ORIGINAL ARTICLE

Factors associated with failed double-J stent placement in patients with obstructive uropathy due to cancer

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KEYWORDS
Obstructive uropathy; Malignant ureteral obstruction

Abstract
Aim: To analyze the clinical, imaging, and surgical factors that are associated with failed double-J stent placement in patients with obstructive uropathy due to cancer.

Materials and methods: An analytic, cross-sectional study was conducted. The variables analyzed were: age, sex, oncologic diagnosis, clinical stage, diagnostic time course, treatment received, preoperative laboratory studies (Hb, leuk, Cr, BUN, urea), imaging studies (US or CAT), and the surgical attempt to place the double-J stent. A comparative analysis was done between the failed and successful placement groups. Statistical analysis was carried out using the Mann-Whitney U test and the chi-square test, and finally, the odds ratio with a 95% confidence interval was employed.

Results: Of the 48 patients, 27 had failed double-J stent placement and 21 had successful placement. Risk factors for failed placement were elevated preoperative levels of urea ≥ 40mg/dl (OR: 16.67 CI: 2.66-134.92 [p=0.0001]), creatinine ≥ 2 mg/dL (OR:7.27 CI:1.41-42.25 [p=0.004]), and BUN ≥ 40mg/dL (OR:4.00 CI:1.37-21.55 [p=0.005]), as well as a deformed trigone (OR:3.29 CI:1.18-9.19 [p=0.002]).

Conclusions: Elevated preoperative levels of creatinine, urea, and BUN, and a deformed bladder trigone are markers for failed double-J stent placement.

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Introduction

Treatment for obstructive uropathy or ureteral obstruction caused by cancer is a challenge for the physician. Symptoms are varying and depend on the acuteness of the underlying pathology. The process is slow, but progressive, in the majority of cases, with vague and nonspecific symptoms such as flank pain and general malaise. However, it can manifest as symptoms of acute obstruction with intense pain, nausea, and vomiting. The 3 main possible causes of obstruction are: direct ureteral compression by the tumor (bladder, colorectal, prostate), extrinsic compression due to the expansion of the retroperitoneal cavity (sarcoma), or ureteral entrapment as a result of enlarged lymph nodes. One of the most widely studied mechanisms involved in the pathophysiology of pain due to ureteral obstruction is related to ureteral contractility during the obstruction, when the increased intraluminal pressure results in hypercontractility and nociceptor activation. Furthermore, smooth muscle ischemia and hypoxia due to ureteral arterial compression can activate additional nociceptors. Stent placement in this pathology can become very difficult technically, unlike placement due to lithiasis, ureteral stricture, or stricture at the pyeloureteral junction, and the failure rate is higher, especially when there is hydronephrosis. Failure is defined by the persistence of pain and hydronephrosis associated with the impossibility of ascending the stent to the obstruction site or up to the renal cavities. This occurs in 16-58% of the patients with ureteral obstruction due to cancer and percutaneous nephrostomy is required for the urinary tract diversion in these cases.

Contrastingly, reports have also stated better success rates of 75-84% for ureteral stent placement. The difference in success is related to the type of pelvic cancer. For example, ureters obstructed due to bladder, prostate, or cervical cancer have had success rates of 15-21%, whereas success rates have been better in patients with colorectal or breast cancer.

The aim of the present study was to identify the risk factors associated with failure in the placement of double-J stents in patients with obstructive uropathy due to cancer, in an effort to aid in deciding upon the most advisable initial diversion, with respect to failure or success.

Materials and methods

A total of 48 patients with cancer and obstructive uropathy manifested as pain and urinary tract dilation, with or without elevated levels of creatinine and urea, were included. The patients were evaluated at the Hospital de Especialidad No. 25 within the last 3 years, did not have any type of previous urinary diversion, and had endoscopic retrograde double-J stent placement attempted in the operating room. The study was approved by and registered with the Local Research and Ethics Committee of the hospital and the participants gave their informed consent. The variables analyzed were age, sex, oncologic diagnosis, diagnostic time course (months), advanced clinical stage, preoperative values (< 48 h before surgery) of creatinine, BUN, urea, and hemoglobin, maximum diameter of the length of the renal pelvis obtained through ultrasound or computed axial tomography (mm), and the presence of invasion or deformity of the bladder trigone evaluated through cystoscopy. These variables were evaluated in relation to being risk factors for double-J placement in the study patients. The cases were divided into 2 groups: one of failed catheter placement and the other of successful catheter placement. We defined failure as failed bilateral double-J stent placement and success as successful unilateral or bilateral placement for each patient. The values of each variable in the two groups were comparatively analyzed. The Mann-Whitney U test and the chi-square test were used for the statistical analysis, along with the odds ratio with a 95% confidence interval (95% CI) (p = 0.05). The SPSS© version 15 statistics package was employed.
Results

