

## W20: Diagnostic and therapeutic approach to obstructed defecation syndrome

Workshop Chair: Giulio Aniello Santoro, Italy

21 October 2014 09:00 - 12:00

Start	End	Topic	Speakers
09:00	09:05	Introduction	<ul style="list-style-type: none"> <li>Giulio Aniello Santoro</li> </ul>
09:05	09:20	Anatomy of the pelvic floor and the posterior compartment	<ul style="list-style-type: none"> <li>S. Abbas Shobeiri</li> </ul>
09:20	09:35	Pathophysiology of obstructed defecation syndrome	<ul style="list-style-type: none"> <li>Anders Mellgren</li> </ul>
09:35	09:55	Ultrasonographic imaging in obstructed defecation syndrome	<ul style="list-style-type: none"> <li>Giulio Aniello Santoro</li> </ul>
09:55	10:10	Defecography and dynamic MRI	<ul style="list-style-type: none"> <li>Pawel Wieczorek</li> </ul>
10:10	10:30	Discussion	All
10:30	11:00	Break	None
11:00	11:15	Anorectal manometry and neurophysiologic tests	<ul style="list-style-type: none"> <li>Giulio Aniello Santoro</li> </ul>
11:15	11:30	Surgical management of obstructed defecation syndrome	<ul style="list-style-type: none"> <li>Anders Mellgren</li> </ul>
11:30	11:45	Pelvic Floor Rehabilitation and Biofeedback	<ul style="list-style-type: none"> <li>Julia Herbert</li> </ul>
11:45	12:00	Questions	All

### Aims of course/workshop

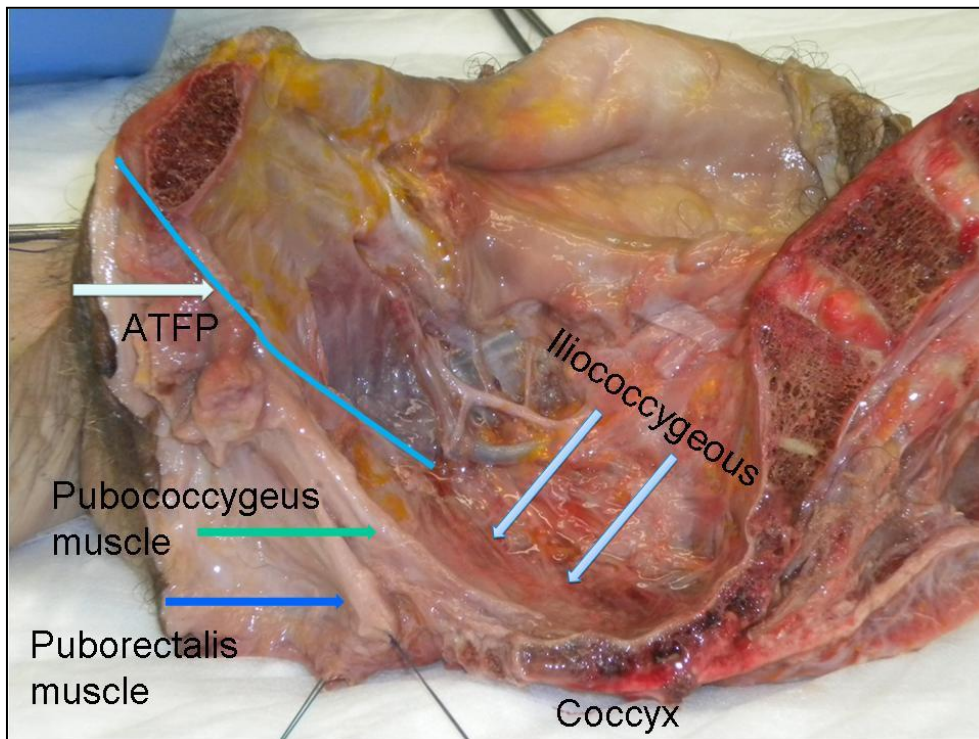
Obstructed defecation syndrome (ODS) can be due to different reasons (rectocele, enterocele, rectal prolapse, intussusception, pelvic floor dyssynergy). Management of ODS depends on a comprehensive understanding of the anatomy and function of the anorectal region. Aims of this workshop are to provide participants the basic knowledge on: 1) the normal anatomy of the anorectum, 2) the diagnostic procedures including imaging techniques, manometric and neurophysiologic tests and 3) the main guidelines and indications for the treatment of ODS.

The pelvic organs rely on their connective tissue attachments to the pelvic walls and support from the levator ani muscles that are under neuronal control from the peripheral and central nervous systems. The term “pelvic floor” is used broadly to include all the structures supporting the pelvic cavity rather than the restricted use of this term to refer to the levator ani group of muscles.

The female pelvis can naturally be divided into anterior and posterior and lateral compartments. The genital tract (vagina and uterus) divides the anterior and posterior compartments through lateral connections to the pelvic sidewall and suspension at its apex. The levator ani muscles form the bottom of the pelvis. The organs are attached to the levator ani muscles when they pass through the urogenital hiatus and are supported by these connections.

### The Levator Ani Muscle

Below and surrounding the pelvic organs is the levator ani muscles. There are three major components of the levator ani muscle. The iliococcygeal portion forms a thin, relatively flat, horizontal shelf that spans the potential gap from one pelvic sidewall to the other. The pubovisceral (also known as the pubococcygeus) muscle attaches the pelvic organs to the pubic bone while the puborectalis muscle forms a sling behind the rectum (**Figure 1**). The lesser known subdivisions of the levator are pubovaginal, puboanal and the puboperineal muscles. When these muscles and their covering fascia are considered together, the combined structures are referred to as the pelvic diaphragm. Once the pelvic musculature becomes damaged and no longer holds the organs in place, the ligaments are subjected to excessive forces.

