

Defecography: a still needful exam for evaluation of pelvic floor diseases

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Summary. The aim of this discussion is to describe what is a defecography, how we have to perform it, what can we see and to present the main physio-pathological illnesses of pelvic floor and anorectal region that can be studied with this method and its advantages over other screening techniques. Defecography is a contrastographic radiological examination that highlights structural and functional pelvic floor diseases. Upon preliminary ileum-colic opacification giving to patient radiopaque contrast, are first acquired static images (at rest, in maximum voluntary contraction of the pelvic muscles, while straining) and secondarily dynamic sequences (during evacuation), allowing a complete evaluation of the functionality of the anorectal region and the pelvic floor. Defecography is an easy procedure to perform widely available, and economic, carried out in conditions where the patient experiences symptoms, the most realistic possible. It can be still considered reliable technology and first choice in many patients in whom the clinic alone is not sufficient and it is not possible or necessary to perform a study with MRI (www.actabiomedica.it)

Key words: defecography, pelvic floor, rectum, anal canal

Introduction

Defecography is a contrastographic radiological examination that highlights structural and functional pelvic floor diseases.

Upon preliminary ileum-colic opacification giving to patient radiopaque contrast, using a remote controlled fluoroscopy, are first acquired static images (at rest, in maximum voluntary contraction of the pelvic muscles, while straining) and secondarily dynamic sequences (during evacuation), allowing a complete evaluation of the functionality of the anorectal region and the pelvic floor.

The aim of this discussion is to describe what is a defecography, how we have to perform it, what can we see and to present the main physio-pathological illnesses of pelvic floor and anorectal region that can be

studied with this method and its advantages over other screening techniques.

Introduction to anatomy and physiology of the pelvic floor

Pelvic floor is an anatomical region divided into three compartments: anterior, intermediate and posterior (or anorectal, the site of disturbed defecation); it is a system made up of muscle-aponeurotic structures capable of providing support to the pelvic viscera and to participate in the operation of two main structures: the endopelvic fascia and levator ani (1).

Under physiological conditions and rest conditions, the anal canal is closed and the rectum has smooth contours, with anal sphincter in proportion; the position of the anorectal junction at rest can be considered

to be a comprehensive indicator of the tone and elasticity of the pelvic floor muscle because the structures are constantly contracted, even when they are in a “rest condition”. Their tone is interrupted only during defecation and urination, hence the role that this examination has in evaluation of pelvic organ prolapse (2).

In the phase of straining, before evacuation, continence of the external anal sphincter is demonstrated.

At the beginning of defecation the pelvic floor drops, with the downward displacement of the anorectal junction, which should not exceed 3 cm in normal conditions, while the anterior rectal wall positions itself forward, not exceeding 2 cm deep; then the anal canal opens and rectum empties (Fig. 1). After the phase of straining, the internal sphincter and the levator ani are contracted, the anal canal closes, the anorectal angle becomes more acute and the pelvic floor, together with the anorectal junction, are raised compared to their rest position.

Technical study

Defecography proves to be a useful completion to clinical examination, studying in a sitting position, the

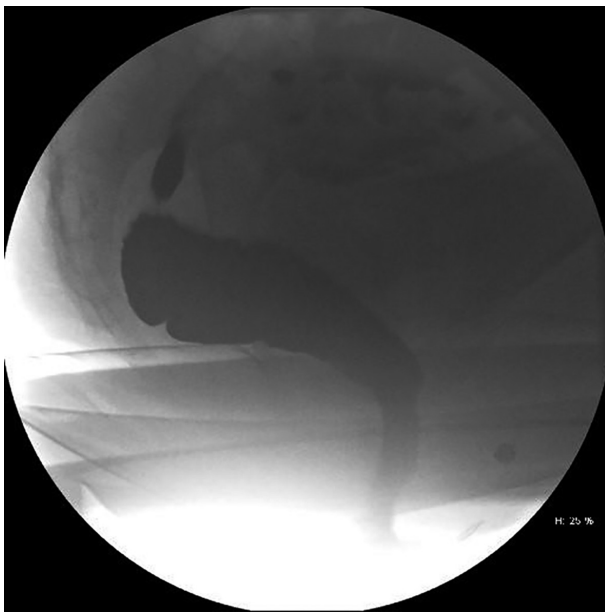


Figure 1. Normal Exhibit: anorectal angle of 90° with regular physiological excursion in functional tests and regular opening in the depletion phase

