

Prenatal Imaging Evaluation of ARM

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No disclosures



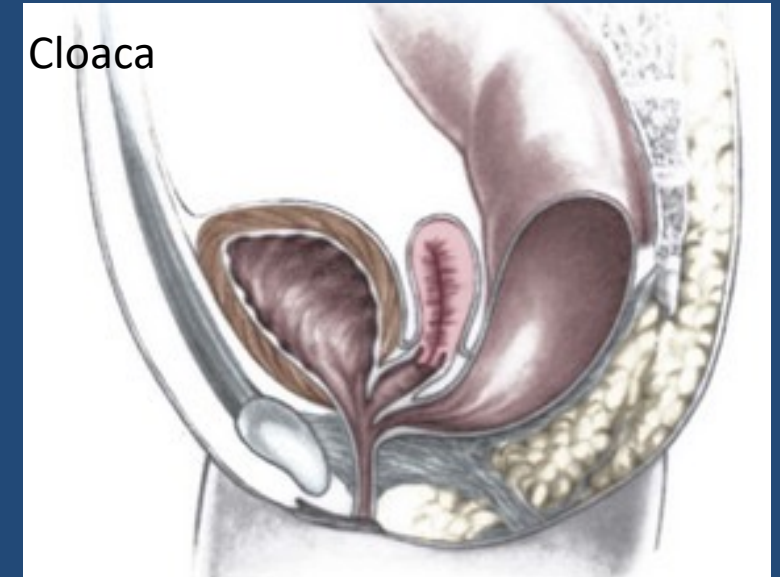
Objectives

- Review the main prenatal imaging findings of ARM
 - Overview of normal fetal anatomy by imaging
- Case-based review of different types of prenatally diagnosed ARM



Anorectal Malformations

- Prenatal diagnosis remains rare ~ 16% 1:5,000
- Different types:
 - Severe forms (most commonly dx in-utero):
 - Cloaca
 - Cloaca exstrophy
 - Less severe forms:
 - Recto-urethral/ bladder fistula
 - Recto-vestibular fistula
 - Imperforated anus with or without fistula





Types of ARM/ Cloaca

Table 1 Fetal MRI findings to help distinguish the cloacal spectrum

	Intestinal	Genital	Urinary	Perineum
Cloacal dysgenesis	Dilated colon above the common channel, decreased T1-W signal of the meconium, which does not reach the perineum.	In general, a greater degree of hydrometrocolops from no perineal outlet. Possible duplication.	Marked urinary ascites. Absent amniotic fluid after 20 gestational weeks. Variable degree of hydroureteronephrosis.	No perineal orifice.
Classic (persistent) cloaca	Dilated colon above the common channel, decreased T1-W signal of the meconium, which does not reach the perineum.	Variable degree of hydrometrocolops. Possible duplication.	Variable degree of hydroureteronephrosis and ascites.	Single perineal orifice at the expected location of the urethra.
Posterior cloaca	Dilated colon above the common channel, decreased T1-W signal of the meconium, which does not reach the perineum.	Variable degree of hydrometrocolops. Possible duplication.	Variable degree of hydroureteronephrosis and ascites.	Single perineal orifice at the expected location of the anus.
Urogenital sinus	Normal in caliber and T1 hyperintense signal extending to the level of the perineum at the anus.	Variable degree of hydrometrocolops. Possible duplication.	Variable degree of hydroureteronephrosis and ascites.	Normal anal orifice. Common urogenital orifice where a urethra is expected.
Cloacal variant	Normal in caliber and T1 hyperintense signal extending to the level of the perineum anterior to the expected anus.	Variable degree of hydrometrocolops. Possible duplication.	Variable degree of hydroureteronephrosis and ascites.	Anal opening anterior to where a normal anal orifice is expected. Common urogenital orifice where a urethra is expected.
Posterior cloacal variant	Normal in caliber and T1 hyperintense signal extending to the level of the perineum at the anus.	Variable degree of hydrometrocolops. Possible duplication.	Variable degree of hydroureteronephrosis and ascites.	Normal anal orifice. Common urogenital orifice posterior to the expected urethra.



Prenatal Diagnosis

- Detected in second trimester anatomical US 18-22 weeks
- Key organs to evaluate on prenatal US/MRI:
 - Kidneys / Bladder
 - Bowel
 - Genitalia
 - Anal Dimple
 - Lower spine / Sacrum
 - Others (associated syndromes)



Prenatal Diagnosis- Imaging

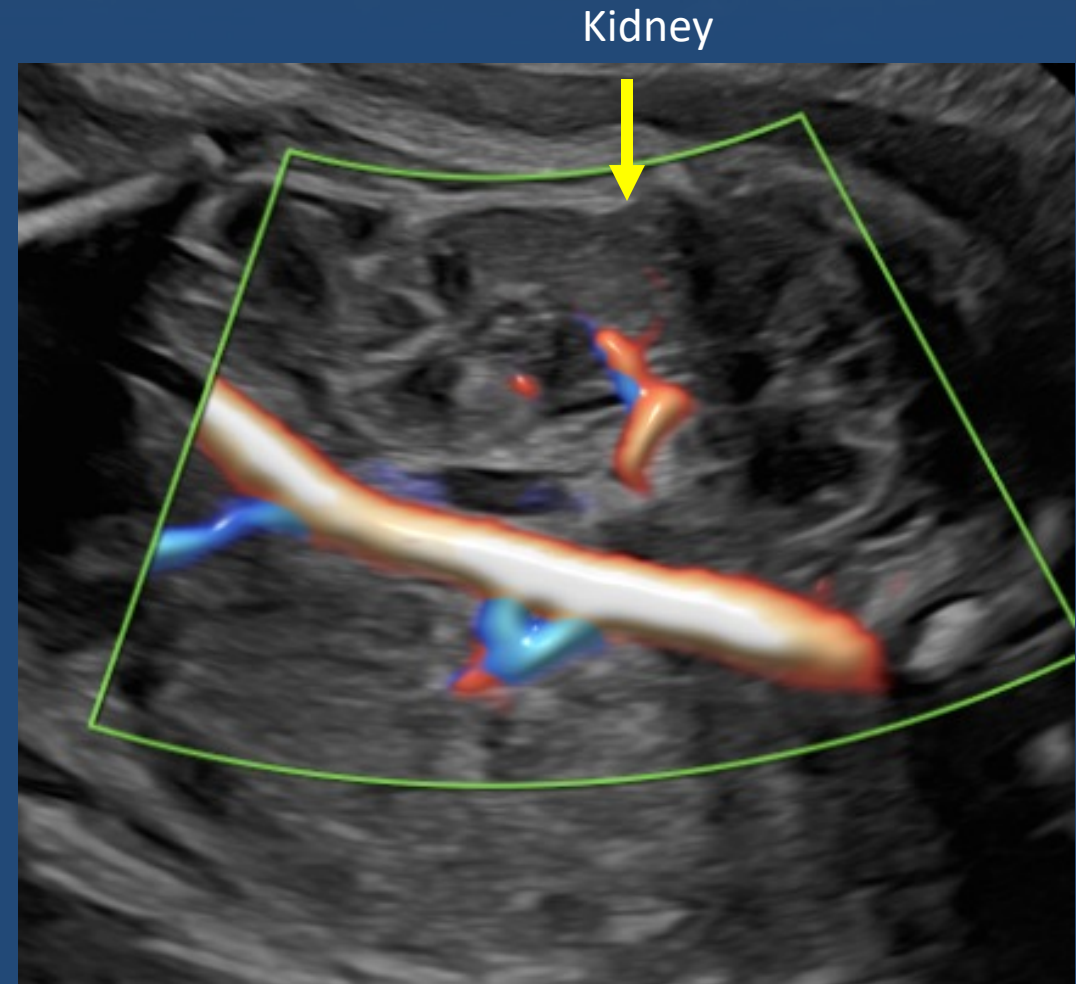
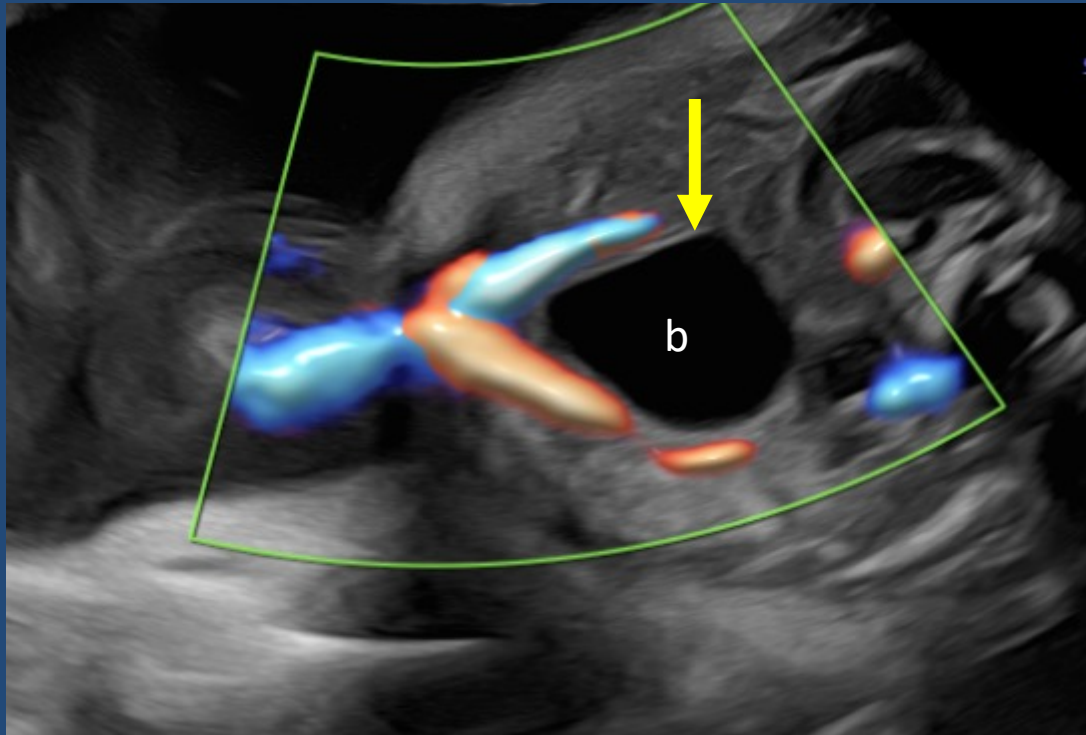
- Most common prenatal imaging findings:
 - Abdominal/ pelvic cystic mass (52%)
 - Hydronephrosis (49%)
 - Oligohydramnios (26%)
 - Ascites (22%)
 - Intestinal distention (18%)
 - Others (abnormal genitalia, distended or absent bladder, 2 vessel cord, renal anomalies, etc.)



Normal Imaging Findings

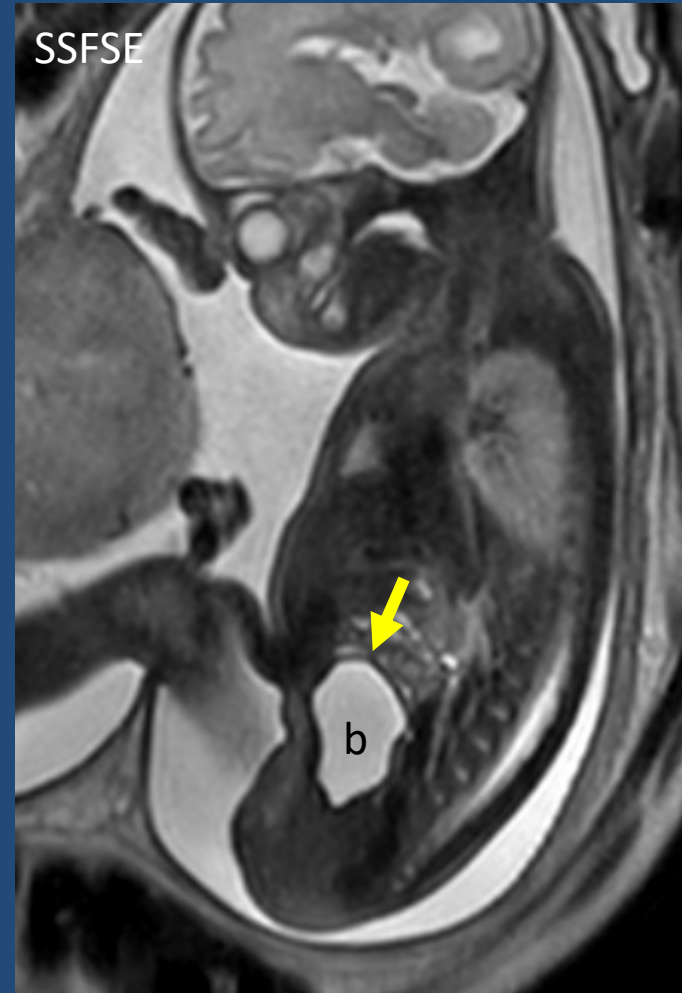
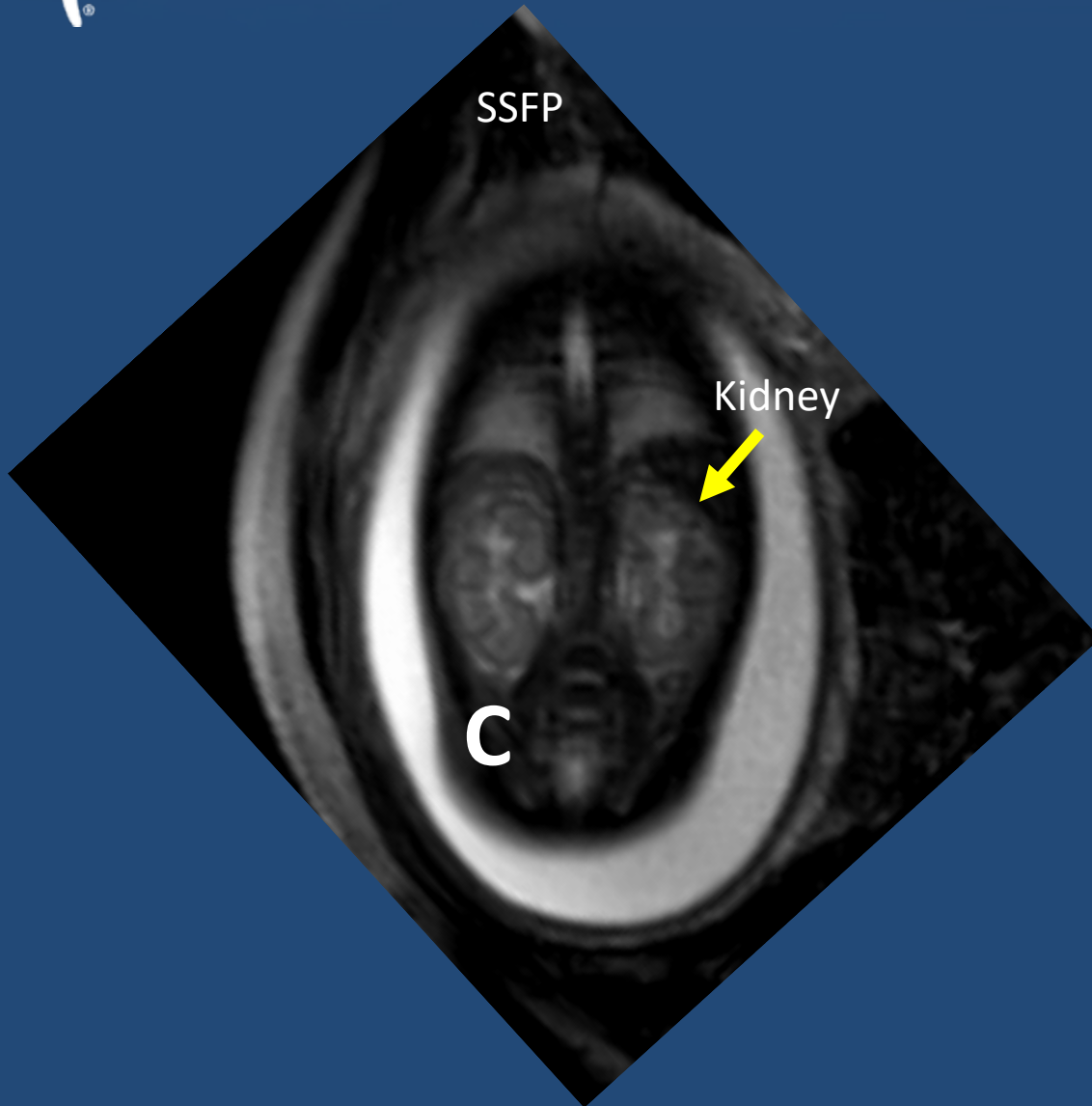