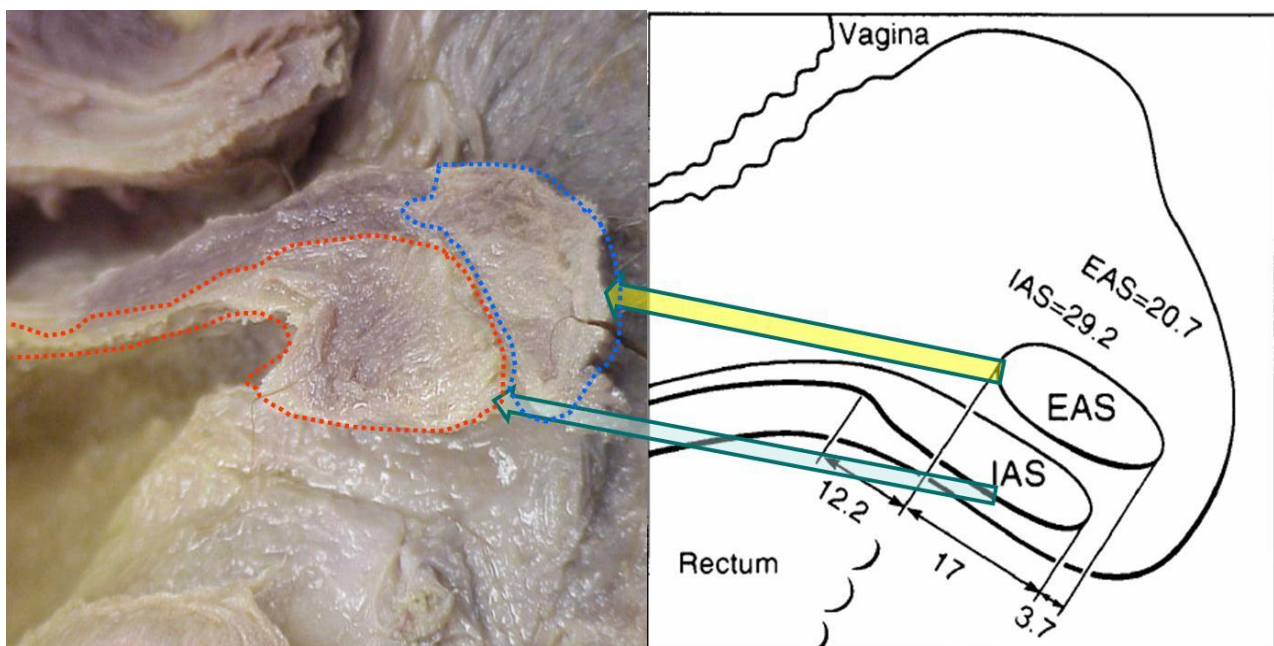


**Figure 1**

## Posterior Compartment and Anal Sphincters

The posterior vagina is supported by connections between the vagina, the bony pelvis, and the levator ani muscles. The lower one-third of the vagina is fused with the perineal body (DeLancey's level III). The mid-posterior vagina (DeLancey's level II) is connected to the rectum by sheets of rectovaginal fascia. These connections prevent vaginal descent during increases in abdominal pressure. In its upper one-third, the posterior vagina is connected laterally by the paracolpium of DeLancey's level I. Separate systems for anterior and posterior vaginal support do not exist at level I. Protrusion of the rectum between the levator ani muscles can be seen when a disruption of the perineal body and connections of the perineal membrane occurs.

Three muscular structures that maintain fecal continence are comprised of the internal anal sphincter (IAS), the external anal sphincter (EAS), and the puborectalis muscle. The anal canal is 2-4cm long. The spatial relationships between the internal and external anal sphincters are such that the internal anal sphincter always extends above the external anal sphincter for a distance of greater than 1 cm. The internal sphincter lay consistently between the external sphincter and the anal mucosa, usually overlapping by 17.0 mm. In the majority of cases, the EAS begins inferior to the IAS by a few millimetres (**Figure 2**).



**Figure 2**

The IAS extends one cm below the dentate line. The striated muscle fibers from the levator ani become fibroelastic as they extend caudally to merge with the conjoined longitudinal layer (CLL) that is inserted between the EAS and IAS. The EAS includes a subcutaneous portion (SQ-EAS), a visibly separate deeper portion (EAS-M), and a lateral portion that has lateral winged projections (EAS-W). The SQ-EAS is the distinct part of the EAS. A clear separation does not exist between concentric portion of EAS-M and the winged EAS-W. The EAS-W fibers have differing fiber directions than the other portions, forming an open “U-shaped” configuration. These fibers are contiguous with the EAS but visibly separate from the puborectalis muscle, whose fibers they parallel.



## Pathophysiology of obstructed defecation syndrome

Anorectal outlet obstruction, also known as obstruction defecation syndrome (ODS), is a pathological condition due to a variety of causes and is characterized by an impaired expulsion of the bolus after calling to defecate. Patients complain of different symptoms, including incomplete evacuation with or without painful effort, unsuccessful attempts with long periods spent in bathroom, return visit to the toilette, use of perineal support, manual assistance (insertion of finger into the vagina or anal canal), straining, and dependence on enema and/or laxatives.

The main distinction in the pathogenesis of ODS is between functional and mechanical causes. In ODS, anatomical findings must always be matched with patients' complaints and quality of life. Mechanical obstruction is nearly always associated to a combination scenario of different pathological conditions: according to this, in ODS patients, an accurate diagnostic workup is mandatory to rule out all pathological conditions that can be responsible.

Failure to release the anal sphincters or paradoxical contraction of the puborectalis muscle are considered the main and most frequent functional causes of ODS. In these patients, biofeedback can achieve reactivation of the inhibitory capacity of all pelvic floor muscles involved in defecation, with an improvement in symptoms of 50%.

