ORIGINAL ARTICLE

Comparative study of morbidity and mortality between ileal conduit and ureterosigmoidostomy after radical cystectomy for bladder neoplasm


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KEYWORDS
Bladder neoplasms; Urinary diversions; Ileal conduit; Colonic urinary reservoirs; Comparative study

Abstract
Objectives: Despite the growing trend in the development of orthotopic neobladders, the procedure cannot be performed in many cases, thereby retaining the validity of other techniques. We propose a comparative analysis between patients with radical cystectomy for bladder neoplasm and reconstruction using the ileal conduit (IC) or ureterosigmoidostomy (USG).

Patients and method: Observational retrospective study on 255 patients with radical cystectomy between 1985 and 2009, selecting group assignments by the use of IC and USG. Analysis of the demographic and preoperative characteristics, perioperative complications, pathology and medium to long-term complications. Comparison of groups using T-Student, U-Mann–Whitney and chi square tests, with p < 0.05 indicating statistical significance. Preparation of survival tables according to Kaplan–Meier, establishing comparisons using the log-rank test.

Results: There were 41 cases of IC and 55 cases of USG, with a mean patient age of approximately 61 years. USGs were performed on a greater number of females than ICs. There were no differences in the need for transfusion, with similar results as other series. There was a greater trend toward the appearance of intestinal fistulae and greater morbidity and mortality in the postoperative period in USG, although it was not significant. There was a greater long-term presence of eventions in IC, and of pyelonephritis and the need for taking alkalinizing agents in USG. The appearance of peristomal hernias in IC was less than in previous series. With a mean follow-up greater than 50 months, the overall survival was 40% at 5 years, with no differences according to urinary diversion.

Conclusions: IC and USG are two applicable urinary diversions in the event that orthotopic neobladder surgery cannot be performed. They have a similar long-term complication and survival profile in our series, although with a higher morbidity in postoperative complications for USG.

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PALABRAS CLAVE
Neoplasias vesicales; Derivaciones urinarias; Conducto ileal; Reservorios urinarios colónicos; Estudio comparativo

Estudio comparativo de morbimortalidad entre conducto ileal y ureterosigmoidostomía tras cistectomía radical por neoplasia vesical

Resumen
Objetivos: Pese a la tendencia creciente a la elaboración de neovejigas ortotópicas, en muchos casos no es posible su realización, manteniendo su vigencia otras técnicas. Planteamos un análisis comparativo entre pacientes con cistectomía radical por neoplasia vesical y reconstrucción mediante conducto ileal (CI) o ureterosigmoidostomía (USG).

Pacientes y método: Estudio retrospectivo observacional sobre 255 pacientes con cistectomía radical entre 1985 y 2009, seleccionando las derivaciones mediante CI o USG. Análisis de características demográficas y prequirúrgicas, complicaciones periquirúrgicas, anatomía patológica y complicaciones a medio y largo plazo. Comparación entre grupos mediante t- de Student, U Mann-Whitney y chi cuadrado, considerando significación estadística si p < 0,05. Elaboración de tablas de supervivencia según Kaplan-Meier, estableciendo comparaciones mediante el test log rank.

Resultados: Cuarenta y un CI y 55 USG, con edad media aproximada de 61 años. USG realizada en un mayor número de mujeres que el CI. Sin diferencias en la necesidad de transfusión, con resultados similares a otras series. Mayor tendencia hacia la aparición de fístulas intestinales y mayor morbimortalidad en el postoperatorio en la USG, aunque no significativa. A largo plazo, mayor presencia de eventaciones en CI y pielonefritis, y necesidad de toma de alcalinizantes en USG. Aparición de hernias periestomales en CI menor que en series previas. Con seguimiento medio superior a 50 meses, supervivencia global del 40% a 5 años, sin diferencias según derivación urinaria.

Conclusiones: CI y USG son 2 derivaciones urinarias aplicables en caso de no poder realizar neovejiga ortotópica, con un perfil de complicaciones y supervivencia a largo plazo similares en nuestra serie, aunque con una mayor morbilidad en las complicaciones postoperatorias de la USG.

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Introduction
Bladder substitution after radical cystectomy in patients with bladder cancer can be performed according to several techniques regarding certain parameters like: tumor stage, urethral involvement, age, renal function, related diseases and patient preferences.