Normal Kidneys and bladder





Normal Kidneys and bladder

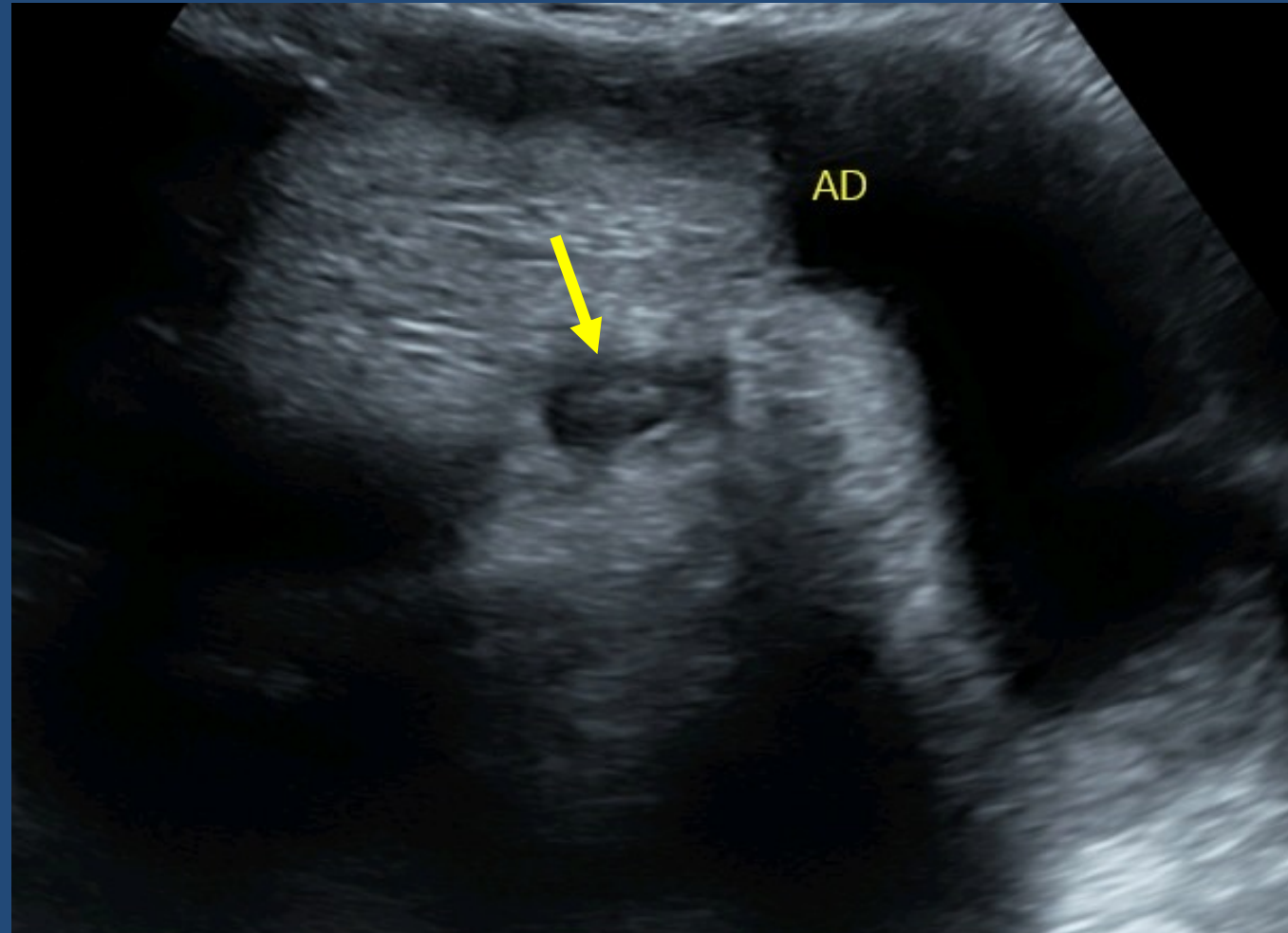




Normal Anal Dimple - US

Rounded or oval

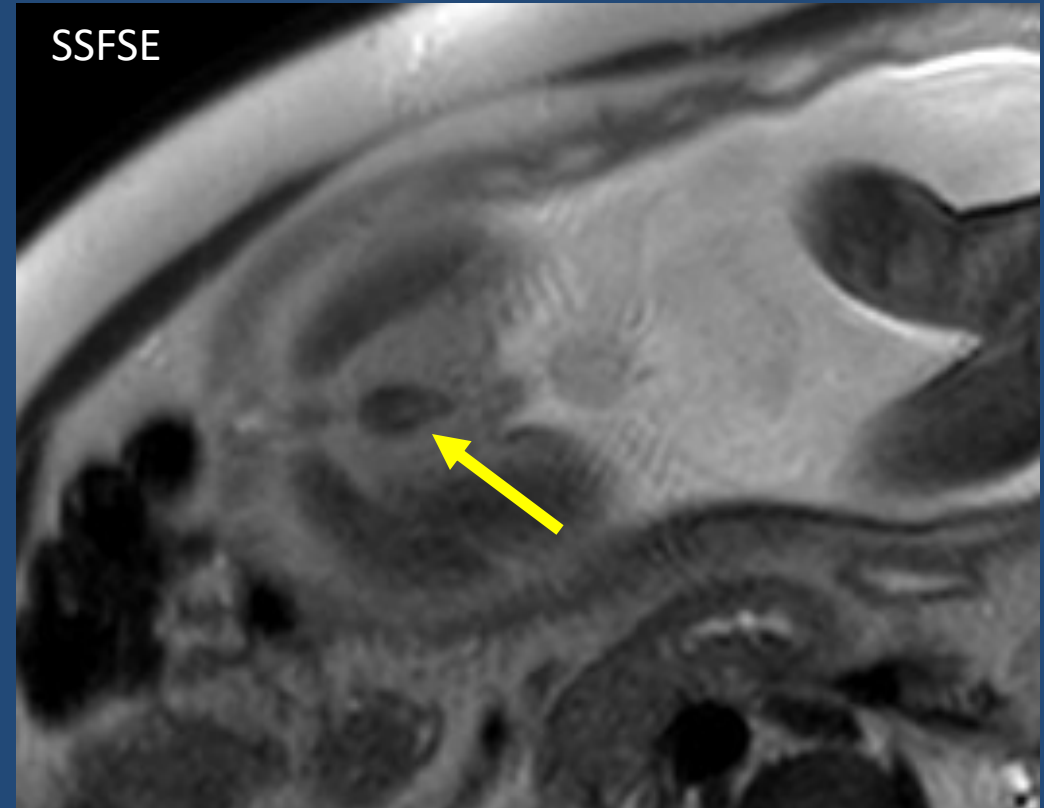
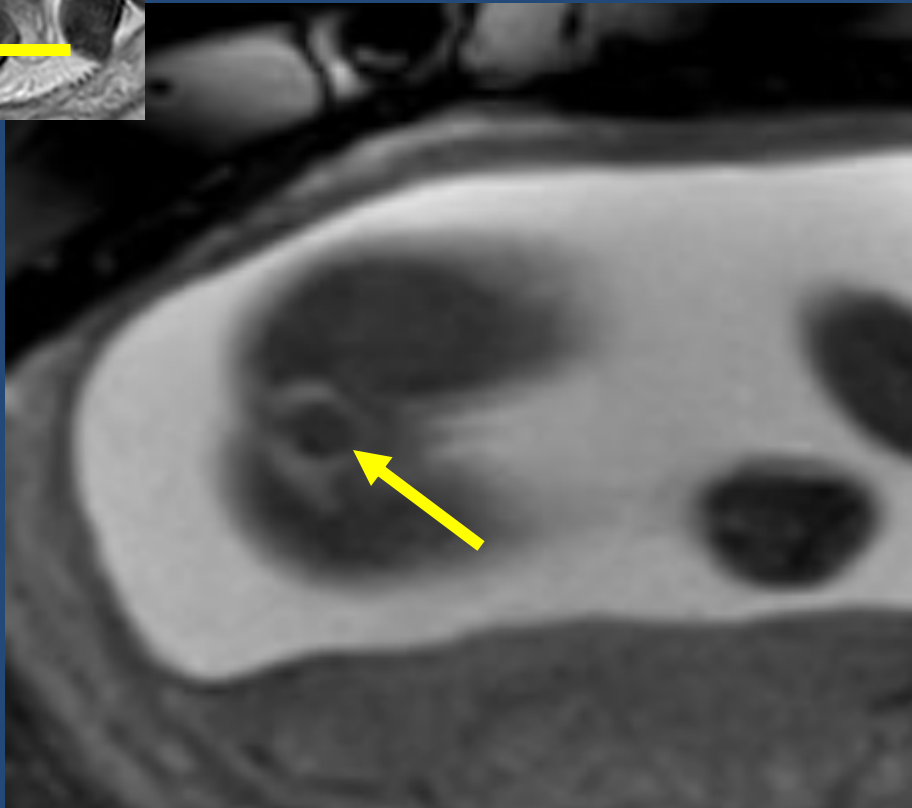
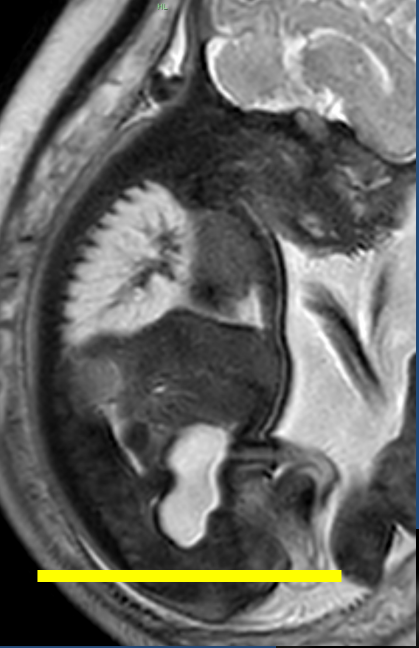
Central hyperechogenicity
Rim of hypoechogenicity



Normal Anal dimple - MRI

Rounded or oval

Hypointensity with surrounding fat signal

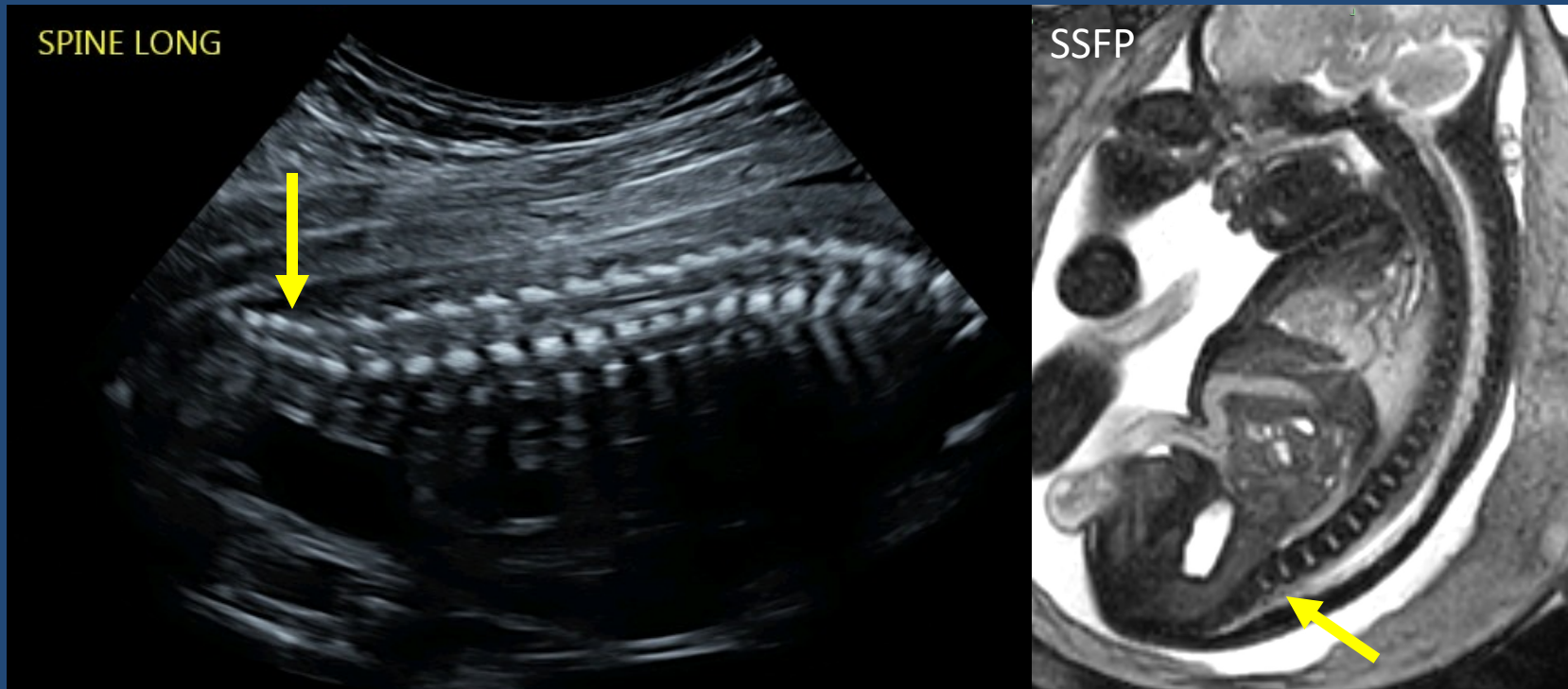




Sacrum

Ossification S1 and S2 at 16-17 weeks

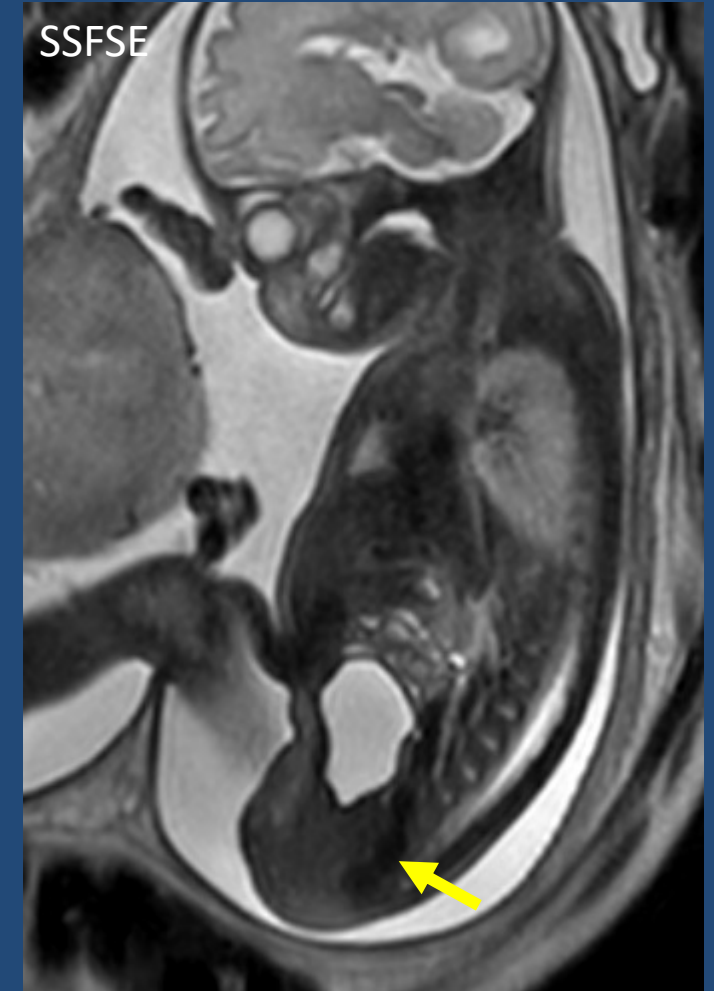
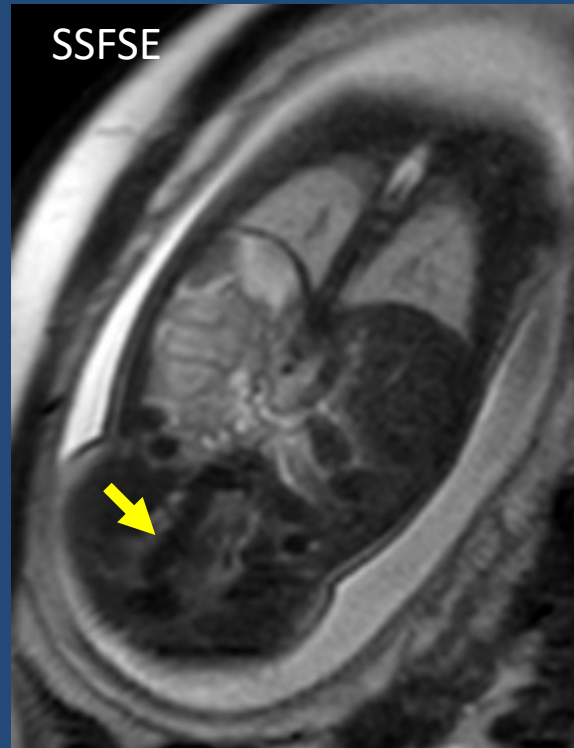
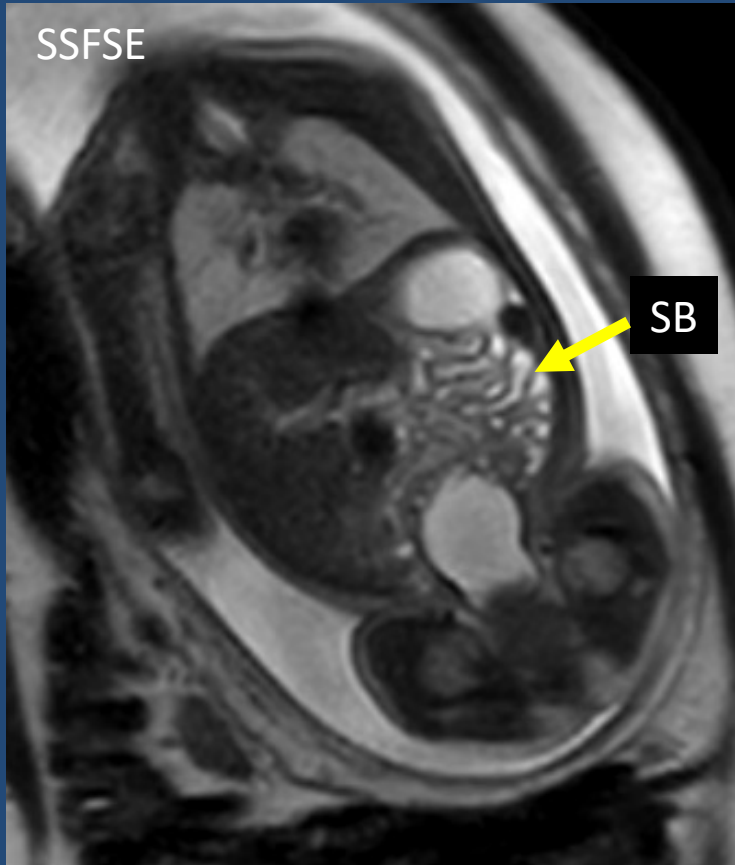
Most fetus have ossification of S4 at 17 weeks





Normal bowel- Colon

Ultrasound cannot see the bowel well in-utero





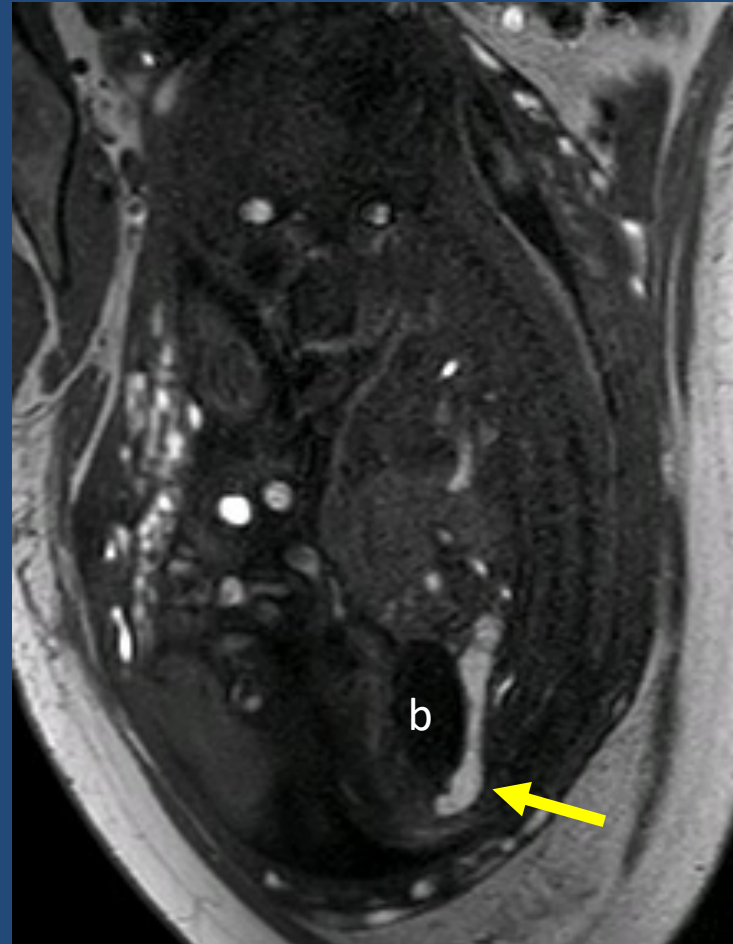
Meconium Signal

Meconium within the rectum by 19-22 weeks

Hypointense on T2

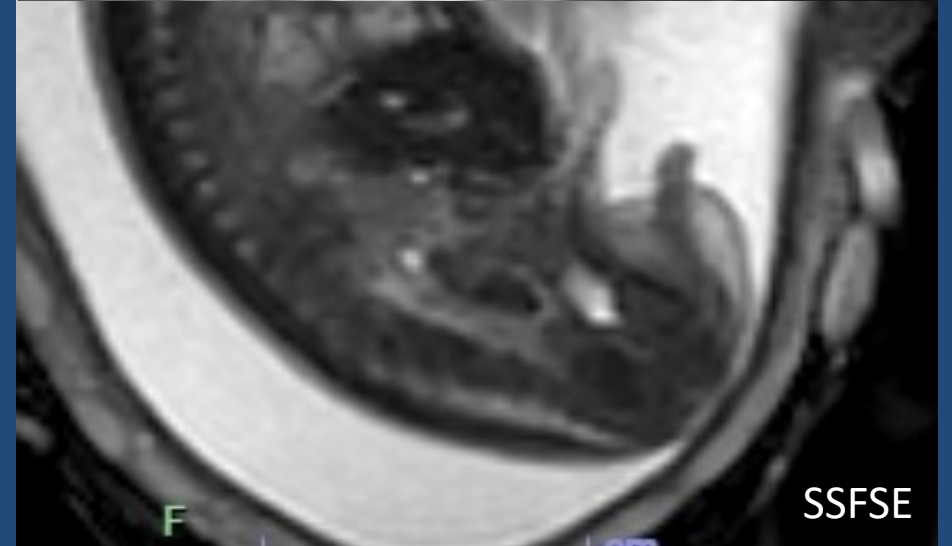
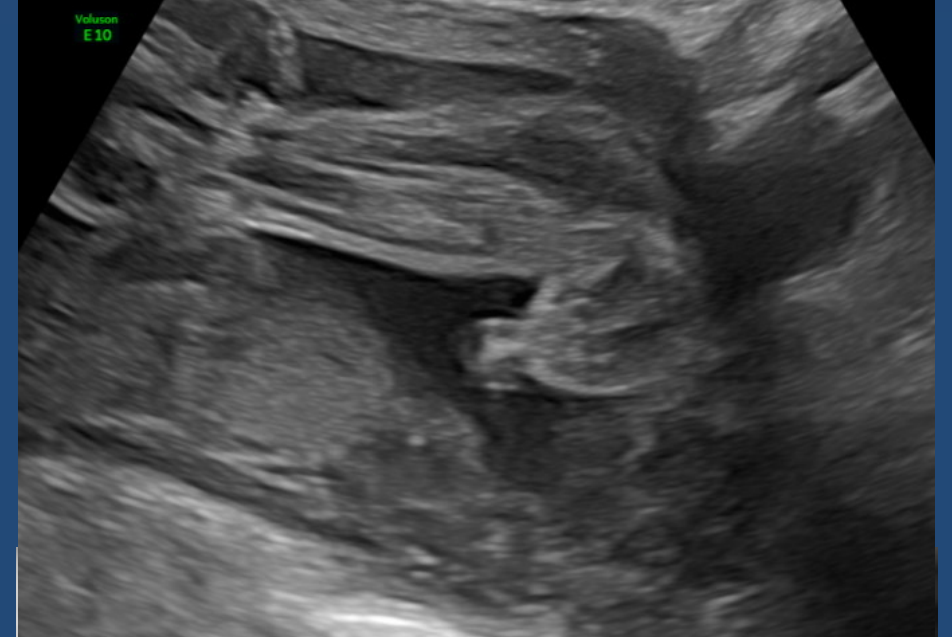