The most relevant mechanical causes of ODS are:

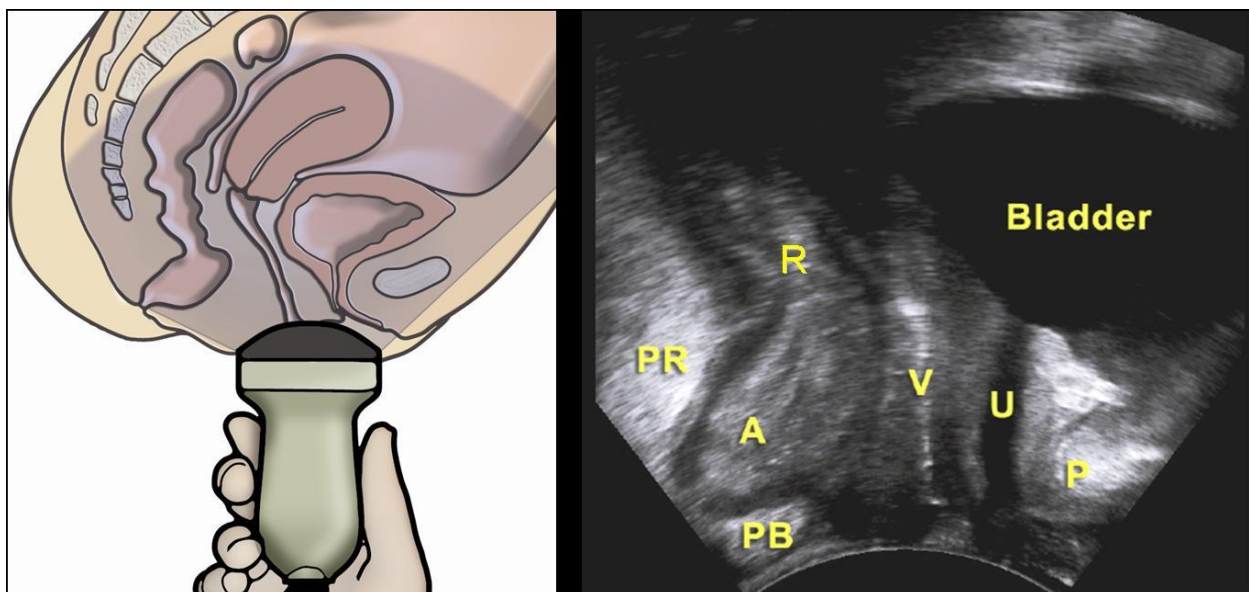
1. *Rectocele*: defined as a herniation of the rectal wall through a defect in the posterior rectovaginal septum in the direction of the vagina. Rectocele may be classified according to its position (low, middle, high), size (small <2 cm, medium 2–4 cm, large >4 cm) and degree (using Half-way system or POP-Q system). It is very frequent in healthy asymptomatic women and it should not be considered a pathological condition only because it is evident at clinical examination or at the defecography.
2. *Intussusception*: is defined as an invagination of the rectal wall into the rectal lumen. It may be described as anterior, posterior, or circumferential. It may involve the full thickness of the rectal wall or only the mucosa and it can be classified as intrarectal (if it remains in the rectum), intra-anal (if it extends into the anal canal), or external (if it forms a complete rectal prolapse)
3. *Enterocoele*: it is a hernia of the small bowel or sigmoid colon (sigmoidocoele) into the pouch of Douglas, which protrudes into the posterior vaginal wall and needs to be differentiated from a true rectocele. Most enterocoelae occur after vaginal or abdominal hysterectomy. It may be symptomatic, causing symptoms of outlet obstruction, and it can also lead to voiding dysfunction.

Pelvic floor US includes different techniques (endovaginal, EVUS; endoanal, EAUS; translabial, TLUS) that may be combined to achieve a complete anatomic and functional assessment. Ultrasound has several important advantages over other imaging modalities (defecography, dynamic magnetic resonance imaging): absence of ionizing radiation, relative ease of use, minimal discomfort, cost-effectiveness, limited time requirement, and wide availability. The recent development of 3-dimensional (3D) and 4-dimensional (4D) US, have renewed interest in the use of this modality to image pelvic floor anatomy as a key to understanding dysfunction.

### Methodology of Pelvic Floor Ultrasound

Standardization of US techniques for pelvic floor imaging (equipment, patient preparation and patient position, technique of examination, image orientation and imaging planes, manner of performing measurements) is essential for repeatability.

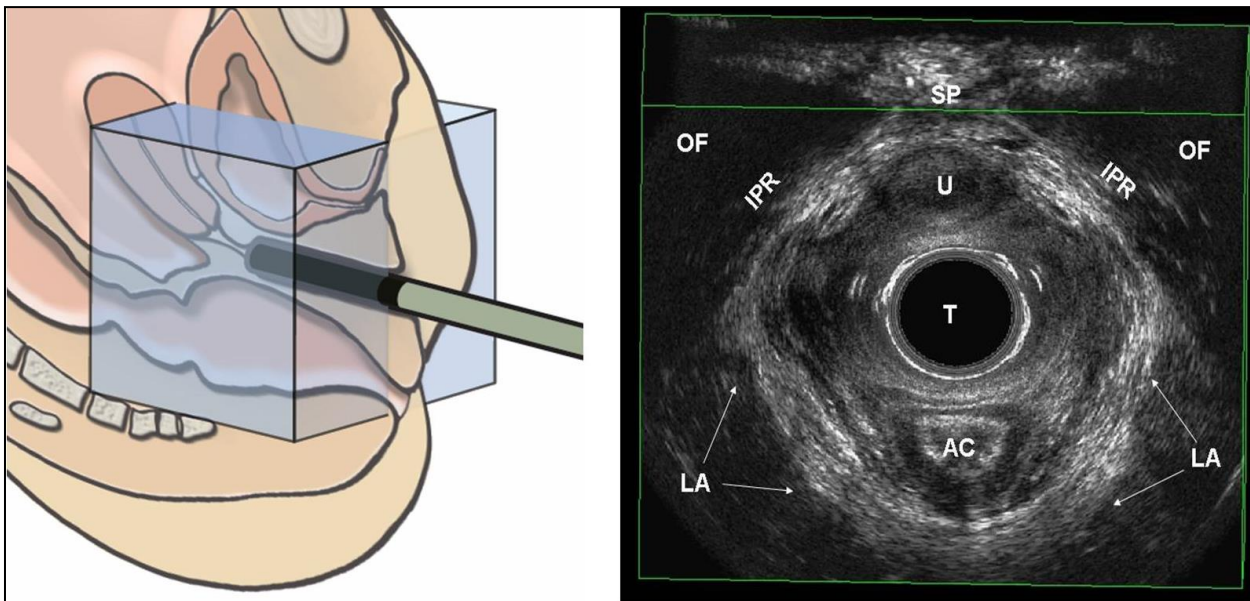
Basic requirement for TLUS include a 3.5-6 MHz curved array transducer with a field of view at least 70°. The transducer is placed on the perineum between the mons pubis and the anal margin. Imaging is initially performed with the patient at rest, positioned in dorsal lithotomy, with the hips flexed and slightly abducted, or in the standing position. 2DTLUS provides a midsagittal view of the pelvic floor, including the symphysis pubis (SP) anteriorly, the urethra and bladder neck, the vagina, cervix, rectum, and anal canal. Posterior to the anorectal junction, a hyperechogenic area indicates the central portion of the levator plate, ie, the puborectalis muscle (PR) (**Figure 3**).



