CASE OF THE WEEK (3): Vesicourachal diverticulum with urachal adenocarcinoma

Emad Chishti

Hey everyone, my name is Emad Chishti and I'm a second-year medical student at the University of Kentucky College of Medicine. I'm joined today by my mentor, Dr. Aman Khurana, an assistant professor and abdominal radiologist at the University of Kentucky. Today we'll be talking about a really cool case of vesicourachal diverticulum with urachal adenocarcinoma. We thought this case would be great to share given the rarity of this finding, relevance to embryology, and interesting histopathologic findings.

So first off, the urachus is the fetal derivative of the allantois, which is a channel between the embryonic bladder and umbilicus. Usually, it involutes before birth and forms the median umbilical ligament, but when it doesn't close off properly, a blind pouch-like structure remains connected to the bladder forming a diverticulum. Most of the time this is asymptomatic, but it can increase the risk for urinary tract infections.

In our case, a 62-year-old male with a history of kidney stones presented with right flank, suprapubic, and inguinal pain of a few weeks duration. He also reported having mucus in his urine and hematuria intermittently over the past two years. Dr. Khurana is going to talk about the imaging findings in more depth, but briefly, his initial CT and ultrasound confirmed the presence of a urachal diverticulum, and also revealed a bladder mass at the dome thought to be transitional cell carcinoma. The patient underwent transurethral resection of the bladder tumor and histologic evaluation of the

specimen was consistent with urachal carcinoma. The patient then had an MRI for surgical planning, and subsequently underwent laparoscopic partial cystectomy with excision of the urachal mass and urachal tract.

Dr. Khurana, do you want to talk about the imaging findings?

Aman Khurana
Yes, sure. So, on this first slide, we have a general sagittal non-contrast CT and two bladder ultrasound images, both demonstrating a bladder diverticulum within the anterosuperior part of the bladder dome, with a soft tissue density tumor protruding from the diverticulum into the bladder cavity. Here on the CT image, you can see it marked by a blue arrow, and on the ultrasound images, it's marked by the green arrow. We also have peripheral calcifications within this diverticulum on the CT image. So, the presumptive diagnosis at this point in time was a bladder diverticulum or a vesicourachal bladder diverticulum due to its location at the anterosuperior part of the bladder dome, with tumor within this diverticulum, and most likely transitional cell carcinoma.

After this, patient underwent a resection of the bladder mass with pathology consistent with invasive, moderately differentiated mucinous adenocarcinoma with signet ring cell features consistent with urachal carcinoma. After this, patient followed up with urology who ordered a pelvic MRI, which we see on the second slide here, with a sagittal T2 MR image on the left demonstrating, again, presence of that bladder diverticulum in the expected location of the urachus and mild T2-hyperintense mass within it. It does not look as impressive as the CT or the bladder ultrasound images on the first slide because patient did undergo bladder mass resection. On this second image, it's an axial post contrast T1-fat saturation image. We still see contrast enhancement within soft tissue located in the diverticulum, so presumptive diagnosis at that point was a residual tumor urachal carcinoma within this diverticulum. Patient then underwent a second surgery, and, again, pathology was consistent with mucinous adenocarcinoma, rather than transitional cell carcinoma.

Emad Chishti
So, there were two things about this case that I did want to ask you about. First off, you mentioned that the imaging findings for peripheral calcification of the bladder mass. Could you speak a little bit about how the presence of this finding helped you come to the diagnosis of urachal adenocarcinoma?

Aman Khurana

Great question. Emad, as you know, the pathology in this case is mucinous adenocarcinoma, and those mucinous cancers love to calcify. So, finding calcification within the soft tissue density mass within the expected location of urachus is actually pathognomonic for urachal carcinoma. These calcifications can be seen in about 50 to 70% of the cases; they may be punctate, stippled, or curvilinear. One thing to keep in mind is bladder calculi. So, within a bladder diverticulum, there is stasis of urine, which increases the risk of bladder calculi. So that's just one thing we have to keep in mind when we see peripheral calcifications within a bladder diverticulum.

Emad Chishti
Okay, so my second question: other than a diverticulum, are there any other congenital abnormalities associated with urachus?

Aman Khurana
Great question. Emad, as you mentioned in the introduction, the urachus usually deteriorates or regresses to a fibrous band known as a median umbilical ligament, and when it fails to involute or regress, we actually have four types of congenital urachal abnormalities. The first one is called a patent urachus, or umbilical urachal fistula, where there is an active communication from the bladder to the umbilicus with drainage of urine or fluid from the umbilicus. The second one is called a urachal sinus, where there is a patent opening at the umbilicus, but it does not connect to the urinary bladder. The third one is called the urachal cyst, when it's sealed off on both ends, but there is a dilated cystic structure within the expected location of the urachus. And the fourth one, which is our case here, is called a vesicourachal diverticulum, where there is an opening from the bladder side, but it does not connect all the way to the umbilicus.

Emad Chishti
Alright, for the multiple-choice question. On histology, the cells lining urachal neoplasms would most likely best resemble which of the following? A) epithelium of the proximal convoluted tubule, B) transitional epithelium, C) intestinal epithelium, or D) fibroblasts. And in this case, the answer is C) intestinal epithelium. So, although urachal remnants themselves are lined by transitional epithelium, the majority of urachal neoplasms are actually adenocarcinomas. Prior to malignant transformation, urachal transitional epithelium undergoes metaplastic changes, causing it to resemble the glandular, mucin-producing columnar epithelium.

Aman Khurana
Great wrap up with that multiple choice question Emad. I hope you all enjoyed this rare yet important case of vesicourachal diverticulum with urachal mucinous adenocarcinoma rather than transition cell carcinoma. We have CT, ultrasound, and MR

correlates of this lesion with peripheral calcifications, which we learned are pathognomonic for such tumors. One thing I forgot to mention is that, on MRI, these tumors do look mildly T2-hyperintense because of the mucin producing cells. Also, I hope you enjoyed the histology and embryology discussion. This is a great case for medical students and radiology residents, and I would say this is fairly high yield for the radiology boards.

Lindsey Negrete

Distinction for urachal carcinomas and vesical tumor of the dome is by the pattern of spread. A urachal tumor tendency to grow in the perivesical space toward the umbilicus. Primary bladder carcinoma will have less extravesical component. DDx diagnosis includes: adenocarcinomas of nonurachal origin, infected urachal remnants, mets from primary lesions of the colon, prostate or female genital tract.

Please submit companion cases (benign urachal neoplasms) such as adenomas, fibromas, fibromyomas and hamartomas. Calling all mentor/mentee pairs. Submit cases as we would love to feature you!!