Hyperintense on T1



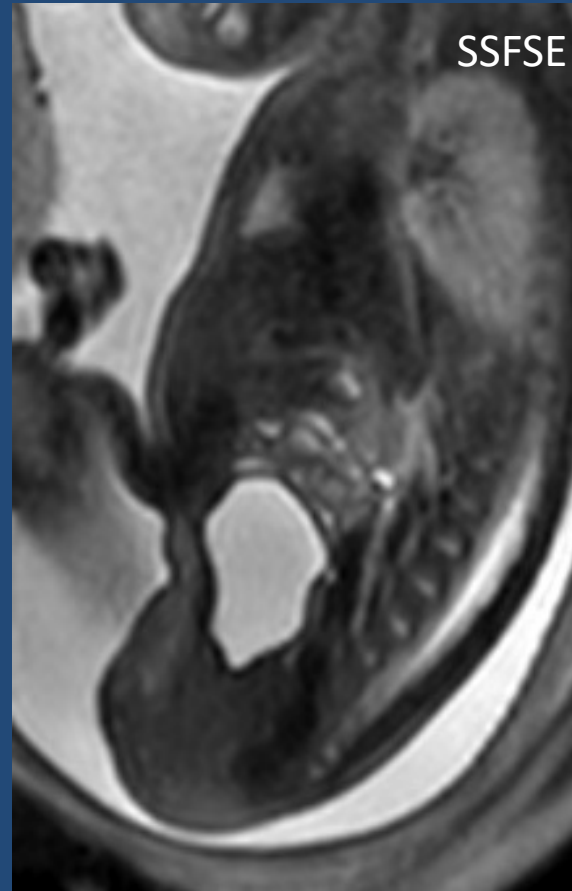
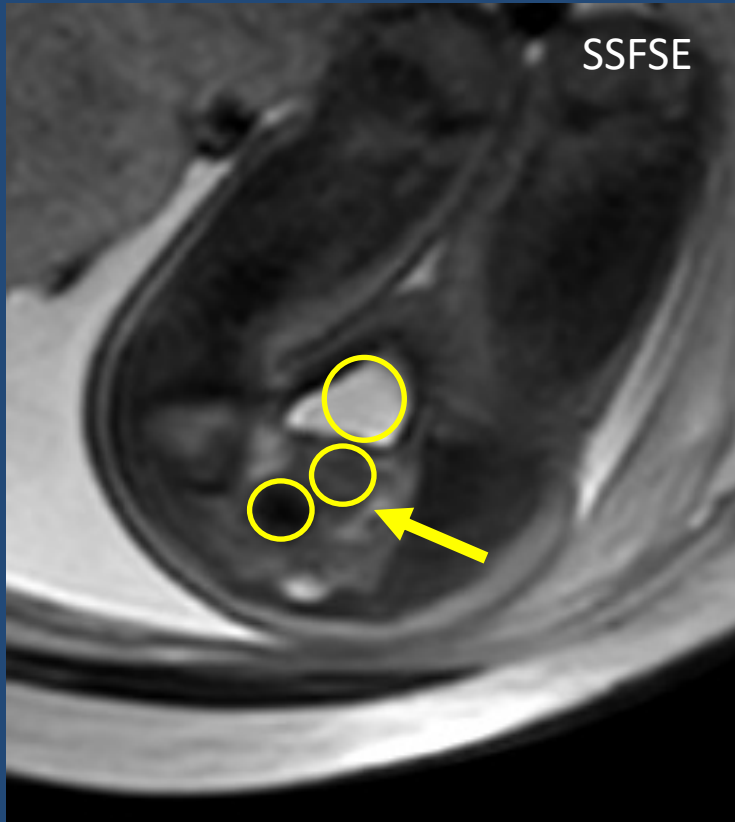


Normal genitalia





Normal uterus



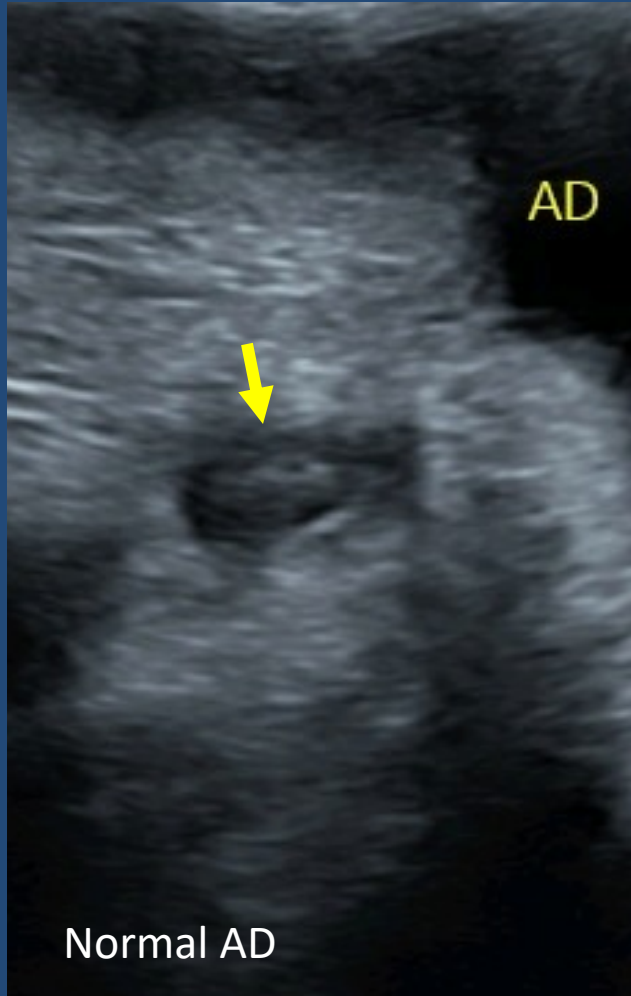
When normal,
not well seen on
SG or CO



Abnormal Imaging Findings

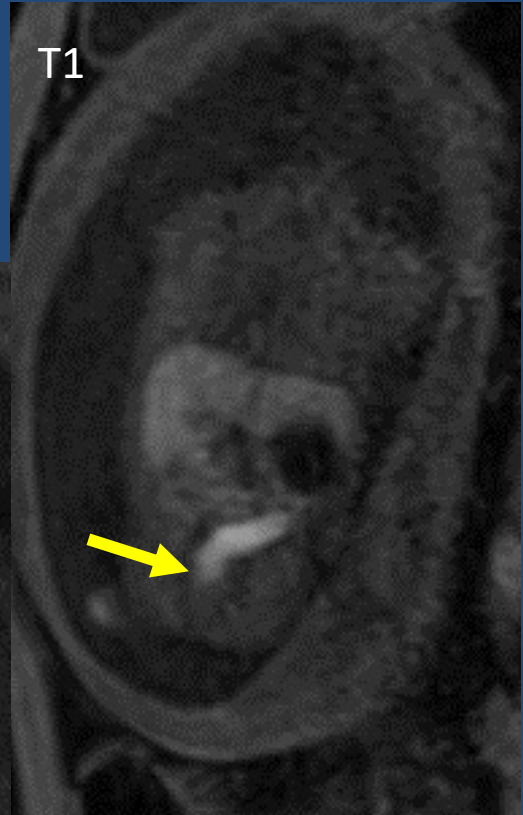
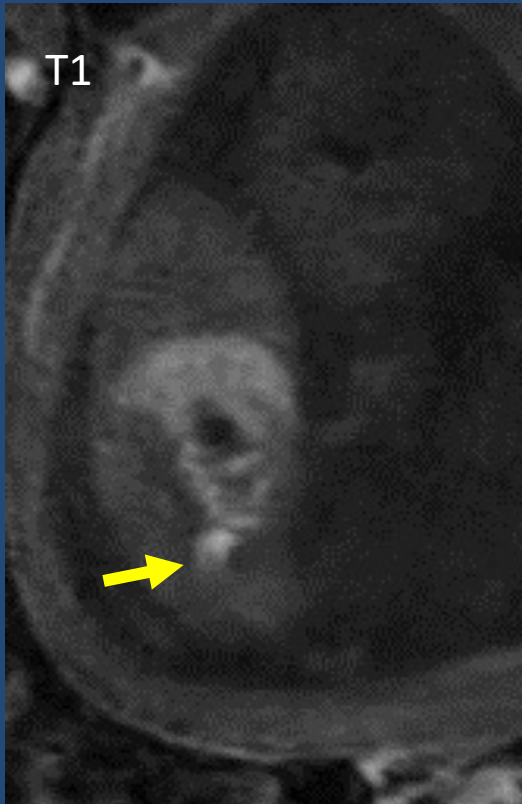
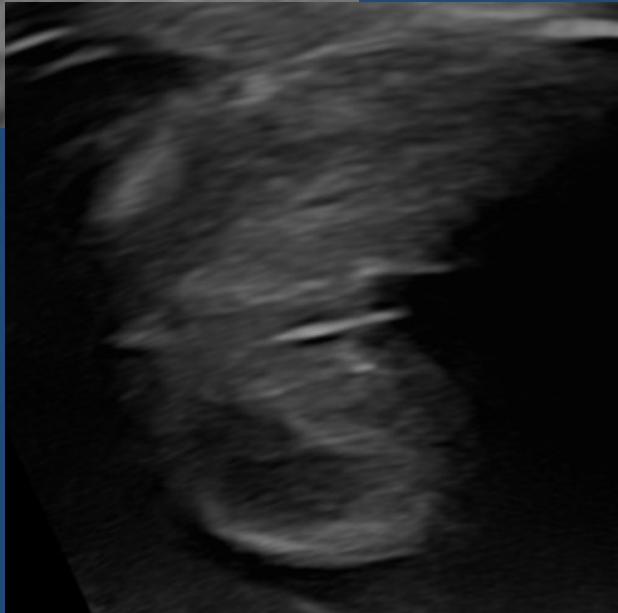
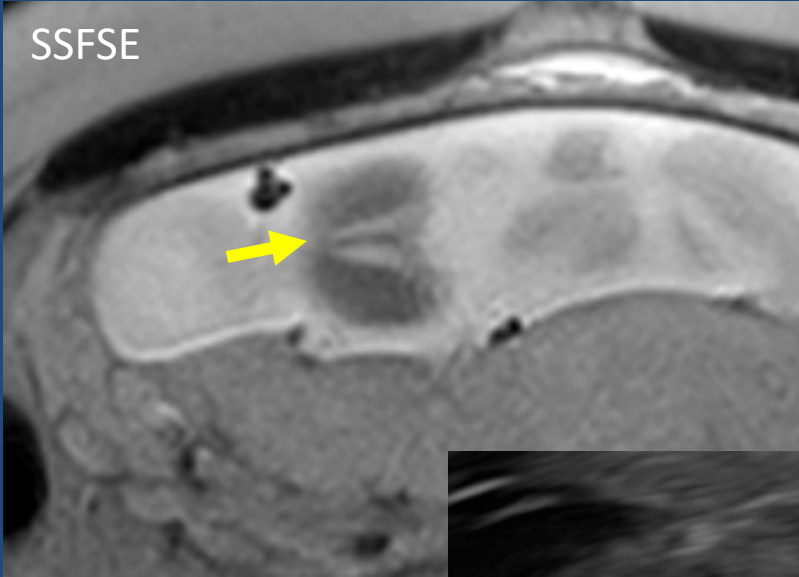


Abnormal Anal Dimple - US





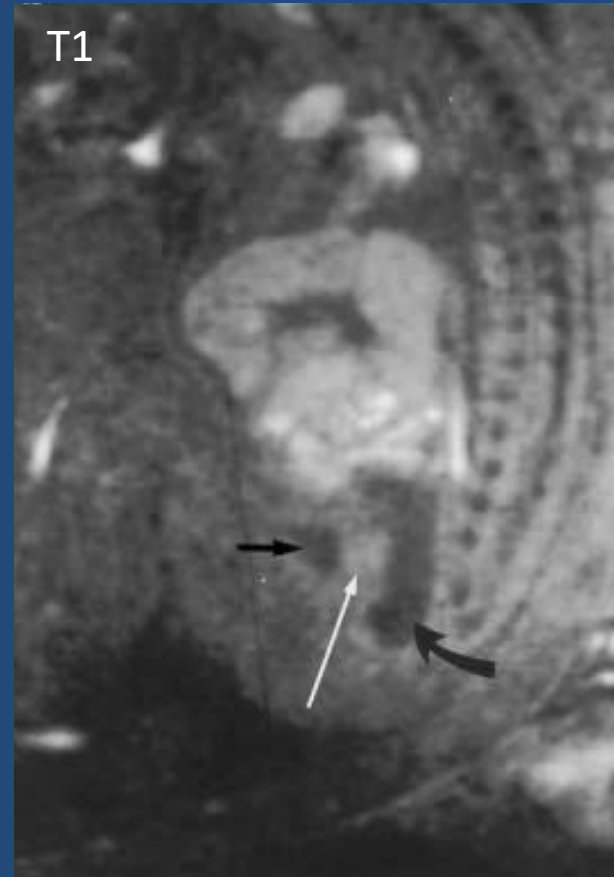
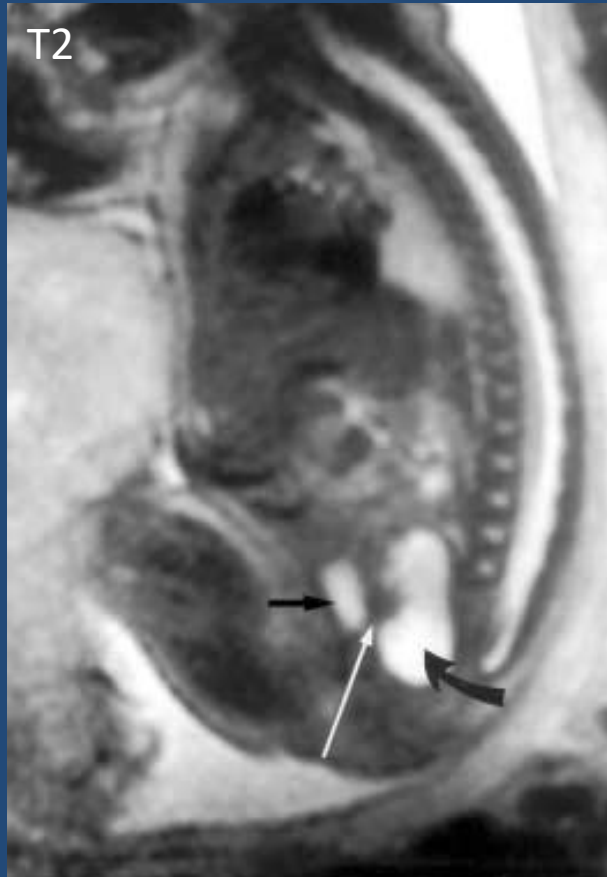
Abnormal Anal Dimple - MRI





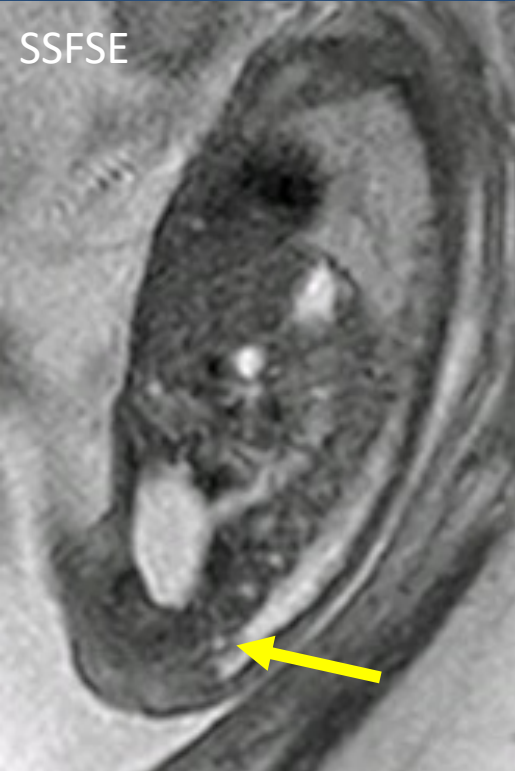
Abnormal Meconium Signal

In cloacal malformations/ recto-urinary fistula: mixed of meconium with urine may cause bowel signal to increase and bladder signal to decrease on T2 weighted sequences and vice versa on T1 weighted sequences

