Dissertation on

VALIDATION OF TWO DIMENSIONAL TRANSPERINEAL ULTRASOUND AND DYNAMIC MAGNETIC RESONANCE IMAGINGIN PELVIC FLOOR DYSFUNCTION

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CERTIFICATE

This is to certify that **Dr. K.SUDHA** has been a post graduate student during the periodMay 2010 to April 2013 at Barnard Institute of Radiology, Madras Medical College,Government General Hospital, Chennai.

This Dissertation titled **"VALIDATION OF TWO DIMENSIONAL PERINEAL ULTRASOUND AND DYNAMIC MAGNETIC RESONANCE IMAGING IN PELVICFLOOR DYSFUNCTION"** is a bonafide work done by her during the study period and is being submitted to the Tamilnadu Dr. M.G.R. Medical University in partial fulfillment oftheM.D. Branch VIII Radiodiagnosis Examination

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DECLARATION

I **Dr.K.SUDHA** solemnly declare that this dissertation entitled, **"VALIDATION OF TWO DIMENSIONAL PERINEAL ULTRASOUND AND DYNAMICMAGNETIC RESONANCE IMAGING IN PELVIC FLOOR DYSFUNCTION"**is a bonafide work done by me at the Barnard Institute of Radiology, Madras Medical College and Government General Hospital during the period 2010 – 2013under the guidance and supervision of the Director, Barnard Institute of Radiology of Madras Medical College and Government General Hospital, Professor **K. Vanitha,** This dissertation is submitted to The Tamil Nadu Dr. M.G.R Medical University, towards partial fulfillment of requirement for the award of **M.D.Degree Radiodiagnosis.**

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ETHICAL COMMITTEE CERTIFICATE

PROFORMA

CONSENT FORM

MASTER CHART

INTRODUCTION

Pelvic floor dysfunctions are complex conditions which commonly affects the elderly women. The pelvic floor dysfunction includes defect of anterior, middle and posterior compartment which includes cystocele,uterine descent and rectocele.

MRI has been used for imagingfemale pelvic floor in preoperative planning of complicated cases.Recently perineal ultrasonography is gaining importance in imaging of pelvic floor.

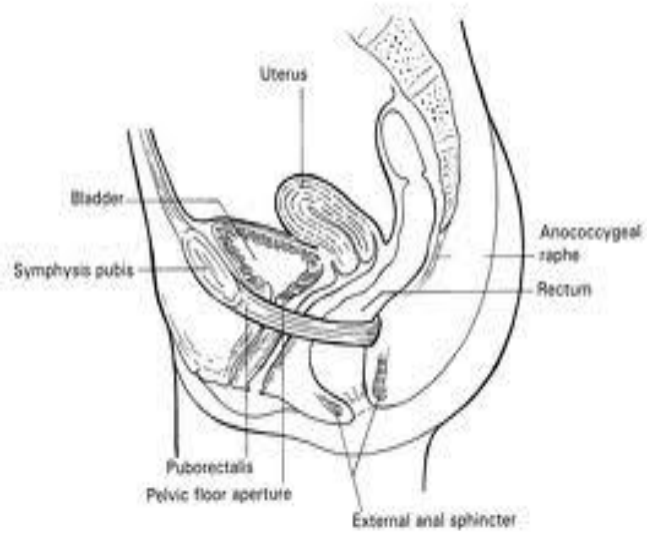
There are many shared advantages of the two imaging modalities namely

1. No ionizing radiation
2. Non invasive
3. Superior soft tissue contrast

Apart from the above mentioned combined advantages, transperineal ultrasound scores overin the aspect of cost effectiveness and repeatability as well as reproducibility of the examinationwhich can be performed in an outpatient clinic.However MRI is superior in imaging largevolume of pelvis.

