W1: Integrated total pelvic floor ultrasound and defecatory dysfunction

Workshop Chair: Alison Hainsworth, United Kingdom
03 September 2019 08:00 - 11:00

Start	End	Topic	Speakers
08:00	08:30	Introduction and know your machine	Alison Hainsworth
08:30	08:45	Pelvic floor anatomy	Alexis Schizas
08:45	09:00	Normal ultrasound pelvic floor anatomy with the integrated approach	Giulio Santoro
09:00	09:10	When to perform integrated total pelvic floor ultrasound	Sophie Pilkington
09:10	09:20	How to perform integrated total pelvic floor ultrasound	Samantha Morris
09:20	09:30	Interactive workstations - Small groups with ultrasound workstations – the interpretation of normal and pathological scans	Alison Hainsworth Giulio Santoro Alexis Schizas Samantha Morris Sophie Pilkington
09:30	10:00	Break	None
10:00	10:45	Interactive workstations - Small groups with ultrasound workstations – the interpretation of normal and pathological scans	Alison Hainsworth Giulio Santoro Alexis Schizas Samantha Morris Sophie Pilkington
10:45	10:55	The report - Drawing all the images together to report integrated total pelvic floor ultrasound	Alexis Schizas
10:55	11:00	Questions	Alison Hainsworth Giulio Santoro Alexis Schizas Samantha Morris Sophie Pilkington

Aims of Workshop
The aim is to learn how to perform and interpret integrated total pelvic floor ultrasound (transperineal, transvaginal, endovaginal) as part of your assessment of pelvic floor dysfunction.

This tool is used in clinic to detect anatomical (rectocoele, enterocoele, intussusception, cystocoele, bladder neck descent, uterine descent) and functional (dyssynergy, poor propulsive effort) abnormalities. You will know how to perform integrated total pelvic floor ultrasound and understand normal and pathological findings. This hands-on workshop allows you to practice image interpretation so that you can begin to use ultrasound in your clinical practice.

Learning Objectives
Understand how to perform integrated total pelvic floor ultrasound (transperineal, transvaginal and endovaginal).

Target Audience
Bowel Dysfunction

Advanced/Basic
Advanced

Workshop Outline

Introduction and Know your Machine
Miss Alison Hainsworth - UK
Integrated total pelvic floor ultrasound is a dynamic, easily accessible, cost effective and safe tool which can be used to screen for anatomical and functional abnormalities in a one stop clinic.
It can be used alongside clinical history and examination to highlight those patients who may need further investigations for possible surgical correction of anatomical abnormalities or those who will primarily benefit from conservative treatments. It is user dependent and so requires training and experience. This workshop will equip you with the tools needed to begin to understand how to perform and interpret integrated total pelvic floor ultrasound.
Integrated total pelvic floor ultrasound can be performed using a standard ultrasound machine. Transvaginal ultrasound scan and endovaginal or endoanal scanning is performed using a rotating single crystal probe. Transperineal ultrasound is performed

using a conventional curved array probe with frequencies of 3 – 6 MHz and a field of view of at least 70 degrees. We will outline how to set up and use the ultrasound machine though we recommend that you engage your local ultrasound machine representatives to go through the optimal settings for integrated total pelvic floor ultrasound with you.

Pelvic Floor Anatomy

Mr Alexis Schizas - UK

An outline of the pelvic floor anatomy in terms of the bony pelvis, the musculature of the pelvic floor and the contents of the pelvis.

The pelvic cavity is bound by the anterior pelvic wall (the posterior surfaces of the bodies and rami of the pubic bones and pubic symphysis) the lateral pelvic walls (hip bones covered with the obturator internus) and posterior pelvic wall (the sacrum, coccyx, the piriformis muscles and covering parietal fascia).

The pelvic floor is a muscular structure which stretches between the pubis anteriorly, the coccyx posteriorly and from one lateral pelvic side wall to the other. The levator ani is the most important muscle (a group of muscles often described as a single structure) and is divided into two major components; iliococcygeus and pubococcygeus (includes the Puborectalis and Pubovaginalis).

The pelvic cavity consists of the posterior, middle and anterior cavities.

The posterior cavity contains the rectum and sigmoid colon. Peritoneum covers the upper third of the rectum at the front and sides and the middle third only at the front. The peritoneum reflects forwards on to the upper vagina to form the pouch of Douglas (rectouterine pouch, lower most limit of the peritoneal cavity). The rectum ends where the muscle coats are replaced by the sphincter muscles of the anal canal at the anorectal junction, slung in the U loop of the Puborectalis at the level of the pelvic floor.