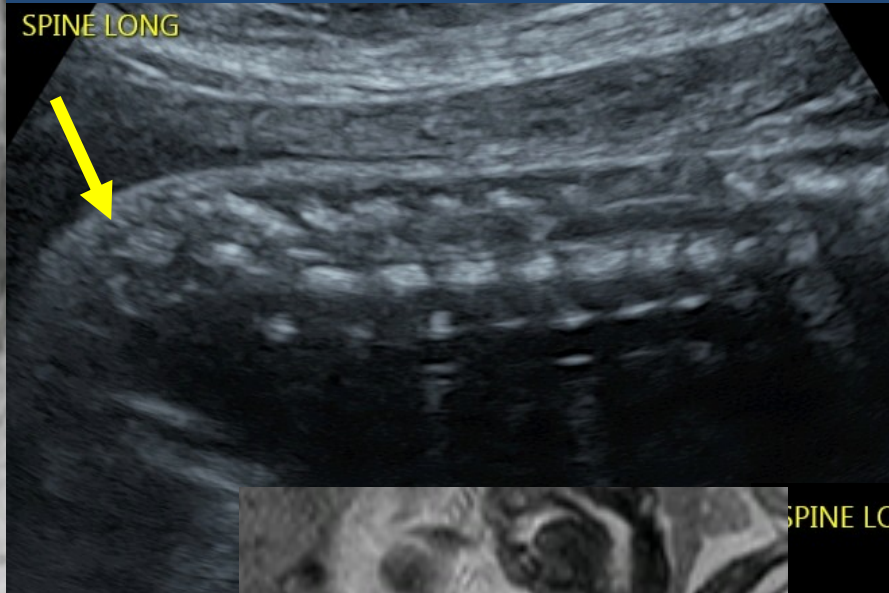




Sacrum



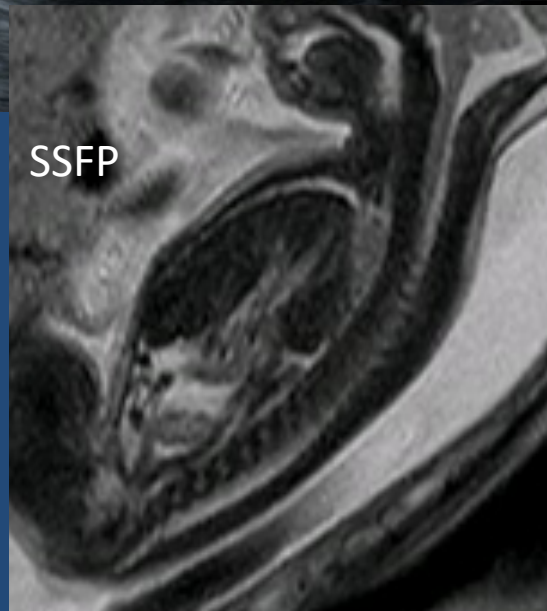
SSFSE



SPINE LONG

Truncated
sacrum

Normal
Spine



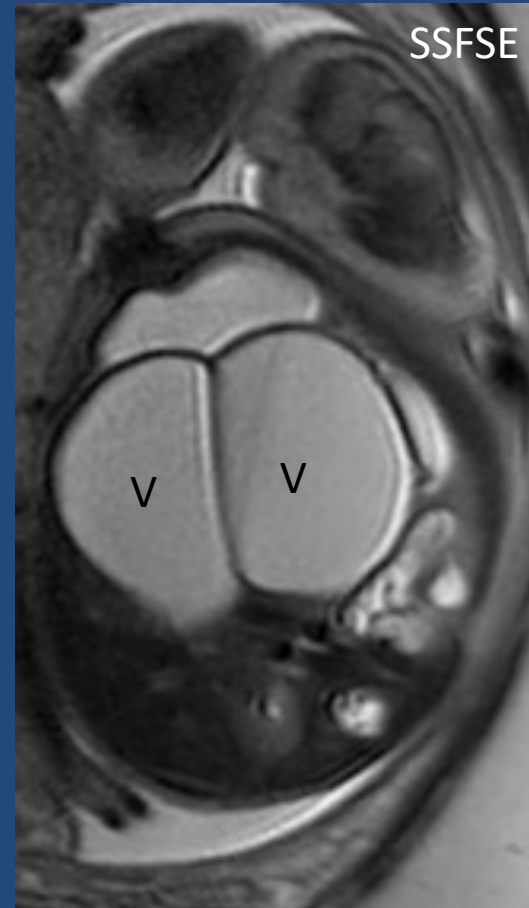
SSFP



SPINE LONG

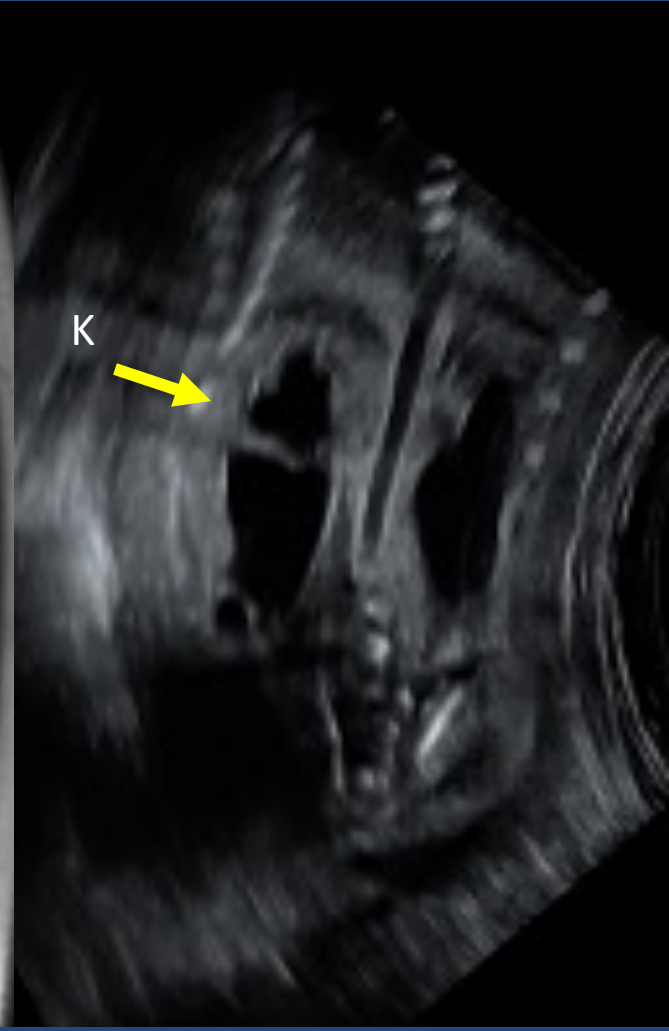
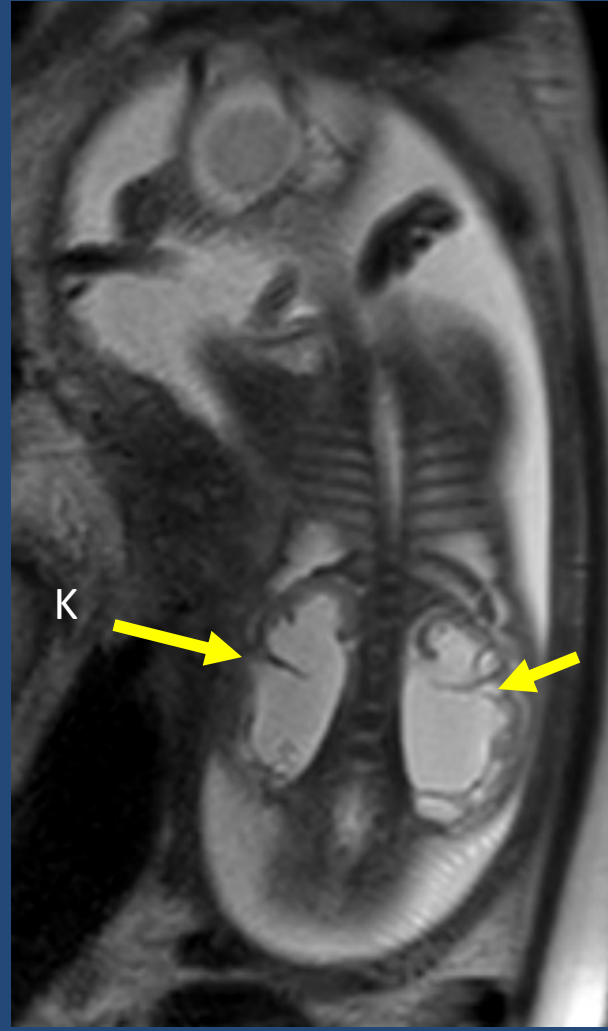
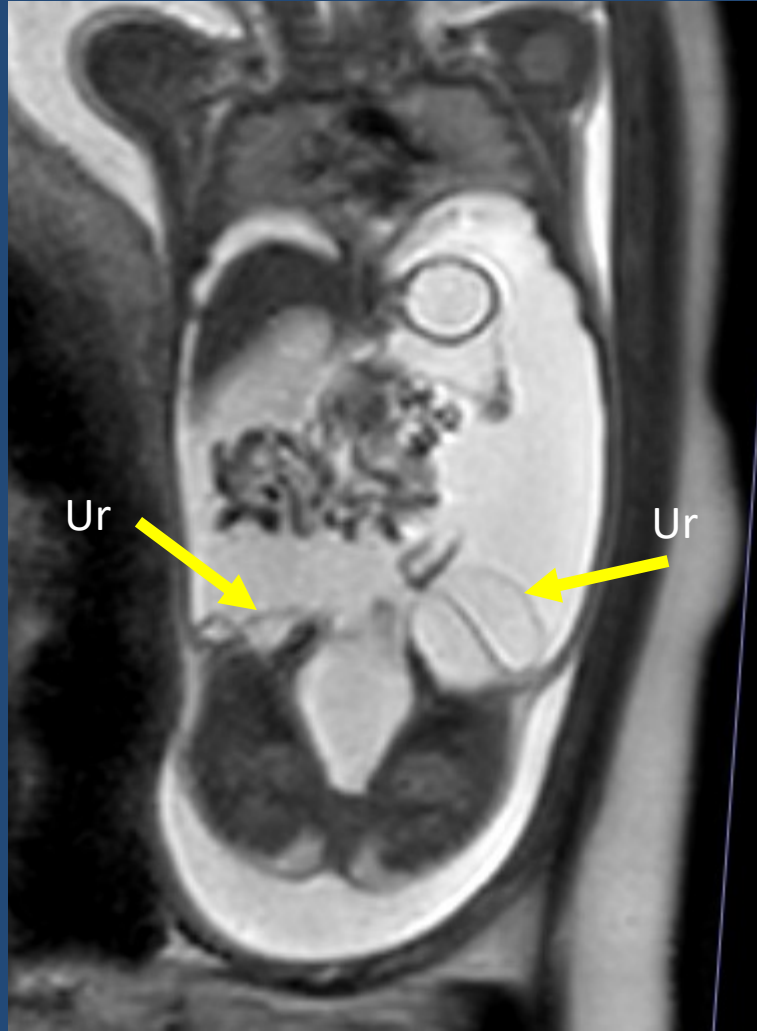


Hydrometrocolpos





Hydroureteronephrosis





What types of Anorectal Malformations are most frequently diagnosed prenatally?

1. Recto-perineal and recto-vestibular fistula
2. Recto-urethral fistula
3. Cloaca and cloacal exstrophy
4. I don't know



What types of Anorectal Malformations are most frequently diagnosed prenatally?

1. Recto-perineal and recto-vestibular fistula
2. Recto-urethral fistula
3. Cloaca and cloacal exstrophy
4. I don't know



Cases



Case 1

- Referred to fetal Care center for hydronephrosis and pelvic cystic mass

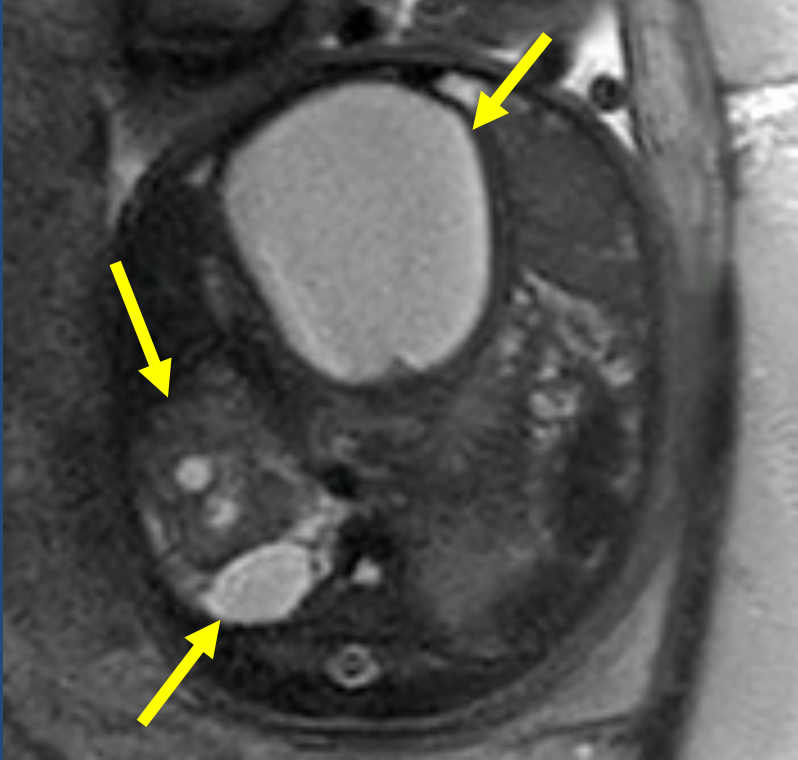
30 weeks
Female



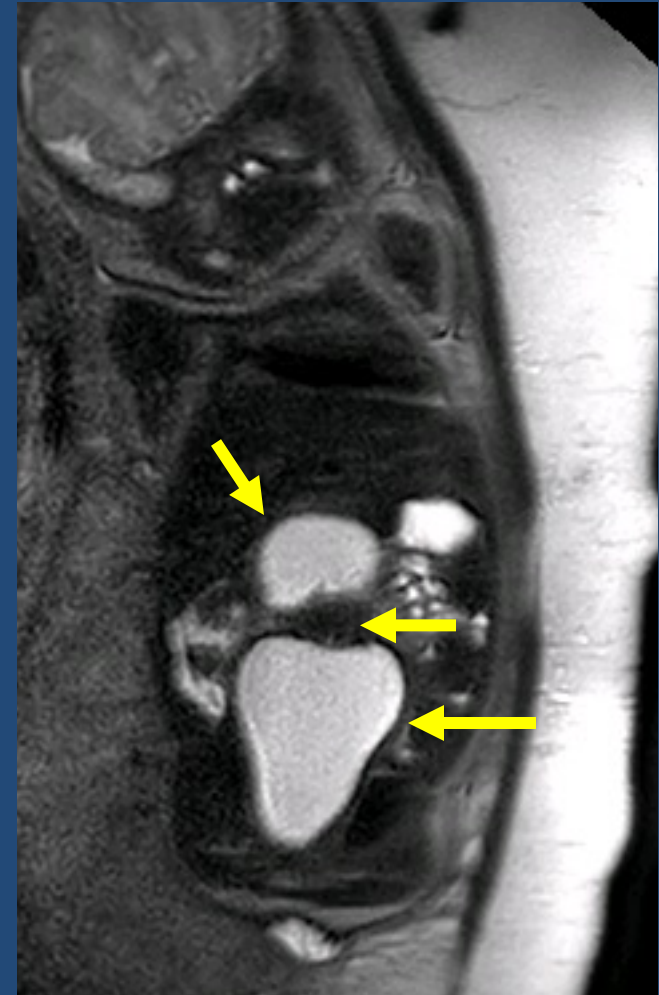


Case 1

Axial SSFSE



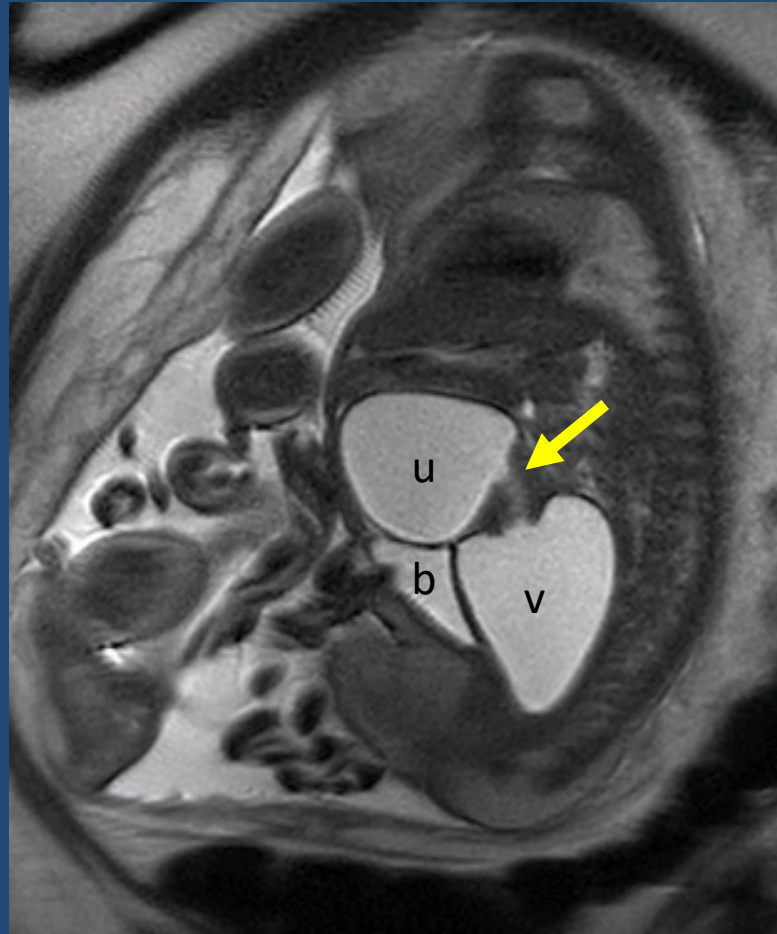
Coronal SSFSE



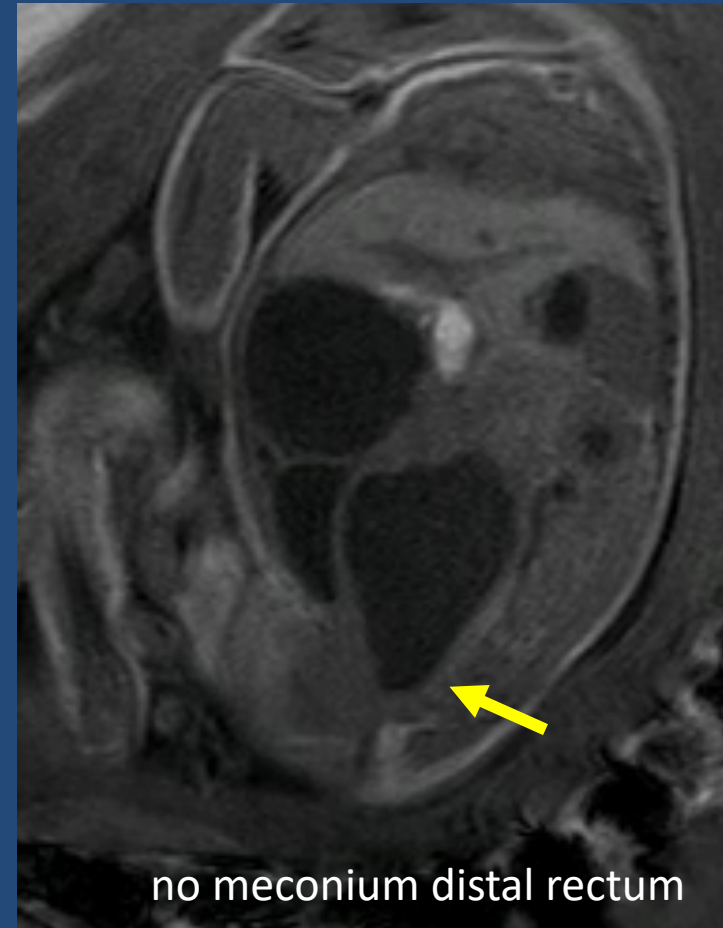


Case 1

Sagittal SSFSE



Sagittal T1



FINDINGS:
Hydronephrosis

“Pelvic cyst”

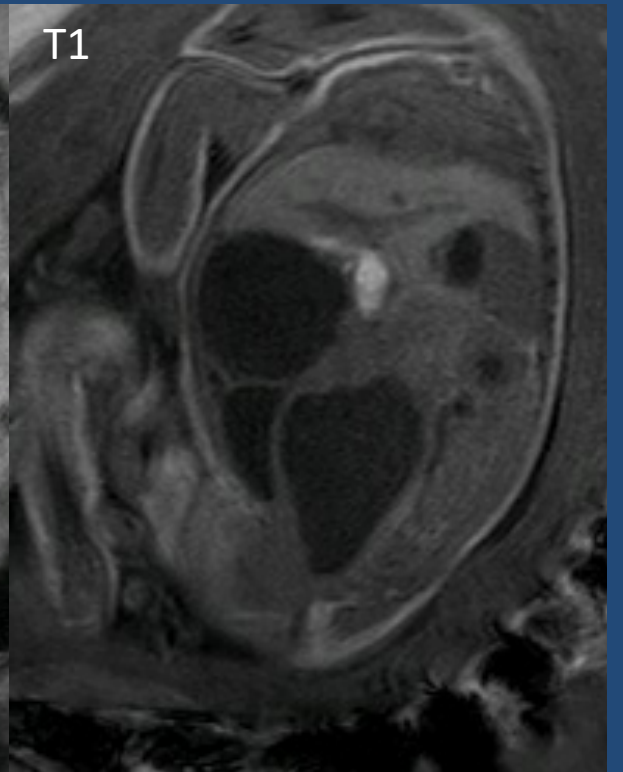
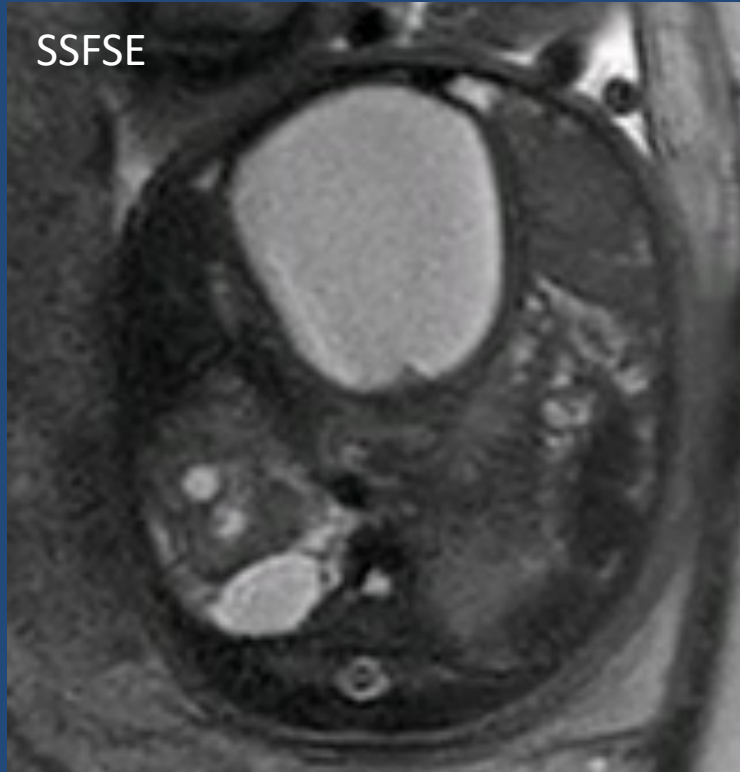
Abnormal
meconium at
rectum

no meconium distal rectum



Diagnosis?

