ORIGINAL ARTICLE

Pyeloplasty without intrarenal stent in pediatric patients☆

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KEYWORDS
Hydronephrosis; Pyeloplasty; Drainage; Pediatrics; Ureteropelvic junction obstruction

Abstract

Purpose: In spite of advances in minimally invasive endoscopic surgery, open dismembered pyeloplasty continues to be used in many pediatric centers, especially in small children. The purpose of this work is to present our experience in the performance of this technique using a minimally invasive open pyeloplasty without intrarenal stents.

Material and methods: A retrospective review was made of patients between July 1992 and July 2009. During this time, 348 patients underwent open dismembered pyeloplasty. A total of 310 patients (89%), 223 boys and 87 girls, underwent open pyeloplasty without intrarenal stent. The incision was from 2 to 2.5 cm in the flank. An extrrenal drain (3–5 days) and a bladder catheter (<24h) were placed in all patients.

Results: A total of 319 pyeloplasties were performed without intrarenal catheter in our Service. Of these, 174 (54.5%) were on the left side, 127 (39.8%) on the right side and 9 (5.6%) were bilateral. Age interval was 14 days to 18 years, 58% of the children being younger than 12 months at the time of surgery. With a mean follow-up of 6.7 years (17 years to 11 months), 312 pyeloplasties (97.8%) were successful, with persistence of the obstructive patient in 7 patients who required a new open pyeloplasty (2.2%). Other complications were: prolonged drainage (6), wound infection (1), and urinary infection (2). Mean stay was 22 h.

Conclusions: Open dismembered pyeloplasty is a safe and effective treatment choice for pyeloureteral stenosis in children and can be done without intrarenal stents with no detriment to its success.

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PALABRAS CLAVE
Hidronefrosis; Pieloplastia; Drenaje; Pediatría; Estenosis pieloureteral

Resumen

Objetivos: A pesar del avance de cirugías mínimamente invasivas, la pieloplastia desmembrada cielo abierto sigue siendo una cirugía muy utilizada en Pediatría, especialmente en niñospequeños. El propósito de este trabajo es presentar nuestra experiencia en la realización de esta técnica a través de una mínima incisión y sin dejar catéteres intrarrenales transanas-tomóticos.

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**Introduction**

The dismembered pyeloplasty described by Anderson-Hynes in 1949 remains the standard treatment of ureteropelvic stenosis (UPS) in Pediatrics, with a success rate above 95%. Most surgeons agree on the need for adequate resection of the stenotic area, spatulating the ureter in order to perform a wide Anastomosis in the most declining area of the renal pelvis. However, if we talk about the choice of approach and the use of intrarenal catheters, the debate continues to this day. With the advancement of video-assisted techniques, the open approach in childhood has started to be questioned, existing in the literature advocates of both procedures, as it is the case with the drainages. The dismembered pyeloplasty was soon associated to nephrostomies and transanastomotic catheters, understanding them as a key to their success. But soon their benefits, still discussed today, started to be doubted. The aim of this paper is to present our experience in the treatment of ureteropelvic obstruction in children operated according to the Anderson-Hynes technique, to which a mini-flank incision was made, and they were not left intrarenal catheter.

**Materials and methods**

Retrospective review of the pyeloplasties performed in our department between July 1992 and July 2009. During that time, 348 patients diagnosed with UPS were operated by means of open dismembered pyeloplasty. Of this group, 38 patients, who had an intrarenal drainage in the form of double J catheter (32) or nephrostomy (6) placed, were excluded (11%). The causes of intrarenal drainage were surgeries in: solitary kidney, bilaterally pyeloplasty, and neonates operated at a young age with azotemia and/or palpable mass that required an extensive resection of the renal pelvis. In 310 (89%), 223 boys and 87 girls, no transanastomotic tutor or nephrostomy were left, and the surgery was performed by means of mini-flank incision.

Renal ultrasound was used as preoperative diagnosis tests to objectify the degree of hydronephrosis, isotopic cystography to rule out the existence of associated vesicoureteral reflux (VUR), and the diuretic renography (MAG-3) to assess the function and the curve of renal excretion. The diagnosis was prenatal in 254 (82%) patients, and in the rest, the study was initiated after a clinical suspicion, when flank pain, urinary tract infection, vomiting and/or hematuria appeared. Also, in 15 patients, it was associated with other congenital anomalies such as UPS of the lower pole of a double system (6), single functioning kidney (4), horseshoe kidney (3), or pelvic kidney (2). The indications for the surgical treatment included: high-grade hydronephrosis (IV, V), recurrent urinary tract infections, renal function lower than 40%, and/or obstructive pattern in the renogram.

