3D Dynamic Ano-rectal Ultra-sonography (Echodefecography) vs. Conventional Defecography in Assessment of Obstructed Defecation.

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ABSTRACT

Purpose: *Discussing obstructed defecation syndrome is intriguing due to diversity of disorders affecting anorectal region. The gold standard examination for assessment of these different disorders is the conventional defecography (CDF), however radiation exposure and lack of evaluation of pelvic structures concerned with defecation process were major disadvantages .Our goal was to evaluate the recently developed Echodefecography (EDF) as a new technique using endoluminal ultrasonography to avoid such disadvantages.* ***Methods:*** *It was a prospective study including 15 patients complaining of obstructed defecation symptoms. The mean age of included patients was 36.7 years ± 14.3 years. All candidates underwent echodefecography and conventional defecography. Geometric measurements of anorectal angle, depth of rectoceles and degree of perineal descent were obtained from both modalities for comparison. Anorectal intussusception was looked for its presence or absence.* ***Results:*** *EDF identified 13 cases of rectoceles while CDF identified 14 cases (good statistical agreement was observed between both modalities [κ value 0.634]). Anorectal descent was diagnosed in 7 cases by EDF and CDF which detected 4 more cases (moderate statistical agreement [κ value 0.483]). Anismus was detected in 3 cases by EDF but in only 2 cases by CDF (fair statistical agreement [κ value 0.286]). EDF detected 12 cases of intussusception, however CDF detected only 1 case (poor statistical agreement [κ value 0.035]).* ***Conclusion****: Echodefecography has good accuracy of detection of different anorectal disorders associated with obstructed defecation syndrome when compared with conventional defecography.*
Keywords: *Defecography, Ultrasonography, Pelvic floor, Rectocele, Anismus, Perineal descent.*

INTRODUCTION

Obstructed defecation syndrome (ODS) includes various disorders of anorectal region characterized by difficult evacuation of fecal matter after experiencing desire to defecate. Among these disorders are rectocele, intussusception, anorectal descent, anismus and enterocele. It is a common problem affecting considerable sector of population, however its true prevalence varies significantly among different studies due to variability of definitions describing it [(1)].

There are a number of imaging modalities addressing pelvic floor disorders including conventional defecography, MRI defecography and ultrasonography (using different approaches whether trans-perineal, trans-vaginal or trans-rectal) [(2-4)]. Conventional defecography is a well-established tool in assessment of ODS but it lacks assessment of anal sphincters and has risk of exposing patients to ionizing radiarion, besides it is inconvenient to many patients [(5)].

Echodefecography, which was first described by Murad-Regadas et al., is a new technique using recent generation of three dimensional ultra-sonographic machines with automatically scanning 360° transducer to assess posterior and middle pelvic compartments [(6)] .

This study aimed to compare the accuracy and to test the agreement of echodefecography with conventional defecography in the diagnosis of pelvic floor disorders associated with ODS.

MATERIALS AND METHODS

This prospective study was held during the period from April 2014 to April 2016 and included 15 patients who were enrolled from Colo-rectal unit, General Surgery department, Kasr Al-ainy hospital, Cairo University. Ethical committee approval was obtained and all patients signed a written informed consent prior to inclusion in the study.

All included patients were complaining of dyschezia for at least 6 months which was defined according to Rome III criteria and those with

secondary constipation or constipation predominant irritable bowel syndrome were ruled out.

Patients with any organic pathology of the colon or rectum as detected by clinical examination or colonoscopy, anal incontinence or contraindications to performance of conventional defecography e.g. pregnancy or TRUS e.g. anal stenosis were also excluded from the study.

Clinical history and complete perineal and anorectal examination were performed in all patients to exclude cases which do not match with the criteria then patients were subjected to conventional defecography and echodefecography.

Conventional Defecography:

Rectal cleaning enema is performed 2 hours before the study. About 250 ml of barium paste is injected transanally then the patient sits on special radiolucent commode and images are taken during different positions namely rest, squeeze and evacuation.