state in which symptoms are usually perceived, structural abnormalities of the anorectal compartment (enterocele, rectocele, sigmoidocele, intussusception and prolapse) and functional (pelvic floor dyssynergia or anismus) allowing to lay the basis for the therapeutic management.

The execution of the contrast-examination requires adequate preparation of the patient, which begins 4 hours before the examination, with the administration of an enema evacuation; necessary condition for a correct running of the investigation, is the opacification of the intestinal loops of the pelvic cavity, which is obtained after oral administration of 400 cc of Prontobario diluted with 30 cc of water mixed with 50 cc of Gastrografin. For the anatomical and functional evaluation of anorectal structures, a fecal-like density preparation consisting of 200 cc of a mixture of water, two bottles of Prontobario (powder) and 50 cc of Gastrografin is provided to complete rectal filling.

The examination includes the acquisition of radiographs in lateral view during restraint and dynamic phase; the images obtained are evaluated based on anatomical landmarks and technical-functional parameters summarized in Table 1.

The study of pelvic floor conditions can also be undertaken with other imaging techniques, such as transectal ultrasound, anal manometry, and electromyography (3). Currently there is an increasing use of dynamic defecoRM, an examination that can provide with excellent degree of accuracy a morphological and functional assessment of pelvic structures; as defecography, it provides real time information on anatomy, muscles and pelvic floor structures, with multiplanar representations of the districts surveyed, without using ionizing radiation (4). DefecoRM however is less available and more expensive than the conventional defecography, it requires the acquisition of images in the supine position for a long time, often with a certain discomfort for the patient, while open MRI are not easily available.

Defecography too has different limitations, one of which connected to the low contrast resolution and the two-dimensionality of the study that can fail in the soft tissues demonstration because of the overlap of the viscera containing contrast in the vicinity of the anal canal or rectum, as the intestinal loops; moreover exposure to radiation is present.

Table 1.

NAME	ANATOMICAL	FUNCTION	
Bi Ischial line	Tangent line to the bottom edge of the ischial tuberosity	The reference line for the evaluation of the anorectal junction	
Pubo Coccyx line (PCL)	Line connecting the lower edge of the pubic symphysis to the lower end of the coccyx	Indirect repere for the muscular floor position in the small pelvis, reference for the evaluation of the anorectal junction	
NAME	FUNCTIONAL	ROLE	NORMAL VALUE
Anorectal angle (ARA)	Angle formed between the line tangent to the rear profile of the rectum and the axis of the anal canal.	Indirect evaluation of the puborectalis muscle contract in the resting phase (angle<) and released under evacuation (angle>)	Between 60° and 105°, average value 92°
			PATHOLOGICAL VALUE
			Overtone: ≤ 90°
Anorectal junction (ARJ)	The distal wall of the rectum in the taper point where it meets the anal canal, the transition point between the puborectalis muscle and the "levator" plan.	Index compared with Anatomical to evaluate lifting and descent of the pelvic floor	NORMAL VALUE
			< 1 cm
			PATHOLOGICAL VALUE
			> 1 < 3 cm (slight) > 3 < 6 cm (moderate) > 6 cm (serious)

Patients which are generally addressed these examinations are represented by men over fifty years of age and menopausal women, for which the radiation problems are limited; therefore, in line with the most important works of literature, we believe that MRI may be considered the method of choice in women of childbearing age, while defecography is to be considered as the choice for remaining patient population (2).

