

The background features a light gray gradient with several realistic water droplets of various sizes scattered across the surface. The droplets have highlights and shadows, giving them a three-dimensional appearance.

# ANORECTAL MALFORMATIONS

PRESENTED BY :AYAH ELAYAN



- ANORECTAL MALFORMATIONS ARE COMMON CONGENITAL PROBLEMS OCCURRING IN 1 IN 5,000 BIRTHS AND HAVE A SPECTRUM OF ANATOMICAL PRESENTATIONS, REQUIRING INDIVIDUALIZED TREATMENTS FOR THE NEWBORN, SOPHISTICATED APPROACHES TO THE DEFINITIVE RECONSTRUCTION, AND MANAGEMENT OF LONG-TERM TREATMENTS AND OUTCOMES.
- ASSOCIATED ANOMALIES RELATED TO THE CARDIAC, RENAL, GYNECOLOGIC, ORTHOPEDIC, SPINAL, AND SACRAL SYSTEMS IMPACT CARE AND PROGNOSIS. LONG-TERM RESULTS ARE GOOD PROVIDED THERE IS AN ACCURATE ANATOMICAL RECONSTRUCTION AND A FOCUS ON MAXIMIZING OF FUNCTIONAL RESULTS.

# DEFINITION

- IMPERFORATE ANUS OR ANAL ATRESIA IS A CONGENITAL ANORECTAL MALFORMATION (ARM) WHERE A NORMAL ANAL OPENING IS ABSENT AT BIRTH. ARMS COMPRISE OF A BROAD SPECTRUM OF DEFECTS RANGING FROM MINOR (E.G., MEMBRANOUS COVERING) TO COMPLEX CLOACAL MALFORMATIONS INVOLVING THE URINARY AND GENITAL TRACTS AS WELL.

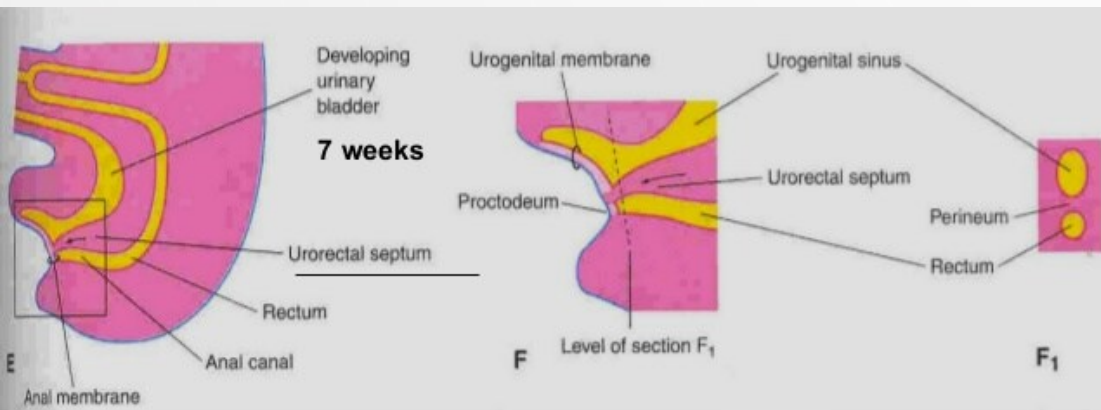




# EPIDEMIOLOGY

- ONE OF THE CAUSES OF BOWEL OBSTRUCTION IN THE NEONATE
- OCCURRING IN ABOUT 1 IN EVERY 4000 TO 5000 LIVE BIRTHS
- ONE-THIRD BEING ISOLATED AND THE REMAINDER ASSOCIATED WITH OTHER CONGENITAL ABNORMALITIES.
- SLIGHT MALE PREDOMINANCE
- ARM HAVE BEEN ASSOCIATED WITH VARIOUS GENETIC CONDITIONS
- THE MOST COMMON LESION SEEN IN MALES IS A RECTOURETHRAL FISTULA, WITH THE MOST COMMON IN FEMALES BEING A RECTOVESTIBULAR FISTULA.

Herman RS, Teitelbaum DH. Anorectal malformations. Clin Perinatol. 2012 Jun;39(2):403-22. doi: 10.1016/j.clp.2012.04.001. PMID: 22682388.



7 weeks

The 2 parts are : **A- Rectum and cranial part of the anal canal dorsally.**  
**B- Urogenital sinus ventrally.**

The postanal or tailgut **degenerates and disappears** as the rectum is formed.

By the **7<sup>th</sup> week**, the urorectal septum has **fused** with the cloacal membrane, **dividing** it into a **dorsal** anal membrane and a **larger ventral** urogenital membrane. The **area of fusion** of the urorectal septum with the cloacal membrane is **represented** in the adult by the **perineal body** ( the tendinous center of the perineum ).

The urorectal septum also, **divides** the cloacal sphincter into **anterior & posterior** parts. The **posterior** part becomes the external anal sphincter and the **anterior part** develops into the superficial transverse perineal ( bulbospongiosus and ischiocavernosus ) muscles. This developmental fact **explains why** one nerve ( pudendal nerve ) supplies **all these muscles**.

### MIDGUT & HINDGUT DEVELOPMENT

#### Key Points

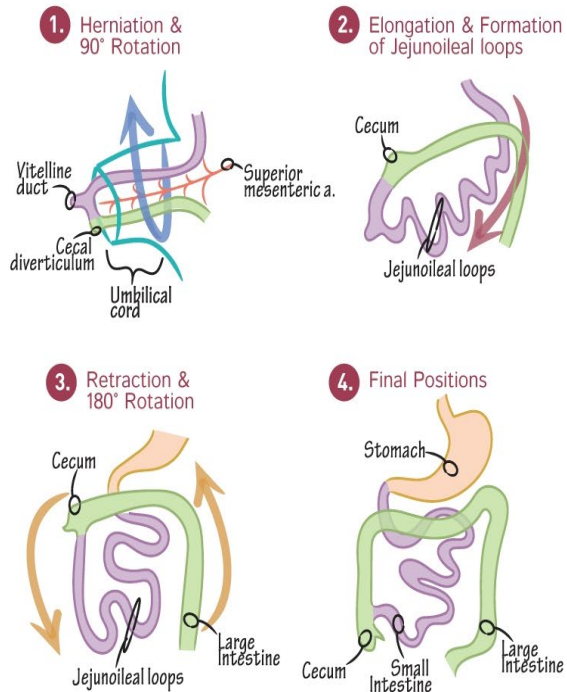
##### Midgut —

- ✓ Primary intestinal loop elongates, outgrows abdominal cavity.
- ✓ Rotates 90° within umbilical cord.
- ✓ Retracts, grows, and rotates an additional 180°
- ✓ Gives rise to distal duodenum, jejunum, ileum, ascending colon and proximal 2/3 transverse colon.

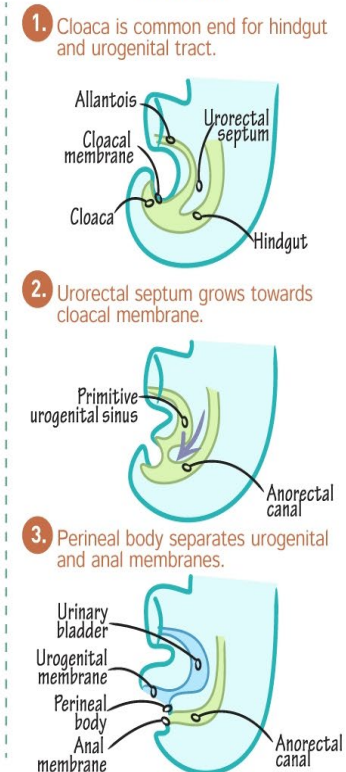
##### Hindgut —

- ✓ Cloacal region differentiates to form separate urogenital and GI channels.
- ✓ Gives rise to distal 1/3 transverse colon, descending & sigmoid colons, and proximal 2/3 anorectal canal.