Different measurements were obtained from static films for identification of various disorders associated with obstructed defecation. Anorectal angle (ARA) is the angle between anal canal line drawn at the middle of anal canal and rectal line drawn at posterior rectal wall. Perineal distance (PD) is the vertical distance between anorectal junction (ARJ) and pubococcygeal (PC) line drawn between tip of coccyx and lower border of symphysis pubis or alternatively head of femur. Puborectalis length (PRL) is the distance between ARJ and symphysis pubis. All measures should be performed at different positions.

Rectocele was identified as any bulging or herniation of the rectal wall and its depth should be measured to define its grade according to Marti classification [(7)] . Perineal Descent was diagnosed if PD at rest is > 4 cm or if difference between PD at rest and during evacuation is > 3 cm. Anismus is identified when ARA during evacuation is the same as at rest or becomes more acute or alternatively when PRL did not increase during evacuation or paradoxically becomes shorter. Anorectal intussuception was diagnosed as invagination of the rectal wall into the anal canal during straining.

Echodefecography:

Rectal cleaning enema is performed 2 hours before the study. According to the technique originally described by Murad-Regadas et al. [(6,8)] , 4 scans were obtained using B & K Medical Systems Pro Focus 2202® scanner and B-K 2050® probe (B-K Medical, Herlev, Denmark) with 50-second proximal-to-distal 6.0-cm automatic scanning, a frequency range of 10-16 MHz, and a focal distance of 2.8-6.4 cm.

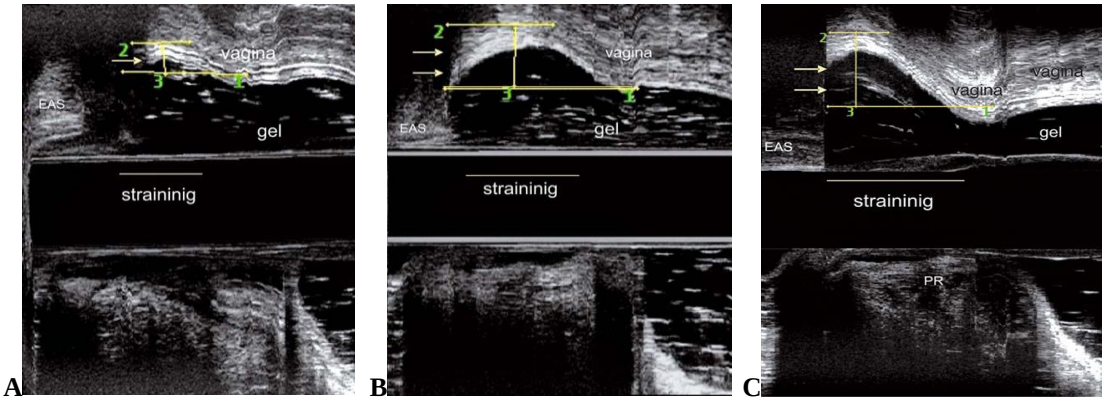
Scan 1 is performed at rest with probe inserted for 6 cm from anal verge to check anatomical configuration of anal canal for muscle injury.

Scan 2 is carried out with patient resting for 3 seconds then maximally strain and probe is positioned proximal to PR muscle then scan is stopped when PR muscle appears again after straining. This scan assesses movements of PR during rest and straining to detect perineal descent.

Scan 3 examines the patient in 3 successive phases with probe inserted for 6 cm from anal verge. The patient is resting in the first 15 seconds then asked to strain in next 20 seconds and finally return to resting state in last 15 seconds. This scan evaluates also puborectalis movements during rest and straining and checks for the presence of anismus and anorectal intussuception.

Scan 4 is done following same phases as scan 2 but after 120–180 ml of gel is injected transanally then probe is inserted 7 cm from anal verge. Depth of rectocele can be measured at this scan and other disorders identified at previous scans can be confirmed.