The internal anal sphincter surrounds the anal canal and is an involuntary, smooth muscle formed from the circular layer of the rectum. The external anal sphincter is composed of three parts (subcutaneous (encircles the lower end of the anal canal, no attachments), superficial (attached to the coccyx behind and perineal body in front) and the deep (encircles the upper end of the anal canal without bony attachments)) but can be considered one muscle. The deep part is continuous with the puborectalis sling muscle causing the acute anorectal angle.

The middle pelvic cavity contains the uterus, cervix and vagina. The upper third of the vagina lies in front of the pouch of Douglas, the middle and lower third are below the peritoneal reflexion. The rectovaginal septum separates the vagina from the rectum.

The anterior pelvic cavity holds the bladder and bladder neck.

Normal ultrasound pelvic floor anatomy with the integrated approach

Professor Santoro Guilio - Italy

An explanation of the normal anatomical appearances to expect when performing integrated total pelvic floor ultrasound.

Transvaginal Ultrasound

Anterior Views: An anterior transvaginal view allows anatomical visualisation of the bladder, muscle layers of the bladder (usually < 5mm), bladder neck, urethra, rhabdosphincter and pubic bone. The bladder neck is a highly reflective, hyperechoic funnel and the urethra is hypoechoic, which contrasts sharply with the surrounding peri-urethral tissue. The pubic symphysis is consistently seen (identification rate 100%) as a hypoechoic oval in front of the bladder reflecting the fibro-cartilagineous disc which connects the bony structures of pubic arch. During Valsalva manoeuvre the bladder neck should not descend more than 2 cm in relation to the pubic symphysis.

Posterior Views: Posterior transvaginal ultrasound enables visualisation of the following structures in the midline: the rectum, anorectal junction and anal canal, the posterior midline portion of the puborectalis sling muscle (a hypoechoic bundle of fibres lying behind the anorectal junction) and the perineal body (a hypoechoic structure anterior to the anal canal).

Three-Dimensional Cross Sectional View: The four anatomical levels demonstrated by transvaginal scanning are as follows. At the highest level the rectum lies posteriorly and bladder neck sits anteriorly. As the scan moves caudally the upper part of the urethra (anterior) and levator ani (lateral) are visualised. The pubic bone comes in to sight at 12 o'clock and is attached to the levator ani, which runs laterally in continuity with the puborectalis muscle sling muscle in the posterior portion. The levator ani are visible as a multi-layer hyperechoic sling at this level. The most caudal portion of the scan reveals the superficial perineal muscles, the perineal body and lower anal canal. Alignment of the pelvic organs (bladder neck or urethra, vagina and rectum or anal canal) indicates that the levator plate is intact and the arched symmetrical appearance pubic bone is a useful landmark to check that scan has been performed in a neutral position.

Transperineal Ultrasound

Sagittal transperineal scanning allows simultaneous visualisation of the anterior (pubic symphysis, urethra and bladder), middle (vagina, uterus, perineal body) and posterior (rectovaginal septum, rectum, anorectal junction) compartments in the midline. The anorectal angle is measured between the posterior wall of the rectum and the longitudinal axis of the anal canal and should open during straining.

Endoanal Ultrasound

Endoanal ultrasound allows visualisation of the internal and external anal sphincters.

When to perform integrated total pelvic floor ultrasound

Sophie Pilkington - UK

Integrated total pelvic floor ultrasound is useful for investigating causes of defaecatory dysfunction with the added advantage of being able to assess causes of vaginal and urinary symptoms.

The anatomy of the pelvic floor is complex and understanding how it functions is difficult to assess.
Surgical management of pelvic floor disorders depends on accurate assessment of the structure and function of the pelvic floor.
Ultrasound is proving to be an excellent modality for assessing the pelvic floor because it is:

- Quick and easy to perform
- Well tolerated by patients
- Assesses all 3 compartments
- No ionising radiation
- Inexpensive
- Easily accessible

Patients with pelvic floor disorders present with symptoms from pelvic organ prolapse (including rectal prolapse), incontinence (urinary and/or anal), pelvic pain or rectal evacuatory problems. Integrated total pelvic floor ultrasound enables assessment of 3-dimensional anatomy and dynamic movements of the pelvic floor to build up a complete understanding of the pelvic floor.
Many patients with pelvic floor disorders do not benefit from surgical intervention. Selecting patients for surgery is challenging and current diagnostic modalities include clinical examination, anorectal physiology, urodynamics, proctography with Barium or Magnetic Resonance Imaging. Pelvic floor ultrasound is a useful addition to the clinical examination and allows the clinician to visualise structures below the surface anatomy.
There is a high rate of failure with recurrent symptoms amongst patients undergoing pelvic floor surgery and 30% of these patients are undergoing repeat surgery. It is difficult to know whether this is due to the nature of the disease and that there is a high inherent failure rate or whether this is due to poor patient selection for procedures. Improved surgical techniques and better patient selection is likely to provide the key for reducing failure rates.
Complete pelvic floor ultrasound has important advantages over conventional methods for imaging the dynamics of the pelvic floor. No ionising radiation is involved. The technique is performed by the clinician and can be carried out quickly and easily in a normal clinic setting without the need for additional appointments. It is particularly suitable for a one stop clinic environment facilitating collection of all structural and functional information at the first appointment. There is minimal patient discomfort and no preparation is necessary. Information is acquired from the anterior, middle and posterior compartments with a series of 3-dimensional and dynamic sequences. The complete sequence of scans provides additional information to confirm and document the physical findings. The complete pelvic floor dataset can then be reviewed at the pelvic floor multidisciplinary meeting. Following surgical intervention, the anatomical outcomes can be assessed by comparing appearances on complete pelvic floor scanning before and after surgery.