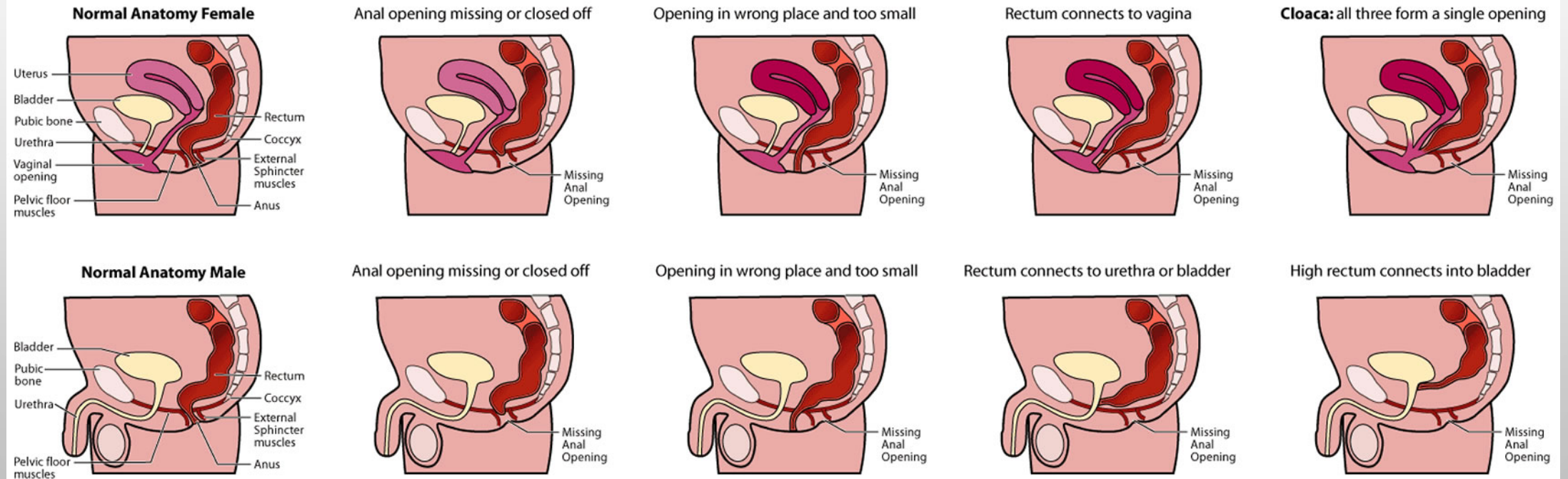
### MIDGUT



### HINDGUT



# EMBRYOLOGY





# CLASSIFICATION

- WINGSPREAD CLASSIFICATION (1984), WHICH DESCRIBED MALFORMATIONS AS LOW, INTERMEDIATE, AND HIGH
- KRICKENBECKCLASSIFICATION (2005), BASED ON PRECISE ANATOMICAL ABNORMALITIES, IS MUCH MORE VALUABLE

## Wingspread classification (1984)

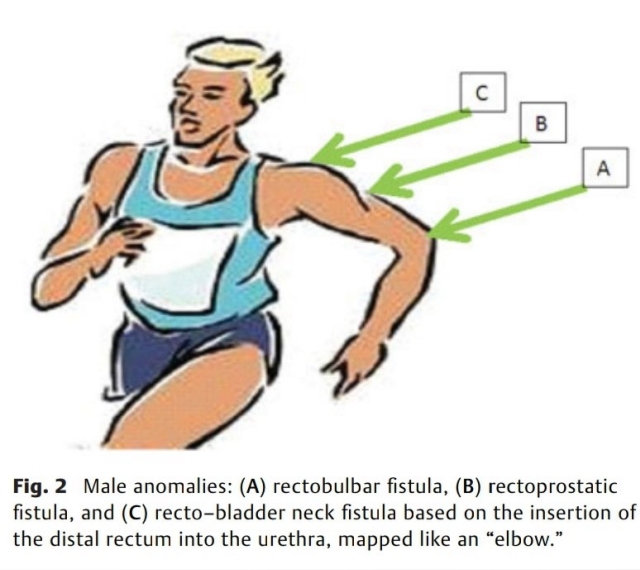
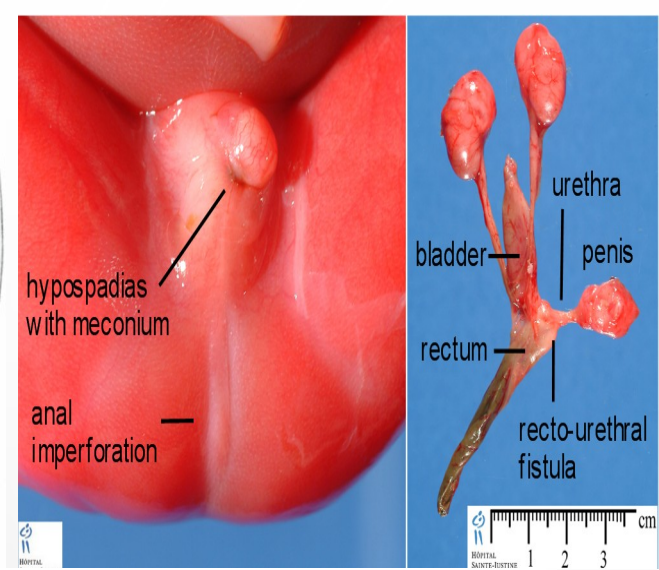
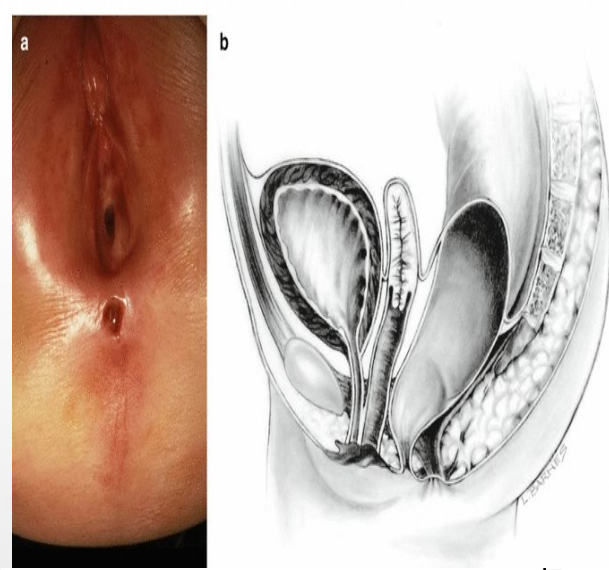
	Boys	Girls
<b>High</b>	Anorectal agenesis <ul style="list-style-type: none"> <li>• With Rectovesical fistula</li> <li>• Without fistula</li> <li>• Rectal atresia</li> </ul>	Anorectal agenesis <ul style="list-style-type: none"> <li>• With rectovaginal fistula</li> <li>• Without fistula</li> <li>• Rectal atresia</li> </ul>
<b>Intermediate</b>	<ul style="list-style-type: none"> <li>• Rectobulbar urethral fistula</li> <li>• Anal agenesis without fistula</li> </ul>	<ul style="list-style-type: none"> <li>• Rectovestibular fistula</li> <li>• Rectovaginal fistula</li> <li>• Anal agenesis without fistula</li> </ul>
<b>Low</b>	<ul style="list-style-type: none"> <li>• Anocutaneous fistula</li> <li>• Anal stenosis</li> </ul>	<ul style="list-style-type: none"> <li>• Anovestibular fistula</li> <li>• Anocutaneous fistula</li> <li>• Anal stenosis</li> </ul>



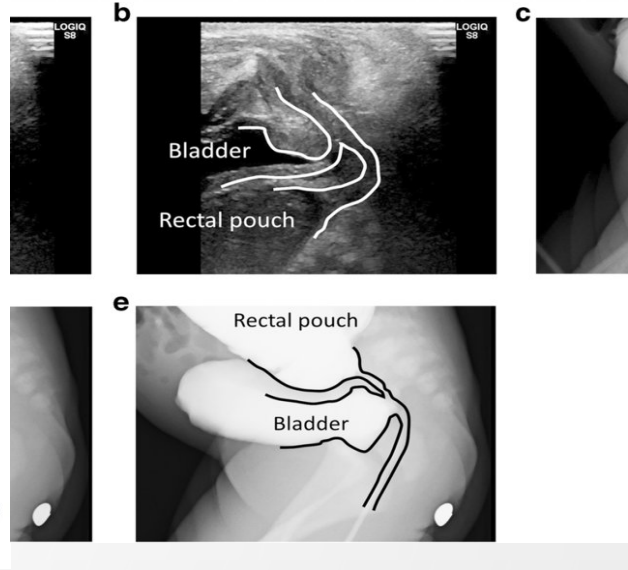
**Table 1** Krickenbeck classification

Major clinical groups
Perineal (cutaneous) fistula
Rectourethral fistula
Prostatic
Bulbar
Rectovesical fistula
Vestibular fistula
Cloaca
ARM with no fistula
Anal stenosis
Rare variants
Pouch colon atresia/stenosis
Rectal atresia/stenosis
Rectovaginal fistula
H-type fistula
Others