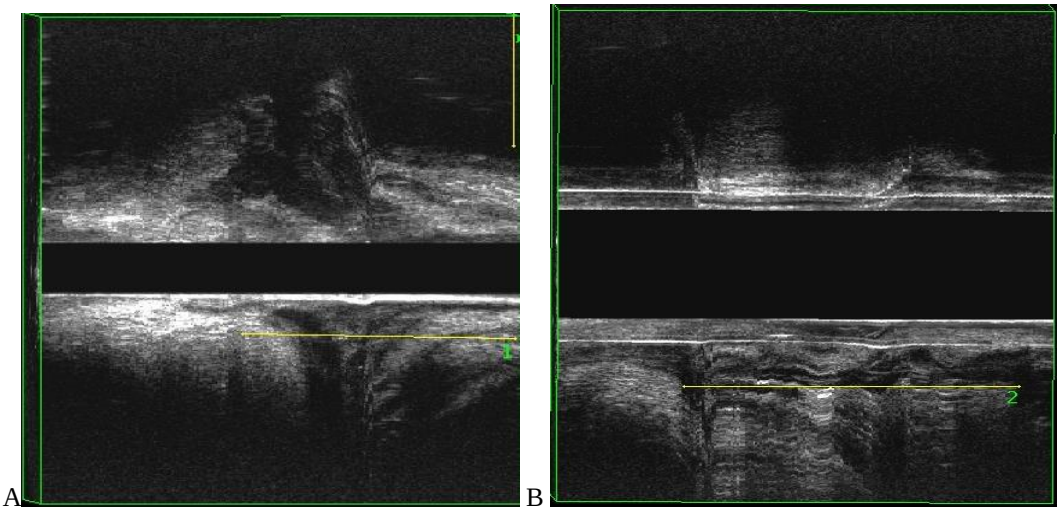
Rectocele can be identified and measured in the sagittal plane in the last scan by measuring vertical distance between 2 horizontal lines drawn parallel to posterior vaginal wall at the beginning of straining and at maximal straining (Figure 1).



A **B** **C**

Fig. 1: A-C. Patient with anorectocele, mid sagittal plane Line 1: parallel with the vaginal wall during initial straining. Line 2: parallel with the vaginal wall at maximal herniation point. Line 3: distance between lines 1 and 2 (anorectocele size) (arrows). EAS external anal sphincter, PR puborectalis muscle A Grade I. B Grade II. C Grade III [(6)] .

Perineal descent (PD) may be diagnosed in sagittal plane if the distance between proximal margin of puborectalis at rest and when it appears again during straining is > 2.5 cm with probe in its position without following descending muscles of pelvic floor (Figure 2).



A B

Fig. 2: Anorectal descent A: (PD =3.41 cm) B: (PD = 4.03 cm).

Anismus can be detected in the axial plane by measuring an angle at rest and straining between 2 lines drawn from outer margin of probe at 3 & 9 o'clock and converging at inner margin of puborectalis at 6 o'clock (Figure 3). It can be also identified in sagittal plane by measuring the angle between line drawn parallel to puborectalis margin and another line perpendicular to the longitudinal axis of the anal canal. The angle during straining becomes more obtuse in axial plane but more acute in sagittal plane due to paradoxical contraction of puborectalis which becomes closer to the probe.