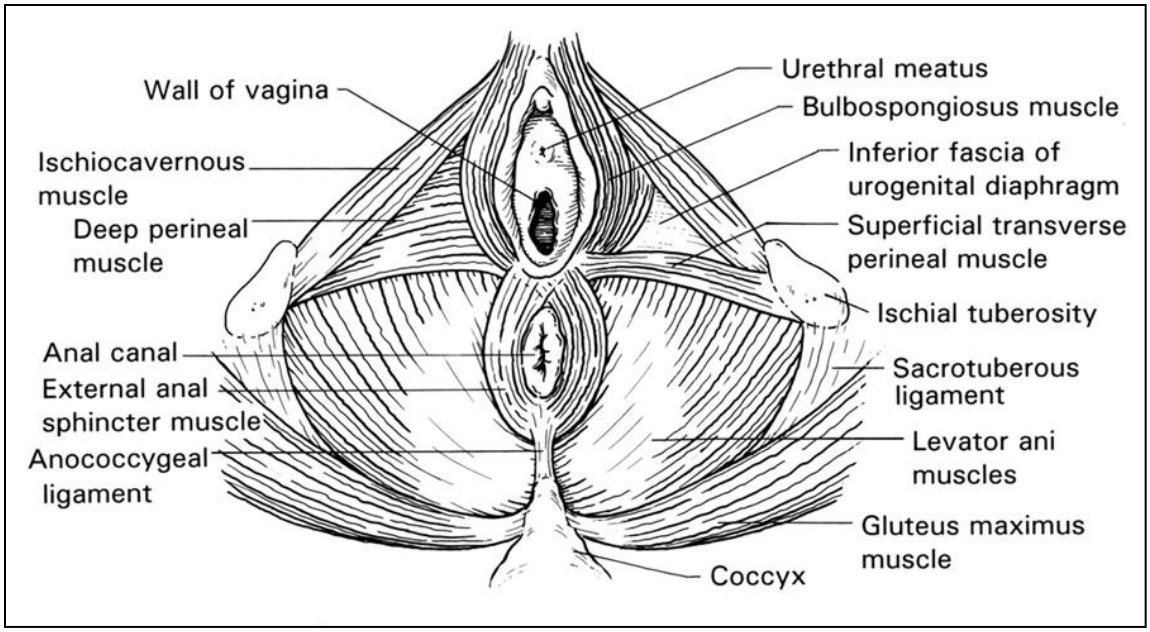
ANATOMY OF THE PELVIC FLOOR

The pelvic floor is a complex, multilayer system which provides active and passive support. Female pelvic floor is multilayered with endopelvicfascia forming the top layer,next is the pelvic diaphragm and the most caudal is the urogenital diaphragm[1].



Pelvic fascia

Pelvic fasciae is so thin structure, such that it is below imaging resolution in any modality.



Compartments

The female pelvic floor has three compartments;

1) The bladder and urethra forming the anterior compartment.

2) The vagina forming the middle compartment and

3) The rectum forming the posterior compartment.

The condensation of endopelvic fascia and the levator ani muscle form support to each ofthese compartments. Anatomical knowledge of the pelvic organs is essential to interpret the clinical findings as well as those of Ultrasound, CT and MRI to make an accurate gynecological diagnosis.

Pelvic floor muscles and fasciae hold the pelvic organs in place. Prolapse, stress incontinenceof urine and feces are related to the laxity and atonicity of these structures.

Denervationofthe pelvic nerves also contribute to pelvic floor dysfunction. Bladder rectum and anal canal share the same musculature and ligamentory supports.Laxity of these supportive structure causes genital prolapseas well as urinary,fecal incontinence.

Prolapse is a common complaint in gynaecologicalpractice.Normally when a women strains there is no descent either of the vaginal walls or of the uterus.In prolapse ,strainingcauses protrusion of the vaginal walls at the vaginal orifice, while in severe cases the cervix of the uterus may be pushed down to the level of the vulva.In extreme cases the whole uterusand most of the vaginal walls may be extruded from the vagina.This happens mostly in post menopausal and multiparous women and is called procidentia.

Supports of the genital tract

DELANCEY introduced three level system of support[2]

1. Level 1:Uterosacral and cardinal ligaments support the uterus and vaginal vault.
2. Level 2: Pelvic fascia and paracolpos which connects the vagina to the whiteline on the lateral pelvic wall through the arcustendinosus.
3. Level 3: Levatorani muscle supports the lower one third of the vagina.

   The clinically unrecognized injuries and breaks in these supports can be detected by ultrasound and MRI.

STRESS URINARY INCONTINENCE

Urinary incontinence may indicate a symptom,a sign or a condition.

The patient complaints of involuntary leakage of urine which she finds socially and hygienically unacceptable. The sign is the objective demonstration of urine loss,and the condition is the underlying pathophysiologic mechanism responsible for the urine leak.