A total of 48 patients in whom double-J stent placement was attempted were included in the study and they were divided into 2 groups: failed or successful placement. Forty-one of the patients were women (85.4%) and 7 were men (14.6%). The failed placement group was made up of 27 patients (56.3%) and the successful group of 21 patients (43.7%). In the latter group, 15 patients had unilateral placement success and only 6 patients had bilateral placement success. Mean age was 45.1 ± 13.6 years, median progression time, considered the time from diagnosis to evaluation due to obstructive uropathy development, was 13.5 months (1-108). The most frequent diagnosis was cervical cancer with 32 cases (66.7%), the median preoperative creatinine value was 6.0 mg/dl (0.4-26.4), BUN was 65.0 mg/dl (6-156), urea was 130 mg/dl (13-338), hemoglobin was 8.4 mg/dl (5.4-10.9), the maximum anteroposterior dilation of the renal pelvis was 33.29 mm (10-53), the bladder trigone was deformed in 34 patients (70%), and there was advanced clinical stage for each type of cancer in 47 individuals (97%).

The qualitative variables were sex, diagnosis, advanced clinical stage, and bladder trigone deformity as a surgical finding in the cystoscopy. Female sex represented 85.4% of the cases and there was an odds ratio (OR) of 1.024, 95% CI: 0.407-2.578 (p = 0.644) associated with failed double-J stent placement. Bladder trigone deformity was observed in the cystoscopy of 34 patients (24 in the failed group and 10 in the successful group) and it was not observed in 14 patients (3 in the failed group and 11 in the successful group). The presence of a deformed bladder trigone had a risk for failed placement of an OR 3.294, 95% CI: 1.18-9.19 (p = 0.002). Advanced clinical stage was present in 97% of the case series.

The quantitative variables were analyzed with the Mann-Whitney U test and associated with the failed or successful stent placement variable. An OR with a 95% confidence interval for risks was obtained at different cut-off points for each significant variable. The median values for the following variables were: creatinine 7 mg/dl (0.7-26.4) in the failed group and 3.5 mg/dl (0.4-11.8) in the successful group (p = 0.009), BUN 74 mg/dl (9.0-156.0) in the failed group and 47 mg/dl (6.0-131.0) in the successful group (p = 0.012), urea 148 mg/dl (19.3-338.0) in the failed group and 124 mg/dl (19.3-338) in the successful group (p = 0.031), hemoglobin 7.6 mg/dl (5.4-10.5) in the failed group and 9.0 mg/dl (5.7-10.9) in the successful group (p = 0.002), maximum diameter of the renal pelvis 33 mm (10-53) in the failed group and 32 mm (13-52) in the successful group (p = 0.479), and diagnostic time course 13 months (1-96) in the failed group and 18 months (4-108) in the successful group (p = 0.140).

The following values associated with risk for failure in double-J stent placement were creatinine 3 2 mg/dl, OR: 7.27, 95% CI: 1.41-42.25 (p = 0.004); BUN 3 40 mg/dl, OR: 4, 95% CI: 0.93-18.06 (p = 0.031); urea 3 60 mg/dl, OR: 16.67, 95% CI: 2.66-134.92 (p = 0.0001); and hemoglobin 9.0 mg/dl, OR: 6.32, 95% CI: 1.37-31.55 (p = 0.005). Bladder trigone deformity was present in 88.8% of the failed group and in 47.6% of the successful group, OR: 3.294, 95% CI: 1.18-9.19 (p = 0.002) (table 1).

Discussion

The results of the success percentages can be interpreted in 2 manners. First, based on the total number of patients in the series (48), which consisted of 27 failed bilateral placements and 21 unilateral or bilateral successful placements, and second, based on the number of ureteral units in which diversion was attempted. The overall number of ureteral units was 96 (69 failed and 27 successful), resulting in a success rate of 56% in relation to the number of patients, and an overall success rate of 29% in relation to diverted ureteral units. On the other hand, cervical cancer (68%) was the most frequent diagnosis and the mean patient age was 45.1 ± 13.6 years, which sharply contrasts with previous reports stating 81% success, with only 6.7% cases of cervical cancer and a mean patient age of 61 years.9 The greatest frequency reported up to now of cases of malignant ureteral obstruction due to cervical cancer is 53.5%.10 It is also noteworthy that in the present case series 97% of the patients had advanced clinical stage disease.