Before starting the surgery, and once the anesthetic time began, a retrograde pyelogram was performed under C-arm fluoroscopy in all cases, in order to assess the position and length of the UPS, the size and position of the ureteral orifice, and the existence of other anatomical abnormalities of the ureter. The exact location of the UPS enabled to perform the surgery through small incisions. Then, after leaving a Foley catheter, the patient was placed in lateral decubitus position and underwent a 2–2.5 cm flank incision (Fig. 1). After accessing the retroperitoneum, the ureter and the ureteropelvic junction were located, carrying out the section of the stenotic area. With the intention to obtain a wide anastomosis, the ureter was spatulated until a 2–3 cm approximate diameter was achieved, after which the most declining area of the renal pelvis was anastomosed with PDS monofilament suture, 6/0 or 7/0, depending on the age of the patient (Fig. 2). In order to perform intracorporeal pyeloplasty safely, we used an enteral feeding probe as tutor, withdrawing it before completing the suture. As a single catheter, we placed a Redon 7 Fr suction drainage in the renal cell, ending the intervention with the externalization of the contraincision drainage and the closure of the defect by means of intradermal suture (Fig. 1B and C). The bladder catheter was removed 24h after the surgery. The drainage was maintained for 3–5 days, removing it in an outpatient way at consultation. The antibiotic prophylaxis was continued until the fifth postoperative day with first-generation cephalosporin. All the patients received acetaminophen with codeine orally in the postoperative and intravenous morphine when necessary. The follow-up was...
Pyeloplasty without intrarenal stent in pediatric patients

Figure 1 (A) 2-cm incision. (B) Incision after performing the surgery. Placement of aspiration perirenal drainage. (C) Scar appearance one month after surgery.

Figure 2 Dismembered pyeloplasty, anastomosis in the most decline area of the pelvis.

performed by means of an ultrasound study a month after surgery, repeating it at three and six months, and then annually. In the cases in which there was no evidence of ultrasound improvement, at least one MAG-3 was requested during the long-term follow-up.

Results

The mean age at surgery was 22.3 months (14 days to 18 years), 58% of the patients being under one year (Table 1). In total, 319 pyeloplasties were performed without intrarenal catheters: 174 (54.5%) of the left side, 127 (39.8%) of the right side, and 9 bilateral (5.6%). The mean follow-up was 6.7 years (17 years to 11 months), and the mean operative time 87 min (65–125).

The mean stay was 22 h (15–48), the majority of the patients being discharged the morning after the surgery. In the case of the patients who stayed more than 24 h, it was due to gastric intolerance or decision of the family. The surgery corrected favorably 312 of the 319 obstructions (97.8%), understanding as success the correction/reduction of the degree of hydronephrosis in the ultrasound, and improved the drainage curve in the diuretic renogram. Seven (2.2%) patients required reoperation to resolve the obstruction. In these children, a double J catheter was placed as temporary bypass until a new open dismembered pyeloplasty that resolved the obstruction was performed. The ages at the time of surgery and the time to reoperation are shown in Table 2.

Table 2 Reoperations, N: 7. Unit of time: months.

<table>
<thead>
<tr>
<th>N</th>
<th>Age surgery</th>
<th>Time to stent placement</th>
<th>Time to reoperation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>108</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>36</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>12</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td>72</td>
<td>0.5</td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td>17</td>
<td>0.5</td>
<td>2</td>
</tr>
<tr>
<td>Mean time</td>
<td>36.28</td>
<td>2.57</td>
<td>5.71</td>
</tr>
</tbody>
</table>

Table 1 Age at surgery: under 12 months.

<table>
<thead>
<tr>
<th>Age at surgery</th>
<th>N</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;6 weeks</td>
<td>46</td>
<td>13.2%</td>
</tr>
<tr>
<td>&gt;6 s&lt;3 ms</td>
<td>76</td>
<td>21.8%</td>
</tr>
<tr>
<td>&gt;3 ms&lt;6 ms</td>
<td>56</td>
<td>16%</td>
</tr>
<tr>
<td>&gt;6 ms&lt;12 ms</td>
<td>25</td>
<td>7.2%</td>
</tr>
<tr>
<td>Total&lt;12 months</td>
<td>203</td>
<td>58.2%</td>
</tr>
</tbody>
</table>
Other complications included prolonged drainage (6), wound infection (1), and fever/urinary infection (2). In the 6 patients who had prolonged drainage (from the fifth to the fourteenth postoperative day), a double J catheter was used as temporary drainage, all presenting a favorable evolution. The removal of the double J was performed between 6 weeks and 3 months after the placement thereof. 95.9% of the UPS resolved with a single general anesthesia. The remaining 4.1% needed 3 anesthetic times, since we had to add that of the cystoscopy and double J catheter placement, and that of its withdrawal, with or without new pyeloplasty.