The symptom of involuntary urine loss may be associated with stressful activity like coughing, sneezing,straining or other physical activity. This is called as stress urinary incontinence. Involuntary urine loss may follow a strong desire and need to void this is called as urge incontinence.

FAECAL INCONTINENCE

Normal anatomy of the anal canal .

The anal canal is 3-4 cm in length and is surrounded by the internal sphincter above andthe external sphincter below. The internal sphincter represents the expanded distal portion of the circular smooth muscle of the rectum and is innervated by autonomic nerves. The external sphincter is a striated muscle and is innervated by the pudentalnerve(sacral 2,3,4). The anal pressure remains above the rectal pressure and internal sphincter remainscontracted in a continent woman,and internal sphincter opens only when the rectum distends aided by intra abdominal pressure . The external sphincter muscle is supplemented by the puborectalis muscle of the levatorani and this

prevents or defers defecation when the suitable situation does not prevail. In addition the rectum forms an angle of 60 -130* with the anal canal and this also helps to keep the internal anal sphincter closed, and prevents stool entering into the anal canal.During defecation ,the angle straightens up and allows the faecal matter to enter the anal canal. The levatoranimuscle relax, so also the external sphincter.

Fecal incontinence is defined as loss of normal control leading to involuntary leakage of faecal contents. Depending upon the degree of incontinence,flatus,loose motion orsolid stools leaks out.Fecal incontinence is reported in 0.5 -2% women following vaginal delivery. Women are more prone to fecal incontinence than men,and elderly women suffer more than younger women.

Fecal incontinence may follow some years after delivery, but many develop it within6 months of delivery. The occult damage to the internal sphincter occurs in 35% women following vaginal delivery, though perineum appears intact.

ANATOMY OF THE PELVIC FLOOR

The pelvic floor consists of the levatorani and the coccygeus muscle and is compared to gutter as it slopes forward from both side towards the median plane.It is traversed by the urethra , the anal canal and the vagina.

PELVIC FASCIA AND MUSCLES

The pelvic fascia is distributed in the extraperitoneal space of the pelvis.

It covers the lateral pelvic wall and the pelvic floor called parietal pelvic fascia; and also surrounds the pelvic viscera called visceral pelvicfascia.

PARIETAL FASCIA OF PELVIC FLOOR

The pelvic fascia covers both the surfaces of the pelvic diaphragm,forming the superior and the inferior layers. The inferior fascia is also known as the anal fascia.In general thefascia of the pelvic floor is loosely arranged between the peritoneum andthe pelvic floor ,forming a dead space for distension of the bladder,therectum,the uterusand the vagina.Howeverfascia is condensed at places to form fibro muscular ligaments which support the pelvic viscera. The various ligaments are dealt with individual viscera including the bladder, uterus andthe rectum.

VISCERAL PELVIC FASCIA

The fascia surrounds the extra peritoneal parts of the pelvic viscera. It is loose and cellular around distensible organs like the bladder, rectum and the vagina.The

visceral layer is attached along a line extending from the middle of back of pubis to the ischial spine.

PELVIC MUSCLES

Pelvic muscles include two groups

1. Pyriformis and obturatorinternus ,which are short lateral rotators of the hip joint.
2. Levatorani and coccygeus, which with the corresponding muscles of the opposite side,form the pelvic diaphragm. Diaphragm seperates the pelvis from the perineum.

Levatorani and coccygeus may be regarded as one morphological entity, divisible Frombefore backwards into the pubococcygeous,illiococcygeus and the coccygeus. These muscles are described below

Levator ani:

The muscle is divisible into a pubococcygeus part and an illiococcygeus part.

Pubococcygeus part:

1. The anterior fibres of this part arise from the medial part of the pelvic surface of thebody of the pubis. These fibres surrounds the vagina and forms the sphincter vagina.Thesefibres are inserted into the perineal body.

2.The middle fibres constitute the puborectalis. These arise from the lateral part of thepelvic surface of the body of the pubis. In females anterior portion of puborectalisisthinner and shorter.

3.The posterior fibres of the pubococcygeus arise from the anterior half of the whiteline on the obturatorfascia.These gets attached to the anococcygeal ligament and tip of coccyx.

Illiococcygeus part:

The fibres arise from posterior half of the whiteline on the obturatorfascia,the pelvic surface of ischial spine and they are inserted into anococcygeal ligament and into sideof the last two pieces of coccyx.

