CASUISTRY

Laparoscopic treatment of urachal remnants

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Abstract

**Objectives:** The urachus is a vestigial obliterated structure derived from the alantoides. Failure of this involution process originates patent urachal remnants. Surgery is the treatment of choice as it prevents both recurrence of symptoms and malignant transformation. The purpose of this study is to present our experience in the laparoscopic management of this pathology.

**Material and methods:** Three male patients (mean age 39 years) underwent laparoscopic excision of urachal remnants. Two patients were diagnosed with an asymptomatic cyst and one patient with urachal sinus presenting with umbilical discharge. A three-port technique was used to remove the whole urachus tract from the umbilicus to the bladder dome, together with a small bladder patch.

**Results:** Mean operating time was 94 min and blood loss was minimal. One patient had small intra-operative bladder rupture, successfully managed with adequate closure. No post-operative complications were observed and all patients were discharged on the second postoperative day. Two years later there was no evidence of recurrence.

**Conclusions:** Urachal remnants can be successfully treated by laparoscopic surgery, with advantages in terms of morbidity, recovery and cosmetic outcome. Large number, comparative studies are still needed to definitely establish it as the gold standard treatment.

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PALABRAS CLAVE

Uraco; Remanentes uracales; Laparoscopia; Cirugía

Tratamiento laparoscópico de los remanentes uracales

Resumen

**Objetivos:** El uraco es una estructura vestigial obliterada derivada de la alantoides. El fracaso de este proceso de involución origina remanentes uracales evidentes. La cirugía es el tratamiento a elegir, ya que previene tanto la reaparición de los síntomas como la transformación maligna. El propósito de este estudio es presentar nuestra experiencia en el manejo laparoscópico de esta patología.

**Material y métodos:** Tres pacientes del sexo masculino (mediana de edad de 39 años) se sometieron a extirpación laparoscópica de los remanentes uracales. Dos pacientes fueron diagnosticados con un quiste asintomático y un paciente con un seno uraco con secreción umbilical. Se utilizó una técnica de tres puertos para eliminar todo el tracto del uraco desde el ombligo hasta la cúpula vesical, junto con una pequeña parte de la vejiga.

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Introduction

Urachal anomalies resulting from the incomplete regression of this vestigial remnant of the allantois include urachal cyst, vesicourachal diverticulum, umbilical–urachal sinus and urachal fistula, depending on which part remains patent. These anomalies occur in 1/5000 adults and are usually asymptomatic and diagnosed incidentally only during routine exams or abdominal surgery for other causes. When symptomatic, these conditions normally present with umbilical discharge or an infra-umbilical mass. Although diagnosis is mainly clinical, different procedures can be used in the diagnostic workup, with ultrasound and CT (computerized tomography) scan being the most useful.

As a result of the high rate of recurring symptoms and the risk of malignancy, surgical excision of the whole urachal tract represents the standard treatment for this group of conditions. Open surgery has been the traditional approach, but with the advent of the minimally invasive techniques, several case reports and small series of laparoscopic excision have been reported since the mid 1990s. We present our experience with the laparoscopic management of these patients.

Material and methods

Three male patients with mean age of 39 years old (range 24–50 years) were diagnosed with and treated for a urachal remnant at our institution between March 2008 and May 2009. The first two patients had an asymptomatic urachal cyst incidentally found during a routine ultrasound. The third patient presented with umbilical discharge and suprapubic pain. The ultrasonography revealed a urachal sinus exerting compression on the bladder dome.

The diagnostic assessment performed for all three patients included clinical history, pre-operative workup, urinalysis, imaging studies, and cystoscopy. CT scan confirmed the ultrasound findings (Fig. 1) and in a case revealed the urachal sinus with intravesical formation consistent with bladder septum or tumor. Cystoscopy showed a mass protruding from the dome, resulting from the sinus compression (Fig. 2). The first two patients had no endoscopic findings. Operating time, estimated blood loss, peri- and post-operative complications, hospital length of stay, pathological findings, and follow-up were reviewed.

