Endorectal ultrasound (ERUS) in pelvic disorders

Barisic G, Krivokapic Z, Markovic V, Saranovic D,
Kalezic V, Sekulic A
Institute for Digestive Diseases, Clinical Center of Serbia,
Belgrade, Serbia

Endorectal ultrasound (ERUS) imaging is a complex process using electronic devices to control ultrasound waves and produce images of anatomic structures. It is a simple, cheap and well-tolerated procedure that provides excellent images of rectal and anal canal wall and pelvic floor muscles together with surrounding organs and tissues. The direct imaging of anal canal and pelvic floor muscles with surrounding tissues allows one to identify sphincter defects, anorectal abscesses and fistulas as well as great variety of benign and malignant pathology of the pelvis. Basically, techniques for ERUS are very similar, but there are some slight modifications regarding equipment, indications, and localization of pathologic process. We describe the technique, indications, results and pitfalls of ERUS with the Brueil & Kjaer type 1850 endosonic probe with 7 and 10 MHz transducers in benign pelvic disorders.

Key words: pelvic floor, muscles, anal canal

INTRODUCTION

Endorectal ultrasound (ERUS) imaging is a complex process using electronic devices to control ultrasound waves and produce images of anatomic structures. Wild and Reid performed first experiments in 1952 and 1956 with their primordial endorectal ultrasound device. The images they obtained were of low quality but they demonstrated that ERUS is a promising technique in evaluating pelvic pathology. Due to the dramatical improvements in technology and growing clinical knowledge in ERUS practice and image interpretation, this method became a powerful diagnostic tool in clinician’s hands.

INDICATIONS FOR ERUS

ERUS has become routine diagnostic procedure for investigation of variety of pelvic disorders. The advantages of ERUS compared to other available diagnostic tools (CT and MRI) are simplicity, low cost, portability, high resolution, avoidance of irradiation and noninvasive nature of the exam. Indications for ERUS were expanding as the experience with this method was growing. Nowadays, ERUS is routinely employed for investigation of both benign and malignant pathology of the pelvis. In benign pelvic pathology most frequent indications for ERUS are investigation of fecal incontinence, perianal fistula and abscess, benign tumours of anal canal, rectum, and anal pain. In malignant pathology ERUS is usually utilized for rectal cancer staging and rectal cancer surveillance.

TECHNIQUE FOR ERUS IN PELVIC DISORDERS

The frequency of ultrasound used for specific application is very important. Lower frequencies have better penetration through tissue but lower resolution while higher frequencies have better resolution but low penetration. We usually performed ERUS using the 10MHz probe covered by a plastic cap filled with boiled water because the rigid plastic cap prevents deformation and motor overload. This plastic cap modification is very useful for imaging anal sphincter defects, perianal fistulas and abscesses and other pathology related to the anal canal and pelvic floor muscles.

The patient is placed in either the left lateral or the supine position. The left lateral position is adequate for men but in women the prone or lithotomy position is preferred since anterior structures are not deformed this way and optimal images can be obtained. Cleansing of the bowel prior to investigation should be performed, usually with one small volume enema one hour before the examination. Digital rectal exam should be performed routinely as a first step in ERUS because it provides useful information about anatomy of the anal canal, presence of scars and stenotic lesions that could preclude insertion of the endosonic probe. The probe can be inserted into the anal canal blindly after thorough lubrication with ultrasound gel. Imaging of the anal canal starts at the top of the pub-
Proximal Anal Canal with Puborectalis U Shaped Hyperechoic Sling (Arrows).

Mid Anal Canal with Dominant Inner Hypoechoic Internal Anal Sphincter Ring (Arrow). Medially to Internal Anal Sphincter is Hyperechoic Thin Ring of Mucosa-Submucosa Complex (Arrowhead).

Distal Anal Canal with Hyperechoic Fibers of Subcutaneous Part of the External Anal Sphincter (Arrow). At This Level of Anal Canal Internal Anal Sphincter Cannot Be Seen. The Lower Border of the Anal Canal Is the Puborectalis Muscle That Appears as a "U" Shaped, Thick Band of Hyperechoic Strands That Encircle the Anal Canal Posteriorly. Within the Upper Anal Canal, One Will Also Visualize the Vagina and the Deep Portion of the External Anal Sphincter, Which Appears as Hyperechoic Structure and Is Indistinguishable from the Puborectalis at This Level. Internal Anal Sphincter Is Also Present at This Level. (Fig. 1)
and are not visible as one pulls the probe further externally. (Fig. 3)

The perineal body is a zone between the posterior vaginal wall and the external anal sphincter. It is made of fibers of the internal and external anal sphincter and the longitudinal muscle of the rectal wall. Normal thickness of the perineal body is 2 to 3 mm.