Coccygeus muscle:

This muscle represents the posterior or ischiococcygeus part of the pelvic diaphragm.

ACTIONS OF PELVIC FLOOR MUSCLES

1. Levator ani and coccygeus close the posterior part of the pelvic outlet.
2. Levatorani fix the perineal body and support the pelvic viscera.

3. During coughing, sneezing, lifting and other muscular efforts,levatorani and coccygeus counteract or resist increased intra abdominal pressure and help to maintain the continence of the bladder and the rectum.
4. In micturition. defecation, and parturition, a particular pelvic outlet is open,but contraction of fibers around other openings resists increased intra abdominal pressure and prevents any prolapse through the pelvic floor.
5. Increase in the intra abdominal pressure is momentary in coughing,sneezing and is more prolonged in yawning, micturition defecation and lifting heavyweights.
6. It is most prolonged and intense in second stage of labor.

CLINICAL ANATOMY

The muscles of the pelvic floor may be injured during parturition. When the perineal body is torn and has not been repaired satisfactorily, the contraction of anterior fibers of the levatorani increases normal gap in the pelvic floor,instead of decreasing it. This results in abnormalities like cystocele,or prolapse of the uterus.

TERMS AND DEFINITIONS

Pubococcygeal line- PCL:

This line is the standard reference line and it connects the inferior border of pubic symphysis and fifth coccygeal vertebra . It represents the level of the pelvic floor. The distance fromthe pubococcygeal line to the base of bladder, the lowermost portion of uterus , and the anorectaljunction has be measured .These measurements are obtained with the patient at restand at maximal pelvic strain.

Levator hiatus:

Hiatal area is the region enclosed between the arms of the puborectalis muscle and contains the anteriorly urethra, centrally the vagina and the anorectum posteriorly.

Minimal hiatal dimension:

The minimal antero posterior diameter of the levator hiatus in the mid-sagittal image.

H line:

It is measure of anteroposterior diameter of the levator hiatus. It is a line extending from the inferior border of symphysis pubis to the anorectal junction posteriorly.

Anal Sphincter :

The anal mucosa appears as 'mucosal star' formed by the folds of the empty anal canal lumen. The internal anal sphincter complex is seen as a well definedhypoechoic ring. The external anal sphincter complex seen as an echogenic ring around the internal sphincter .Imaging of anal sphincter complex should include from the caudal to cranial, i.e from the anus to the level of the puborectalis sling because the appearance of the sphincter at the level of the superficial external sphincter and at the level of the puborectalis muscle is different. The total length of the anal sphincter complex was evaluated to facilitate location and to access the exact extent of the defect.

These reference lines are shown in the graphical representation.**Fig.1.**

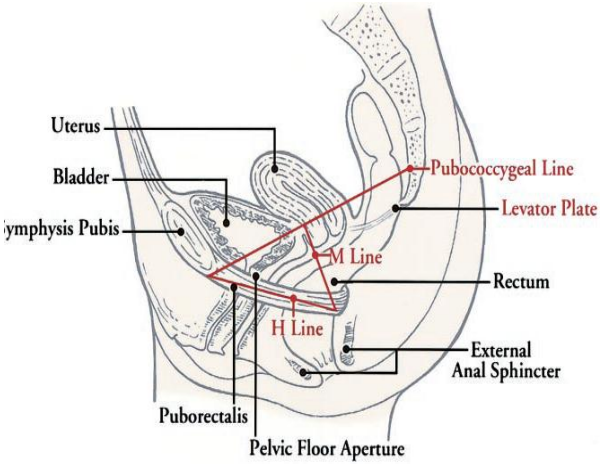


Fig.1.Graphical representation of various lines used in pelvic floor imaging.

MR FINDINGS OF PELVIC ORGAN PROLAPSE

Cystocele and stress incontinence

Cystocele is diagnosed based on the following criteria[3],

1.Base of the urinary bladder below the level of inferior border of pubic symphysis.

2.Base of the urinary bladder 1 cm beyond the pubococcygeal line .

Contraction of the levatorani muscle complex prevents the bladder from descending below the pubococcygeal line . But in case of pelvic floor laxity there is weakness of this supporting structures leading to bulging of the vaginal wall in the cranial aspect anteriorly which is called as cystocele.