How to perform integrated total pelvic floor ultrasound

Miss Samantha Morris - UK

An outline of the patient preparation and position which we have adopted as well as instructions for the sequence in which we perform integrated total pelvic floor ultrasound.

Patient Preparation: Some advocate the use of an enema and recommend urination in order to empty the rectum and bladder prior to the examination and allow the patient to bear down freely. However, the presence of stool in the rectum may aid in visualisation of a rectocoele. The use of small bowel contrast (50 mls Gastrografin® diluted 1:1 with tap water is ingested one hour prior to examination) and vaginal and rectal filling with ultrasound gel have also been described.
Patient Position: The patient lies supine with the legs drawn up and flexed, the feet together and the legs apart. The dorsal lithotomy position with the legs in stirrups may also be adopted. Endoanal ultrasound can either be performed with the patient in the dorsal lithotomy position or supine. Each probe is covered with ultrasound coupling gel, a latex sheath and further coupling gel, ensuring there are no air bubbles between them. The probes are decontaminated between each patient, including the use of an anti-sporicidal agent.
Transvaginal Ultrasound: Initially, the probe is held still (facing anteriorly) to obtain two dimensional anterior views during squeezing, relaxing, bearing-down and coughing. The probe is kept in the same position whilst the patient is at rest to obtain a 360-degree cross sectional image. Next, the probe is rotated within the vagina to face posteriorly and the patient is again asked to squeeze, relax, bear-down and cough.
Transperineal Ultrasound: The transducer is rested on the perineum to obtain dynamic mid sagittal views whilst the patient is squeezing, relaxing, bearing down and then squeezing, relaxing and coughing.
Endoanal Ultrasound: The probe is held still and a 360-degree cross sectional image is obtained.

Interactive Workstations

A series of workstations examining dynamic images from anterior transvaginal, endovaginal, posterior transvaginal and transperineal in both pathological and healthy cases.

The pathology that you may encounter include the following:

Transvaginal Ultrasound

Anterior Views: Though there is no definition of 'normal', bladder neck decent over 2cm is indicative of pelvic floor insufficiency. Hypermobility of the bladder neck may indicate urinary incontinence and bladder wall thickness may represent detrusor instability.

Ultrasound scanning is useful for the visualisation of synthetic mesh implants from previous surgeries, which is helpful for the evaluation of complications and recurrence.

Posterior Views: Posterior transvaginal scanning during Valsalva manoeuvre may demonstrate infolding of the rectal wall, with or without subsequent reverberation echoes, which indicates the presence of intussusception. It is not yet known how to accurately grade the severity of intussusception based on ultrasound scanning alone and assessment with defaecatory imaging (proctography or MRI) can further delineate functional anatomy. During the Valsalva manoeuvre a rectocoele is the protrusion of the anterior rectal wall with impingement onto the perineal body. The ultrasound probe will splint any rectocoele and therefore underestimate the size of the rectocoele. An enterocoele may also be visualised between the rectum and the probe during Valsalva.

Three Dimensional Cross Sectional View: A levator plate injury appears as a complete or partial loss of normal muscle which may result in a mal-alignment of the pelvic floor organs. The integrity of the levator ani muscle can be scored according the system described by Shobeiri and colleagues to the quality of the puboanalis, the puborectalis and the puboviscerali s. Each subgroup is analysed in an axial plane scored (0 = no defect, 1 = minimal defect with <50% muscle loss, 2 = major defect with >50% muscle loss, 3 = total absence of the muscle). Each muscle pair is scored from 0 (no muscle loss) to 6 (total absence). For the entire levator plate a cumulative score (maximum 18) is calculated and categorised as normal (0), mild (< 6), moderate (7 – 12) and severe (>13)**Error! Reference source not found.**.