Classic cloaca



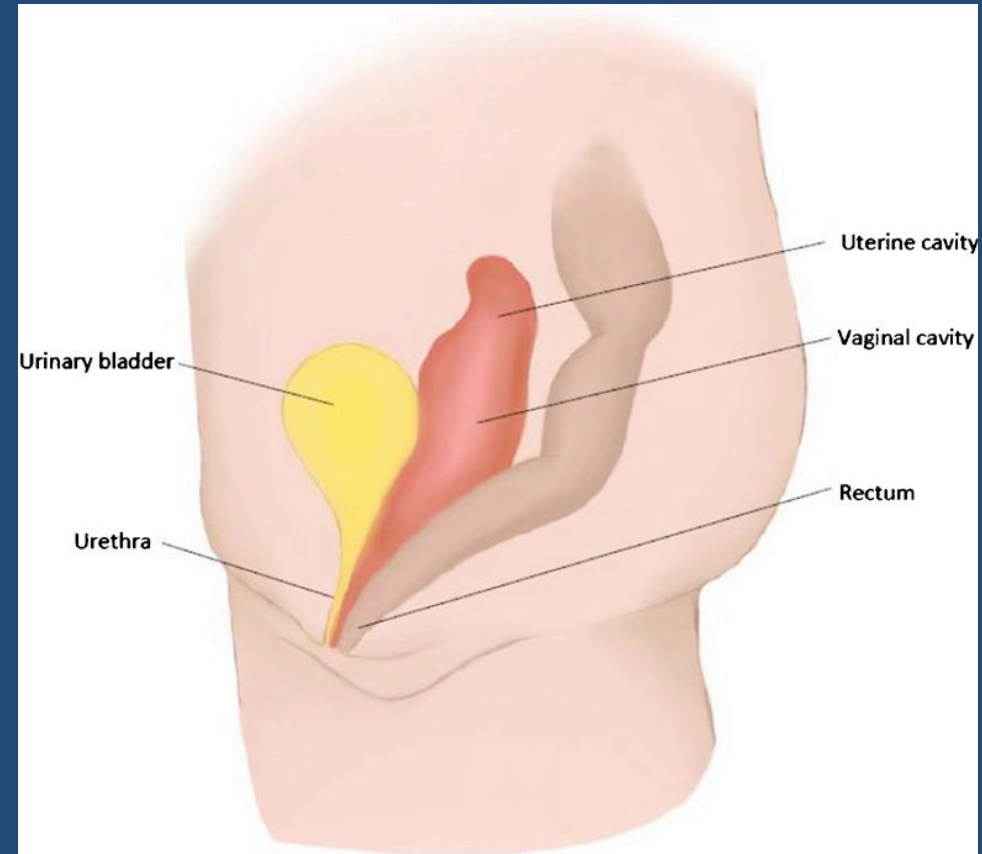


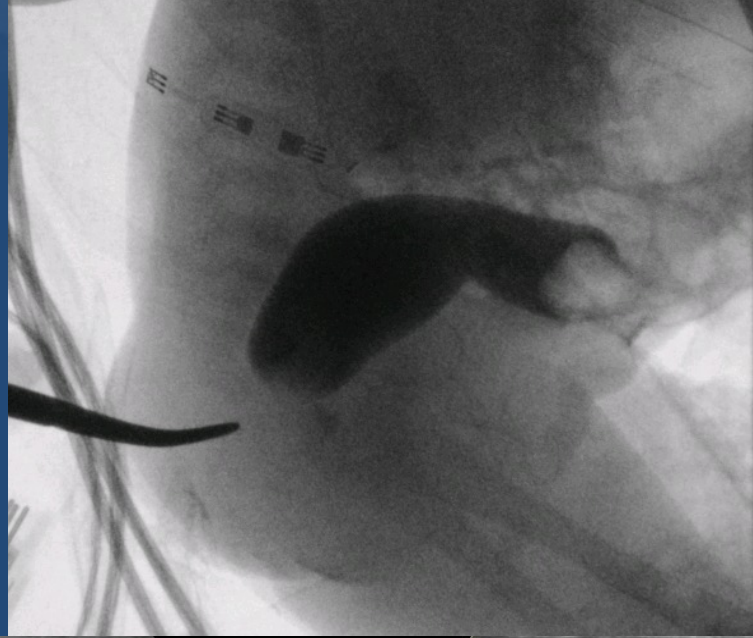
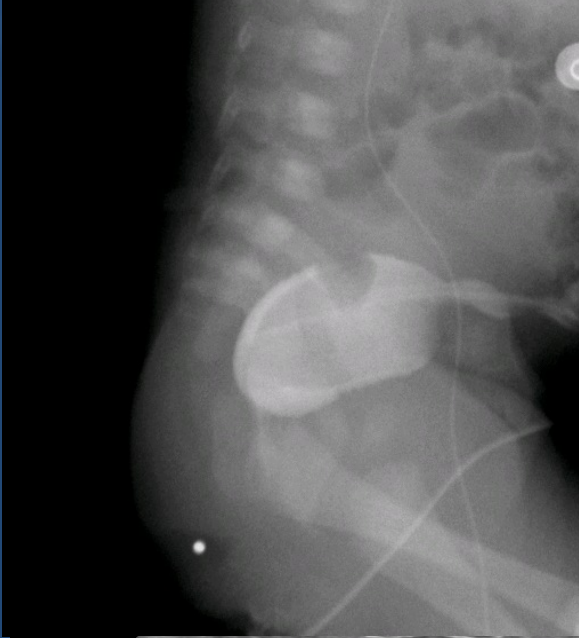
Case 1

Classic cloaca

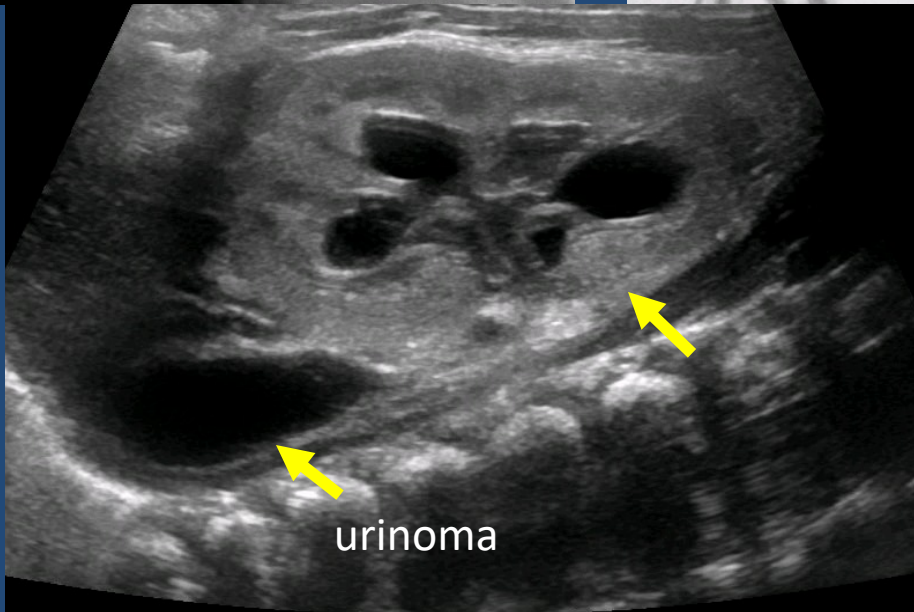


ix courtesy of Dr. Bischoff

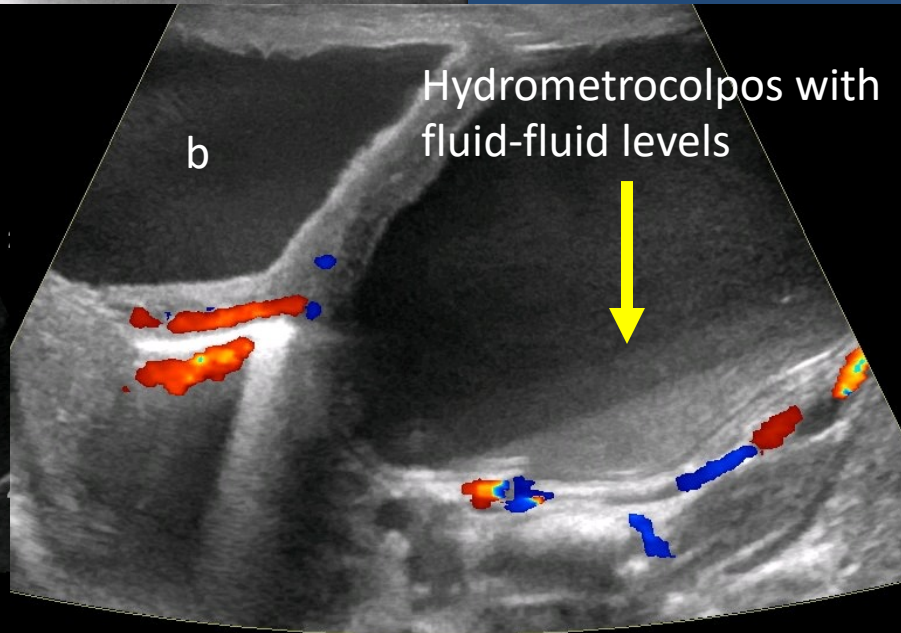




Postnatal Images



SAG RT KIDNEY



TRANS ML PELVIS



What is the single finding that should make you think about the possibility of cloaca?

1. Oligohydramnios
2. Hydronephrosis
3. Hydrometrocolpos
4. Ascites



What is the single finding that should make you think about the possibility of cloaca?

1. Oligohydramnios
2. Hydronephrosis
3. **Hydrometrocolpos**
4. Ascites

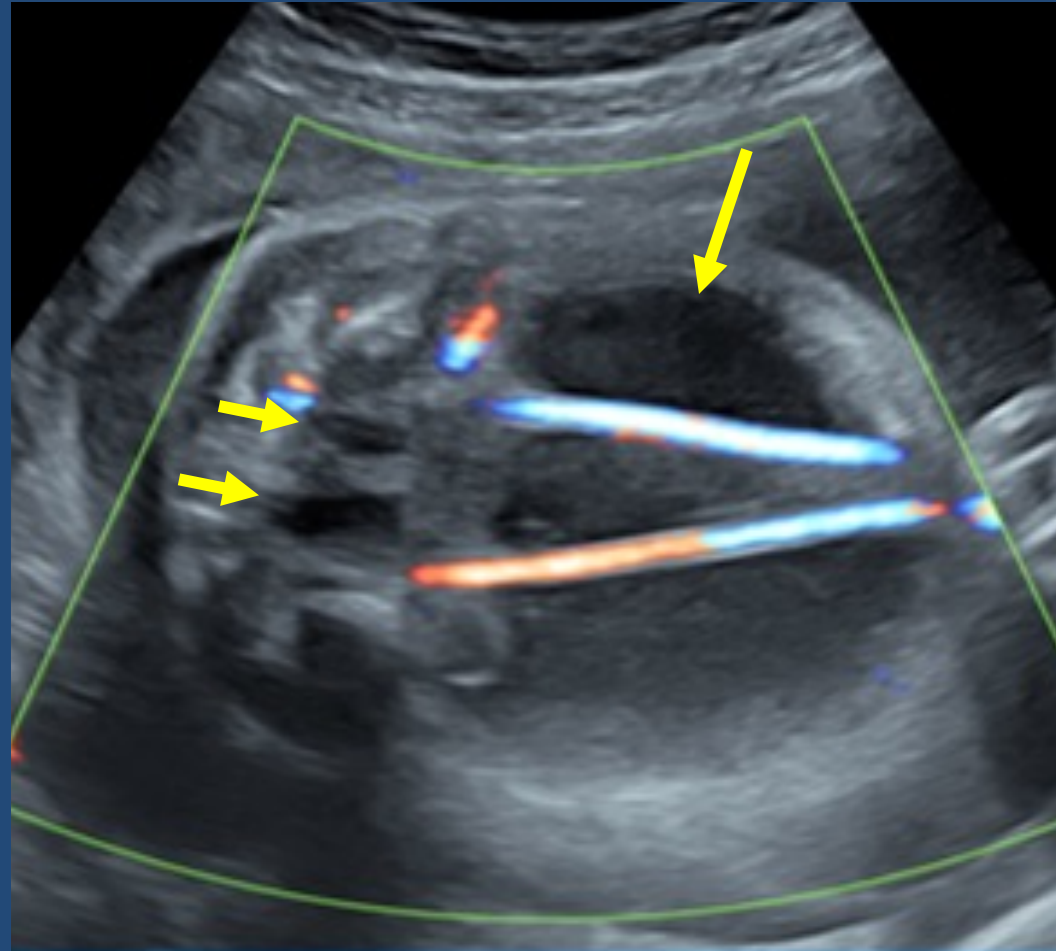


Case 2



Case 2

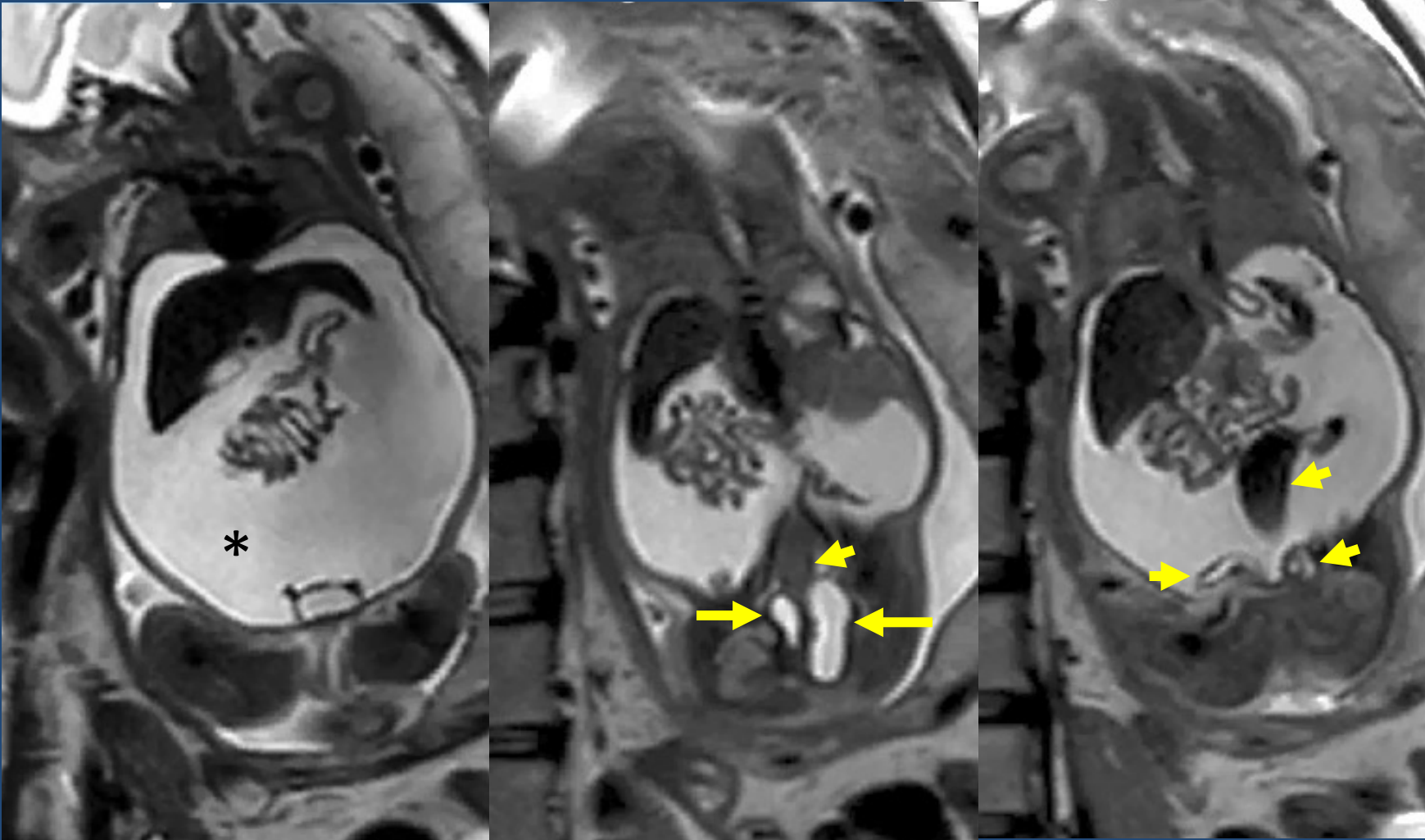
26 weeks
Referred for ascites
and pelvic cysts





