



Trends in surgical management of urachal anomalies☆☆☆



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ABSTRACT

Purpose: We have noted an increasing frequency of diagnosed urachal anomalies. The purpose of this study is to evaluate this increase, as well as the outcomes of management at our institution over 10 years.

Methods: A retrospective analysis of urachal anomalies at our institution was performed. Inclusion criteria were Anomalies of Urachus (ICD 753.7) or Urinary Anomaly NOS (ICD 753.9) between January 2000 and December 2010. Exclusion criteria were having an asymptomatic urachal remnant incidentally excised.

Results: Eighty-five patients (49 male, 36 female) presented between 0 and 17 years of age (mean 1.5 years). Diagnoses increased from 0 in 2000 to 21 in 2010. Zero was surgically managed in 2000 while 21 were managed in 2010 ($p = 0.0145$). Fifteen patients (17.6%) were observed with 13 (13/15, or 15.3%) resolving without complication while 2 were operated on. Average time to resolution (clinical or radiologic) was 4.9 months (Range: 0.4–12.6). A total of seventy-two patients (84.7%) underwent excision. Thirty-nine (54%) surgical cases were outpatient while 33 (46%) were admitted. Thirteen (18%) had post-operative complications. Ten (77%) of the complications were wound infections. Patients under 6 months of age accounted for 60% (6 of 10) of all wound infections and 52% (17 of 33) of hospitalizations.

Conclusions: Our experience and review of the literature suggest a high complication rate with surgical management in young patients, mostly from infections and support non-operative management of all non-infected urachal remnants in children.

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The urachus is an embryonic connection between the urinary bladder and the allantois, which obliterates to form the median umbilical ligament in utero [1]. Failure to obliterate at any point can lead to urachal anomalies (UAs). Due to the risk of infection and malignant degeneration later in life, surgical excision has been the standard of care [2–8]. Conservative management of UAs has been increasingly recommended, especially in younger children [9–12]. At our institution, we have noted an increasing frequency of urachal anomalies diagnosed. The purpose of this study was to review our 10-year experience with urachal anomaly management at Children's Hospital and Medical Center of Omaha, Nebraska and the current diagnostic and treatment modalities. We further analyzed children under 6 months of age in order to determine their outcomes, given that some have recommended conservative therapy for this age group [13].

1. Methods

A retrospective case-series was performed with patients from Omaha Children's Hospital and Medical Center. All charts between January 2000 and December 2010 with a diagnosis of Anomalies of Urachus (ICD 753.7) or Urinary Anomaly NOS (ICD 753.9) were reviewed. 460 records were reduced to 369 after removal of duplicates. 278 cases were then excluded for having no actual history of an urachus, while 6 additional cases were removed because they were an incidental, asymptomatic urachal remnant excised at the time of another procedure. The remaining 85 cases were evaluated in this study. Fifteen patients were followed until radiographic or clinic resolution; however, 2 failed observation and went on to surgery. At the discretion of the individual surgeon, 72 total patients underwent surgical excision of an urachal anomaly. Cases were evaluated by sex, age at diagnosis, initial presentation, diagnostic modalities utilized, radiographic findings, infectious organisms isolated, outcomes of operative and non-operative care, complications, histological findings, and duration of hospitalization. Statistical analysis was performed using linear regression analysis and Fisher's Exact Test. Linear regression examined the increase in frequency of the cases diagnosed and operated on during the testing period. Fisher's Exact was used to evaluate the relationship between patient age, post-operative wound infections, and antibiotic usage. Approval

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for this study was received from the University of Nebraska Medical Center and Children’s Hospital Institutional Review Board.

2. Results

2.1. Demographics (see Table 1)

Eighty-five patients were identified with urachal anomalies with a male to female ratio of 1.36. Diagnoses increased from 0 to 21 during the study period (See Fig. 1). From 2000 to 2002 there were no patients diagnosed with urachal anomalies. Three patients were diagnosed in 2003. Two of those patients underwent surgical excision while 1 was observed, again at the discretion of the individual surgeon. These patients presented between January and November 2003. Linear regression analysis of cases diagnosed vs. time during the study period yielded a p-value < 0.0001 (R² = 0.67 and t = 22.61). Linear regression analysis of cases operated on vs. time yielded a p-value < 0.0001 (R² = 0.62 and t = 18.50).

2.2. Presentation

These 85 patients presented in a variety of manners: forty-three patients (51%) with drainage, 20 (24%) with an umbilical polyp/granulation, 16 (19%) with an infected urachus, 1 (1%) with an umbilical cord cyst, 1 (1%) with a patent urachal fistula, and 4 (5%) were found incidentally on radiography performed for other reasons (1 VUCUG for neurogenic bladder, and 3 during screening US for multiple congenital anomalies). Of the 16 patients that presented with an infected urachus, *Staphylococcus aureus* was isolated in 9 (56%) cases, *Enterococcus* spp. in 1 (6%), and *Escherichia coli* in 1 (6%) case. No organism was identified in 5 (31%) of the 16 cases.