Although currently, orthotopic ileal bladder substitute (BS) is considered as the technique of choice, it is not always possible to perform it for several reasons, and other possibilities, for example ileal conduit (IC) and ureterosigmoidostomy (USG), play their role after cystectomy.

Numerous series of patients undergoing these surgical diversions have been reported, although there are few comparative studies between them. According to our knowledge, no series compares directly both diversions.

We propose a retrospective observational study of perioperative, med- and long-term complications as well as mortality and cancer-specific survival (CSS) in two groups of patients: patients with IC and patients with USG.

Patients and method
The data of patients undergoing radical cystectomy and urinary diversions because of oncological reasons were analyzed in the Hospital Universitario Marqués de Valdecilla of Santander (HUMV). In most of the patients, data were recorded retrospectively reviewing clinical histories of die and operated patients before 2008. Since January 2008 data were recorded prospectively during follow-up.

255 radical cystectomies were performed from 1985 to 2009 in our center. Those patients who had undergone IC or USG were selected.

Radical cystoprostatectomy or anterior pelvic exenteration, in women, was carried out by the classical procedure, with open approach associated to ilio-obturator bilateral lymphadenectomy. IC reconstruction according to the Bricker technique was performed in 41 cases. USG was carried out in 55 patients, in 4 cases (7.3%) with creation of a Mainz pouch II and with direct reimplantation into sigmoid in the remaining 51 patients. Periodic checks were done during follow-up, including physical examination, blood test, venous blood gas analysis and imaging test of the upper urinary tract and of the diversion.

Demographical data, clinical history at diagnosis and the number of previous transurethral resections (TUR) to radical cystectomy, as well as neoadjuvant treatments were recorded. The perioperative data include the performance of urethrectomy and appendectomy during intervention, type of ureteral reimplant, the need for transfusion of blood products, the use of parenteral nutrition and the period of maintenance of ureteral catheter. Pathological variables of cystectomy and lymphadenectomy specimens are analyzed.

Early postoperative complications and the treatment required are recorded. Early postoperative period is defined as the hospital stay after radical cystectomy, or 30 days after intervention when patient is discharged. Prolonged ileus is
defined as an inability to start an oral diet by postoperative day 7 and as prolonged fever when its duration is 3 days. Similarly, follow-up complications and their management are described. Hydronephrosis is defined as dilatation of the renal pelvis grade II or higher. Metabolic acidosis and pyelonephritis were taken into account when patients required hospitalization for their treatment. Urothelial neoplasm recurrence is defined as the appearance of neoplasm in the upper urinary tract, or as relapse in the tumor bed, regional nodes or at distance, during the follow-up.

When data were independent, Student’s t-test was used to compare means between groups, and U Mann–Whitney test for comparison of medians. Percentages were compared using Chi-square test. Statistical significance was set at $p < 0.05$. Survival tables were made using the Kaplan–Meier method and compared by the log rank test. Statistical analysis was performed using SPSS 15.0 for windows.

### Results

Radical cystectomy with orthopic ileal neobladder is the most frequent diversion in our series (105 cases, 41.2%). USG was carried out in 55 cases (21.6%) and IC in 41 cases (16.1%). 52 patients (21.6%) underwent to cutaneous ureterostomy; permanent nephrostomy was used in 2 cases (0.8%). Demographical data of patients undergone to radical cystectomy with IC and USG diversion are listed in Table 1.

Perioperative variables are described in Table 2.

In both groups, ureteral reimplantation was performed using external tutors (mean catheter time 10.18 ± 3.3 days). In IC group, reimplantations were mostly Wallace I and II; Goodwin reimplantations were used in USG group.

Pathological results of specimens removed are described in Table 3.

Early postoperative complications are summarized in Table 4.