Transperineal Ultrasound

Rectocoele: During sagittal transperineal scanning a rectocoele appears as an out-pouching of the anterior rectal wall, into the vagina, which may be present at rest but become more evident during straining. The rectovaginal septum cannot be reliably identified and so its' assessment is not considered clinically relevant. A rectocoele usually contains faecal material and associated bowel gas, resulting in specular echoes and reverberations and the distension of the rectocoele on ultrasound may depend upon the presence of trapped stool.

Enterocoele/ Sigmoidocoele: An enterocoele or sigmoidocoele characteristically appear as a hyperechoic mass descending from above the rectal ampulla into the vagina or rectovaginal space on transperineal scanning. The small bowel may be visible due to peristalsis but it is not possible to distinguish between the two entities or demonstrate their functional implications during ultrasound and defaecation proctography can be used for additional assessment. Enterocoele may be graded according to severity (grade I when the most distal part descends into the upper third of the vagina, grade II when the distal part descends into the middle third and grade III when the distal part descends into the lower third). A peritoneocoele is defined as an enlarged rectovaginal space (more than 2cm).

Cystocoele: A cystocoele may be graded (I – III). A grade I cystocoele is defined as the prolapse of the bladder onto the vagina, grade II is where the bladder falls into the vagina and grade three is when the bladder prolapses through the vagina.

Endoanal Ultrasound

Thickened or paucity of internal anal sphincter. Obstetric anal sphincter injury and evidence of previous repair may also be visualised.

The report - drawing all the images together to report integrated total pelvic floor ultrasound

Mr Alexis Schizas - UK

An outline of how to identify the salient positive and negative findings on integrated total pelvic floor ultrasound to write a meaningful and clinically relevant report.

Suggested Learning before Workshop Attendance

- BK Medical: Guide to Multicompartmental Pelvic Floor Scanning

- Total pelvic floor ultrasound for pelvic floor defaecatory dysfunction: a pictorial review. Hainsworth AJ, Solanki D, Schizas AM, Williams AB. Br J Radiol. 2015;88(1055):20150494. doi: 10.1259/bjr.20150494. Review.

- The Dynamic Transperineal Ultrasound Era of the Evaluation of Obstructed Defecation Syndrome. Dis Colon Rectum. 2016 Aug;59(8):800-3. Martellucci J, Brusciano L.

- Integrated total pelvic floor ultrasound in pelvic floor defaecatory dysfunction. Hainsworth AJ, Solanki D, Hamad A, Morris SJ, Schizas AM, Williams AB. Colorectal Dis. 2017 Jan;19(1):O54-O65. doi: 10.1111/codi.13568.

- Accuracy of integrated total pelvic floor ultrasound compared to defaecatory MRI in females with pelvic floor defaecatory dysfunction. Br J Radiol. 2016 Dec;89(1068):20160522. Hainsworth AJ, Pilkington SA, Grierson C, Rutherford E, Schizas AM, Nugent KP, Williams AB.

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- Pelvic floor disorders: role of new ultrasonographic techniques. World J Urol. 2011 Oct;29(5):615-23. doi: 10.1007/s00345-011-0708-x. Wieczorek AP, Stankiewicz A, Santoro GA, Wozniak MM, Bogusiewicz M, Rechberger T. PMID:21671056

- Perineal body anatomy seen by three-dimensional endovaginal ultrasound of asymptomatic nulliparae. Colorectal Dis. 2016 Apr;18(4):400-9. doi: 10.1111/codi.13119. PMID: 26382090. Santoro GA, Shobeiri SA, Petros PP, Zapater P, Wieczorek AP.

- Translabial ultrasound in the assessment of pelvic floor and anorectal function in women with defecatory disorders. Tech Coloproctol. 2014 May;18(5):481-94. doi: 10.1007/s10151-013-1117-5. Epub 2014 Feb 11. Dietz HP1.

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- Accuracy of Four Imaging Techniques for Diagnosis of Posterior Pelvic Floor Disorders.
Obstet Gynecol. 2017 Nov;130(5):1017-1024. doi: 10.1097/AOG.0000000000002245.
van Gruting IMA1, Stankiewicz A, Kluivers K, De Bin R, Blake H, Sultan AH, Thakar R.

Other Supporting Documents, Teaching Tools, Patient Education etc

Handouts

- Clinical uses of pelvic floor ultrasound: A colorectal surgeon's view. Marianne Starck, Pelvic Floor Centre, Malmo University Hospital, Sweden, BK ultrasound
- Use of the pelvic floor multicompartment scanning in clinical practice. Elizabeth R. Mueller, M.D., M.S., FACS, Assisstant Professor, Medical Director of Female Pelvic Medicine and Reconstructive Surgery, Loyola University, Chicago, Chicago Stritch School of Medicine, USA