**Figure 3**

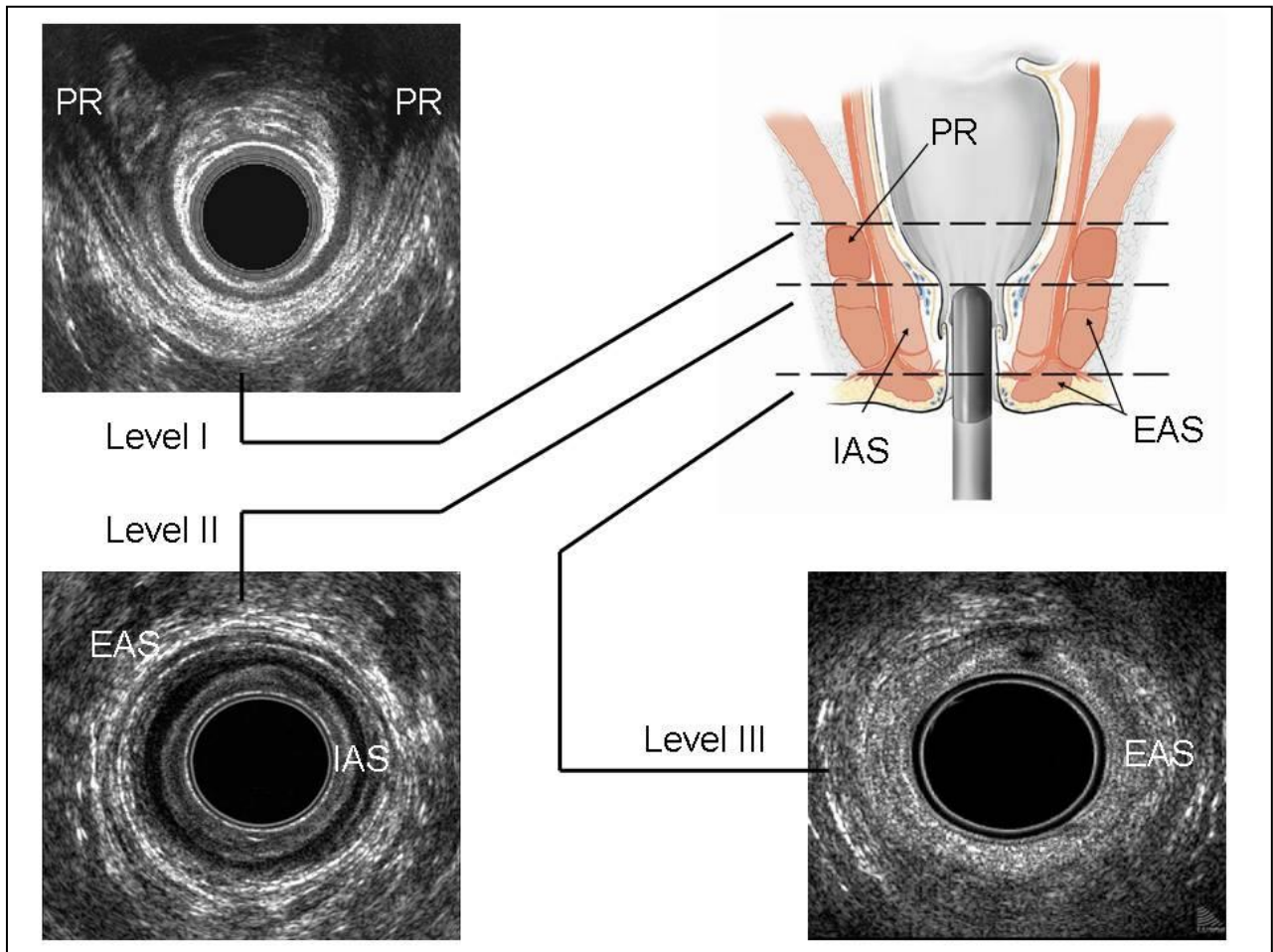
The valsalva maneuver is routinely used to reveal pelvic organ prolapse (POP) as downward displacement of pelvic organs below a line placed through the inferoposterior symphyseal margin. Pelvic floor muscle contraction (PFMC) during US is a highly useful tool in the assessment of the pelvic floor musculature, both in purely anatomical terms and for function. A levator contraction will reduce the size of the levator hiatus (LH) in the sagittal plane and elevate the anorectum, changing the angle between the levator plate and SP. As an indirect effect, other pelvic organs are displaced cranially, and there is compression of the urethra, vagina, and anorectal junction, explaining the importance of the LA for urinary and fecal continence as well as for sexual function. Currently, the most common 3D probes are those that combine an electronic curved array of 3 to 8MHz with mechanical sector technology, allowing fast motorized sweeps through a field of vision. 4D imaging implies the real-time acquisition of volume ultrasound data.