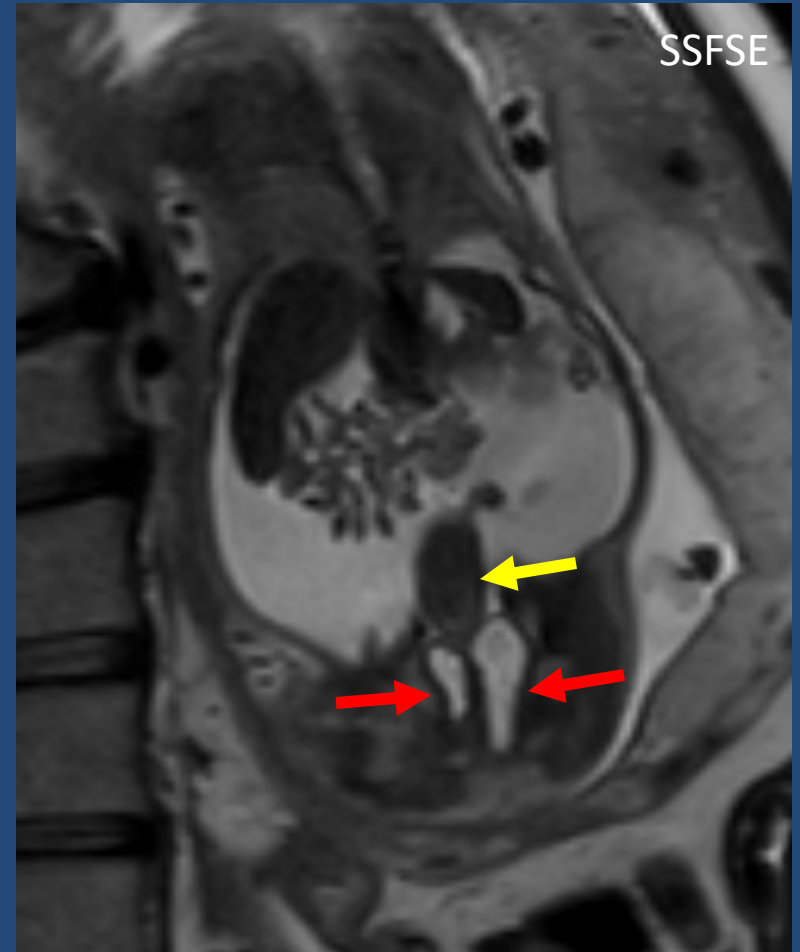
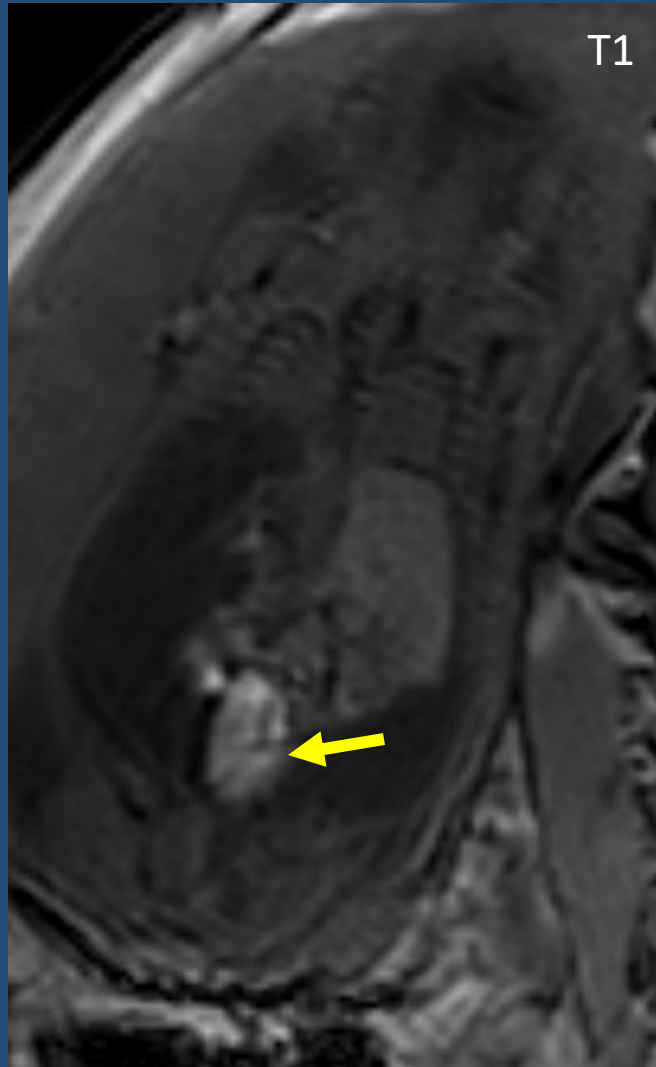
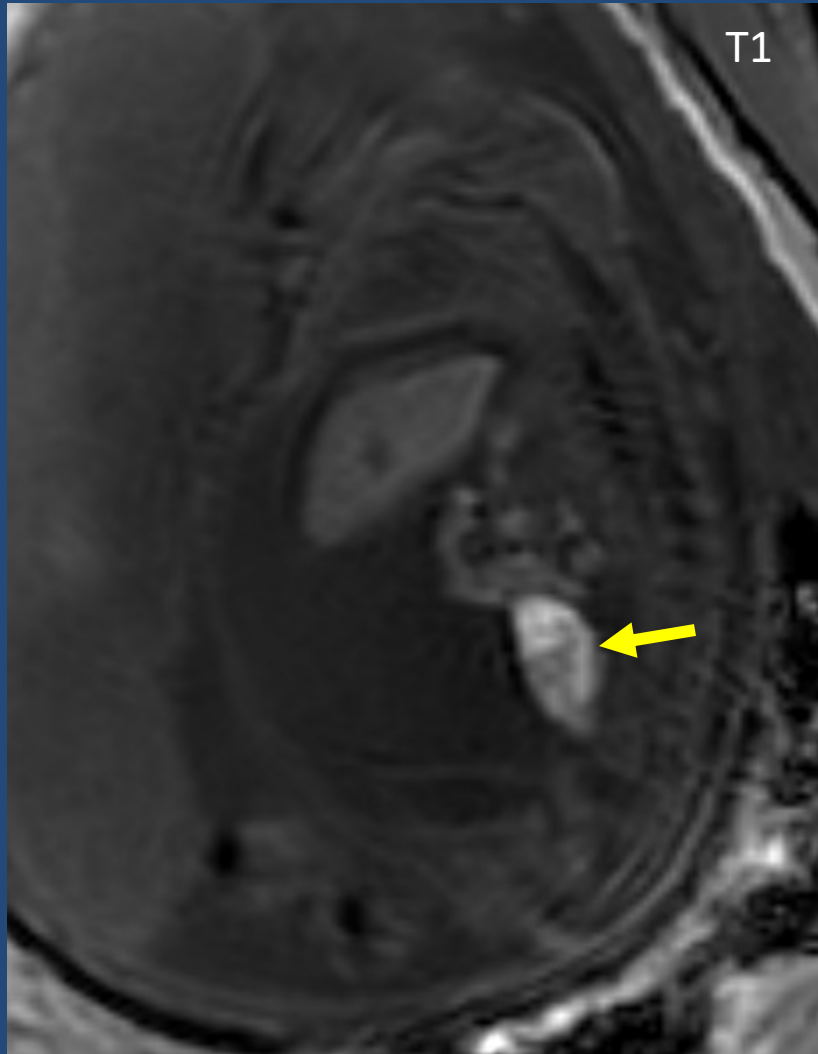
Case 2

Coronal SSFSE





Meconium





Diagnosis?

Posterior cloaca

FINDINGS:

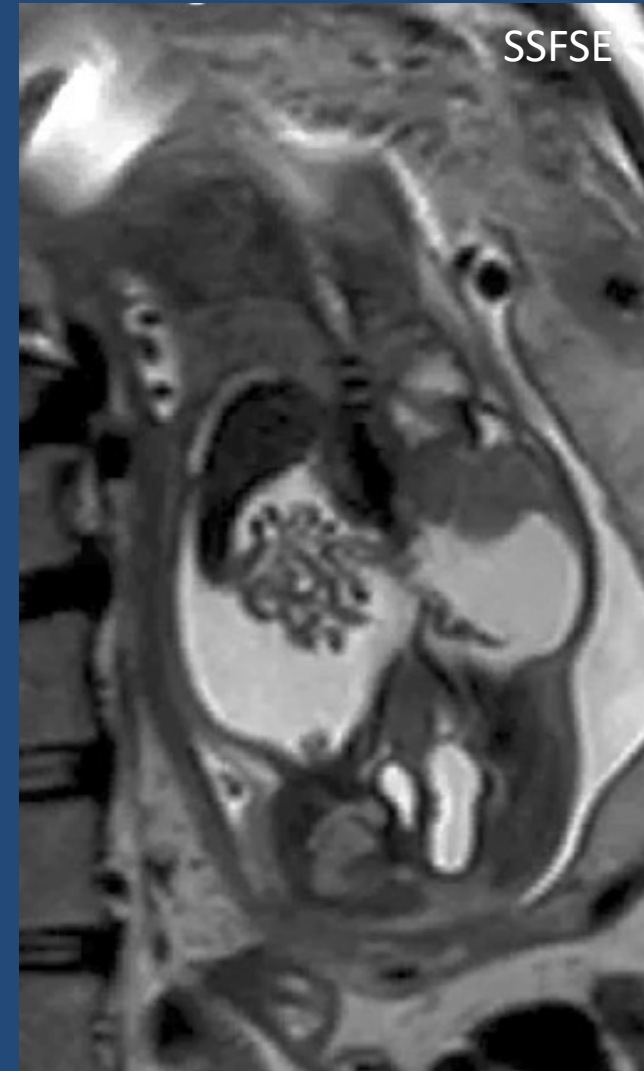
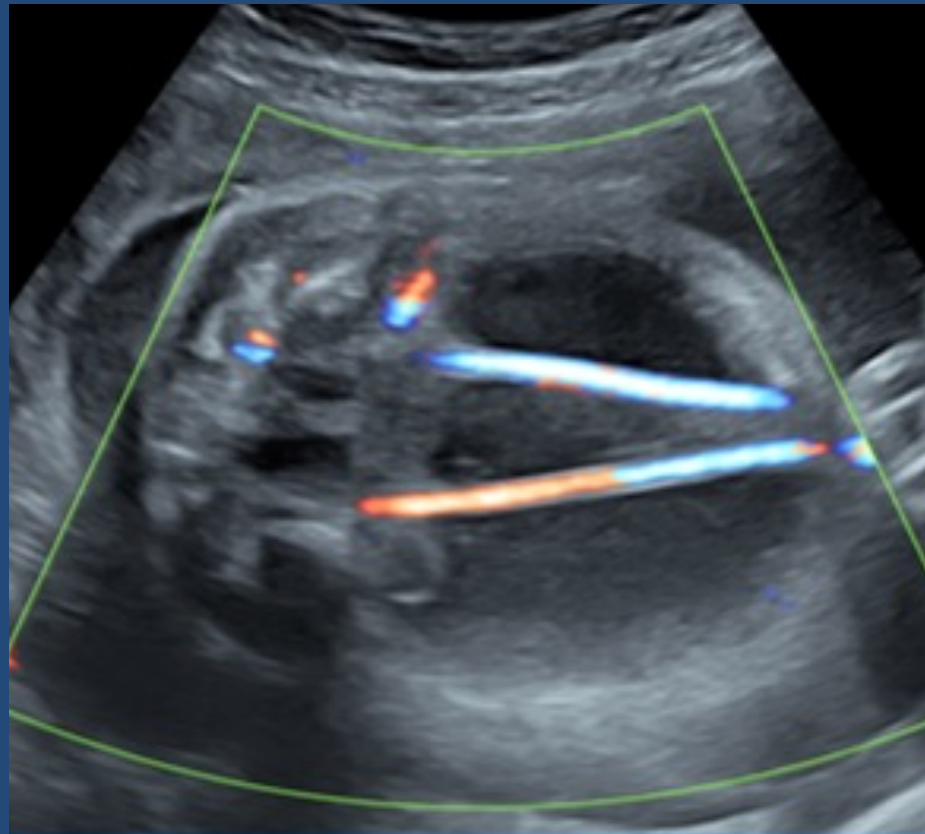
AD posteriorly located

Ascites

Double tubular cystic
pelvic structures

Structure coming in
between the two cysts

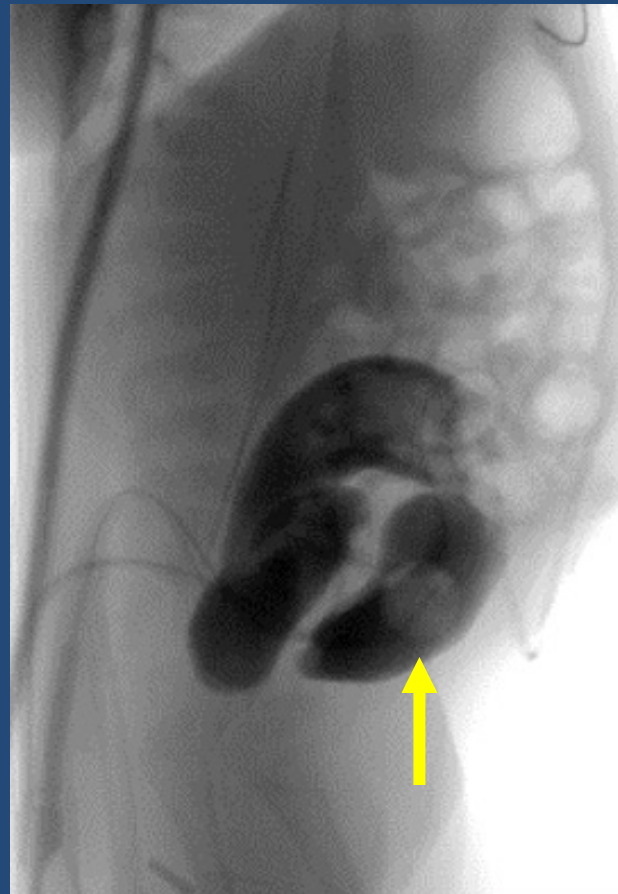
Abnormal meconium
signal



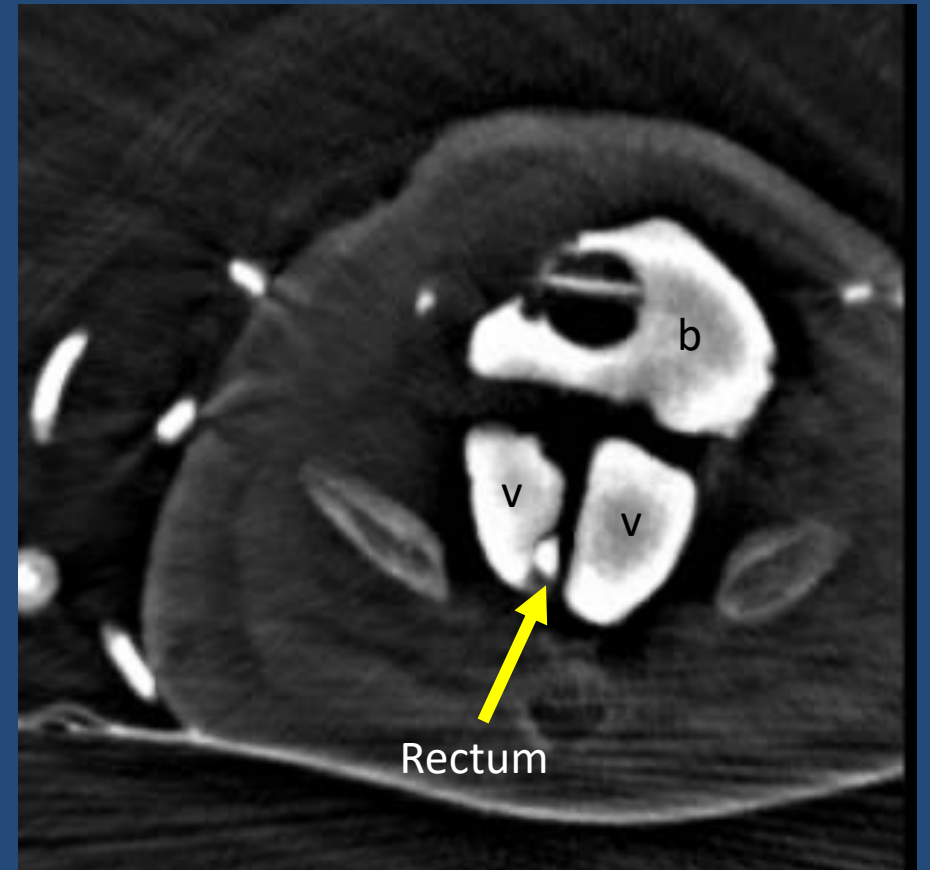


Case 2

Post-natal cloacogram

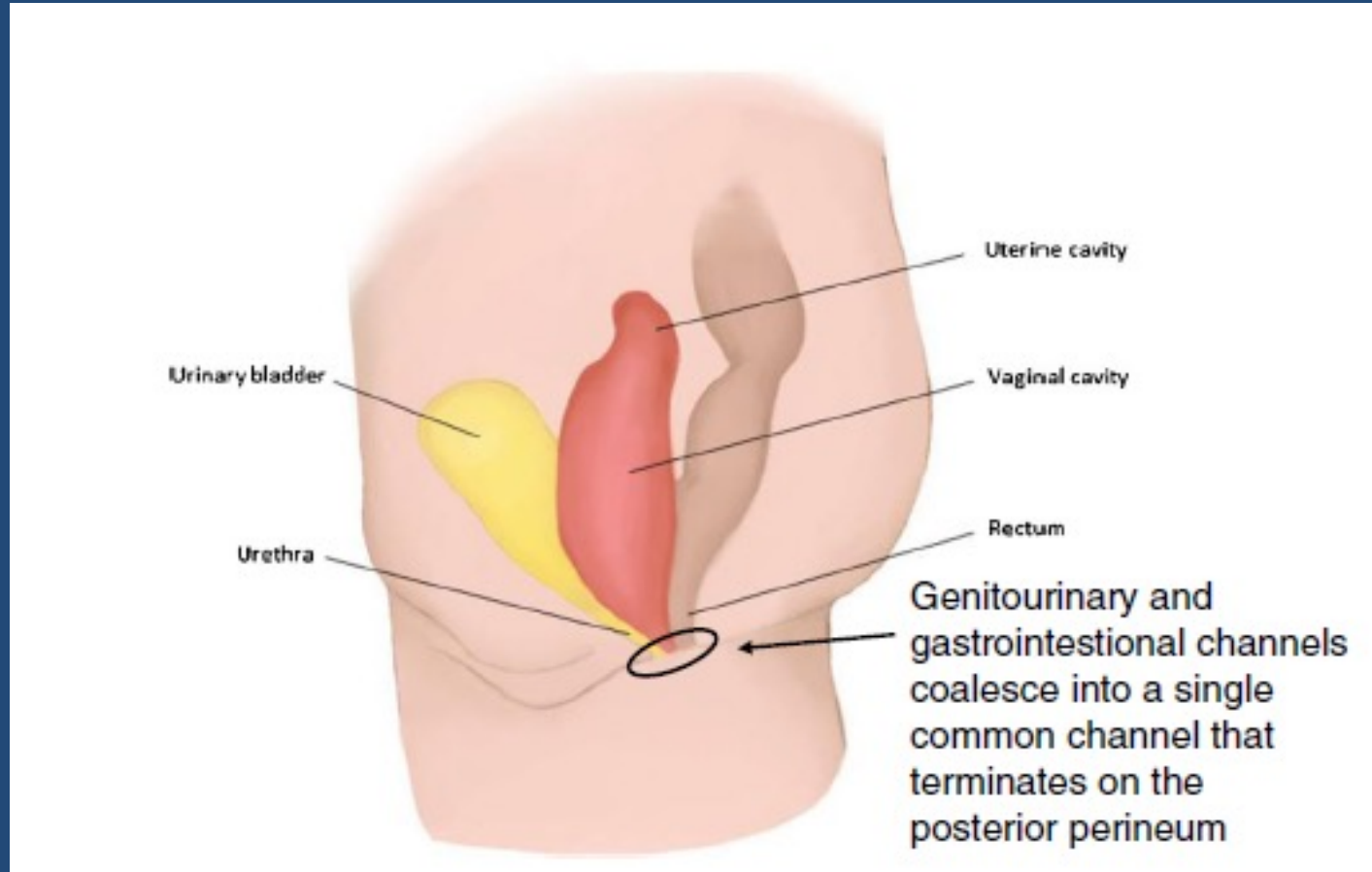


Fluoro-CT reconstruction





Posterior cloaca





Which studies should be ordered during the first 24 hours of life?

1. Computed Tomography of the abdomen
2. Spinal MRI
3. Echocardiogram, kidney US, spinal US, pelvic US
4. Sacral x-ray AP and lateral
5. Babygram
6. Options 3, 4, and 5.



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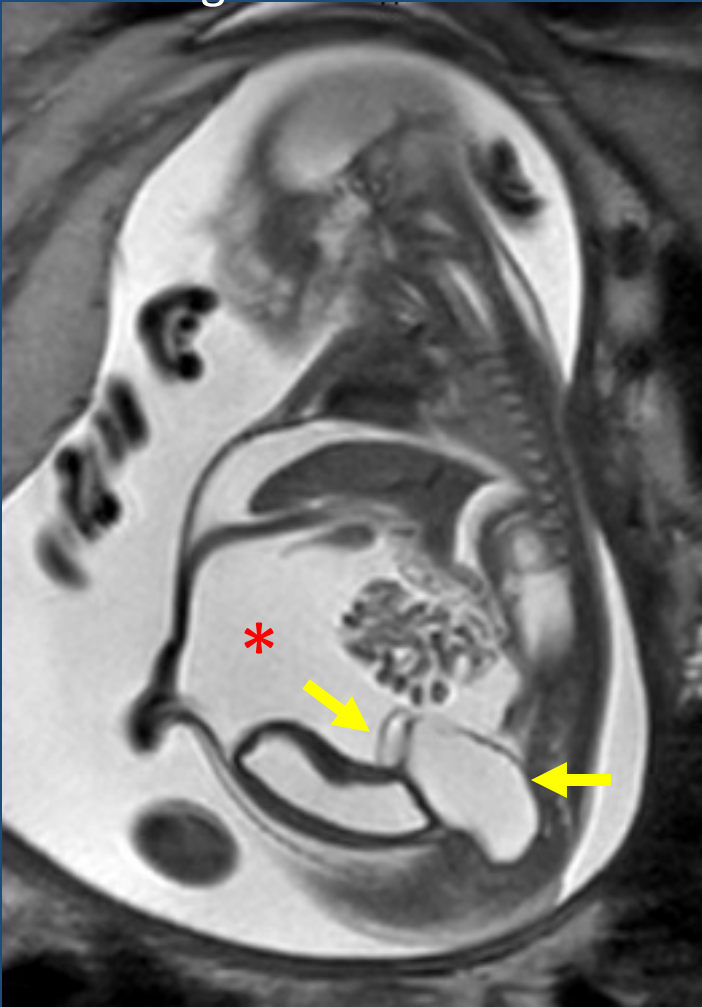
Case 3



Case 3

26 weeks. Referred for ascites and hydronephrosis

Sagittal SSFSE



Coronal SSFSE



T1





Diagnosis?