The mean time it took to develop obstructive uropathy from the time of oncologic diagnosis was 20.65 ± 21.9 months, in contrast to that reported by Wong et al.4 of 11 months and a mean age of 62 years. Sex showed no significant difference in relation to risk for failure, concurring with the findings of other reports.9

Hydronephrosis has been identified as a risk factor for failed double-J stent placement,5,6,9 but the aim of our study was to find a renal pelvis dilation cut-off point that could be related to failure. Such a point was not found, given that there were no significant differences between the study groups, with a median 33 mm in the failed group and 32 mm in the successful group (p = 0.479).

The values representing risk factors for failed placement were: preoperative levels of urea 40 mg/dl, OR: 16.67, 95% CI: 2.66-134.92 (p = 0.0001); creatinine 2 mg/dl OR: 7.27, 95% CI: 1.41-42.25 (p = 0.004); and BUN 40 mg/dl, OR: 4.00, 95% CI: 0.93-18.06 (p = 0.031); as well as Hb £ 9 mg/dl, OR: 3.29, 95% CI: 1.18-9.19 (p = 0.002). In the literature reviewed, we found no risk levels associated with the factors described in our study, nor any established cut-off points with sufficient statistical significance.

We did not describe survival in our study sample or the viability of the successfully placed stents, both of which must be analyzed later. The factors described herein should be prospectively applied for validating their use as recommendation guidelines in decision-making.

Conclusions

In the multidisciplinary management of patients with cancer and secondary obstructive uropathy, the present study found 5 risk factors associated with double-J stent placement failure: preoperative levels of urea 40 mg/dl, OR: 16.67, 95% CI: 2.66-134.92 (p = 0.0001); creatinine 2 mg/dl, OR: 7.27, 95% CI: 1.41-42.25 (p = 0.004); BUN 40 mg/dl, OR: 4.00, 95% CI: 0.93-18.06 (p = 0.031); Hb £ 9 mg/dl, OR: 3.29, 95% CI: 1.18-9.19 (p = 0.002). It is likely that the large percentage of double-J stent placement failure in our study enabled the detection of clear risk factors with statistical significance.
Factors associated with failed double-J stent placement in patients with obstructive uropathy due to cancer

Ethical responsibilities

Protection of persons and animals. The authors declare that the procedures followed conformed to the ethical standards of the responsible committee on human experimentation and were in accordance with the World Medical Association and the Declaration of Helsinki.

Data confidentiality. The authors declare that they have followed the protocols of their work center in relation to the publication of patient data.

Right to privacy and informed consent. The authors have obtained the informed consent of the patients and/or subjects referred to in the article. This document is in the possession of the corresponding author.

Financial disclosure

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Conflict of interest

The authors declare that there is no conflict of interest.

References


<table>
<thead>
<tr>
<th>Table 1</th>
<th>Clinical, imaging, and urological characteristics of 48 patients in whom double-J stent placement was successful or failed</th>
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</thead>
<tbody>
<tr>
<td>Double-J stent placement</td>
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</tr>
<tr>
<td>Failed (n = 27)</td>
<td>Successful (n = 21)</td>
</tr>
<tr>
<td>Age (years)</td>
<td>46.1 ± 14.1</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>23</td>
</tr>
<tr>
<td>Men</td>
<td>4</td>
</tr>
<tr>
<td>Diagnosis (cancer)</td>
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<tr>
<td>Cervical</td>
<td>18</td>
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<tr>
<td>Endometrial</td>
<td>4</td>
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<td>Testicular</td>
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<td>Ovarian</td>
<td>0</td>
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<tr>
<td>Undetermined</td>
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<tr>
<td>Diagnostic time course (months)</td>
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<tr>
<td>Advanced clinical stage</td>
<td>27 (100%)</td>
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<tr>
<td>Creatinine ≥ 2 mg/dl</td>
<td>24 (88.8%)</td>
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<tr>
<td>BUN ≥ 40 mg/dl</td>
<td>22 (81.4%)</td>
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<tr>
<td>Urea ≥ 60 mg/dl</td>
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<tr>
<td>Hemoglobin &lt; 9 g/dl</td>
<td>23 (85%)</td>
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<tr>
<td>Renal pelvis diameter (mm)</td>
<td>33 (10-53)</td>
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<td>Presence of deformed trigone</td>
<td>24 (88.8%)</td>
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