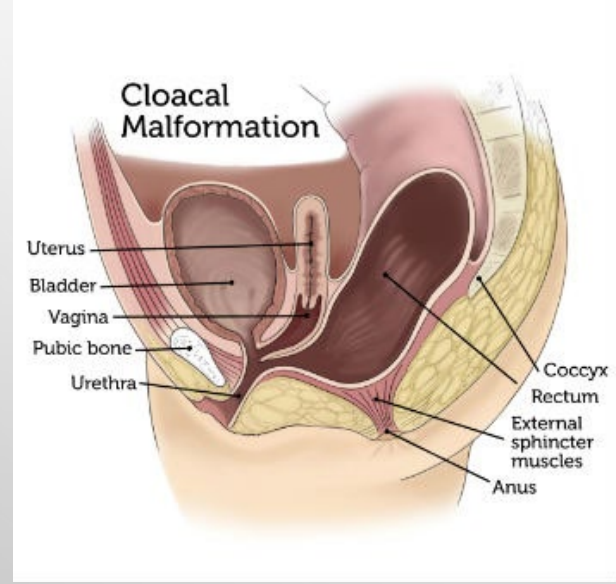
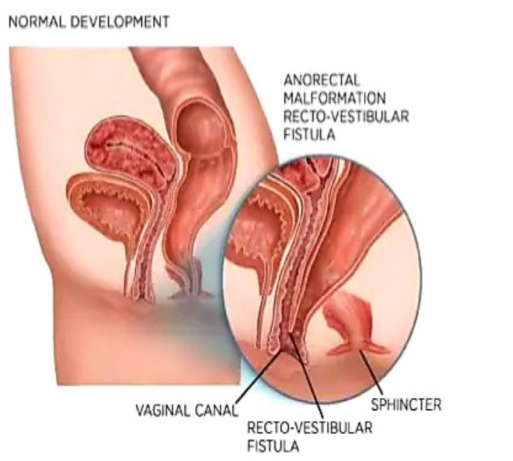
Abbreviation: ARM, anorectal malformation.



**Fig. 2** Male anomalies: (A) rectobulbar fistula, (B) rectoprostatic fistula, and (C) recto-bladder neck fistula based on the insertion of the distal rectum into the urethra, mapped like an "elbow."



**RECTO-VESTIBULAR FISTULA**



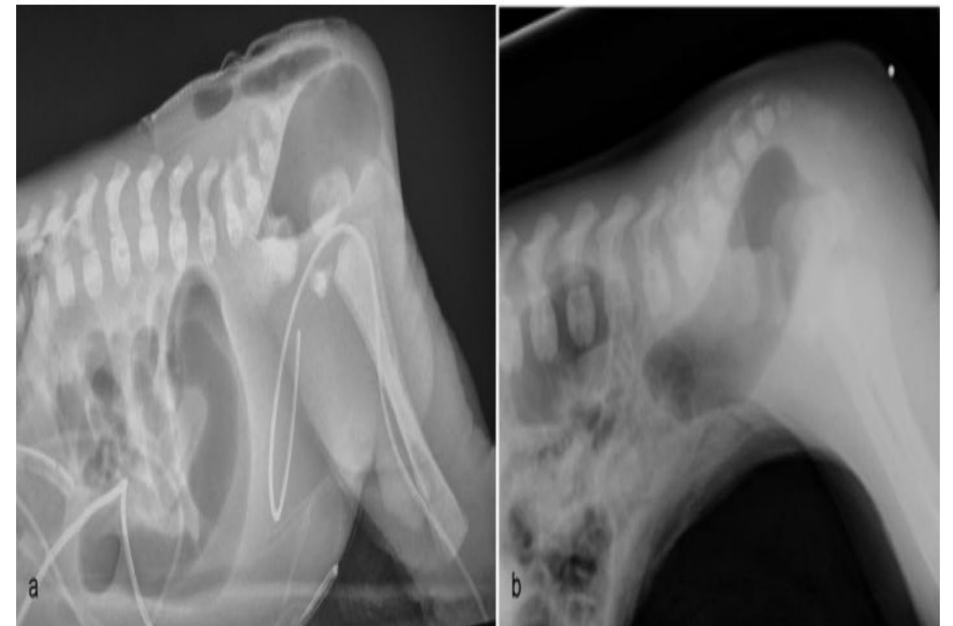


# DIAGNOSIS AND WORKUP

- PRENATAL DIAGNOSIS HAS BOTH LOW SPECIFICITY AND LOW SENSITIVITY.
- IN THE NEWBORN, ASSESSMENT TO MAKE AN ANATOMICAL DIAGNOSIS AND A REVIEW OF ASSOCIATED ANOMALIES ARE THE KEY GOALS.
- A CAREFUL PERINEAL INSPECTION GIVES CLUES TO THE TYPE OF MALFORMATION PRESENT
- ASSESSMENT FOR THE PRESENCE OF A FISTULA SHOULD BE PERFORMED.
- RADIOLOGICAL EVALUATIONS DONE PRIOR TO 24 HOURS MAY BE MISLEADING, AS THE RECTUM WILL BE INCORRECTLY DIAGNOSED AS VERY HIGH.



**Fig. 1.** Bucket-handle deformity.



**Fig. 1** Cross-table lateral film in two newborns. (a) In a reachable rectum, a newborn anoplasty can be performed. (b) In a distant rectum, a colostomy is required.

Herman RS, Teitelbaum DH. Anorectal malformations. *Clin Perinatol.* 2012 Jun;39(2):403-22. doi: 10.1016/j.clp.2012.04.001. PMID: 22682388.



# DIAGNOSIS AND WORKUP

- RADIOLOGIC STUDIES CAN HELP TO DETERMINE A HIGH FROM A LOW LESION AND ASSIST WITH SURGICAL PLANNING.
- THE INVERSION RADIOGRAPH, DESCRIBED BY WANGENSTEEN AND RICE, SHOWS THE DISTANCE BETWEEN THE DISTAL GAS BUBBLES IN THE COLON AND THE PERINEAL OPENING.
- LATER, NARASIMHARAO AND COLLEAGUES REFINED THIS TECHNIQUE BY USING A PRONE CROSS-TABLE LATERAL RADIOGRAPH , IN THIS SERIES, THE PATIENTS WERE PLACED IN THE PRONE POSITION FOR A MINIMUM OF 3 MINUTES.

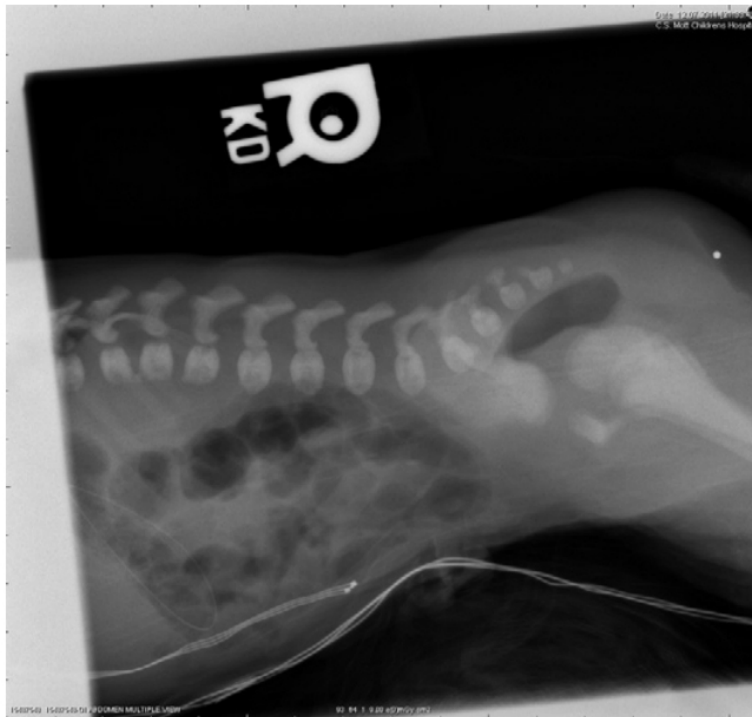


Fig. 2. A cross-table lateral radiograph.

### Anorectal malformation (Imperforate Anus)



This is an invertogram to assess the distance between the distal rectum and the perineum of a newborn with anorectal malformation. The distance will help us to decide the choice of surgery. In this case, the distance is 1.3cm. What is your choice of surgery?



- LUMBAR SPINE AND THE SACRUM SHOULD BE REVIEWED RADIOGRAPHICALLY (X-RAY AND SPINAL ULTRASOUND, MAGNETIC RESONANCE IMAGING [MRI] IF NEEDED) TO LOOK FOR SPINAL AND SACRAL ABNORMALITIES.
- ULTRASONOGRAPHY OF THE ABDOMEN AND PELVIS WILL EVALUATE FOR HYDRONEPHROSIS, AND SPECIFICALLY IN FEMALES, A HYDROCOLPOS, WHICH IS A VAGINA DILATED WITH URINE AND MUCOUS



- AFTER INITIAL EVALUATION AND RADIOLOGIC IMAGING, ONE MUST NEXT LOOK FOR OTHER CONGENITAL ANOMALIES, ESPECIALLY THOSE THAT COULD BE LIFE THREATENING.
- ABOUT 50% TO 67% OF ALL ANORECTAL MALFORMATIONS ARE ASSOCIATED WITH OTHER ANOMALIES (KNOWN COLLECTIVELY BY THE ACRONYM VACTERL).