Surgical technique

After induction of general anesthesia, the patients were positioned supine and placed in the Trendelenburg position. A nasogastric tube for stomach decompression and a Foley catheter for bladder instillation were placed. The main surgeon stood on the right side of the patient, the assisting surgeon on the left side and the monitor was placed at the foot of the table.
The peritoneal cavity was assessed using the Hasson open technique, and a pneumoperitoneum was created by insufflating CO₂ until a sustained intra-abdominal pressure of 12 mm Hg was reached. Three trocar ports were then inserted. The 12-mm port, used for passage of a 30° optic camera, which allows for better visualization of the anterior abdominal wall structures, was positioned in the midline, halfway between the umbilicus and the xiphoid process. A 10-mm port for the instrumentation (i.e. diathermy unit, dissector, scissors, and needle holder) was placed under direct vision at the umbilical level, laterally to the right rectus abdominis muscle, to avoid injury to the epigastric vessels. A final 5-mm port for auxiliary instruments (i.e. grasper) was also placed under direct vision at the same level as the 10-mm trocar, but to the left flank (Fig. 3).

The procedure began by dissecting intra-peritoneal adhesions. The urachus and medial umbilical ligaments were visualized (Fig. 4). A small midline peritoneal incision was performed just below the umbilicus, and the peritoneum between the two medial ligaments was dissected, using a combination of blunt and sharp dissection, liberating the urachus from its attachments to the transversalis fascia. Once the bladder was reached, a small patch of the vesical dome was resected and subsequently closed with a 2/0 continuous absorbable suture. The urachus was placed in a specimen bag (EndoCatch Gold, Tyco, U.S.A.) and removed through the 12-mm port incision. The bladder was then filled with sterile saline to rule out leaks. Hemostasis was reassessed and a surgical drain was put in place. Finally, the fascial and the skin incisions were closed with absorbable sutures and metallic staples respectively.

Results

Mean operating time was 94 (49–158) min and mean estimated blood loss was 40 ml. All specimens were removed intact. In the patient with urachal sinus, further to the laparoscopic excision, it was necessary to perform an additional periumbilical open incision, from where the specimen was removed.

In terms of intra-operative complications, one patient had a minor intra-peritoneal bladder rupture, successfully managed with a 2/0 absorbable suture. After bladder refilling, no leakage was noted. The surgical drain was removed at 24 h and the median length of stay was 2 days. The Foley catheter was removed 8 days after the surgery to ensure a safe closure of the bladder wall. The pathological examination revealed urachal remnants with urothelial cells displaying inflammatory changes.

These patients were followed-up for a mean time of 9 months (7–13). During this period, no post-operative complications were noticed. One patient had an episode of cystitis, managed successfully with appropriate antibiotic-therapy. At the time of follow-up, no patient showed clinical or imaging evidence of recurrent urachal pathology.

Discussion

Cabrolius published in 1550 the first case of treatment of a symptomatic urachal remnant.⁹ There are currently over 300 reported cases in the literature worldwide.⁴ Urachal anomalies can be either congenital, if the obliteration process is incomplete by the time of birth, or acquired, if partial or complete repermeabilization occurs following the normal involution of this structure.⁷ Depending on which segment remains patent, four different types of urachal remnants may occur: (i) urachal fistula, (ii) vesico-urachal diverticulum, (iii) urachal–umbilical sinus, and (iv) urachal cyst.

The last one is the most common (30%) of urachal remnants.¹⁰ An isolated segment of the urachus remains patent, having communication with neither the bladder nor the umbilicus.⁴,¹¹ It forms when desquamation and degeneration of the urachal epithelium occurs.¹² Urachal cysts are
usually small and asymptomatic, but can present at any age if they become large and infected. The most common clinical presentation is pyrexia, with painful masses, fever, and voiding symptoms. As the urachus is located in the prevesical space of Retzius, this generally prevents the infection from spreading to superficial layers of the anterior abdominal wall. *Staphylococcus* spp. and other skin flora-species are the most frequently involved organisms. However, in some cases, a cyst can rupture into the coelomic cavity with subsequent peritonitis, or even fistulize through the skin or into intra-abdominal organs.\(^1,10,13,14\) Urachal anomalies may also be associated with other findings such as vesico-ureteral reflux, hypospadias, meatal stenosis, cryptorchidism, anal atresia, omphalocele, and uretero-pelvic obstruction syndrome.\(^1,16\)