Endovaginal US can be performed with rotational mechanical or radial electronic transducers that provide a 360° view of the pelvic floor or with an electronic biplane transducer with a linear array that provides midsagittal sectional imaging of the posterior compartment. The mechanical transducer has an internal automated motorized system that allows an acquisition of 300 aligned transaxial 2D images over a distance of 60 mm in 60 seconds. The set of 2D images is instantaneously reconstructed into a high resolution 3D image for real-time manipulation and volume rendering. 3D-EVUS provides the following information in the reconstructed axial plane: (1) LH dimensions: determined in the plane of minimal anteroposterior dimensions; (2) PR muscle dimensions: determined in the plane of maximum muscle thickness; (3) Qualitative assessment of the PR and its insertion on the inferior pubic rami (**Figure 4**).



**Figure 4**

Endoanal US is performed with the same 360° field of view transducers used for EVUS. The anal canal is divided into 3 levels of assessment in the axial plane, referring to the following anatomical structures: (1) upper level: corresponds to the sling of the PR and the complete ring of the IAS; (2) middle level: corresponds to the superficial part of the EAS (concentric band of mixed echogenicity), the conjoined longitudinal layer, the IAS (concentric hypoechoic ring), and the transverse perineal muscles; (3) lower level: corresponds to the subcutaneous part of the EAS (**Figure 5**).

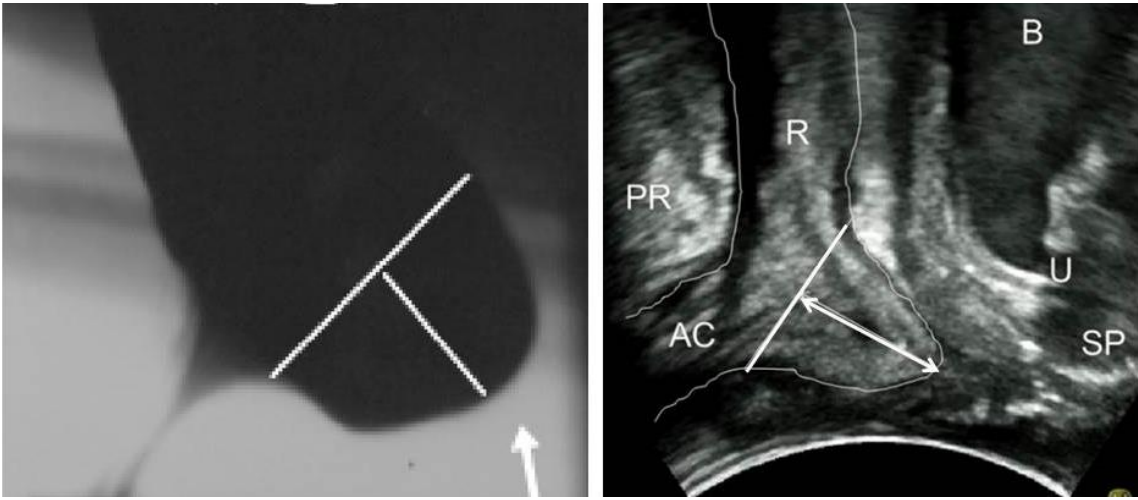


**Figure 5**

### **Clinical Application of Pelvic Floor Ultrasound in ODS**

Pelvic floor US can be used to assess LA avulsion, that is the disconnection of the muscle from its insertion on the inferior pubic ramus (IPR) and the pelvic sidewall. Avulsion is the consequence of overstretching of the LA during crowning of the fetal head and occurs in 10%-36% of women at the time of their first delivery. The main effect of avulsion is probably attributable to the enlargement of the LH that may result in excessive loading of ligamentous and fascial structures, which may, over time, lead to connective tissue failure and the development of prolapse.

Dynamic TLUS and EVUS has been shown to demonstrate rectocele, enterocele, and rectal intussusception with images comparable to defecography. The extent of a rectocele is measured as the maximal depth of the protrusion beyond the expected margin of the normal anterior rectal wall. On sonographic imaging, a herniation of a depth of greater than 10 mm has been considered diagnostic (**Figure 6**). The rectal intussusception may be observed as an invagination of the rectal wall into the rectal lumen or the anal canal during maximal valsalva maneuver. Enterocele is ultrasonographically visualized as downward displacement of abdominal contents into the vagina, ventral to the rectal ampulla and anal canal. Small bowel may be identifiable due to its peristalsis. The extent of an enterocele is measured against the inferior margin of the symphysis pubis. Pelvic floor dyssynergy can be documented during valsalva maneuver because the ARA becomes narrower, the LH is shortened in the anteroposterior dimension and the PR thickens in evidence of a contraction. The most relevant utility of EAUS applies in the detection of localized EAS and/or IAS defects in patients with obstructive defecation disorders.



**Figure 6**



### DEFECOGRAPHY

Defecography, or evacuation proctography plays an important diagnostic role in patients with ODS. At rest, the anal canal is closed, and the rectum assumes its normal upright configuration. The position of the pelvic floor is often inferred by reference to the pubococcygeal line (inferior margin of pubic symphysis to the sacrococcygeal junction). Perineal descent is measured from this line to the anorectal junction and may be up to 1.8 cm at rest. Some pelvic floor descent during evacuation is considered normal, and a descent of up to 3 cm from the rest position to anal canal opening is acceptable. The anorectal angle (ARA) is defined as the angle between the anal canal axis and the posterior rectal wall and on average is around 90°. The puborectalis muscle impression is often visible at rest. The puborectalis length (PRL) can be estimated by measuring the distance between the ARA and symphysis pubis. The emptying phase of the proctogram gives important information about rectal structure and function. In normal proctogram we observe an increase in the ARA, obliteration of the puborectalis impression, wide opening of the anal canal, evacuation of rectal contents, and lack of significant pelvic floor descent. After evacuation is complete, the anal canal should close, the ARA recover, and the pelvic floor return to its normal baseline position.