# CARDIAC

- CARDIAC ANOMALIES RANGES FROM 10% TO AS HIGH AS 30%
- ECHOCARDIOGRAM
- ATRIAL SEPTAL DEFECTS AND VENTRICULAR SEPTAL DEFECTS HAVE BEEN THE MOST COMMON FINDINGS

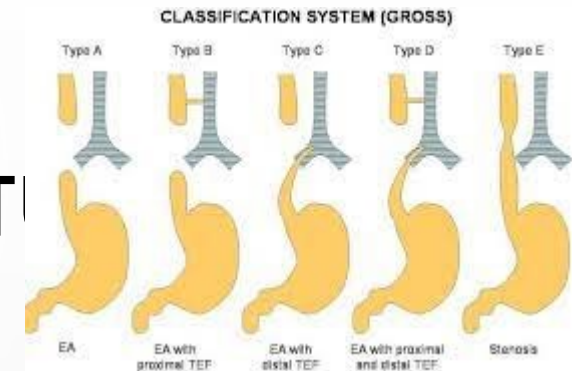


# SPINAL AND VERTEBRAL

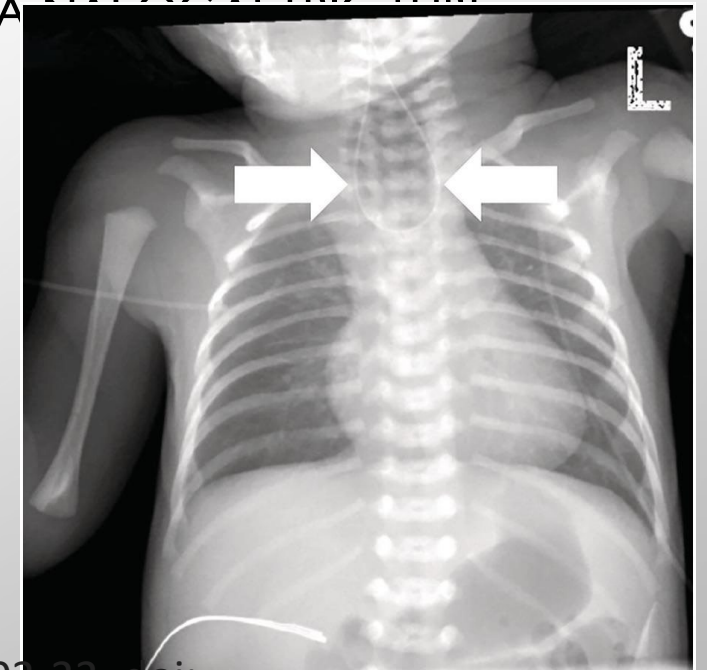
- THE MOST PREVALENT ASSOCIATIONS WITH ARM, WITH AN OVERALL INCIDENCE RANGING BETWEEN ONE-THIRD AND ONE-HALF OF ALL ARM PATIENTS
- TETHERED CORD IS THE MOST COMMON SPINAL ABNORMALITY AND OCCURS IN ABOUT 20% TO 30% OF PATIENTS.
- DIAGNOSIS OF THESE ANOMALIES IS USUALLY VIA SPINAL ULTRASONOGRAPHY IN YOUNG INFANTS; HOWEVER, ONCE THE CHILD IS PAST THE AGE OF 1 YEAR, MAGNETIC RESONANCE IMAGING (MRI) IS OFTEN NEEDED.
- THE DEGREE OF THE ABNORMALITIES OF THE SACRUM HAS BEEN SHOWN TO A HAVE A STRONG CORRELATION WITH POSTOPERATIVE FUNCTION AND COMPLICATIONS.

Herman RS, Teitelbaum DH. Anorectal malformations. Clin Perinatol. 2012 Jun;39(2):403-22. doi: 10.1016/j.clp.2012.04.001. PMID: 22682388.

# TRACHEOESOPHAGEAL FISTULA



- 5% TO 10% OF PATIENTS WITH ARM.
- ROUTINE CHEST RADIOGRAPH DURING THE ATTEMPTED PASSAGE OF A NASOGASTRIC TUBE





# GENITOURINARY ASSOCIATIONS

- RANGES FROM 33% TO ALMOST 50%.
- THE MOST COMMON ANOMALY OVERALL IS REFLUX, AND THE MOST COMMON HIGH LESION IS RENAL AGENESIS.
- PATIENTS WHO HAVE COMPLEX ANOMALIES, 39% WILL HAVE A LUMBOSACRAL OR SPINAL CORD ANOMALY AND OF THESE, 43% WILL SUFFER FROM LOWER URINARY TRACT DYSFUNCTION.
- NERVE INJURY DURING RECONSTRUCTION OR DUE TO SACRAL AGENESIS MAY LEAD TO INCONTINENCE.

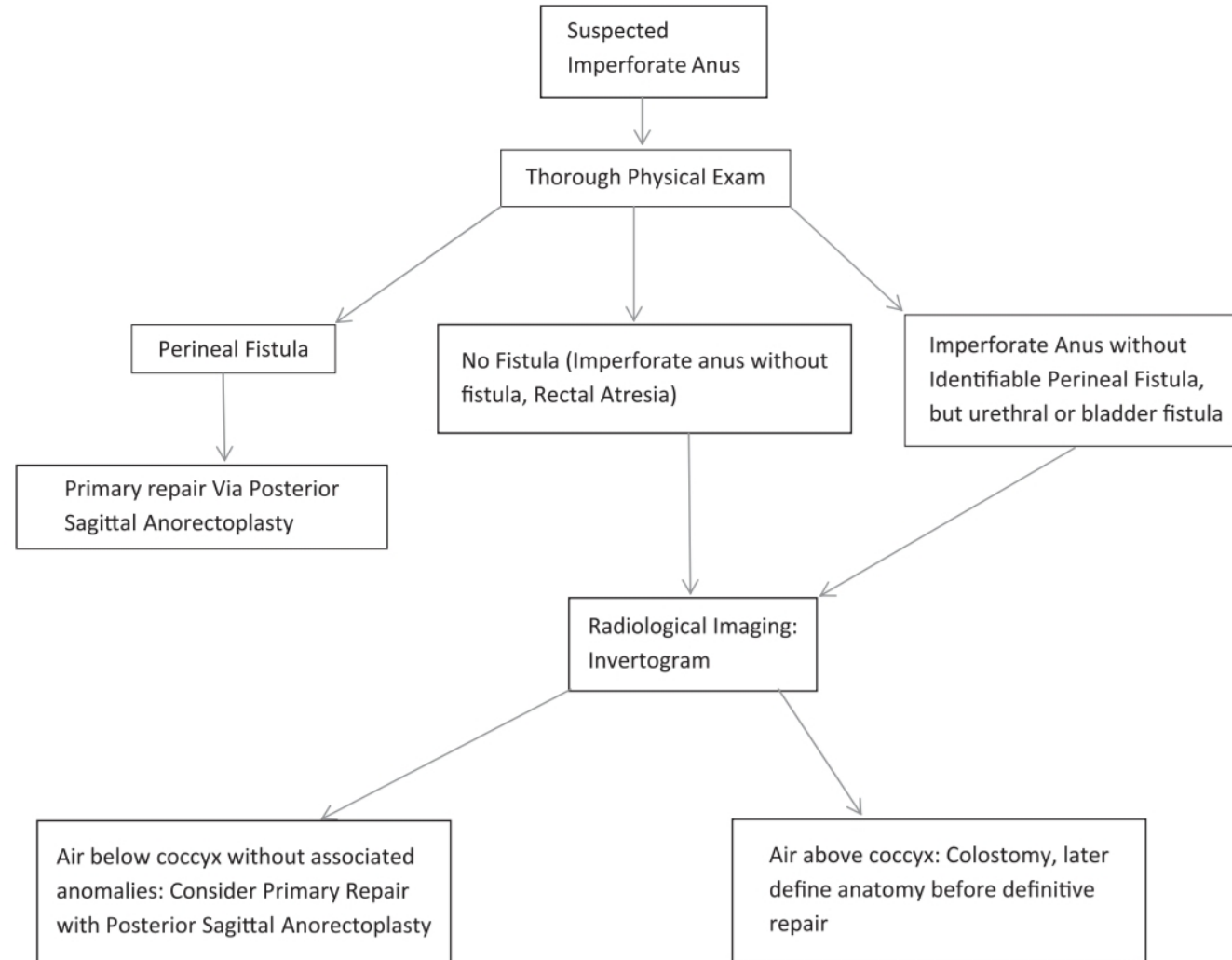


- ALL PATIENTS SHOULD UNDERGO A SCREENING RENAL ULTRASONOGRAM
- VOIDING CYSTOURETHROGRAM SHOULD BE PERFORMED IN THOSE WITH UPPER RENAL TRACT ANOMALIES, LUMBOSACRAL AND SPINAL ABNORMALITIES, OR FREQUENT URINARY TRACT INFECTIONS.
- URODYNAMICS SHOULD BE ASSESSED IN ALL PATIENTS WITH COMPLEX HIGH ARM.