Posterior Cloaca Variant

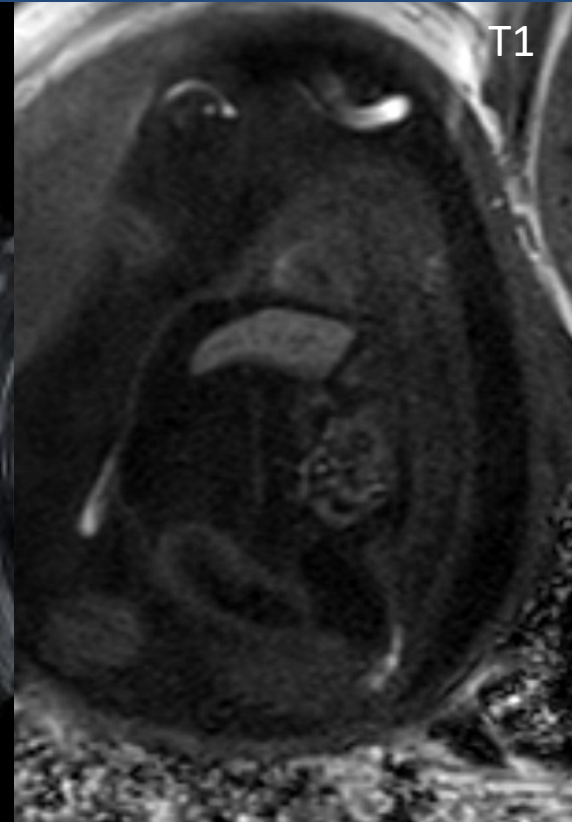
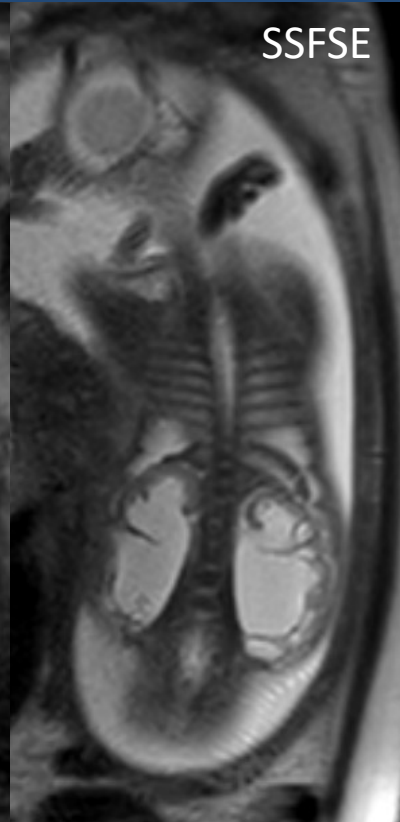
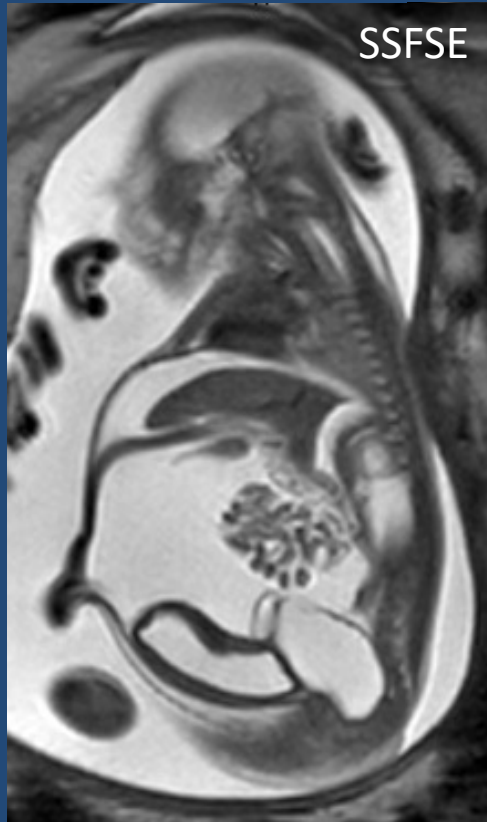
FINDINGS:

Double cystic pelvic structure

Hydroureteronephrosis

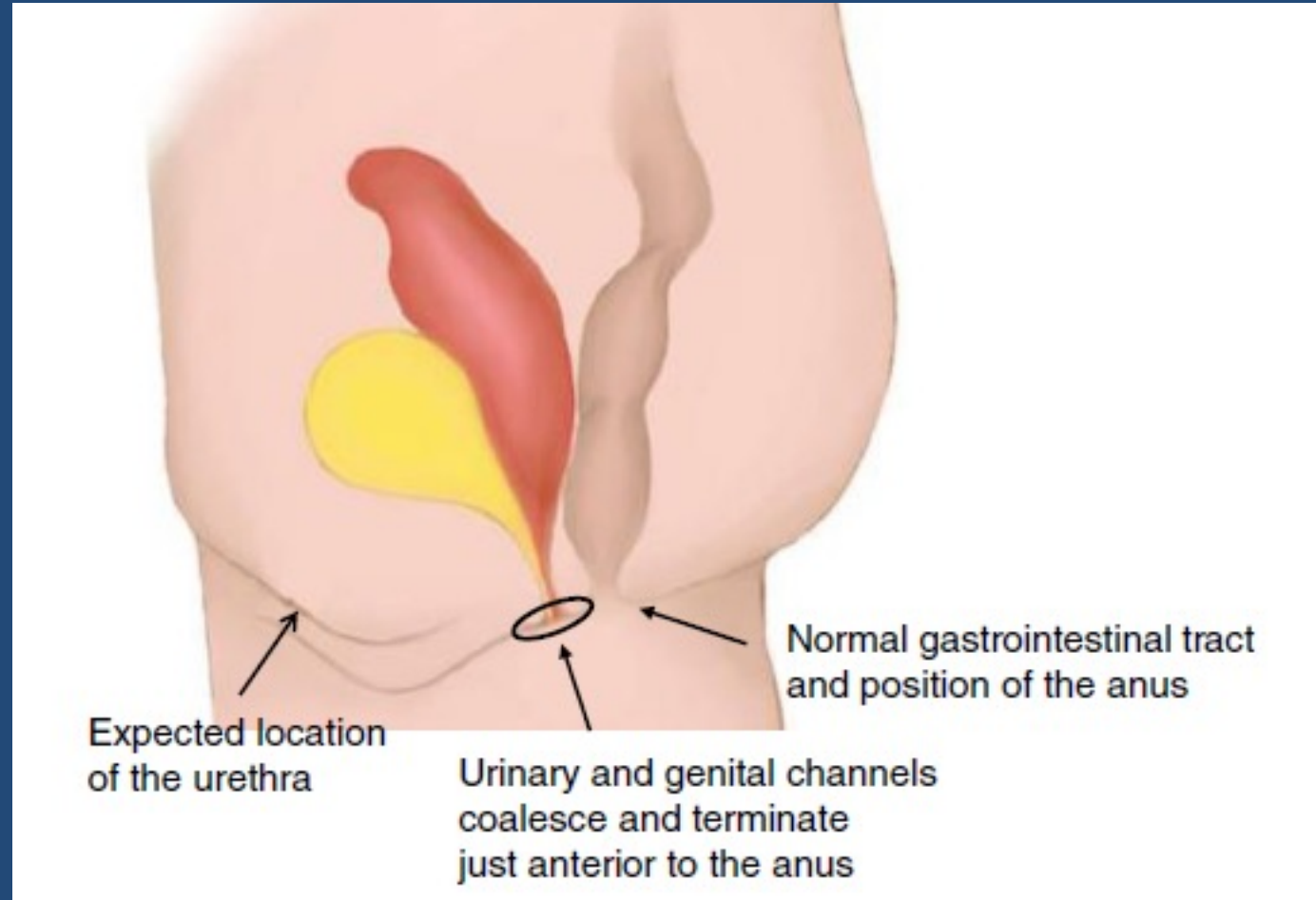
Normal meconium

Normal position of AD





Posterior Cloaca Variant





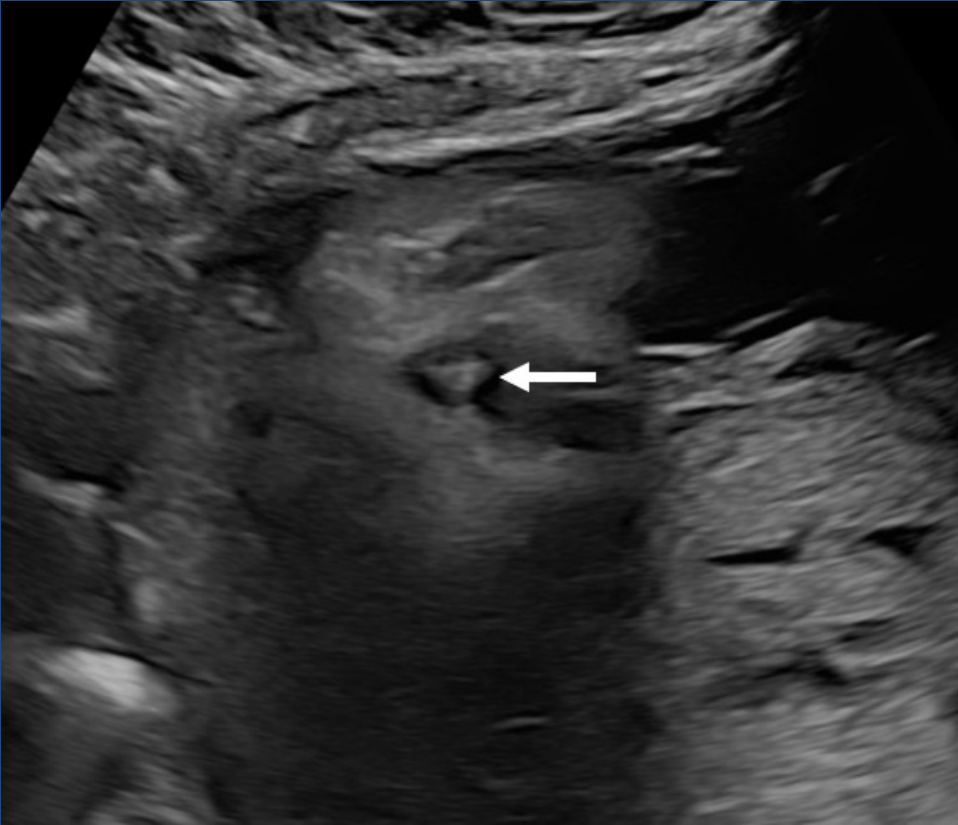
Posterior Cloaca Variant



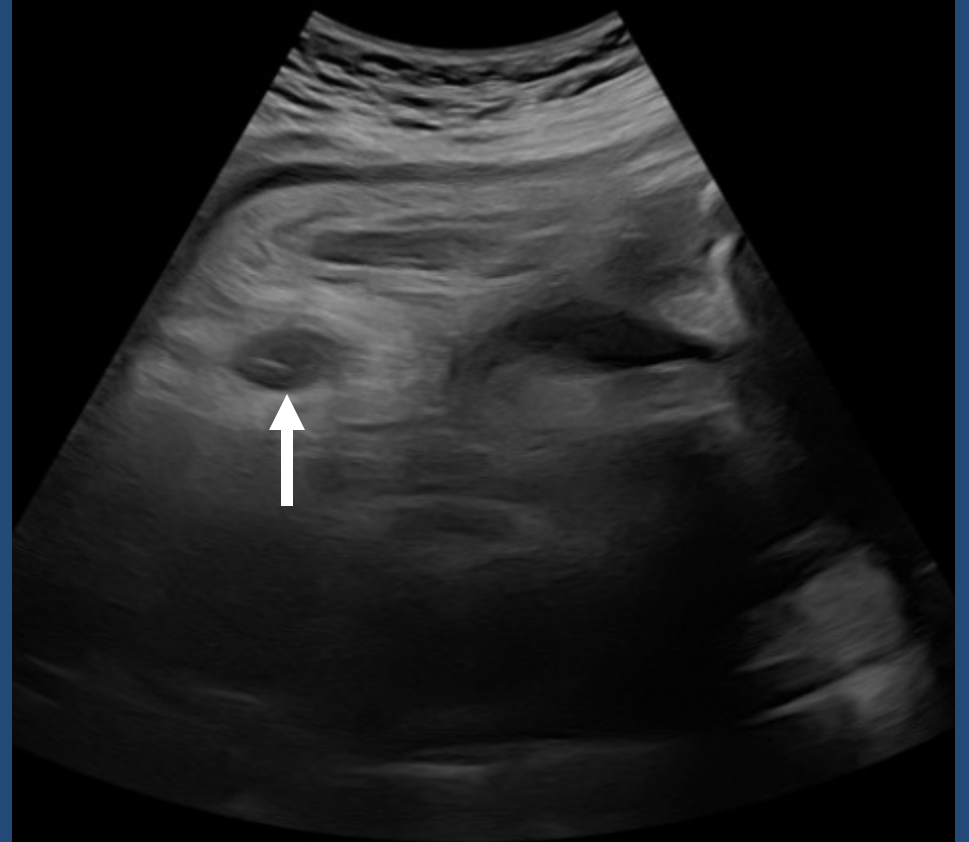


Which one of these two anal dimples is abnormal?

A



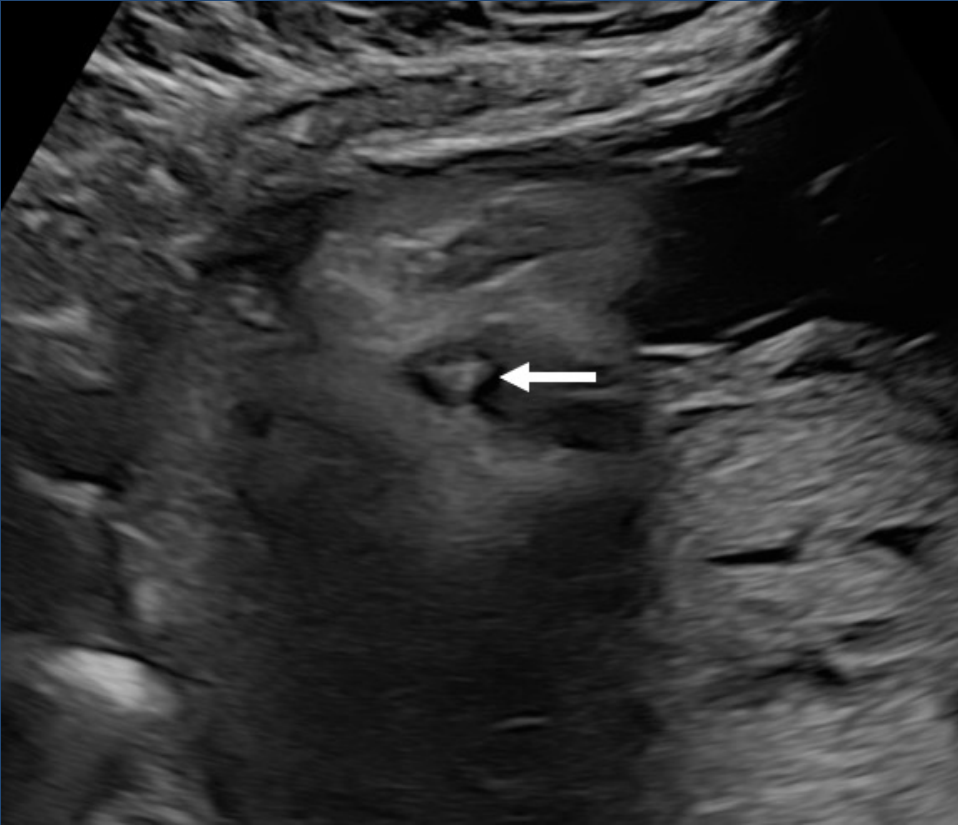
B



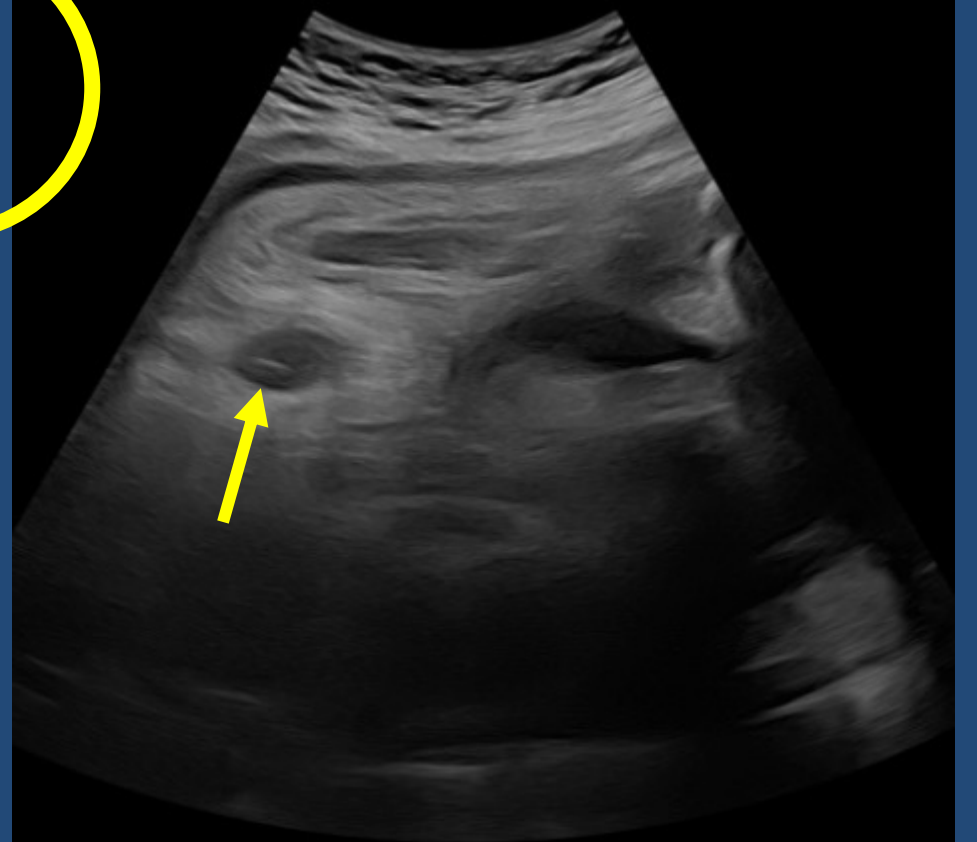


Which one of these two anal dimples is abnormal?