### Table 1 Clinical and demographical data of the sample.

<table>
<thead>
<tr>
<th>Variable</th>
<th>IC (median-range, years)</th>
<th>USG (median-range, years)</th>
<th>Signification (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>61.95 (33–70)</td>
<td>60.75 (38–82)</td>
<td>0.394</td>
</tr>
<tr>
<td>Previous-TUR (median-range, N)</td>
<td>1.90 (1–6)</td>
<td>1.59 (1–8)</td>
<td>0.270</td>
</tr>
<tr>
<td>Women (no.,%)</td>
<td>2 (4.9)</td>
<td>14 (25.5)</td>
<td>0.011 (&lt;0.05)</td>
</tr>
<tr>
<td>Hematuria at diagnosis (no.,%)</td>
<td>31 (81.6)</td>
<td>50 (92.6)</td>
<td>0.109</td>
</tr>
<tr>
<td>Neoadjuvant chemotherapy (no.,%)</td>
<td>16 (39)</td>
<td>9 (16.4)</td>
<td>0.020 (&lt;0.05)</td>
</tr>
</tbody>
</table>

### Table 2 Perioperative data of the sample.

<table>
<thead>
<tr>
<th>Variable</th>
<th>IC (no., %)</th>
<th>USG (no., %)</th>
<th>Signification (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antibiotic prophylaxis (no., %)</td>
<td>40 (97.6)</td>
<td>53 (96.4)</td>
<td>0.739</td>
</tr>
<tr>
<td>Tromboembolic prophylaxis (no., %)</td>
<td>38 (92.7)</td>
<td>52 (94.5)</td>
<td>0.709</td>
</tr>
<tr>
<td>Urethrectomy (no., %)</td>
<td>12 (29.3)</td>
<td>14 (25.5)</td>
<td>0.450</td>
</tr>
<tr>
<td>Appendectomy (no., %)</td>
<td>27 (65.9)</td>
<td>10 (18.2)</td>
<td>0.000 (&lt;0.05)</td>
</tr>
<tr>
<td>Parenteral nutrition (no., %)</td>
<td>41 (100%)</td>
<td>53 (96.4%)</td>
<td>0.217</td>
</tr>
<tr>
<td>Hemoderived transfusion (median-range, no.)</td>
<td>2.3 (0–7)</td>
<td>2.4 (0–10)</td>
<td>0.885</td>
</tr>
<tr>
<td>Ureteral catheters (no., %)</td>
<td>40 (97.6)</td>
<td>55 (100)</td>
<td>0.244</td>
</tr>
<tr>
<td>Days with ureteral catheters (median-range, no.)</td>
<td>11.14 (2–20)</td>
<td>9.77 (83–15)</td>
<td>0.105</td>
</tr>
</tbody>
</table>

8 patients developed intestinal fistulas: 1 patient was exitus (12.5%), 1 fistula was managed conservatively (12.5%) and the remaining 6 fistulas were repaired surgically (75%), including discharged colostomy in 4 cases. Urinary fistulas were developed in 12 patients: 1 patient was exitus (8.4%), 7 cases were managed conservatively (58.1%) by uni- (2 cases) or bilateral nephrostomy (5 cases), ureteral reimplantations were carried out in 2 patients (16.7%) and 2 cases were converted to a cutaneous ureterostomy (16.7%). 4 patients were exitus in the early postoperative period: 2 cases as a consequence of cardiac causes and 2 cases related to infectious causes (intestinal fistula in 1 patient and postoperative