### Abnormal Study

- 1. Intussusception and prolapse:* Intussusception refers to infolding of the rectal wall into the rectal lumen. It may be described as intrarectal, intraanal, or external to form a complete rectal prolapse. A useful indicator of true intussusception is the presence of abnormally wide invaginating rectal folds measuring more than 3 mm. A more robust method is the calculation of the ratio of the intussusciens diameter and intussusceptum lumen diameter. A ratio of more than 2.5 is highly suggestive of true intussusception. Full rectal prolapse is easily diagnosed, as the intussusceptum continues its descent and becomes exteriorized as a barium coated “mass” beyond the anal canal.
- 2. Rectocele:* Rectocele diagnosis on evacuation proctography is straightforward and can be defined as any anterior rectal bulge. The depth of a rectocele is measured from the anterior border of the anal canal to the anterior border of the rectocele. A distance of <2 cm is classified as small, 2–4 cm as moderate, and >4 cm as large. A small rectocele is essentially a normal finding in many women. More relevance is barium trapping at the end of evacuation (defined as retention of >10% of the area, and this itself is related the size of the rectocele).
- 3. Enterocele:* An enterocele is diagnosed when small bowel loops enter the peritoneal space between the rectum and vagina (rectogenital space). Diagnosis of an enterocele on proctography is only really possible if oral contrast has been administered before the examination. The rectogenital space widens after evacuation when pressure from the adjacent full rectum is reduced, and as such, enteroceles are usually diagnosed at the end of the procedure. Formation can be prevented by filling of the rectogenital space with any other structure such as a cystocele or large rectocele. Herniation of the sigmoid into the rectogenital space (sigmoidocele) is significantly less common than an enterocele although symptoms may be more severe. Diagnosis is based on the barium-filled sigmoid (or fecal contents within the sigmoid) anterior to the rectum.

4. *Functional Abnormalities*: although the diagnosis of anismus may be suggested by tests of anorectal physiology, proctography has an important diagnostic role. Various proctographic abnormalities have been described, including prominent puborectal impression, a narrow anal canal, and acute anorectal angulation. Moreover, patients with anismus classically demonstrate delay in anal canal opening and prolonged, incomplete evacuation.

## DYNAMIC MRI

Although conventional defecography has its value in diagnostic assessment, the technique has some significant limitations. There is a considerable irradiation associated with conventional evacuation proctography; the technique is limited from a practical point of view by its projectional nature and its inability to detect soft tissue structures. Over recent years, dynamic magnetic resonance imaging (MRI), also called MR defecography, has gained increasing interest for assessment of pelvic floor abnormalities. Dynamic pelvic MRI may be performed in closed- and open-configuration MR systems and allows for evaluation of the pelvic floor in different positions. Images are obtained at rest, at maximal sphincter contraction, during straining, and during defecation in the midsagittal plane.

### MR Findings in Patients with Outlet Obstruction

1. *Rectocele*: An anterior rectocele is the most frequent anatomical abnormality in patients with pelvic floor disorders and is defined as a rectal wall protrusion or bulging during defecation. The anterior wall is most commonly involved, but a rectocele may also be located in the posterior rectal wall. Dynamic MR enables an accurate assessment of size, location, and degree of emptying of a rectocele, which are important factors for treatment strategy. Using dynamic pelvic MRI, an anterior rectocele may be classified with regard to its size, expressed as the depth of wall protrusion beyond the expected margin of the normal anterior rectal wall, into small (<2 cm), moderate [2–4 cm], and large (>4 cm). In addition, rectoceles are classified into those with complete evacuation and those with incomplete evacuation depending on the contrast material retention at the end of defecation (**Figure 7**).



**Figure 7**

2. *Enterocele*: Enterocele is defined as an internal herniation of the peritoneal sac below the pubococcygeal line (PCL) into the rectovaginal space. The PCL is defined as the line that joins the inferior border of the symphysis pubis to the last coccygeal joint on midsagittal images. The PCL is used as the reference line for pelvic floor weakness evaluation. Along this line, which is independent of the pelvic position, the pelvic floor muscle and pubovesical ligament attach. Enteroceles most frequently occur at the end of evacuation and can be filled with omental fat (peritoneocele), small bowel (enterocele), or sigmoid colon (sigmoidocele). The extent of an enterocele is measured at 90° to the PCL from the lowest margin of herniation content (e.g., small-bowel loop) during evacuation effort on defecography. They are classified as small if they extend less than 3 cm below the PCL, moderate if they extend from 3 to 6 cm below this line, and large if they extend 6 cm or more below this line. Large enteroceles slipping over the anal canal lead to outlet obstruction and a feeling of incomplete evacuation due to rectal compression.

2. *Rectal prolapse*: Rectal prolapse is an invagination of the rectal wall and may be classified as internal or external. The location may be anterior, posterior, or circumferential and may involve all rectal-wall layers (full-thickness prolapse) or only the mucosa (mucosal prolapse). The internal rectal prolapse, also called intussusception, may be classified as intrarectal internal prolapse when the invagination is confined to the rectum or as an intra-anal internal prolapse when its apex penetrates the anal canal and remains in it during straining. The external rectal prolapse is an invagination of the rectal wall beyond the anal canal. The mean frequency of internal rectal prolapse is between 12% and 27% in patients with evacuation disorders, and the most frequent clinical manifestation is the feeling of incomplete evacuation. Dynamic MRI enables differentiation between a mucosal internal prolapse and a full-thickness internal prolapse, which is of clinical importance since the treatment is different.

3. *Pelvic floor descent*: Pelvic floor descent, or descending perineal syndrome, is an excessive caudad movement of the pelvic floor during evacuation. This abnormality is the most common finding in patients with outlet obstruction and is associated with pelvic pain and a feeling of incomplete evacuation. Outlet obstruction may be associated with a descent of any of the three pelvic compartments (i.e., posterior, middle, or anterior). The landmark for the posterior compartment is the anorectal junction. There are different quantification or grading systems, but the preferred is to measure the descent of the anorectal junction with respect to the PCL. A small rectal descent is considered when the anorectal junction is less than 3 cm below the PCL, a moderate descent when the distance between anorectal junction and PCL is between 3 and 6 cm, and a large rectal descent when the distance between the anorectal junction and PCL is more than 6 cm. Pelvic floor weakness is generalized and frequently involves multiple sites especially in constipated patients. Cystoceles are expression of the descent of the anterior compartment, and descent of the vaginal vault (or any part of the remaining cervix in case of hysterectomy) represents descent of the middle compartment. The descent of the anterior and middle compartments are quantified relative to the PCL in a similar fashion as described for the posterior compartment.