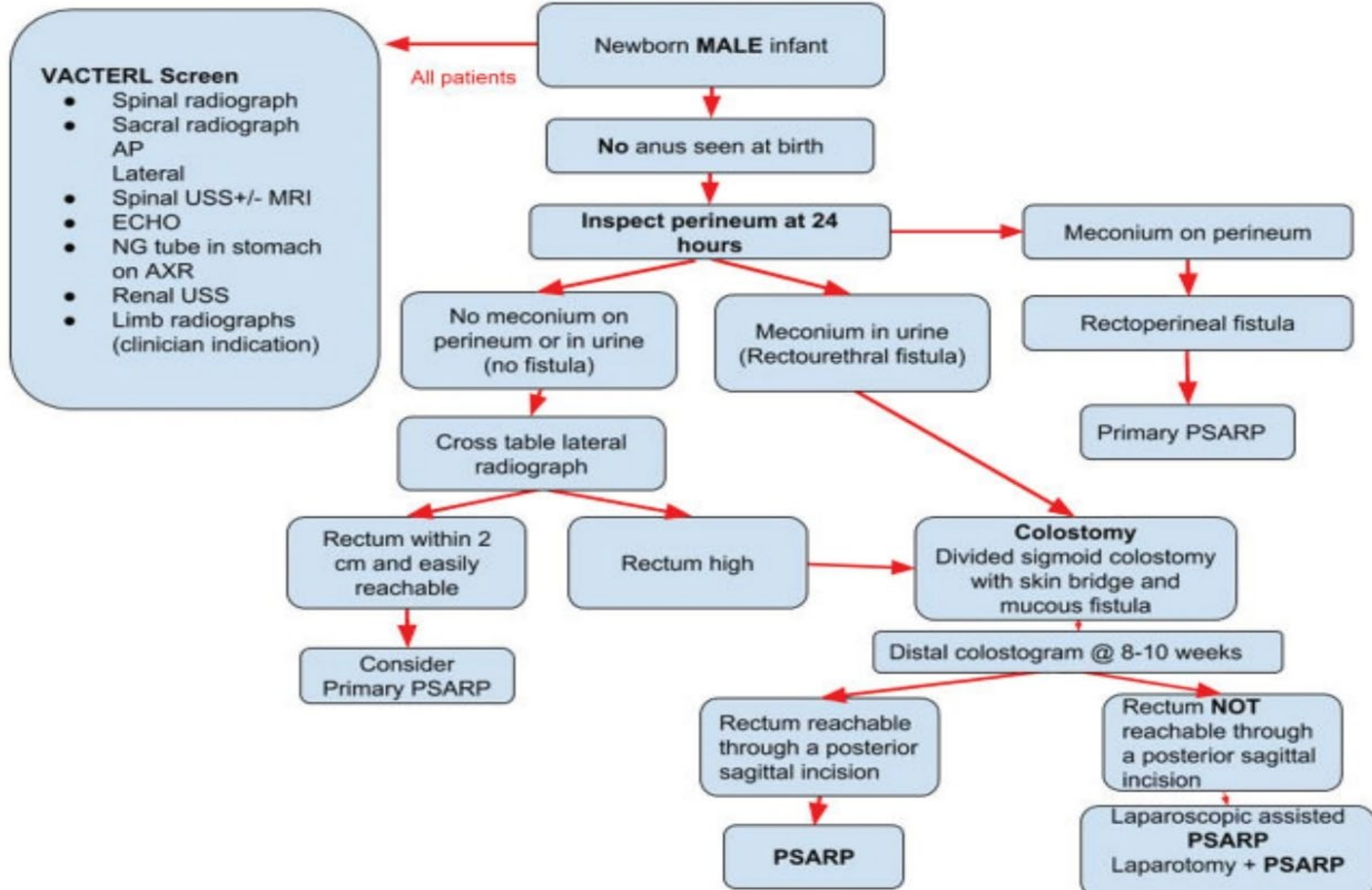
# GYNECOLOGIC ASSOCIATIONS

- COMMON IN ARM
- 17% OF PATIENTS WITH A RECTOVESTIBULAR FISTULA, THE MOST COMMON ANORECTAL MALFORMATION SEEN IN FEMALES, HAD AN ASSOCIATED GYNECOLOGIC ANOMALY.
- ANOMALIES INCLUDED MULTIPLE OR ABSENT VAGINA, CERVIX, AND UTERUS.



**Fig. 4.** Decision-tree diagram for lesions in the male.

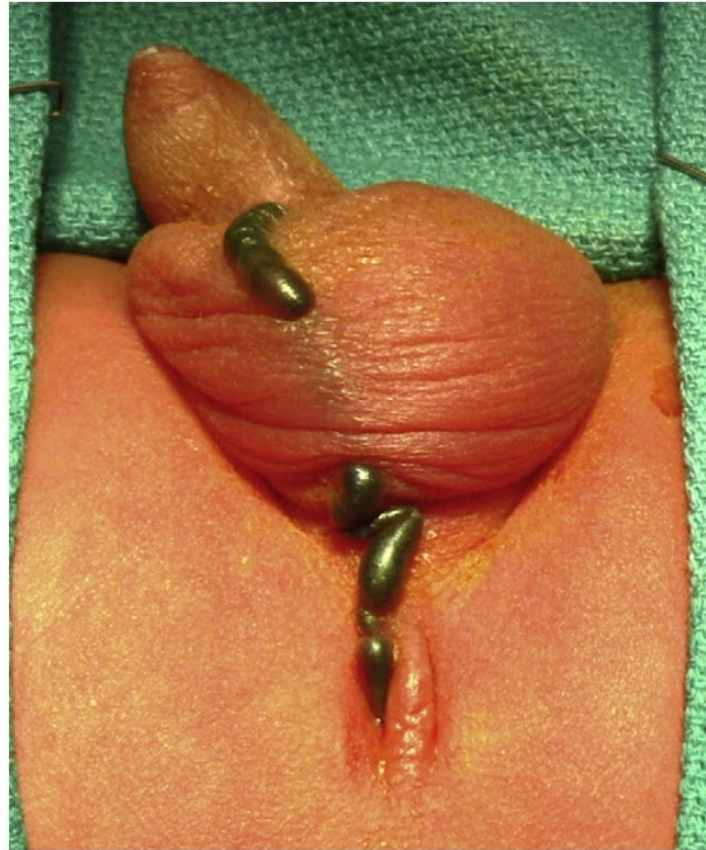
Herman RS, Teitelbaum DH. Anorectal malformations. Clin Perinatol. 2012 Jun;39(2):403-22. doi: 10.1016/j.clp.2012.04.001. PMID: 22682388.



b



- 
- 
- 



**Fig. 5.** Meconium tracking along the fistula in a low imperforate anus in the male.

Herman RS, Teitelbaum DH. Anorectal malformations. Clin Perinatol. 2012 Jun;39(2):403-22. doi: 10.1016/j.clp.2012.04.001. PMID: 22682388.

# HIGH LESIONS

- HIGH RECTOURETHRAL FISTULA
- THE FISTULA OPENS ONTO THE URETHRA POSTERIORLY.
- NO INTERNAL ANAL SPHINCTER, AND THE MUSCLE QUALITY OF THE EXTERNAL SPHINCTER IS POOR.
- PHYSICAL EXAMINATION, CLASSICALLY THERE IS NO IDENTIFIABLE RECTUM, A FLAT PERINEUM, A POORLY FORMED MIDLINE GROOVE AND A BARELY VISIBLE