### Table 3 Pathological data of the sample.

<table>
<thead>
<tr>
<th>Variable</th>
<th>IC (no., %)</th>
<th>USG (no., %)</th>
<th>Signification (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>pT0</td>
<td>4 (10)</td>
<td>4 (7.3)</td>
<td>0.772</td>
</tr>
<tr>
<td>pT1</td>
<td>7 (17.5)</td>
<td>9 (16.4)</td>
<td></td>
</tr>
<tr>
<td>pT2</td>
<td>14 (35)</td>
<td>19 (34.6)</td>
<td></td>
</tr>
<tr>
<td>pT3</td>
<td>7 (17.5)</td>
<td>16 (29.1)</td>
<td></td>
</tr>
<tr>
<td>pT4</td>
<td>8 (20)</td>
<td>7 (12.7)</td>
<td></td>
</tr>
<tr>
<td>pN0</td>
<td>26 (66.7)</td>
<td>34 (61.8)</td>
<td>0.535</td>
</tr>
<tr>
<td>pN1</td>
<td>3 (7.7)</td>
<td>6 (10.9)</td>
<td></td>
</tr>
<tr>
<td>pN2</td>
<td>2 (5.1)</td>
<td>7 (12.7)</td>
<td></td>
</tr>
<tr>
<td>pN3</td>
<td>8 (20.5)</td>
<td>8 (14.5)</td>
<td></td>
</tr>
<tr>
<td>pM0</td>
<td>38 (100)</td>
<td>53 (98.2)</td>
<td>0.680</td>
</tr>
<tr>
<td>pM1</td>
<td>0 (0)</td>
<td>1 (1.8)</td>
<td></td>
</tr>
<tr>
<td>Grade II</td>
<td>7 (22.6)</td>
<td>6 (13.3)</td>
<td>0.293</td>
</tr>
<tr>
<td>Grade III</td>
<td>24 (77.4)</td>
<td>39 (86.7)</td>
<td></td>
</tr>
<tr>
<td>Ca. transitional</td>
<td>33 (91.7)</td>
<td>49 (90.6)</td>
<td>0.859</td>
</tr>
<tr>
<td>Squamous</td>
<td>1 (2.8)</td>
<td>1 (1.9)</td>
<td></td>
</tr>
<tr>
<td>Adenocarcinoma</td>
<td>2 (5.6)</td>
<td>3 (5.7)</td>
<td></td>
</tr>
<tr>
<td>Neuroendocrine</td>
<td>0 (0)</td>
<td>1 (1.9)</td>
<td></td>
</tr>
<tr>
<td>Cis. associated</td>
<td>7 (21.9)</td>
<td>7 (15.9)</td>
<td>0.508</td>
</tr>
<tr>
<td>Prostate carcinoma</td>
<td>3 (7.3)</td>
<td>1 (1.8)</td>
<td>0.182</td>
</tr>
</tbody>
</table>
sepsis in the other). Respiratory infections were found in 3 cases (3%), metabolic acidosis in 2 cases (2%) and pyelonephritis in one case (1%). No significant differences were observed in complications between both diversion groups. However, in USG patients the number of major complications (intestinal fistula, urinary fistula, evisceration and exitus) is greater than in IC group. In the subgroup of patients with major complications (8 IC and 14 USG), statistically significant differences in the mean number of complications were found (1 in IC group vs 1.86 in USG group; \( p < 0.05 \)).

Complications that appeared during medium- and long-term follow-up are recorded in Table 5. During follow-up, urinary undiversion was done in 2 patients: one USG was converted to IC and one IC was converted to bilateral cutaneous ureterostomy. Active resolution of utero-intestinal stenosis was carried out by ureteral diversion in 2 patients with IC and by antegrade dilatation in one patient with USG. Staghorn lithiasis was developed in one patient with USG. Neither fecal nor urinary incontinence have been observed in patients with USG, except for one patient who showed stress incontinence.

During follow-up there were 67 exitus. There are no differences between diversions: 30 cases with IC (44.8%) and 37 with USG (55.2%)—\( p < 0.534 \). In 35 cases, death was caused by non-urological conditions; 19 cases with IC (63.3%) and 16 with USG (43.2%), there are no differences between groups (\( p < 0.104 \)).

With a mean follow-up of 50.7 months (range: 0–272 months), overall survival rate is 35.5% in IC group and 40.3% in USG group. There are no significant differences between groups (\( p < 0.679 \)).

![Figure 1 Kaplan–Meier curve of cancer-specific survival between groups.](image-url)
CSS rates were 64.4% in IC group and 52.2% in USG group. No significant differences were found between groups ($p < 0.474$) (Fig. 1).

Recurrence-free survival rates were 51.3% in IC group and 53.1% in USG group (mean follow-up 50.7 months). No significant differences were found between groups ($p < 0.609$).

Discussion

Despite the large number of diversions that have been described in the urological literature, ideal form of urinary diversion remains to be developed. Although in last two decades, urinary tract diversion with orthotopic neobladder is a growing trend, ileal conduit remains the most widely used option. Orthotopic diversions are much more frequent in urban hospitals and in patients with higher socioeconomic status and with lower comorbidity rates. In the current context of aging population, less complex and aggressive urinary diversions remain valid. However, the improvement in survival rates for patients who underwent radical cystectomy with neobladder becomes important to develop a long-term analysis of complications. Despite further refinement of the surgical technique, radical cystectomy is a complex surgical procedure with major perioperative complications, most of them related with the type of urinary diversion performed.