Magnetic resonance imaging done with the patient at rest and valsalva brings out the alteration in normal anatomical position of bladder ,urethra with good soft tissue resolution.

Uterine or vaginal vault prolapse

Literature review identifies uterine descent below the reference line ie pubococcygeal

line as uterine prolapse. In case of posthysterectomy patients the descent of vaginal vault below the reference line is considered ad vault prolapse.

As a consequence of normal vaginal/ instrumental vaginal delivery there occurs injury to the uterosacral ligament which stretches and causes widening of levator hiatus. This leads to descent of vaginal fornices and along with the cervix and the uterus.

These changes are seen in axial and sagittal MRI and Transperineal ultrasound as

1. Abnormal shape of vagina . Instead of the normal H shape it balloons out and hence the walls are wide apart.
2. Visualization of cervix at the level of inferior border of symphysis.
3. Visualization of vaginal vault at or below the level of pubic symphysis.

Pelvic floor dysfunction

The anteroposterior diameter of the levator hiatus, measured from the pubis to the posterior wall anal canal at the level of anorectal junction. In patients with pelvic floor laxicity there is loss of tone of levatormuscle ,leadingto bulge of the levatormusclewhich is called as ballooning . The hiatal dimension as represented by

the H Line is normally below 6 cm . Hiatal widening is diagnosed when it exceeds 6 cm. The descentof the pelvic floor as represented by the M Line is normally below 2cm. In case of pelvicfloor laxity it exceeds 2cm[4].

These changes are measured in MRI and Transperineal ultrasound as:

1.Widened tranverse diameter of levator hiatus which is the distance between the inner margins of the levator ani muscle measured at varying levels and the average is taken for consideration.

2.Increased anteroposterior length of levator hiatus i.e. abnormal H Line.

3.Increased laxicity of pelvic floor as evidenced by abnormal M Line.

The levator plate is normally parallel to the pubococcygeal line . In women with

pelvic floor dysfunction the levator plate assumes vertical orientation instead of its normal horizontal orientation.This levator plate distortion in orientation is measured only with MRI because the levator plate is not well appreciated with ultrasound. Hence this parameter was not considered for comparison.

INTERPRETATION

PCL LINE:

The bladder is easily identified in all women because the urine is hyperintense in T2 weighted imaging and hence the standard protocol includes sagittal T2 weighted images for dynamic MRI evaluation. The Transperineal ultrasound equivalent of MRI PCL Line is drawn in the midsagittal plane using the same anatomical landmarks.

In women with pelvic floor dysfunction , descent of uterus / vaginal vault beyond 1 cm below the PCL line defines uterine /vaginal vault prolapse. When the descent exceeds 2cm beyond the PCL line strongly indicates the need for surgical intervention.

First PCLline is drawn in the sagittal T2WI in static and dynamic acquired image **Fig.2. and Fig.3.**Then the measurements of the bladder base and uterine cervix as a represent of anterior and middle compartment from the PCL in centimeters is calculated both in rest and strain images.

LEVATOR HIATUS

The H line is identified in MRI using sagittal T2WI both at rest and in dynamic images at the level of minimum hiatal dimension. The same is identified with transperineal ultrasound along the minimal hiatal dimension, in the mid-sagittal image