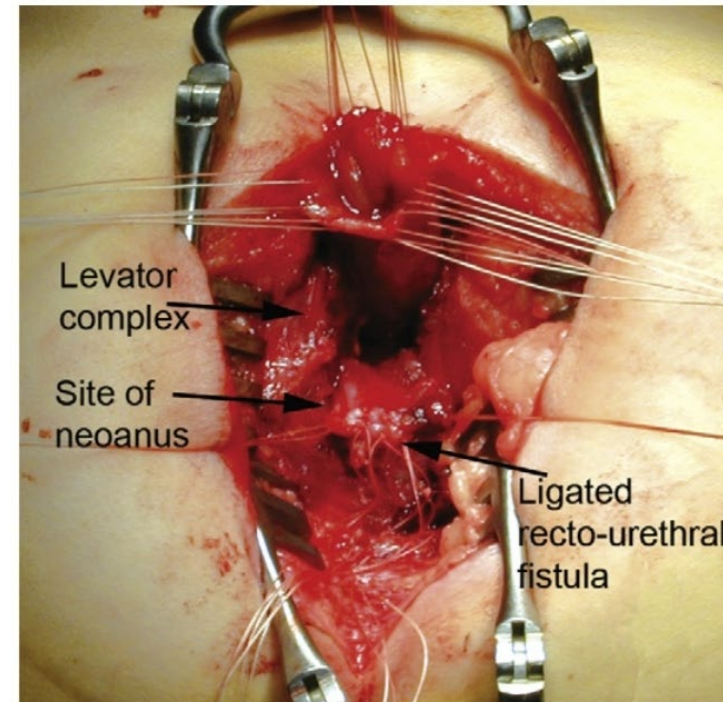
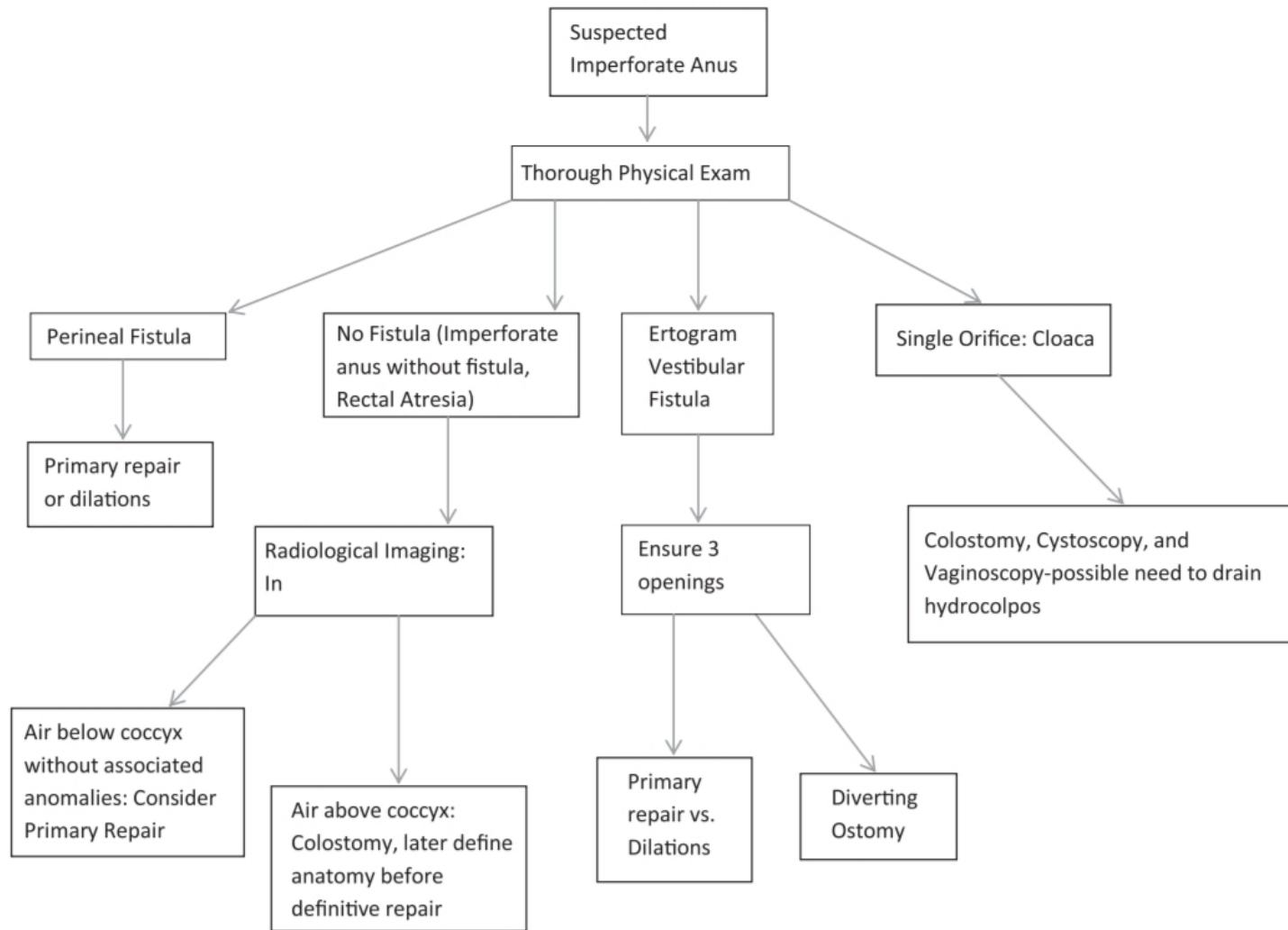
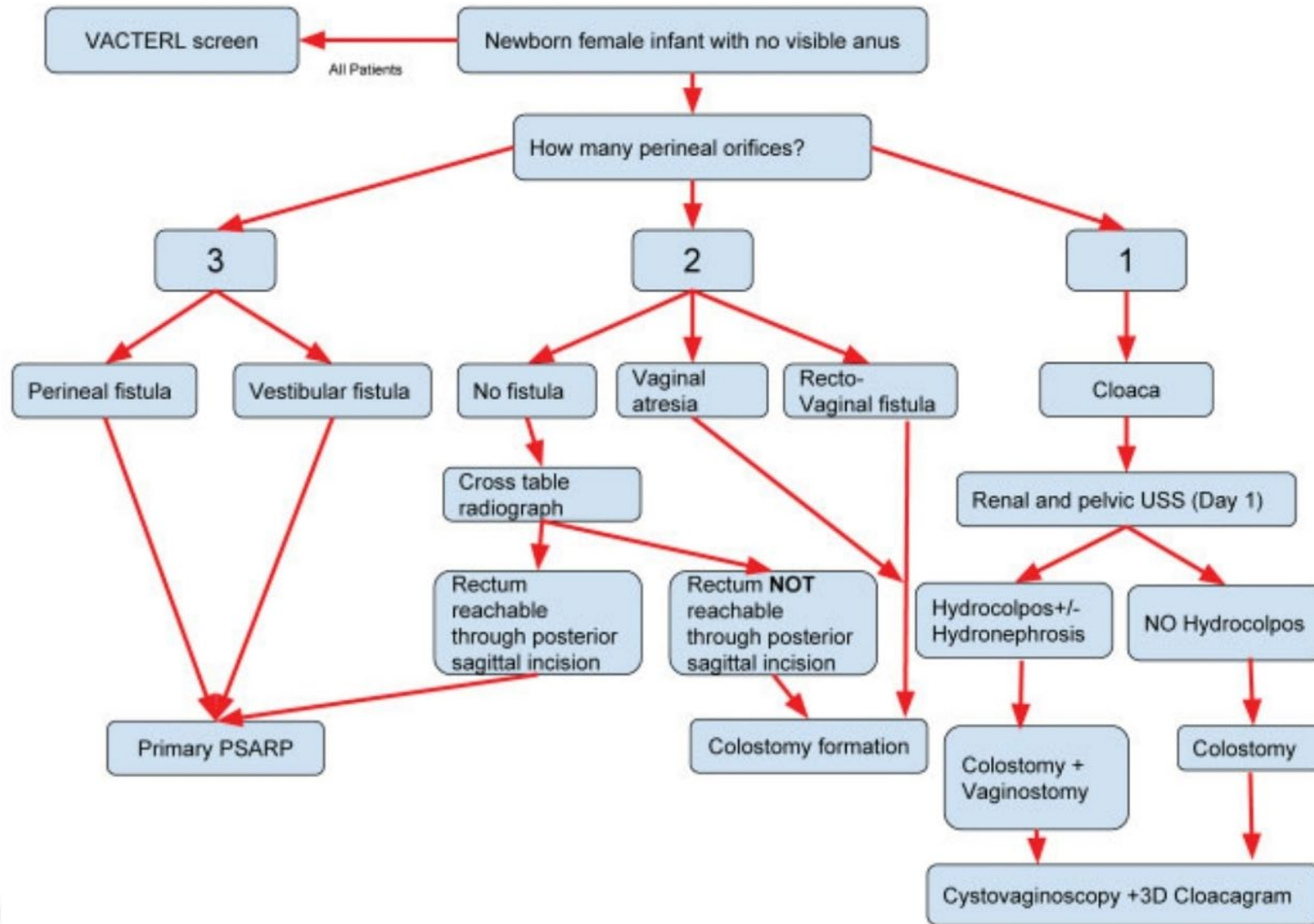


Fig. 6. Intraoperative photo of a posterior sagittal rectoanoplasty.