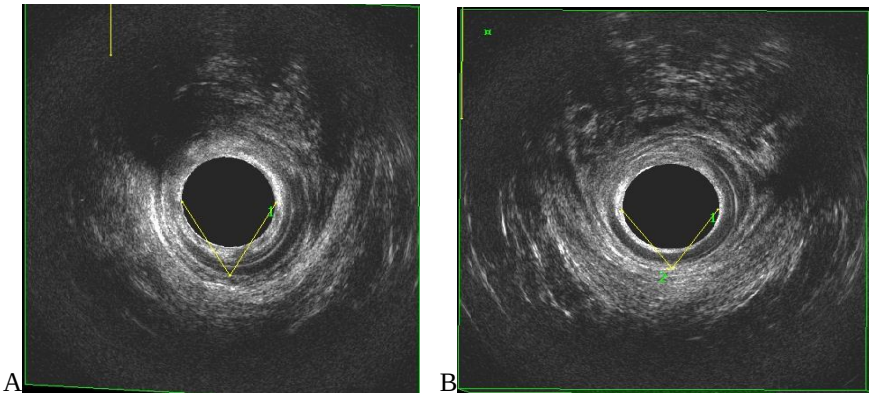


Fig. 3: Axial plane: A: at rest (Angle =63.5º), B: during straining (Angle = 72º) **(Case series)**

Anorectal intussusception can be diagnosed in axial (Figure 4), sagittal or diagonal planes by visualization of two parallel muscle layers during straining in both scans 3 or 4.

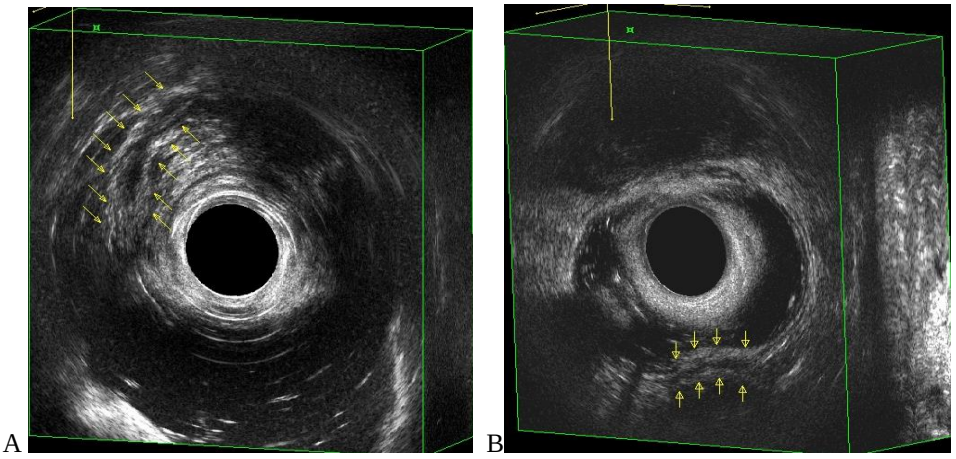


Fig. 4.Anorectal Intussusception (axial plane) A Anterior- B Posterior **(Case series).**

Agreement between both diagnostic methods was tested using kappa (κ) statistic. The κ value indicated strength of agreement: 0.41 to 0.60 was moderate; 0.61 to 0.80 was good; and 0.81 to 1.0 was very good. Accuracy was represented using the terms sensitivity, specificity, +ve predictive value, -ve predictive value, and overall accuracy. *P* values less than 0.05 was considered statistically significant. All statistical calculations were done using computer program SPSS (Statistical Package for the Social Science; SPSS Inc., Chicago, IL, USA) release 15 for Microsoft Windows (2006).

RESULTS

14 patients (93.33%) were diagnosed as having rectocele (13 cases [86.67%] detected by both modalities and 1 case was detected by only CDF) and 1 patient was normal at both modalities. Good statistical agreement was demonstrated between both modalities regarding diagnosis of rectocele *(κ value 0.634*).

Perineal descent was detected in 11 cases (73.33%) (7 cases [46.67%] were identified by both modalities and 4 cases were identified by only CDF) and 4 patient were considered normal

by both modalities. Moderate statistical agreement was shown between both modalities regarding detection of perineal descent *(κ value 0.483*).