A



B

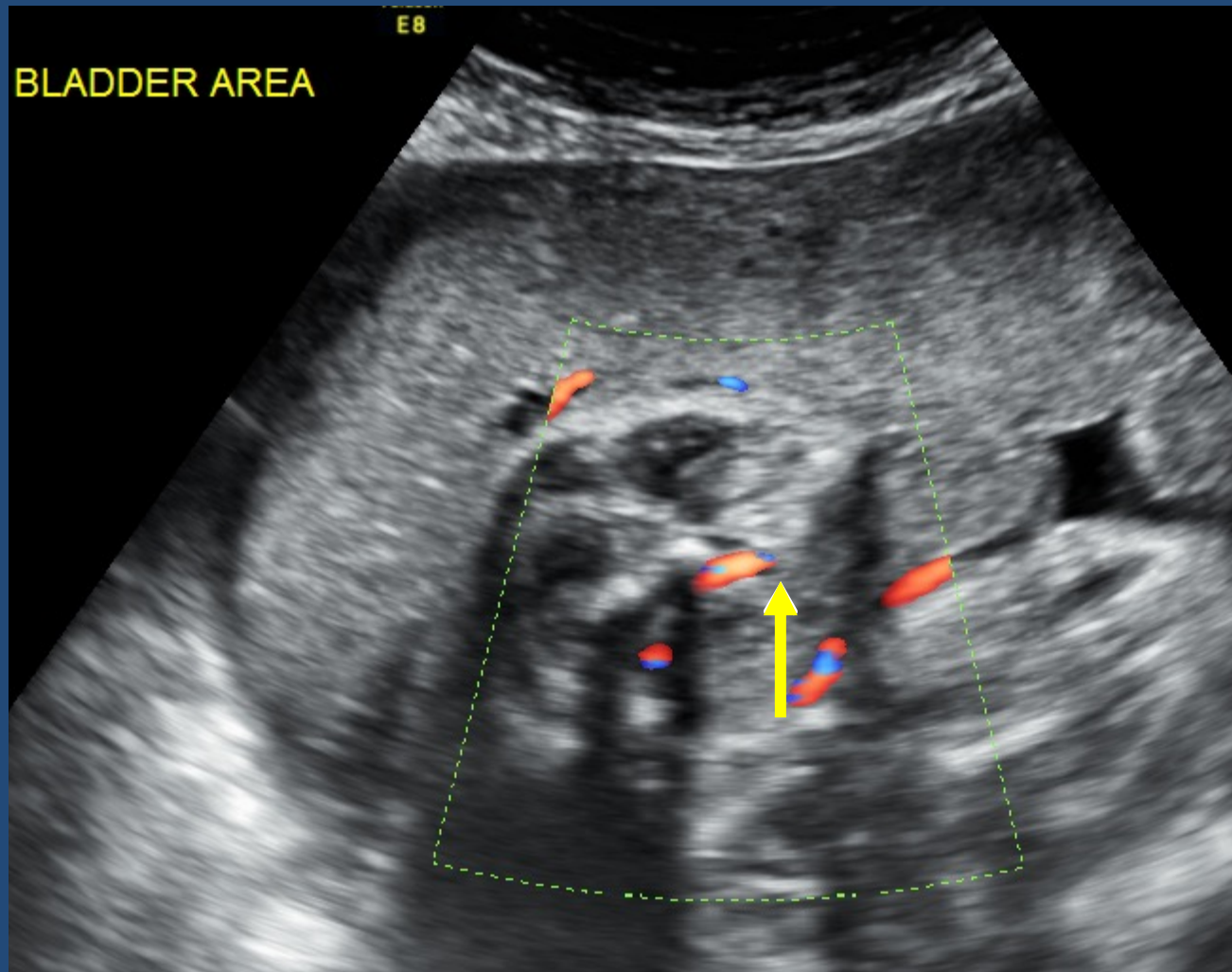




Case 4



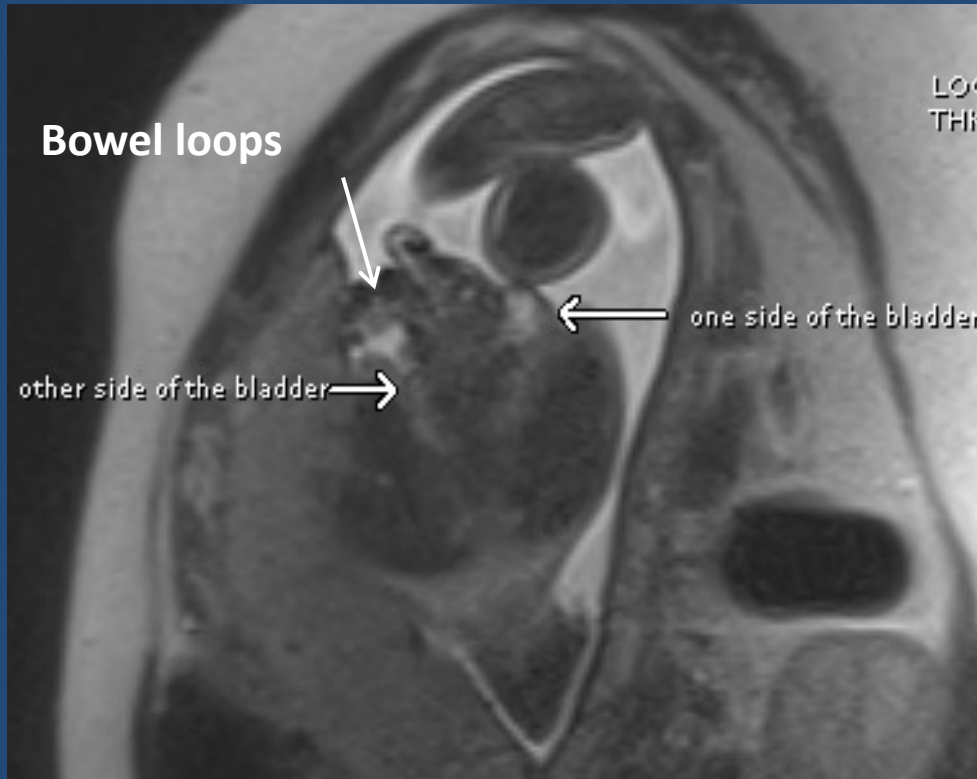
Case 4



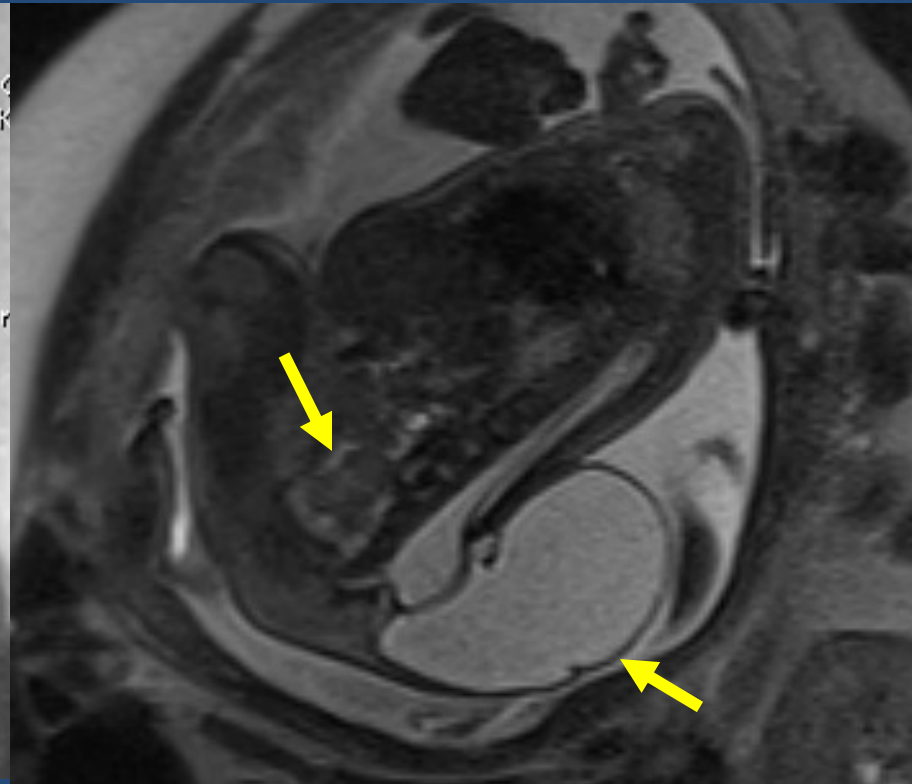


Case 4

Axial SSFSE



Sagittal SSFSE





Diagnosis?

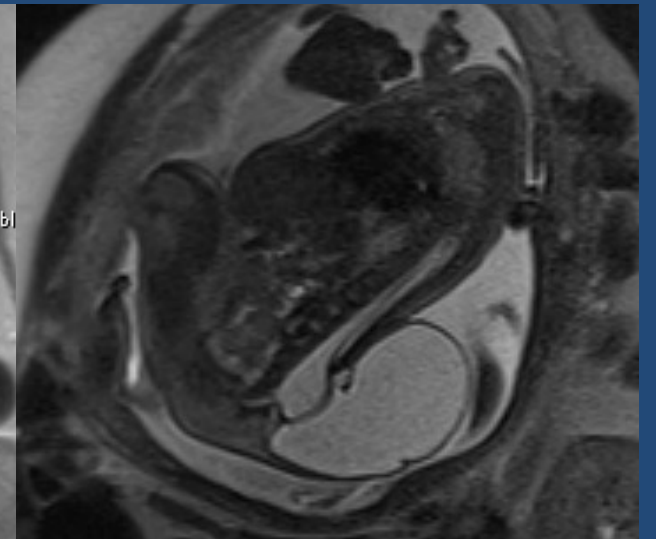
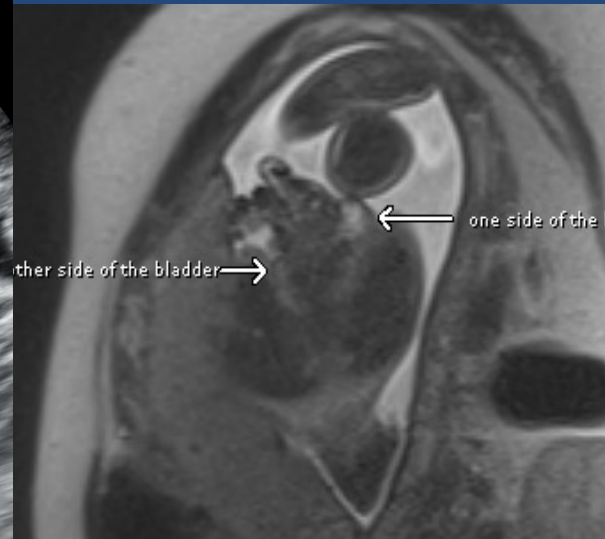
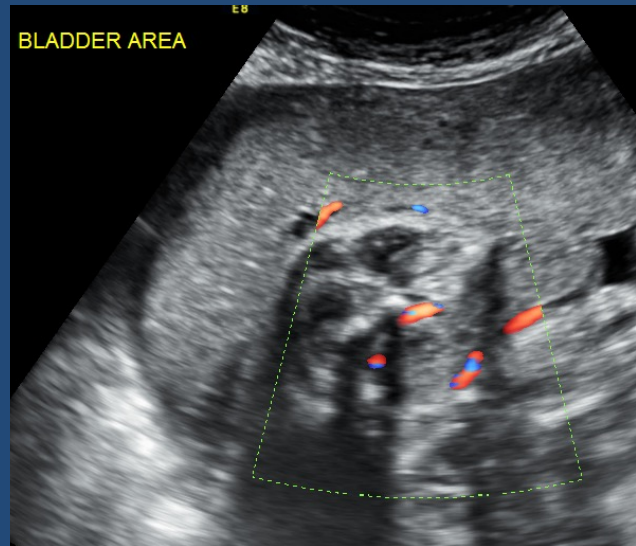
Cloaca Exstrophy - OEIS

FINDINGS:

Bladder exstrophy

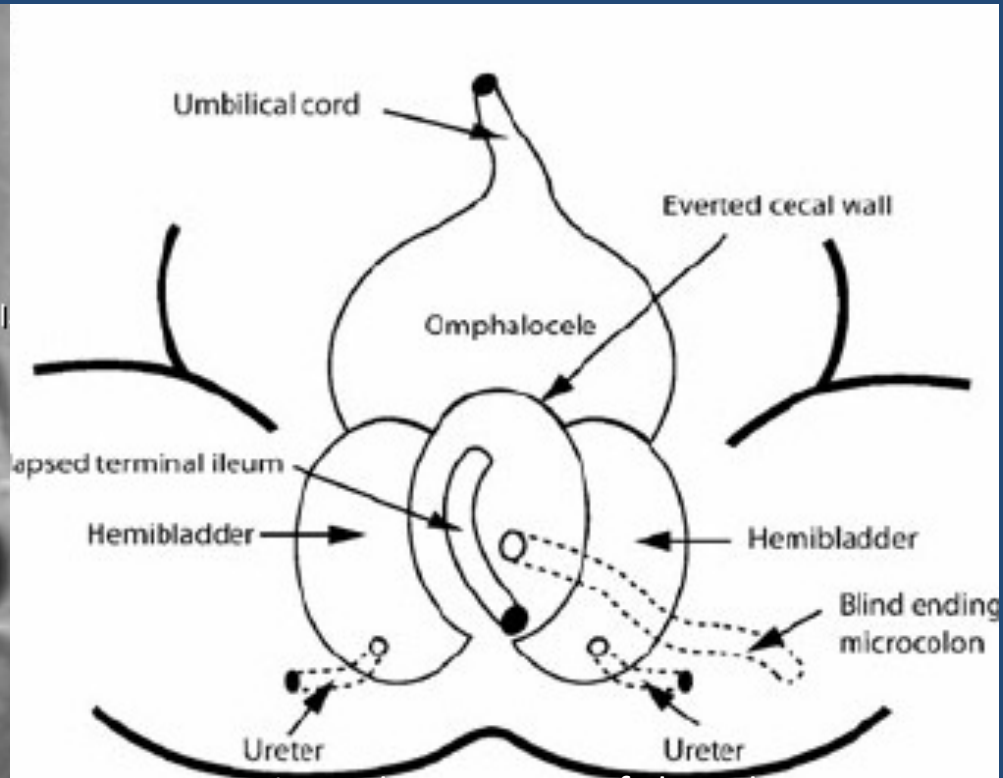
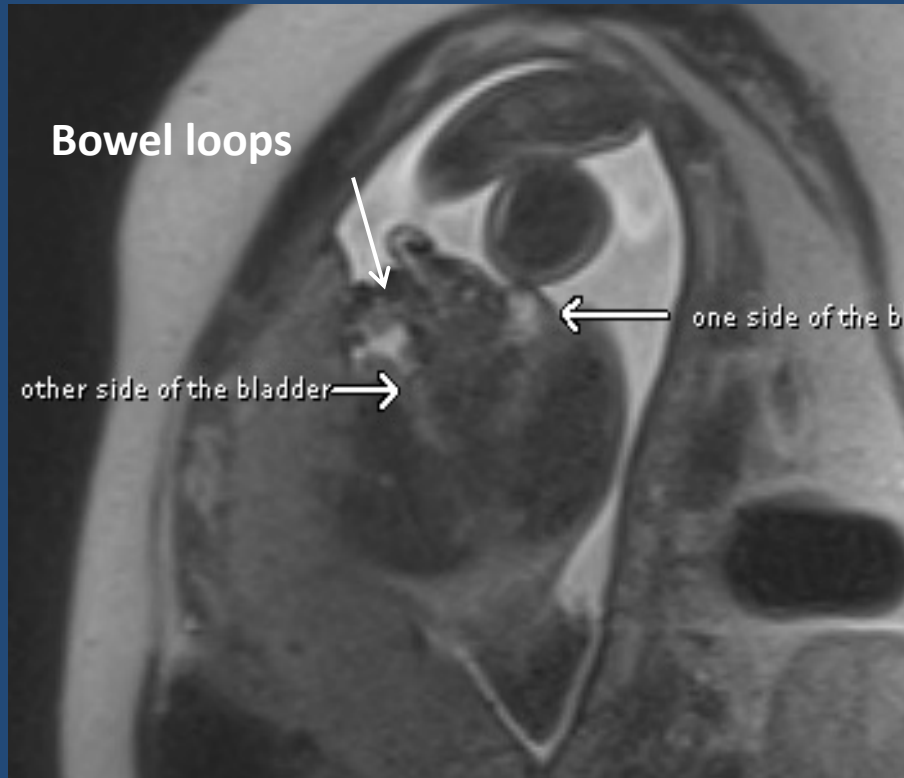
Ventral wall defect/
omphalocele

Posterior spinal
dysraphism





Cloaca Exstrophy



Calvo-Garcia et al - Fetal MRI of cloacal exstrophy



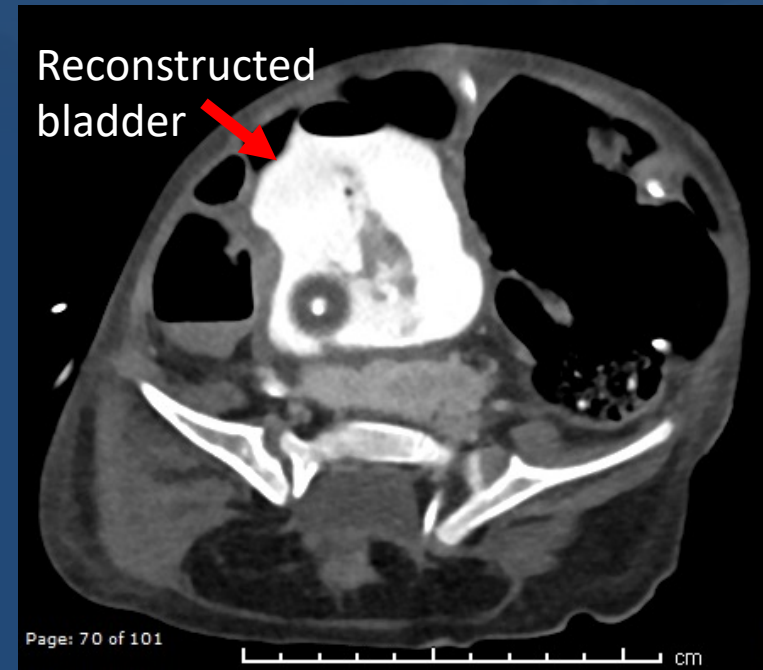
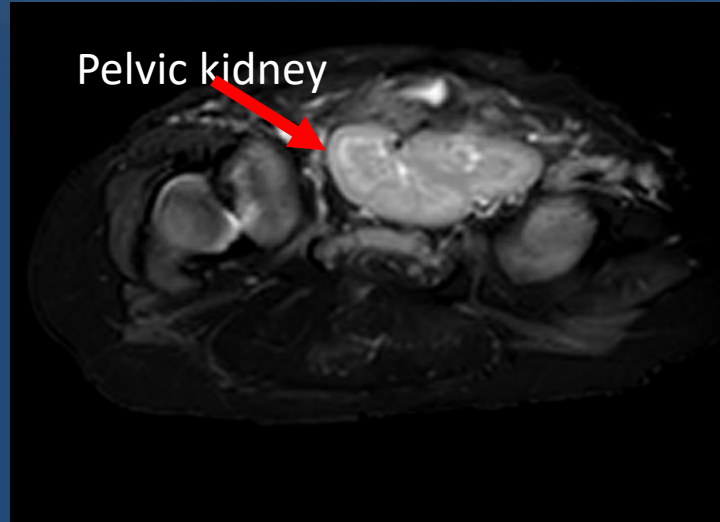
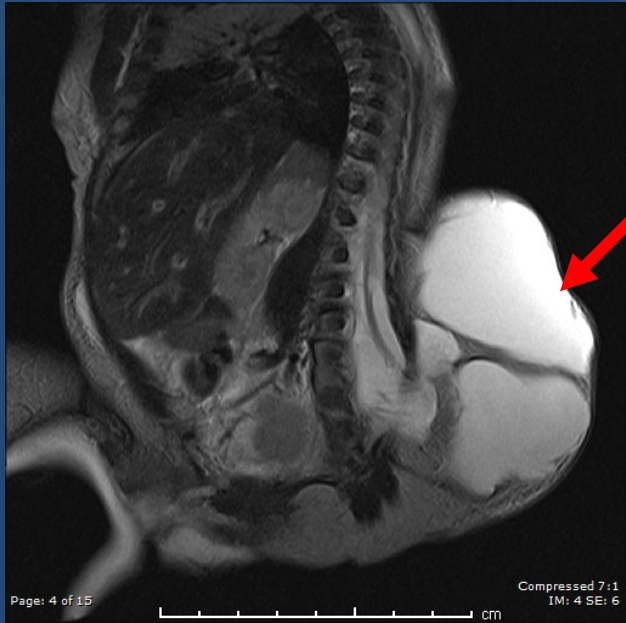
OEIS Complex

- O - Omphalocele
- E - Exstrophy, cloacal
- I - Imperforate anus
- S - Spinal defect



Postnatal images





Long arrows: Corpora cavernosa

Short arrows: corpora spongiosa at the base
of the penis



Take Home Points

Suspect Anorectal Malformation:

- Cases of bowel dilation with intraluminal calcification, in the presence of:
urological anomalies and/or vertebral anomalies

Suspect Cloaca:

- Cases of dilated vagina (s)

Thank you!

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**Colorado Fetal
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