Discussion

The dismembered pyeloplasty is considered the gold standard for the correction of the ureteropelvic stenosis, with positive results both in adults and in children. In adult patients, the laparoscopic approach has proved to be superior to the open approach, providing benefits on postoperative pain, hospital stay, and cosmetic result without significantly harming the success of the surgical technique. However, the studies in children are inconclusive. According to Braga et al., the laparoscopic access can be an accurate option for children older than 3 years, as it decreases the hospital stay without increasing the postoperative complications, but in recent years, there have also appeared papers defending that the open approach is not synonymous with long stays. Like us, they get hospital stays below 24 h and a good cosmetic outcome with incisions smaller than 2 cm, the operative time and the economic cost being lower than that of the laparoscopic technique.

As for the type of open approach, we found several studies comparing the flank incision with the lumbotomy, the latter presenting a higher rate of postoperative complications. Although Braga et al. claim that in children under 3 years, the lumbotomy provides results comparable to the flank access, in other ages, the failure rate increases. To this we can add the benefits of the mini-incision approach, as the postoperative morbidity decreases and the cosmetic result improves without jeopardizing the success of the surgery. Kajbafzadeh et al. postulate that the mini-flank incision is a safe and sufficient way to expose the pelvis and ureter without damaging the tissues. Especially if, as in our case, the pyeloplasty is performed intracorporeally, trying to make smooth and precise maneuvers that avoid the appearance of postoperative fibrosis in the anastomotic area.

A key step to achieve the success of pyeloplasty with small incisions is the performance of the retrograde pyelogram. Failure to do so constitutes an independent risk factor for the recurrence of the UPS, like the dorsal lumbotomy. This study allows us to assess the characteristics of the stenosis and the presence of other anatomic abnormalities, such as distal ureteral stenoses or the polar vessel, considering it key in planning the surgery.

The use of drainage, however, has not proved to have benefits that justify their use in pyeloplasty widely. The decision to leave the anastomosis tutored or not accompanies dismembered pyeloplasty since its origins. Although Anderson and Hynes did not see it necessary when they described the technique, soon others began to defend its advantages: maintaining the anastomosis aligned, facilitating the urination from the kidney, and reducing the leakages are the main actions attributed to it, and the reason for its use. But the reality is that they also generate complications such as migrations, spasms, urinary infections, or stone formation, to which we must add the need for a second anesthetic time for its removal.

In order to reduce its disadvantages, some authors began to replace the usual double J catheters for double J with extension, or even feeding tubes that are externalized by skin contralincision, after crossing the renal parenchyma or pelvis, and can be removed on an outpatient basis at consultation. With this, the migration of the stent and further anesthesia are attempted to be avoided, but its externalization may cause parenchymal damage and bleeding.

On the other hand, not letting them makes urine leakages through the anastomosis more frequent, which may lead to the occurrence of fibrosis and obstruction. In our case, we have tried to reduce their appearance developing comprehensive and watertight anastomoses and placing a Redon type suction drainage near the suture in place of the Penrose.

The truth is that the papers found in the literature on the usefulness of transanastomotic stents show no significant differences in the occurrence of complications and the success of the surgical technique. One thing to value of our study is the low incidence of complications (4.9%) compared to other series published (10–15%). Karen et al. compare groups of patients with transanastomotic catheter and without catheter, finding a non-significant difference in postoperative complications for the first: 12 and 15%, respectively. However, it should be noted that the approach was not taken into account when analyzing the complications, and that an unspecified percentage of patients in the second group was operated for lumbotomy. Elmalik et al. objectify in their study fewer complications in the group without stents (10.6 vs. 15.5%), with a similar recovery of the renal function between the groups. Nevertheless, they advocate its use based on the fact that the improvement of the hydronephrosis appears at an earlier time. And, although they claim that tutoring the anastomosis decreases the stay, we got an average stay of 22 h, improving even the number of patients with stents of that study.

We think that intrarenal catheters may be useful in isolated cases, such as bilateral pyeloplasty, solitary kidney, or reinterventions, but its widespread use is unjustified, as it represents an added morbidity to the patient without advantages over the results. Despite the limitations that the study presents for being retrospective and descriptive, we want to highlight the low rate of complications and the high percentage of success achieved (97.8%), even in children under one year, which seems to be benefited by the use of the retrograde renogram and the mini-flank incision.

The open dismembered pyeloplasty is highly effective in the treatment of the UPS in children, and managing without intrarenal catheters does not undermine its success.
Conflict of interest

The authors declare that they have no conflict of interest.

References