Urinary diversion with orthotopic ileal neobladder is mostly performed in our center, while diversion with IC is used in patients in whom enterocystoplasty is not feasible. Classically, USG has been performed in those patients not candidates to enterocystoplasty showing expressed rejection of the cutaneous stoma. We developed USG according to classical procedure (Mainz II diversion in 4 cases), without any significant advantage despite the theoretical advantages of colonic conversion.

We have proposed to compare both urinary diversions because we have not found comparative studies between them and because both techniques are second-line options when enterocystoplasty is not feasible.

We have found differences with sex, probably due to women’s choice of USG technique (no candidates to neobladder) linked to lesser body image disturbance. The number of patients undergoing neoadjuvant chemotherapy is larger in the IC group, perhaps regarding to worse tumor spectrum in these patients.

In our series, the number of transfusions is comparable to actual series, showing a perioperative mortality rate of 4.2%, a little bit higher than those reported in other groups. Moreover, perioperative mortality is found only in patients who underwent USG, although without statistical significance. In regard to early complications, we have not found significant differences between diversions, although USG group shows a higher incidence of intestinal and urinary fistulas, and prolonged ileus and fever are more frequent in IC group. No differences are found between each complication; however, when confining our study to major perioperative complications subgroup, patients with USG show a higher mean number of them. It could be explained for being the complications more severe in this group of patients. In our group, intestinal fistula was the most relevant and with more morbidity complication. In most of cases (75%) reoperation was required and, in many of these cases, colostomy was necessary.

With regard to complications during follow-up, this study highlights the significant differences in the number of incisional hernias between groups that are more numerous in IC group, despite not presenting a higher number of wound infections or evisceration in postoperative period. By contrast, the percentage of peristomal hernias (4.9%) is lower than in other series (about 14%). The number of hospitalizations for pyelonephritis has been significantly higher in USG group (38%) than in other classical series (reaching 19.4%). In IC group, the percentage of pyelonephritis (13.5%) is similar to other publications. Note that no differences have been found regarding hospitalizations for metabolic acidosis; however there were significant differences in chronic intake of bicarbonate (higher in USG group). Although hyperammonemnic encephalopathy is a complication reported in patients with USG, this complication has not been described in our study.

IC group had a higher tendency, not significant, showing intestinal subocclusive symptoms (9.8%), although this percentage is lower than in other series.

Hydronephrosis, due to reflux or stenosis at the junction ureterointestinal, is another common complication during follow-up in both diversions without significant differences between groups. Regarding ureteral stenosis, no differences between groups and with previous series have been found. However the management of this complication is different in each group. Percutaneous antegrade dilatation has been described as a successful procedure for the treatment of ureteral stenosis in patients with USG, as in a patient of our series. Literature reports the development of lithiasis as another complication that appears at long term in both diversions (50%). However, in our series, only one case of a patient with USG developed staghorn stones. Finally, it is remarkable to note that one patient with USG developed colon tumor after more than 15 years of follow-up. This complication has been found in series with long-term follow-up, especially in young patients with USG diagnosed of bladder exstrophy (up to 13.3% of cases). Despite its low incidence and its long latency, this complication requires a proper control by occult blood test in stools and annual colonoscopy from the tenth year of follow-up.

Despite longer follow-up, regarding recurrence-free survival rates and overall CSS no significant differences have been found. Therefore, we think that there is no influence of the type of diversion used.

Among the limitations of this study, its mostly retrospective nature stands out (much of the data have been collected from the clinical records of our series). Regarding complications, we have not used a validated classification what impairs the comparison with other series. Nowadays, the Clavien classification is being implemented in the prospective series carried out in our center.

As conclusions, we can state that IC and USG are two applicable urinary diversions in the event that orthotopic neobladder surgery cannot be performed, both showing similar complications profile in our series. Both diversions must be offered to the patient, being necessary to explain their major differences, their similarities in long-term
survival rates and emphasize the severity of postoperative complications and possible solutions, especially in the group of patients with USG.

Conflict of interest

The authors declare that they have no conflict of interest.

References