4. *Anismus*: Anismus is an outlet obstruction characterized by difficulties in rectal evacuation due to an abnormal activity of pelvic floor musculature. During normal defecation, the pelvic floor descends, the internal and external sphincters relax, and the anorectal junction opens due to the puborectalis muscle reflex inhibition. A paradoxical contraction or an insufficient relaxation of the puborectalis or external sphincter muscles are the causes of obstruction and, in most cases, these dysfunctions are not confined to a single muscle. At dynamic pelvic MRI, findings of functional ODS are represented by a prolonged attempted defecation and incomplete evacuation and by the behavior of the ARA, that becomes more acute instead of obtuse.



## Anorectal manometry and neurophysiologic tests

Pelvic organ prolapse is related to the impairment of anatomical support of pelvic viscera provided by the levator ani muscle complex and the connective tissue attachments of the pelvic organs (endopelvic fascia). The disruption or dysfunction of one or both of these components may also occur in descending perineum syndrome. There is undoubtedly a large group of constipated patients who complain bitterly of inability to evacuate but in whom no significant underlying structural abnormality is found. Clinically, they are often recognized by their inability to evacuate a rectal balloon.

Anorectal manometry can provide useful data for evaluation of anorectal function in patients affected by posterior prolapse: sphincter activity, rectal compliance, and rectal sensation may be tested. Posterior vaginal wall prolapse concerns the rectum (rectocele) but can also include the small (enterocele) or large bowel (sigmoidocele). Anterior rectoceles represent a herniation of the anterior rectum into the posterior wall of the vagina. There are two types of anterior rectocele: the “distension” rectocele, where vaginal vault and uterus are in a normal position within the pelvis, and the “displacement” rectocele, which occurs when the posterior vaginal wall follows the descent of the vaginal vault. Anorectal dysfunction may be noted in both types of rectocele: the distension rectocele is related to a pelvic floor dyssynergia, a collapse of the pelvic floor connotes the displacement rectocele. Anorectal manometry provides different reports: paradoxical sphincter response (impaired anal relaxation at straining) is detected as a marker of pelvic floor dyssynergia. Low pressures of the anal canal are recorded, at rest and during maximal voluntary contraction, in patients with displacement rectocele. Therefore manometric evaluation, supplemented by other physiologic and morphologic tests, is indispensable for the therapeutic strategy. When there are signs of paradoxical sphincter response, a rehabilitative attempt is essential; on the other hand, surgical repair of the large rectocele may be considered in the absence of dyssynergic defecation or after failed rehabilitative treatment.

Three common tests are frequently utilized in the evaluation of neuromuscular disorders: (A) *Nerve conduction studies*, which evaluate the velocity of propagation of an action potential along different nerve segments; (B) *Repetitive nerve stimulation*, which tests the consistency of transmission across the neuromuscular junction; and (C) *Electromyography*, which evaluates the intramuscular response to inherent neuronal signals. These tests are complementary to one another; no one test provides all the diagnostic information. In addition, multiple testing sites are required to not only localize the injury, but also to describe the extent of affected anatomy.

The levator ani complex is likely innervated by direct sacral branches rather than by branches from the pudendal nerve. Access to the most distal and medial muscles of the levator ani complex can be achieved in two ways. The muscle is palpated transvaginally and the needle can be directed through the vaginal mucosa posterolaterally, until EMG activity is detected. Using a longer needle, the muscle can alternatively be accessed following anal sphincter EMG. This is done by directing the needle in the posterior portion of the anal sphincter beyond to the anal sphincter. Initially, as the needle is advanced beyond the anal sphincter, one encounters an area of electrical silence in the medial limits of the ischioanal fossa, then EMG activity resumes when the needle reaches the levator ani. Electromyographic data suggest that patients with anismus may inappropriately contract their pelvic floor muscles on evacuation.



## Management of obstructed defecation syndrome

Treatment of outlet obstruction is often disappointing, and many authors reported no encouraging results after surgery. As a consequence, an initial conservative approach has been encouraged: high-fiber diet, biofeedback, and rehabilitation of the pelvic floor muscles can help to reduce symptoms of outlet obstruction.

When it has been demonstrated that the predominant alteration is the rectocele, repair of the anterior rectal wall through the different approaches described (transvaginal, perineal, or transanal) should be performed. The simplest operation is the transanal suture of the anterior rectal wall, with satisfactory results in more than 80% of patients. Depending on the size and in absence of a large rectal intussusception, Sarles operation may be carried out and combined with an anterior levatorplasty in case of contextual presence of fecal incontinence. Taking into consideration new technologies, rectocele and rectal occult mucosal prolapse may be also resected with a GIA stapler (STARR or TRANS-STAR procedures) with satisfactory short-term results. Alternative approaches are represented by discrete fascia repair or mesh (biologic or synthetic) positioning.

Rectal prolapse surgery can be performed by a perineal, abdominal or laparoscopic approach. The perineal approaches (Delorme or Altemeir) are reserved for elderly patients with significant comorbidity as they are associated with limited surgical stress and relatively low postoperative morbidity. Nevertheless, recurrence rates up to 58% and persistent bowel dysfunction are commonly reported. The abdominal approach is considered to be the choice for patients in good health condition. The decision on whether or not to perform sigmoid resection is based on bowel function and sphincter muscle status. If the patient has normal bowel function or constipation associated with normal anal tone, a resection (Frykman-Goldberg technique) is preferred. Whenever diarrhea or sphincter damage is suspected, the maintenance of the sigmoid colon (suture rectopexy; Ripstein technique – anterior sling rectopexy; Wells technique – posterior mesh rectopexy) seems to be correlated with better functional results.