2.3. Imaging

Sixty patients underwent ultrasonography, 17 had a voiding cystourethrogram (VCUG), 7 underwent computed tomography (CT), and 1 patient had a sinogram performed. Some patients underwent more than one imaging study. 24 patients had no diagnostic imaging performed and were operated on based on history and physical exam. The single patient with a patent fistula had a sonogram to confirm the diagnosis. Sensitivities for US, VCUG, and CT were found to be 95%, 5.9%, and 85.7% respectively.

Table 1
Presenting demographics.

		N = 85 (%)
Sex	Male	49 (58)
	Female	36 (42)
	M:F	1.36
	Age (months) at diagnosis	
	Mean	17.7
	1st Quartile	0.7
	2nd Quartile	1.6
	3rd Quartile	8.3
	4th Quartile	215.7
	Median	1.6
Primary Presenting Symptom	Drainage	43 (51)
	Umbilical Polyp/Granulation	20 (24)
	Infection	16 (19)
	Fistula	1 (1)
	Umbilical Cord Cysts	1 (1)
	Incidental Radiographic Finding	4 (5)

2.4. Pathology

Pathology specimens were available for review for 70 of the 72 surgical patients. Two of the patients did not have pathology slides available for review in our system. Gross examination revealed a patent tubular structure in 2 of the specimens confirmed under microscopic examination. A tubular structure/remnant without a patent lumen on gross examination was present in an additional 39 specimens. Microscopic examination confirmed microscopic tubular elements, or epithelial remnants, in these 39 specimens. An inflamed tract was present in 10 of the specimens. No dysplastic change or malignancy was identified.

2.5. Outcomes

Fifteen patients (17.6%) with urachal remnants were initially treated with a conservative approach of observation. Two patients failed this conservative approach and eventually required excision for persistence of umbilical drainage and irritation. There were no adverse outcomes in this group. The remaining 13 patients in the conservative group were followed to resolution by ultrasonography (n = 6) or clinical criteria (n = 7). Clinical criteria were defined as resolution of drainage and local irritation. Thus the success rate for conservative management via observation is 87% and the failure rate 13%. Mean follow-up time for the 7 cases that resolved by clinical criteria was 6.2 months, while mean follow-up time for the 6 that resolved by radiographic findings was 3.4 months (range 0.4–12.6 months).

Seventy-two patients with urachal remnants, including the 2 who failed observation, underwent operative management (Fig. 2). Thirty-nine (54%) surgical cases were performed as outpatient, while 33 (46%) were admitted. Seventeen (24%) patients were hospitalized overnight due to a low post-conceptual age, while 16 (22%) were kept overnight for other reasons: requiring antibiotics for infection (n = 10), tracheomalacia (n = 1), concurrent surgical procedures (n = 2), and unknown (n = 3). A total of 38 (53%) surgical patients received preoperative antibiotics, leaving 34 (47%) that did not.

There were 13 (18%) surgical patients with post-operative complications, of which 10 were wound infections, 2 were persistent drainage, while one was a persistent granuloma and stitch abscess. Twenty-three percent (3/13) of patients with a complication required a second surgery to resolve their complication. Sixty percent of wound infections (6/10) occurred in patients who did not receive peri-operative antibiotics.

2.6. Age < 6 months

There were 61 (72%) of all patients who were less than 6 months of age. These patients comprised 60% (6/10) of wound infections and 52% (17/33) of overnight hospitalizations. One patient less than 6 months of age also required a second trip to the OR to remove a granuloma resistant to conservative therapy. Of those 7 patients less than 6 months of age who developed a complication, 3 (43%) received pre-operative antibiotics, while 4 (57%) did not. Patients less than 6 months of age also comprised 92% (12/15) of patients whose UA resolved with observation alone.

3. Discussion

The urachus begins to elongate during the 4th and 5th gestational months in utero as the embryonic bladder descends into the pelvis and eventually obliterates into a fibrous remnant. The time that it actually begins to obliterate remains quite controversial. This structure lies in the space of Retzius between transversalis fascia and preperitoneum [5,11,13,14]. Persistence of the urachus after birth can occur at any point along the tract extending from the dome of the bladder to the umbilicus [10,11,15, 6]. Types of urachal remnants include a cyst, sinus, patent urachus, and bladder diverticulum (Fig. 2). Cysts are the most commonly reported anomaly, while a sinus is second in frequency followed by a patent urachus. [5,12,13,17–19].

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