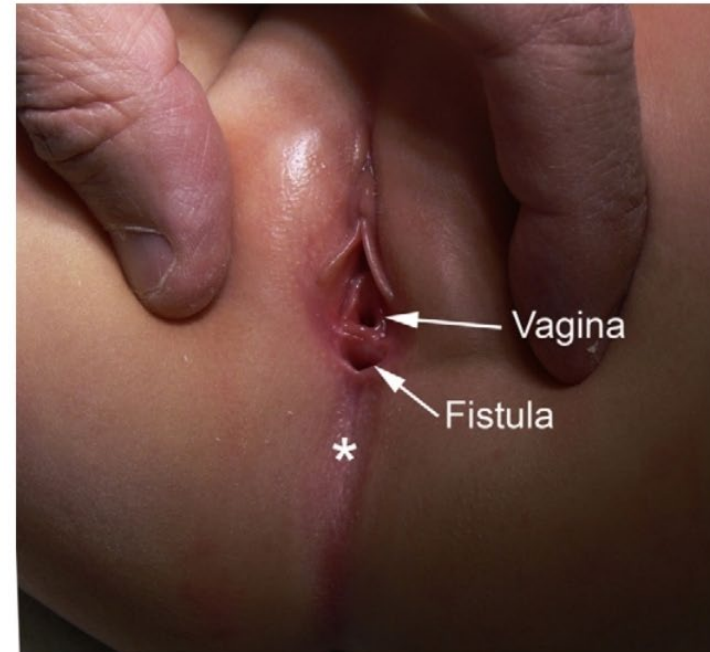


**Fig. 9.** Decision-tree diagram for lesions in the female.

Herman RS, Teitelbaum DH. Anorectal malformations. Clin Perinatol. 2012 Jun;39(2):403-22. doi: 10.1016/j.clp.2012.04.001. PMID: 22682388.



a



**Fig. 10.** Picture of a low imperforate anus in the female, showing 3 distinct orifices. \* Represents site of normal anal opening.



# LAPAROSCOPY IN HIGH ARMS

- SURGICAL REPAIR OF HIGH ARM INVOLVES DISSECTION AND MOBILIZATION OF THE DISTAL RECTUM, LIGATION OF THE FISTULA, AND ACCURATE PLACEMENT WITHIN THE SPHINCTER MECHANISM.
- IN 1982, DEVRIES AND PENA DEVELOPED THE POSTERIOR SAGITTAL ANORECTOPLASTY (PSARP), WHICH IS AN OPEN PROCEDURE THAT ACHIEVES THESE GOALS.
- LAPAROSCOPICALLY ASSISTED ANORECTAL PULL-THROUGH (LAARP) WAS DEVELOPED BY GEORGESON ET AL. LAARP HAS INCREASED IN POPULARITY OVER THE NEAR-TWO DECADE EXPERIENCE

Tashiro J, Sola JE, Thorson CM, Pandya S, Perez EA. Laparoscopic Technique in the Management of High Anorectal Malformations: A Propensity Score-Matched Outcome Study Using a Large Inpatient Database. *J Laparoendosc Adv Surg Tech A*. 2020 Jan;30(1):87-91. doi: 10.1089/lap.2019.0248. Epub 2019 Nov 26. PMID: 31770066.

- HIGH ARMS, WHICH INCLUDE ANORECTAL AGENESIS, RECTOVAGINAL OR RECTOPROSTATIC FISTULA, BLADDER NECK FISTULAS, AND/OR RECTAL ATRESIA, HAVE BEEN APPROACHED VIA THE

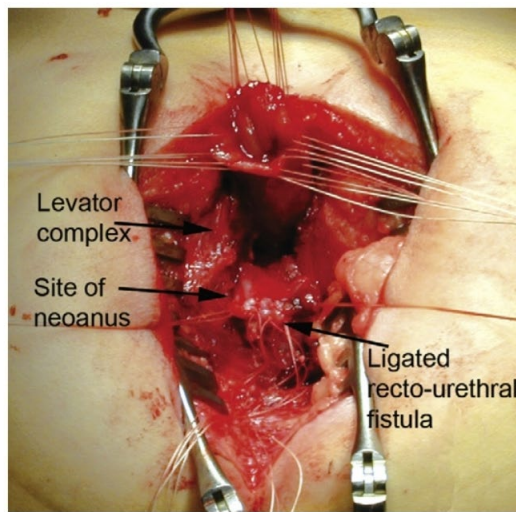


Fig. 7. Positioning of the patient for operative repair.

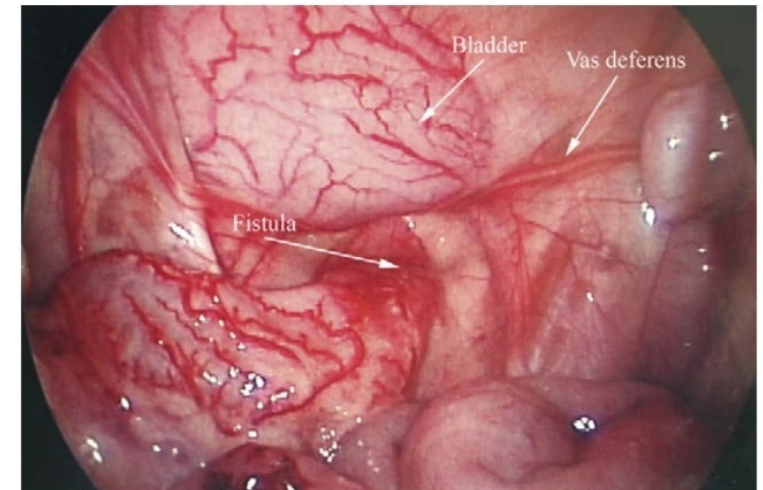


Fig. 8. Laparoscopic view showing bladder, fistula, and vas deferens.

Fig. 6. Intraoperative photo of a posterior sagittal rectoanoplasty.

Tashiro J, Sola JE, Thorson CM, Pandya S, Perez EA. Laparoscopic Technique in the Management of High Anorectal Malformations: A Propensity Score-Matched Outcome Study Using a Large Inpatient Database. *J Laparoendosc Adv Surg Tech A*. 2020 Jan;30(1):87-91. doi: 10.1089/lap.2019.0248. Epub 2019 Nov 26. PMID: 31770066.