Persistent urachal remnants have an incidence of 1/5000 adults and 2/300,000 children.\(^3,4,17\) Despite being rare, a physician must always consider this diagnosis in cases presenting with periumbilical mass and inflammation or umbilical discharge.\(^1\) When symptomatic, the differential diagnosis should include other clinical conditions such as appendicitis, omphalitis, adnexal torsion, and vitelline duct anomalies (e.g. Meckel’s diverticulum).\(^2\)

The diagnosis is often established by clinical history and physical examination, especially in children, but imaging exams are normally used to confirm the diagnosis.\(^2,16,18\) In that context, ultrasonography is very useful with a diagnostic accuracy of over 90%.\(^16\) Abdominal CT or MRI are suitable alternatives in cases where ultrasound does not offer a conclusive diagnosis.\(^2\) A sinogram may be used in patients with umbilical drainage, although some authors reported no advantages of this diagnostic modality.\(^16\) Cystoscopy and cystography are of no use, except in cases where malignant disease is suspected.\(^16\) Because of the frequent association with vesicouretal reflux, some authors propose that a voiding cystourethrogramy should be performed.\(^19\)

Surgical excision is advocated as the traditional treatment to avoid recurrent disease and future malignant transformation.\(^2,6-7\) However, there have been reported cases of spontaneous resolution with no intervention\(^6\) and there is still controversy on whether or not an incidental, asymptomatic urachal remnant should be treated. Although its malignancy potential has been described,\(^3\) urachal carcinoma, particularly adenocarcinoma, accounts for only 0.17–0.34% of bladder cancers\(^6\) and some authors have actually found no association between incidental urachal remnants detected in early childhood and malignant transformation later in life.\(^5,19\) For this reason, several authors propose that active surveillance is a more appropriate approach.\(^2,6,16\) The surgical approach should include resection of the entire tract extending from the umbilicus to the bladder, with a small bladder cuff to prevent the 30% risk of recurrence in case of partial excision.\(^1,3,16\) For an uncomplicated urachal remnant, it should be a one-stage procedure. In cases where the remnants are infected, it is still a matter of debate whether it should be done in one or two stages. In the traditional approach, the treatment should initially be conservative, with drainage and antibiotic therapy, followed by resection at a later stage. Some authors have challenged this option proposing that, with effective antibiotherapy, one-stage management can be safe and successfully accomplished.\(^10\) However, McCollum et al. in their series concluded that the risk of postoperative complications surpasses the benefits of a one-stage intervention, thus supporting the traditional approach.\(^16,21\)

Since the first published case of laparoscopic treatment of a urachal cyst by Tronsden et al. in 1993,\(^9\) a growing number of case reports\(^13,15,22,23\) and small series\(^17,18,20\) have been described in the literature. As in open surgery, laparoscopy should follow the same principles of complete removal of the urachal remnants, extending from the umbilicus to the bladder dome. For that purpose, we adopted the port positioning system used by Cadeddu et al.\(^21\) and Khurana and Borzi,\(^17\) in which the 30° laparoscope is placed in the midline above the umbilicus, and the two assisting trocars are placed laterally to both recti muscles. We feel that this positioning offers the easiest and most natural way of visualization and manipulation of the anterior abdominal structures. Although the lateral positioning of the laparoscope allows for a better definition of the whole urachal tract, as proposed by Cutting et al.\(^2\) and Turial et al.,\(^20\) in our experience, that approach was not necessary. One limitation that we came across was that the inability to remove the suprafascial segment of the urachal sinus.\(^1,3,4\) This step of the procedure had to be done by classic open incision, which can be seen as a pitfall of this technique. Mean operative time was 94 min, which concurs with other series and was only longer because, in the patient with urachal sinus, an external excision of the umbilical suprafascial segment had to be performed. Blood loss was minimal and although one patient suffered a small bladder rupture during the intervention, this was effectively managed with a tight suture. No postoperative complications were observed.

Okegawa et al.\(^24\) compared open and laparoscopic surgery and showed better outcomes for the latter in terms both of hospital length of stay and time to return to activities of daily living. Sánchez et al.\(^1\) and Turial et al.\(^20\) confirmed these positive results. Despite the increasing evidence, we still feel that large, multicentric, prospective randomized trials comparing the two techniques are needed to definitely confirm laparoscopic surgery as the treatment of choice for urachal remnant disease.

### Conflict of interest

The authors declare that they have no conflict of interest.

### Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.acuroe.2012.08.001.

### References