EVALUATION OF INCONTINENCE

Endoanal ultrasound is valuable diagnostic tool in patients with fecal incontinence because it provides a 360-degree image of the anal canal with direct image of the internal and external anal sphincter together with the puborectalis muscle. Clear images of hypoechoic internal sphincter and hyperechoic external sphincter and puborectalis help in distinguishing fecal incontinence due to the sphincter injury and neurogenic or idiopathic incontinence. This may directly influence further treatment. Moreover, endoanal ultrasound can determine exact localization and size of the muscle defect. Any discontinuity of the hypoechoic band of the internal anal sphincter is suggestive to sphincter injury. (Fig. 4)

Detection of the injury of the external anal sphincter is more challenging especially in anterior portion. Loss of the fine parallel fibrillar echostripe is suggestive of external anal sphincter injury. Ultrasound can be used for the follow-up of patients after sphincteroplasty. If the sutured edges have retracted it should be clearly visible with endoanal ultrasound imaging and the patient may benefit from re-do surgery. (Fig. 5)

EVALUATION OF PERIANAL FISTULA AND ABSCESS

In the majority of patients with perianal fistula or abscess endoanal ultrasound imaging is not essential since the diagnosis can be easily established with clinical exam. However, there are more complex abscesses and fistulas, recurrent fistulas, unusual suprarelevator abscesses, suprasphincteric fistulas, perianal Crohn's disease where endoanal ultrasound imaging could be very helpful. Abscesses and fistulas are usually seen as hypoechoic perirectal defects. Sometimes, fistulous tracts cannot be easily recognized and followed with conventional endoanal ultrasonography. In order to aid identifying these tracts, diluted hydrogen peroxide can be instilled into the
external opening with catheter. It fills the tract and makes it visible as intensive hyperechoic structure showing its relations with the surrounding structures. Secondary tracks and extensions may be identified this way. It is very important because unrecognized secondary tracts and extensions are the main causes of recurrent perianal fistula or abscess. ERUS has also been used to assess disease activity in ulcerative colitis and Crohn’s disease. (Fig. 6)

**EVALUATION OF BENIGN TUMORS**

Due to high-resolution, ERUS is capable of imaging different layers of the rectal wall thus enabling rectal and anal canal cancer staging. Benign tumors of anal canal and surrounding tissues like adenomas, endometriomas, pre-sacral tumors or cysts can be evaluated and even biopsied by ultrasound guidance to reveal the exact nature of the mass. (Fig. 7)

**EVALUATION OF ANAL PAIN**

ERUS is very helpful diagnostic tool in determining the origin of acute or chronic anal pain. Perianal or retorectal abscesses can be detected with ERUS before the onset of classical clinical signs. Moreover, ERUS can be used to exclude some anorectal disorders that can result in acute or chronic anal pain. Some rare conditions like hereditary internal anal sphincter myopathy that produces severe proctalgia fugax syndrome can be recognized with ERUS by thickening of the internal anal sphincter up to 1 cm. Abnormally thick internal anal sphincter is invariably present in the solitary rectal ulcer syndrome and occasionally with uncomplicated constipation.

**RESULTS**

Transrectal ultrasound has gained popularity in the last decade because it is noninvasive, portable, not expensive, and most important very reliable technique for the rectal wall and pelvic floor imaging. In evaluation of fecal incontinence ERUS proved to be reliable in detecting internal and external anal sphincter defects with accuracy ranging from 83 to 100%.

ERUS also proved to be very helpful in investigation of anal fistulas with accuracy ranging from 60 to 90%.[7,8] Operative management of perianal fistulas was influenced by findings of ERUS in 38% of cases.[9]

ERUS can reliably measure transmural inflammation in Crohn’s disease and is sensitive to changes in the clinical activity.[9] Anal wall thickness measurements might offer objective assessment of clinical activity of the disease and response to therapy.[10]

**CONCLUSION**

There is a significant learning curve for the technique of ERUS and image interpretation, but once the expertise is achieved, transrectal ultrasound becomes reliable and powerful diagnostic tool in hands of the clinician. The advantages of ERUS as an diagnostic tool are simplicity, low cost, portability, high resolution, avoidance of irradiation and noninvasive nature of the exam.

**SUMMARY**

Endorectal ultrasonografiija je kompleksan proces koji ulaznučne talase koristi za dobijanje slika određenih anatomskih struktura. To je jednostavna, jeftina i neinvazivna dijagnostička procedura koja omogućuje dobijanje izuzetno dobrih slika zida rektuma i analnog kanala zajedno sa mišićima pelvićnog poda i okolnim strukturama i tkivima. Kvalitetne slike pomažu kliničarima u dijagnosticizaciji brojnih malignih i benignih bolesti organa i tkiva male karlice kao što su defekti analnih sfinktera, anorektalni apscesi i fistule itd. U osnovni tehniku ERUS su slične ali postoje manje razlike u zavisnosti od opreme koja se koristi, indikacija i lokalizacije patološkog procesa. U ovom radu se opisuju tehničke, indikacije, rezultati i nedostaci ERUS u radu sa Bruel & Kjaer tip 1850 aparatom i sondama od 7 i 10 MHz u dijagnosticizaciji benignih patologija pelvićnog poda.

Ključne reči: pelvični pod, mišići, analni sfincter

**REFERENCES:**


5. Lindsey J, Hynnychys MM, George BD, Mortensen NJMC. The role of anal ultrasound in the management of anal fistulas. Colorectal Disease 2002;4:118-122