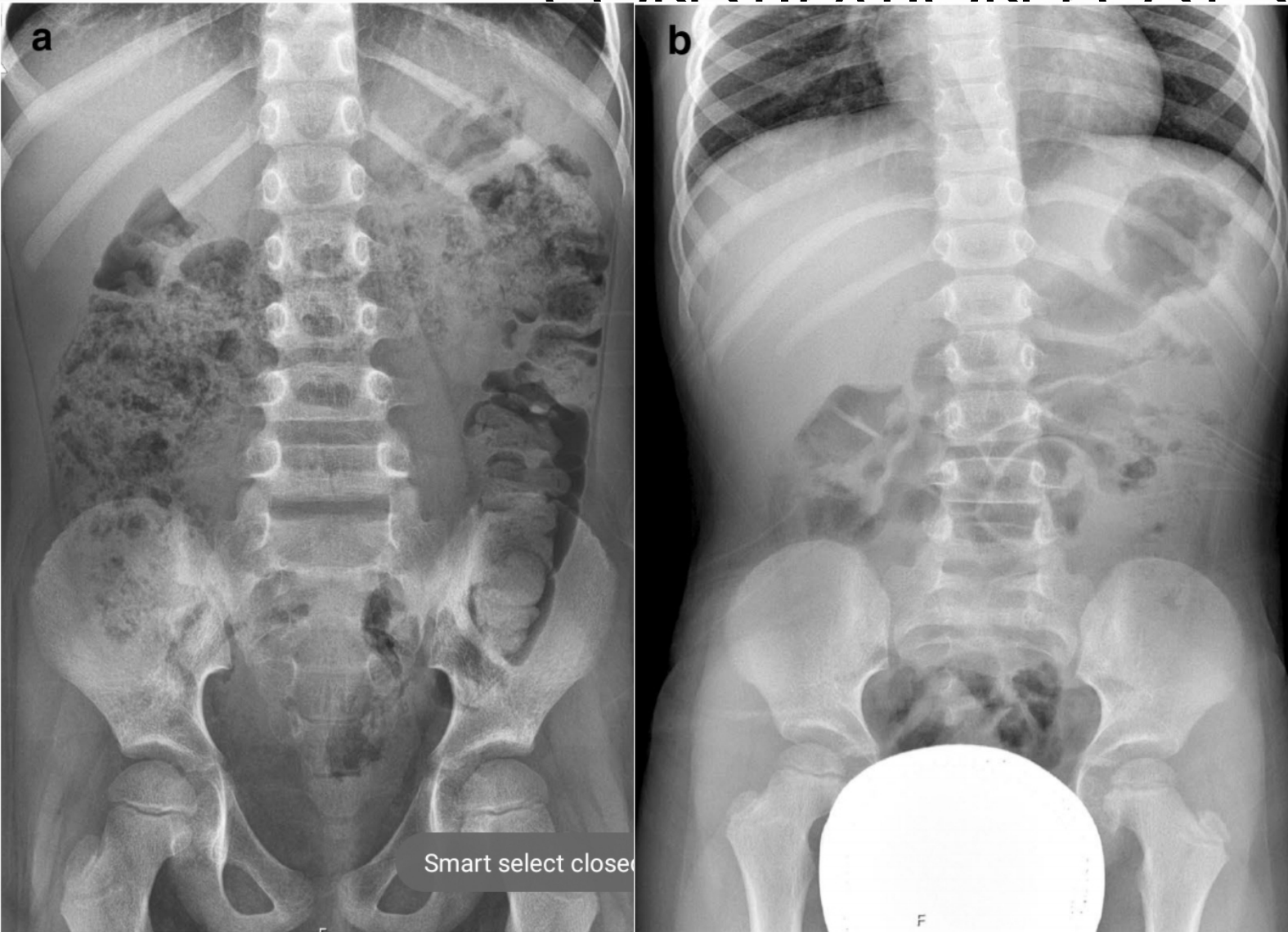


- LAARP HAS BEEN DEMONSTRATED TO HAVE BENEFITS OVER PSARP.
- LAARP HAS LOWER POSTOPERATIVE COMPLICATIONS INCLUDING WOUND INFECTIONS AND DEHISCENCE AS WELL AS LOWER LOS
- MORE FAVORABLE ANAL MANOMETRY FINDINGS, SUCH AS HIGHER ANAL CANAL RESTING PRESSURE, AND LOWER RATES OF SEVERE CONSTIPATION.



- OVERALL POSTOPERATIVE COMPLICATIONS, AS WELL AS SPECIFIC MEASURES OF REOPERATION, WOUND INFECTION, WOUND DEHISCENCE, AND MORTALITY, WERE NOT CHANGED BY THE PROCEDURE PERFORMED.
- BENEFITS OF LAARP WITH REGARD TO RESOURCE UTILIZATION, WHICH MAINTAINING SIMILAR RESULTS TO PSARP WITH REGARD TO COMPLICATIONS FOLLOWING THE SURGICAL REPAIR OF HIGH ARMS TRAINING SURGEONS TO PERFORM LAARP WHEN POSSIBLE FOR THIS INDICATION

## CONSTIPATION POST SURGERY



**Fig. 4 a** Abdominal X-ray in a patient with ARM with constipation, fecal impaction, and occasional soiling; He was started a bowel management program with rectal washouts and oral stimulant laxatives. **b** Plain X-ray of the same patient 2 weeks after the bowel management program; his soiling was ceased and voluntary bowel movements achieved with oral laxatives alone without the need for regular rectal enemas



# CONSTIPATION POST SURGERY

- COMMON LONG-TERM PROBLEM AFTER THE SURGICAL TREATMENT OF ALL TYPES OF ARMS.
- PATIENTS WITH ARMS LACK A NORMAL ANAL CANAL WITH VARIABLE DEGREES OF DEFECTIVE SENSITIVITY AS WELL AS DEFICIENT SPHINCTER MUSCLE COMPLEX TO SQUEEZE AND RELAX VOLUNTARILY DEPENDING ON THE TYPE OF ARM AND ALTERED MOTILITY PROBLEMS, USUALLY HYPOMOTILITY
- MOREOVER, PERIRECTAL DISSECTION CAUSES SOME DEGREE OF DENERVATION WHICH MAY BE RESPONSIBLE FOR THE LACK OF ANAL CANAL SENSATION.
- EARLY RECOGNITION OF PROBLEMS ASSOCIATED WITH CONSTIPATION IS ESSENTIAL TO IMPLEMENT APPROPRIATE MEDICAL TREATMENT AFTER SURGERY OF ARMS TO AVOID CONSTIPATION-RELATED MORBIDITIES.

Divarci E, Ergun O. General complications after surgery for anorectal malformations. *Pediatr Surg Int.* 2020 Apr;36(4):431-445. doi: 10.1007/s00383-020-04629-9. Epub 2020 Feb 21. PMID: 32086570.



- IN PATIENTS WITH ARM, STOOL SOFTENERS USUALLY FAIL AND CAUSE FECAL INCONTINENCE , SINCE THEIR ACTUAL NEED IS TO MODIFY INTESTINAL MOTILITY RATHER THAN STOOL CONSISTENCY.
- STIMULANT LAXATIVES LIKE SENNA HAVE A CLEAR BENEFIT ON BOWEL MANAGEMENT WHEN COMPARED WITH OSMOTIC LAXATIVES
- THE AMOUNT OF LAXATIVE IS USUALLY DETERMINED IN A TRIAL-ERROR FASHION AND SHOULD BE INCREASED UNTIL REACHING OPTIMAL DOSAGE FOR ADEQUATE COLONIC EVACUATION.
- THE TREATMENT OF CONSTIPATION IN ARMS SHOULD CONSIST OF DIETARY RECOMMENDATIONS INCLUDING FIBER, LAXATIVE TREATMENT, AND ENEMA REGIMEN (IF REQUIRED) TO EVACUATE RECTOSIGMOID COLON EFFECTIVELY.



- THE REGIMEN OF LAXATIVES OR ENEMAS SHOULD BE DETERMINED BY A STRUCTURED BOWEL MANAGEMENT PROGRAM. IT IS CRUCIAL TO PREVENT DEVELOPMENT OF MEGARECTUM, SINCE IT COULD LEAD TO INTRACTABILITY OF CONSTIPATION AND FECAL SOILING.
- PATIENTS WITH MEGARECTUM REMAIN UNRESPONSIVE TO BOWEL MANAGEMENT PROGRAM AND MAY ACTUALLY BENEFIT FROM RESECTION OF THE DILATED SEGMENT



# FECAL INCONTINENCE

- FECAL INCONTINENCE IS AN OVERWHELMING AND FREQUENT CLINICAL PROBLEM WHICH NEGATIVELY AFFECTS THE QUALITY OF LIFE OF ARM PATIENTS.
- FECAL INCONTINENCE, DEFINED AS THE INABILITY TO CONTROL THE EMISSION OF FATUS AND/OR FECES, CAN BECOME AN OBSTACLE IN THE OCCUPATIONAL, SOCIAL, EMOTIONAL, SPORTIVE, AND SEXUAL SPHERES OF A PERSON'S LIFE, LEADING TO PSYCHIATRIC DISORDERS AND EVEN LOSS OF INDEPENDENCE



# TYPES OF INCONTINENCE

- OVERFLOW PSEUDOINCONTINENCE MOSTLY DUE TO UNTREATED CONSTIPATION AND ITS LONG-TERM CONSEQUENCES
- TRUE INCONTINENCE
- IT IS IMPORTANT TO DIFERENTIATE BETWEEN THE TWO TYPES, SINCE BOTH HAVE DISTINCT MANAGEMENT STRATEGIES, AND PATIENTS WITH OVERFLOW PSEUDOINCONTINENCE HAVE THE MOST FAVORABLE OUTCOME
- INCONTINENCE COULD CAUSE SEVERE PERIANAL DERMATITIS IN SMALL CHILDREN



Divarci E, Ergun O. General complications after surgery for anorectal malformations. *Pediatr Surg Int.* 2020 Apr;36(4):431-445. doi: 10.1007/s00383-020-04629-9. Epub 2020 Feb 21. PMID: 32086570.



# MANAGEMENT

- THE FIRST STEP OF THE TREATMENT SHOULD BE A DETAILED EVALUATION INCLUDING THROUGH EXAMINATION (EVEN UNDER ANESTHESIA IF REQUIRED) TO DETERMINE THE QUALITY OF SPHINCTERS AND TO EXAMINE THE LOCALIZATION OF ANUS.
- RADIOLOGICAL ASSESSMENT INCLUDING ULTRASONOGRAPHY AND PELVIC MRI MAY ALSO BE REQUIRED.



# MANAGEMENT

- A MISLOCATED ANUS WOULD NEED A REDO SURGERY PROVIDED THAT THE PATIENT HAS GOOD SACRUM AND SPINE
- IF THE PATIENT'S ANUS IS IN ITS NORMAL POSITION, BUT THE CONTINENCE PREDICTION INDEX IS LOW, BOWEL MANAGEMENT PROGRAM SHOULD BE INITIATED TO ACHIEVE FECAL CONTINENCE.
- FOR THOSE PATIENTS WHO ACHIEVE CONTINENCE BY THE BOWEL MANAGEMENT PROGRAM, AND IT IS ANTICIPATED THAT THIS WILL BE NEEDED LIFETIME LONG, MALONE'S ANTEGRADE CONTINENCE ENEMA (MACE)
- EXTERNAL NEUROMYOGENIC STIMULATION WITH PERIANAL ELECTRODES AND SACRAL NERVE

Divarci E, Ergun O. General complications after surgery for anorectal malformations. *Pediatr Surg Int.* 2020 Apr;36(4):431-445. doi: 10.1007/s00383-020-04629-9. Epub 2020 Feb 21. PMID: 32086570.

STIMULATION

ANY QUESTIONS???