4 cases (33.33%) were diagnosed as having anismus (1 case [0.07%] diagnosed by both modalities and 3 cases were diagnosed by only one modality) and 11 patients were considered normal by both modalities. Fair statistical agreement was detected between both modalities regarding identification of anismus *(κ value 0.286).*

Anorectal intussusception was identified in 12 patients (80%) (1 case [0.07%] was diagnosed by both modalities and 11 cases diagnosed by only EDF) and 3 patients were considered normal by both modalities. Poor statistical agreement was shown between both modalities regarding diagnosis of intussusception (*κ value 0.035*).

Accuracy of EDF in diagnosis of different disorders associated with obstructed defecation in comparison to CDF is shown in table (1).

Table 1: Accuracy of EDF compared to CDF in assessment of ODS

	Sensitivity	**Specificity**	**+(ve) PV**	**-(ve) PV**	**Accuracy**
Rectocele	92.86	100	100	50	93.33
Perineal Descent	63.64	100	100	50	73.33
Anismus	50	84.62	33.33	91.67	80
Intussusception	100	21.43	8.33	100	26.67

DISCUSSION

Conventional defecography is well-established tool for assessment of obstructed defecation syndrome and was considered gold standard technique for long period of time, however there are many limitations for its use namely radiation exposure and lack of assessment of anal sphincters and other pelvic compartments unless opacification of small bowel, vagina and urinary bladder is performed which makes the exam lengthy and uncomfortable to many patients.

Echodefecography was developed to avoid such disadvantages as this modality allows for accurate assessment of anal sphincters for occult injuries and enables visualization of middle pelvic compartment disorders like enteroceles without need for bowel opacification besides it can detect different disorders of posterior compartment identified by conventional defecography with good accuracy.

There are many studies in literature that revealed concordance of conventional defecography with different ultrasonographic approaches described for assessment of different defecatory disorders [9-13] .

The current study showed comparable results to previous studies which demonstrated that echodefecography can identify all posterior compartment disorders associated with obstructed defecation which can be detected by conventional defecography [6,8,14,15] .

It was unexpected to find that echodefecography has higher sensitivity for detection of anorectal intussusception however this may be explained by superiority of endorectal ultrasonography for delineation of rectal wall layers. On the contrary, conventional defecography identified more cases of perineal descent than echodefecography did which could be due to the ability of the former to correlate between pelvic floor muscles and bony landmarks.

There was concordance between both modalities regarding detection of different grades of rectocele, yet echodefecography provides easier and more obvious way of measuring depth of rectocele. On the other hand, there was fair statistical agreement between both modalities regarding diagnosis of anismus.

Despite that echodefecography is performed in left lateral position that is less physiological than squatting position used for conventional defecography, it did not prevent evacuation of ultrasound gel and was more comfortable to most patients. Also, ultrasound gel has a consistency that is different from that of barium paste used for conventional defecography, but it was capable of inducing sufficient urge for defecation.

Lack of assessment of anterior pelvic compartment is one of the limitations of this new technique. Based on clinical presentation of patient and findings of echodefecography, other imaging techniques as transperineal ultrasonography or MR defecography could be used as a complementary exam.

Automatic scanning of the probe used in our study made the exam well tolerated by patients as there is no need for moving the probe to and fro after insertion, besides it records movements of anorectal structures during straining in real time with 3D configuration which enables assessment of different anatomical structures after finishing exam in axial, sagittal and oblique planes.

As any imaging modality using ultrasonography, echodefecography is operator dependent and previous experience with endorectal ultrasonography and different anorectal disorders associated with obstructed defecation is essential, however it is an easy exam to perform with rapid learning curve. It is a tool that is available in surgeon's hands which is a major advantage that allows for correlation with clinical and operative findings and avoids time waste.

CONCLUSION

Echodefecography showed good accuracy of detection of different anorectal disorders associated with obstructed defecation syndrome when compared with conventional defecography. It has the advantages of availability, low cost, safety, patient acceptance and easy learning.

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