Pathology and defecography

The disorders of defecation include a broad spectrum of diseases with clinical manifestation often non-specific, the symptoms are sometimes not reported since described as "embarrassing" and are difficult to interpret because of the non clear proctologic relevance as gynecological or urological. These diseases tend to be chronic and patients, to promote the evacuation, tend to excessively strive, further damaging the function of the pelvic floor and favoring the development of structural abnormalities.

Rectocele

This condition, that consists of an anterior bulge of the rectal wall of more than 2 cm in the anteroposterior diameter, is almost only present in females, caused by the weakness of the anterior rectal wall; the rectovaginal septum is damaged by labor or willful

constipation, rare are the congenital causes. Clinical manifestations are caused by incomplete emptying of the rectum; some patients apply digital rectal or vaginal maneuvers to complete evacuation.

At rest the conformation of the ampoule is normal, at the beginning of defecation the abdominal pressure crushes ampoule on the pelvic floor and makes it slip forward, adherent and herniating in vagina, generating saccular of figerform protrusion in which fecal material accumulates.

Image shows, at the maximus straining, the anterior wall ampoule protrusion related to the anal canal axis. There are 3 degrees of compromission: little (less than 2 cm), medium (2-4 cm) and severe (more than 4 cm). Excessive straining may also cause posterior bulges of the rectum because of hernias of the levator ani on posterolateral pelvic floor (Fig. 2).

Prolapse

This condition is distinguished, by the extension inside the viscus, in intrarectal, rectoanal and extern; it is also differenziated in simple (if only mucosa protrudes) and complete/intussusception, due to how many layers of viscera are involved.

Patient shows constipation, tenesmus, haematochezia, incontinence, rectal blockage and meccanical obstruction due to the intrarectal prolapsed wall which creates a plug obstructing the stool transit, causing barium paste to stagnate inside the viscus after examination.



Figure 2. Anterior Rectocele: during evacuative highlights modest intracanalicular prolapse associated with rectocele front middle grade, with a maximum of 3.4 cm in diameter that determines modest barium entrapment

At the end of expulsion, also in a normal patient, is possible to see a folding of the internal mucosa layer with thickness lower than 3 mm. If this thickness, more often seen at the anterior wall of rectum, is more than 3 mm but less than 1 cm, we can diagnose a simple prolapse; if this thickness is more than 1cm we have a complete prolapse, in which all layers are involved. In case of intussusception the wall is completely involved starting from 6-8 cm above the anal canal, and it is possible to see an expansion of the canal itself due to a circular infolding of the rectal wall invaginated into the lumen, that can be so dramatic to pass through the anus and prolapse externally; the rectum pulls the anterior peritoneum caudally, covering the rectum and resulting in a deep pouch that can contain small bowel (i.e., enterocele)

Overtone

It is a type of stenosis of the anorectum caused by a spasm of a component of the external ani sphincter muscle, described by Wasserman in 1964; it's a disorder of defecation determined by the reduction or impossible relaxation of pubo-rectal muscle.

Young adults are most prevalent involved, maybe due to an associate psicologic cause. This kind of muscle overtone is classified in primitive or secondary to abscess, fistula and fissure. The incomplete release of the muscle, shown as an imprint on the posterior recto-anal transition zone, leads to reduce opening of the ano-rectal angle during the evacuation, that remains at about 90 degrees, obstructing the ampoullar emptying (Fig. 3); this condition may also conduct to prolapse

