdown per stent change operation. The 2 main costs were operating room and global anesthesia costs. The per unit cost of a polymer and a metallic stent was $121 and $887, respectively. Polymer stents represented 3% of the total cost while metallic stents represented 18.3%.

The total cost of changing a metal stent for unilateral ureteral obstruction was $4,851.50 and the estimated cost of