The laparoscopic approach (laparoscopic ventral rectopexy) in comparison with the laparotomic approach has the following advantages: reduced postoperative pain, shorter hospitalization, better cosmesis, and earlier recovery. Currently, laparoscopy is the preferred approach for the abdominal management of complete rectal prolapse. New minimally invasive techniques are emerging, such as robotic assisted and single trocar laparoscopy; however, any real role of these modalities has been proven.

Patients with intractable constipation can be treated with Sacral Nerve Stimulation, involving an electrostimulation of the sacral nerves and pudendal nerve by means of an implantable pulse generator.

In conclusion, the surgeon must elect his surgical approach accordingly to each individual patient, depending on gender, co-morbidities, presence of constipation, prior abdominal surgery, and recurrence. If the case is a recurrence, it is of utmost importance to know which surgery was performed which would allow the surgeon to plan the procedure adequately and know the available blood supply.



## **Pelvic Floor Rehabilitation and Biofeedback**

Continence is a complex mechanism, in which different anatomical and functional parts interplay, and any condition that alters this equilibrium, can theoretically cause defecation disorders. Normal defecation is related to the following mechanisms: voluntary relaxation of puborectalis and external anal sphincter, intra abdominal pressure increased / closed glottis initiates rectal emptying, achieved with eccentric contraction abdominal muscles with diaphragmatic descent, pelvic floor descends 2-3 cm anal canal funnels, isometric contraction pubococcygeus, iliococcygeus and ischiococcygeus-rectal support, stabilised trunk and >90 degree hip flexion and closing reflex-sphincters, PR levator plate.

Biofeedback is a strategy based on operating condition derived from the psychological learning theory and is an effective therapy in patients with ODS associated with pelvic floor dyssynergy. Biofeedback training is aimed to instruct patients how to relax their striated muscle sphincter apparatus, by means of techniques that are directed to modification of rectal perception and puborectalis responsiveness. Modes of therapeutical action imply that patient is able to comprehend and willing to cooperate with therapist. Different devices can be utilized and vary from visual, verbal or auditory feedback.

Essentially, three modality of treatment are employed to teach the patients to exercise anal muscles. The first modality consists of anal manometric catheter, intra-anal electromyography (EMG) electrodes, or perianal external EMG electrodes. Ultrasound has been used as well to monitor sphincter contraction. Pressures or EMG signals are displayed on a monitor or chart recorder to illustrate the patient how the sphincter function and to teach how to isolate anal sphincter contraction from buttocks and abdominal effort. The second mode consists of a three-balloon system to facilitate sensor-motor coordination, by correctly identifying rectal distention and responding by relaxation of the puborectalis and anal sphincters. The third approach implies sensory impairment re-training and patient is taught to discriminate smaller volume of balloon distention, by gradually reducing rectal volume inflation. Trained patients learn how to promptly relax pelvic floor muscles as balloon rectal distension is perceived.

Patients with slow transit and disordered defecation showed benefits from biofeedback, compared to patients with isolated slow transit, demonstrating that disordered defaecation may secondarily delay transit and that after dyssynergy was eliminated, transit normalised.



## References

Santoro GA, Wieczorek AP, Stankiewicz A, et al. High-resolution three-dimensional endovaginal ultrasonography in the assessment of pelvic floor anatomy: a preliminary study. *Int Urogynecology J* 2009;20:1213-22

Shobeiri SA, LeClaire E, Nihira MA, Quiroz LH, O'Donoghue D. Appearance of the Levator Ani Muscle Subdivisions in endovaginal 3-Dimensional Ultrasonography. *Obstet & Gynecol* 2009;114:66-72

Santoro GA, Fortling B. The Advantages of Volume Rendering in Three-Dimensional Endosonography of the Anorectum. *Diseases of the Colon & Rectum*. 2007;50:359-68

Santoro GA, Wieczorek AP, Dietz HP, et al. State of the art: an integrated approach to pelvic floor ultrasonography. *Ultrasound Obstet Gynecol* 2011;37:381-396

Santoro GA, Dietz HP. Ultrasonographic evaluation of outlet obstruction and the female pelvic floor. *Seminars in Colon & Rectal Surgery* 2010

Haylen BT, de Ridder D, Freeman RM. An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint report on the terminology for female pelvic floor dysfunction. *Int Urogynecology J* 2010;21:5-26

Groenendijk AG, Birnie E, Boeckxstaens GE, Roovens JP, Bonsel GJ. Anorectal function testing and anal endosonography in the diagnostic work-up of patients with primary pelvic organ prolapse. *Gynecol Obstet Invest* 2009; 67: 187-194

Kaufman HS, Buller JL, Thompson JR, et al. Dynamic pelvic magnetic resonance imaging and cystocolpodefecography alter surgical management of pelvic floor disorders. *Dis Colon Rectum* 2001; 44: 1575-1584

Snooks SJ, Barnes PR, Swash M, Henry MM. Damage to the innervation of the pelvic floor musculature in chronic constipation. *Gastroenterology*. 1985 Nov;89(5):977-81

Hagen S, Stark D, Glazener C, Sinclair L, Ramsay I. A randomized controlled trial of pelvic floor muscle training for stages I and II pelvic organ prolapse. *Int.Urogynecol.J.Pelvic.Floor.Dysfunct.* 2009;20:45-51

Mellgren A, Bremner S, Johansson C, et al. Defecography. Results of investigations in 2816 patients. *Dis Colon Rectum* 1994;37:1133-1141

Ashari LH, Lumley JW, Stevenson ARL, Stitz RW. Laparoscopic assisted resection rectopexy for rectal prolapse: ten year experience. *Dis Colon Rectum* 2005; 48:982-987

Solomon MJ, Young CJ, Evers AA, Roberts RA. Randomized clinical trial of laparoscopic versus open abdominal rectopexy for rectal prolapse. *Br J Surg*. 2002; 89: 35-39