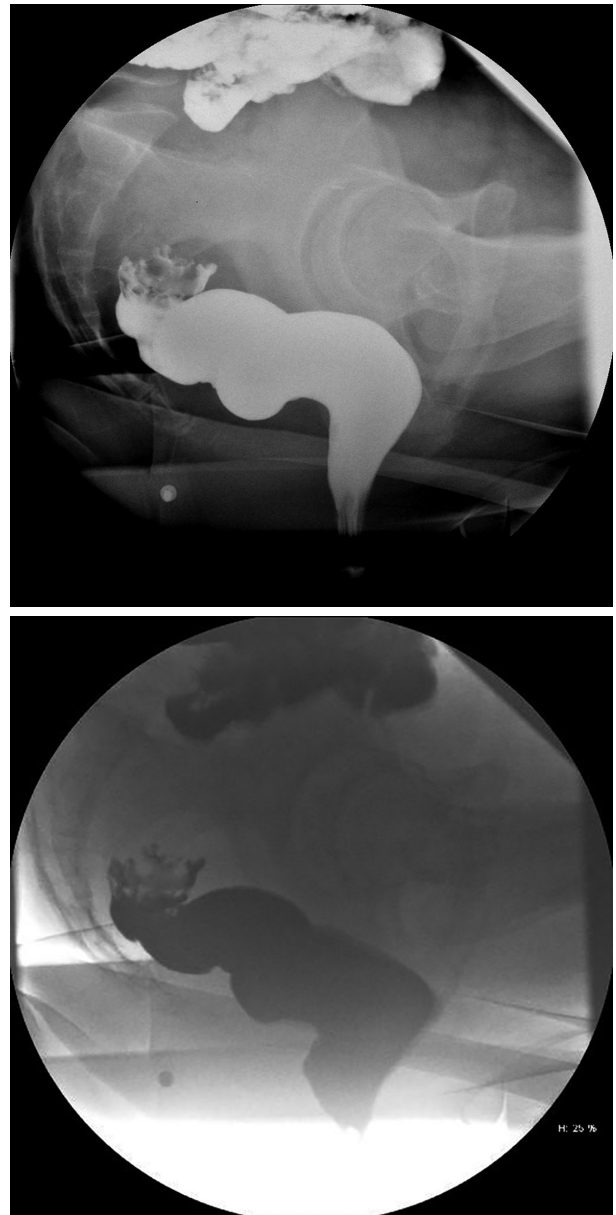


Figure 3. Overtone: poor opening of anus-rectal angle with constant notch on the rear wall

(Fig. 4) or lesion on the mucosa of this zone, like solitary sore of rectum, that may evolve in retracting scar.

Enterocoele - Sigmoidocoele

It consists in herniation of a peritoneal sac into the pouch of Douglas, containing ileal loops (enterocoele) or part of the sigmoid (sigmoidocoele).

This condition is almost exclusively found in female subjects, due to gynecological procedures such as hysterectomy, ureteropexy or pelvic surgical procedures. Patient describes a sense of pelvic oppression during evacuation and incomplete emptying of the rectum, not associated with obstructed defecation.

It is also described as a “functional” enterocoele, caused by the drop of ileal loops during the ejection phase, and ascent at the end of it (Fig. 5). It is called true or obstructive enterocoele when loops fall below the pubo-coccygeal line and compress the upper wall of the tank ampullary arranging, in the woman, between the rectum and the vagina.

For a good study of this kind of pathology it is important to have a sufficient opacification of the intestine, showing a widening of the space between rec-

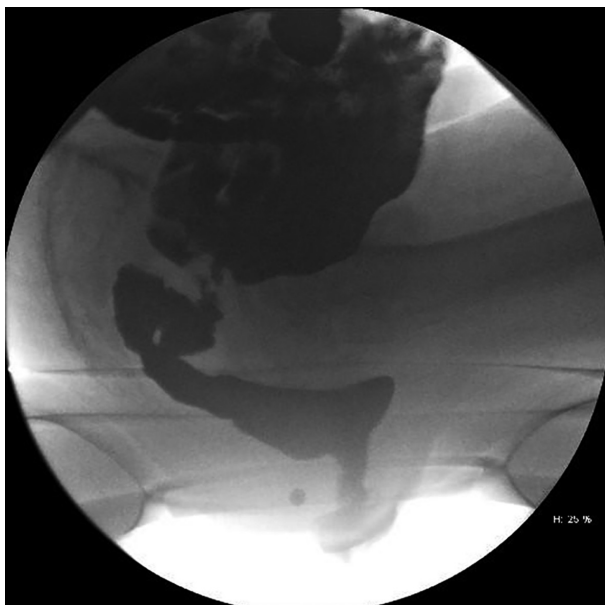


Figure 4. Overtone with Anterior Rectocele: during evacuative phase detects poor modification of anus-rectal angle as overtone, which is established with a modest intracanalicular prolapse with accompanying anterior fingerform rectocele

