ORIGINAL RESEARCH—SURGERY

National Trends in the Treatment of Penile Prosthesis Infections by Explantation Alone vs. Immediate Salvage and Reimplantation

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ABSTRACT

Introduction. A penile prosthesis infection (PPI) is either treated with explantation of the prosthesis with a possible delayed reimplantation or a salvage procedure with an immediate reimplantation of the prosthesis.
Aim. We used a large, all-payer national database to investigate the use of the salvage procedure in the setting of PPI.
Methods. The study used years 2000–2009 of the Nationwide Inpatient Sample to identify PPIs treated with immediate salvage or explantation alone. Admissions were then stratified by various parameters to compare differences in the salvage rates.
Main Outcome Measures. Salvage Rate of Penile Prosthesis infection.
Results. A total of 1,557 patients were treated with an explantation only (82.7%) or salvage (17.3%) for PPI, a proportion that remained stable over the study period. The patients treated with salvage were younger (60.4 vs. 65.1 years), more likely to be discharged home (87.3% vs. 61.9%), and were less likely to have a severe presentation (7.2% vs. 31.6%) than those who were explanted only ($P < 0.001$). These factors were confirmed on multivariate regression analysis. The regression also revealed that treatment at rural hospitals had lower odds of salvage than treatment at urban teaching hospitals. Race, comorbid diabetes, and insurance status did not independently affect the salvage rate. There was no significant difference in total hospital charges between groups.
Conclusions. Salvage rates have remained low over the past decade. Our study elucidated several factors decreasing the chances of salvage after PPI including age, severity of presentation, and hospital setting. **Zargaroff S, Sharma V, Berhanu D, Pearl JA, Meeks JJ, Dupree JM, Le BV, Cashy J, and McVary KT. National trends in the treatment of penile prosthesis infections by explantation alone vs. immediate salvage and reimplantation. J Sex Med 2014;11:1078–1085.**

Key Words. Erectile Dysfunction; Infection Penile Prosthesis; Surgery; Salvage Procedure

Introduction

Erectile dysfunction affects 18 million men in the United States or 18.4% of the male population aged 20 years or older, and this prevalence is expected to increase with the continuing decline in death from cardiovascular diseases and the associated increase in life expectancy in the United States [1]. Other major risk factors for this condition include diabetes, hypertension, and lower urinary tract symptoms, all of which are also becoming more common as the population ages [2]. As a result, the expected number of patients not responding to phosphodiesterase inhibitors,

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vacuum devices, and intercavernosal injections is also expected to increase.

Penile prostheses remain the established treatment for such patients. These devices have been largely successful in restoring patient satisfaction, and much effort has been taken to minimize device complications, with the most serious being penile prosthesis infection (PPI). The majority of PPIs are caused by skin flora, particularly staphylococcus epidermidis, and they usually occur within 1 year of surgery [3]. The prevalence of PPI in modern series is estimated to be between 1% and 3% for first implantation, and 10% and 18% for repeat implantations [3,4]. These rates may further decline by 50% with the use of drug-coated prostheses for both first time and repeat implantations [5,6].

Although many subclinical PPI's are initially managed with oral antibiotics, failure of medical management or overt infection necessitates prosthesis removal [3]. Traditionally, reimplantation of the prosthesis was attempted after several months to allow for clearance of infection and edema [7]. However, *Brant* et al. [8], *Kaufman* et al. [9], and *Teloken* et al. [10] presented an alternative protocol, now called the salvage procedure, in which all prosthetic components are removed to allow for a stepwise irrigation and resterilization, followed by the immediate reimplantation of a new prosthesis along with one month of oral antibiotics. Patients undergoing the salvage procedure had infection-free rates ranging from 71% to 91% [8–12]. Proponents of the salvage procedure claim these patients are at lower risk for cavernosal fibrosis and penile shortening than patients undergoing the traditional delayed reimplantation [7,11]. Nevertheless, there have not been randomized controlled trials comparing immediate salvage to delayed reimplantation, and observational studies have not conclusively demonstrated the superiority of one protocol [12]. As a result, a recent consensus document on penile prostheses recommended a shared decision-making model between the patient and provider when a salvage is not contraindicated [13].

In the current study, we use a large, all-payer national database to contribute to the body of literature comparing immediate salvage vs. explantation alone in the setting of infection. We report the incidence of these procedures from 2000 to 2009 and also attempt to uncover patient and hospital characteristics that may be associated with the protocol employed. In addition, we compare in-hospital patient outcomes, such as disposition at discharge and total hospital charges.

Methods

The study was conducted using the nationwide inpatient sample (NIS) of health-care cost and utilization project. The NIS is sponsored by the Agency for Healthcare Research and Quality and collects data on 7.4–8 million hospital admissions, comprising a 20% sample from approximately 1,000 hospitals in the United States. Hospitals are selected to adequately represent the complete national cohort based on geography, ownership (public, private, etc.), urban/rural location, teaching status, and bed size. The NIS ascribes sampling weights to individual discharges to enable national projections for survey data. More than 100 parameters of data are recorded for each admission, including demographic information, diagnoses, procedures, mode of payment, total charges, and length of stay [14]. Of note, the NIS reports diagnoses using the International Classification of Diseases-9th revision-Clinical Modification (ICD-9-CM) diagnosis codes, and it reports procedures using the ICD-9-CM procedure codes, as opposed to the more widely used current procedural terminology codes.

In our study, years 2000–2009 of the NIS were queried for an infection or inflammatory reaction because of genitourinary device, implant, and graft using the ICD-9-CM diagnosis code 996.65. For inclusion in our study, patients required both an ICD-9-CM diagnosis code of 996.65 and one of the following ICD-9-CM procedure codes: removal of internal prosthesis of penis (64.96) or insertion or replacement of a noninflatable (64.95) or inflatable (64.97) penile prosthesis. Patients treated with prosthesis explantation only had the ICD-9-CM diagnosis code of a PPI (996.65) and the ICD-9-CM procedure code for explantation (64.96) but did not have any code for reimplantation. A salvage procedure was defined by the presence of *all* of the following in the same hospital admission: the ICD-9-CM diagnosis code for PPI (996.65), the ICD-9-CM procedure code for explantation (64.96), and the ICD-9-CM procedure codes for reimplantation of either an noninflatable (64.95) or inflatable (64.97) prosthesis.

Patients were then stratified into demographic categories to compare differences in the explantation only vs. salvage rates. All patient refined

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