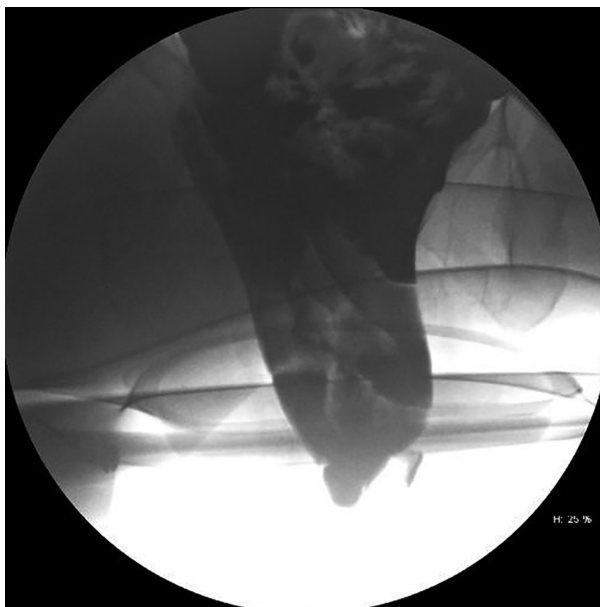


Figure 5. Obstructive Enterocoele: during evacuative phase significant obstructive enterocoele with commitment ileal loops at the level of the anal canal and compression of the rectal walls

tum and vagina due to the interposition of ileal loops or sigmoid, evident during the increase of abdominal pressure. Occasionally enterocoeles become evident only when the rectum has been completely emptied and sufficient space is left for the small bowel loops to herniate. If the herniated bowel protrudes on the anterior rectal wall, there's an associated rectal prolapse.

Perineum descending syndrome

In a situation of pelvic floor muscle hypotonia patients present a difficult evacuation, incomplete emptying of the rectum, and/or incontinence. This condition is usually found in elderly women; risk factors are chronic stypsis, neurologic dysfunction, perineal trauma, multiparity and surgical procedures.

We can observe a descendant of anorectal junction more than 3,5 cm during straining, that, itself, indirectly represents the perineal descent caused by increased intraabdominal pressure during straining, associated with relaxation of the puborectalis and pelvic muscles.

The difference of depth, related to bony landmark (bis-ischiatic line or coccygeal tip), during resting po-

sition and, most caudal, during straining of evacuation, shows the severity of the condition; also an anorectal angle more than 130° at rest that increases to more than 155° during straining, indicates anomalies.

If the patient has a chronic process, a prolonged strain is necessary for evacuation, leading to a weakening of the pelvic muscles due to the stretching, that can also damage the nervous structures, causing pain and incontinence.

Ano-rectal dyssynergia

In a picture of inappropriate contraction of the puborectalis muscle during evacuation, instead of physiologic relaxation, we can see a spastic pelvic floor syndrome. Clinical manifestations are increasing of evacuation time (more than 30 seconds is highly predictive) and incomplete emptying, sometimes associated to focal pathological alterations such as solitary ulcers, fistulas, and thrombotic hemorrhoids, but some cases are idiopathic.

Specific features are a lack of pelvic floor descent during straining and evacuation and paradoxical contraction of the levator ani; less specific is the aberrantly deep impression of the puborectalis sling on the posterior rectal wall at rest, caused by the presence of a hypertrophic levator ani muscle, that can be observed also in asymptomatic subjects in which the measurement of the anorectal angle changes is not significant.

Conclusions

Defecography is an easy procedure to perform widely available, and economic, carried out in conditions where the patient experiences symptoms, the most realistic possible. We therefore believe that it can

be still considered reliable technology and first choice in many patients in whom the clinic alone is not sufficient and it is not possible or necessary to perform a study with MRI (5-9).

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