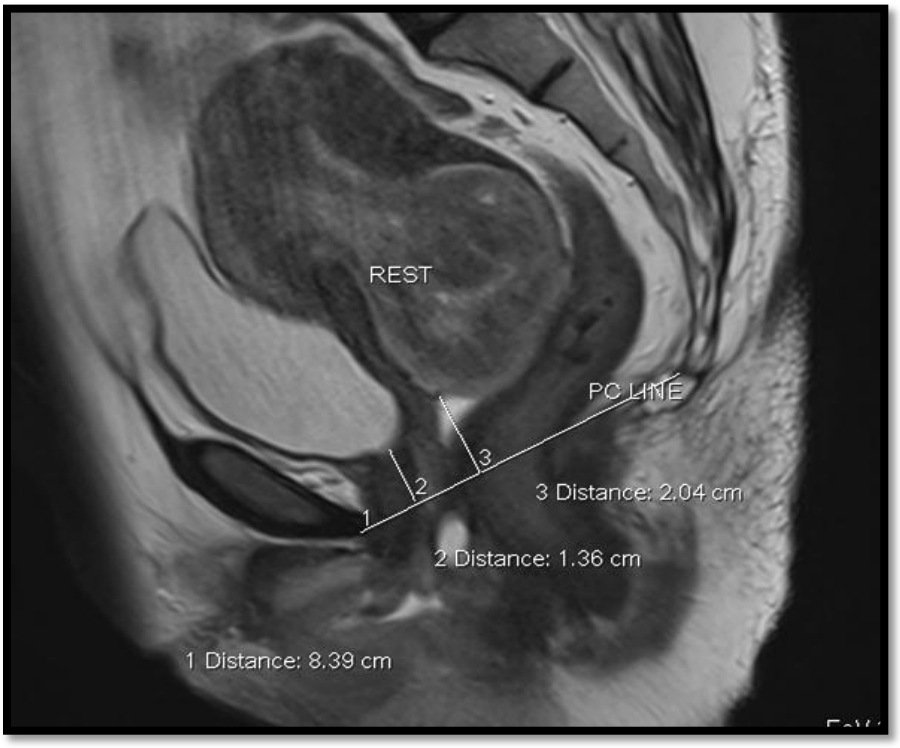


Fig.2. T2WI in Midsagittal view showing the reference lines, urinary bladder,uterus and anorectum from anterior to posterior at rest.(There is endometrial fibroid polyp protruding via cervix)

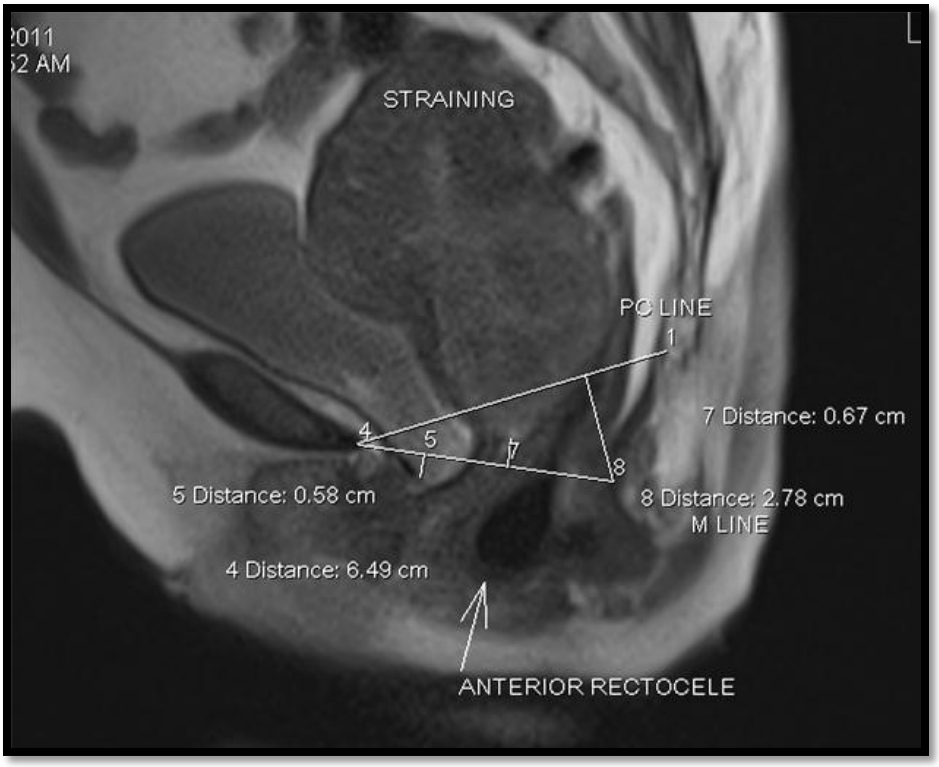


Fig.3.T2WI in Midsagittal view showing the reference lines, urinary bladder,uterus and anorectum from anterior to posterior during valsalva.

The transperineal ultrasound equivalent of MRI PCL line is from the inferiorpubic symphysisto the echogenic levatorani muscle in the posterior margin of anorectal junction since the coccyxis not seen in ultrasound image. As above the descentof bladder base and uterinecervixbeyond this line bot at rest and with strain are measured .**Fig.4.** The strain images are supplemented with cine loop thus helping in confirming the findings.

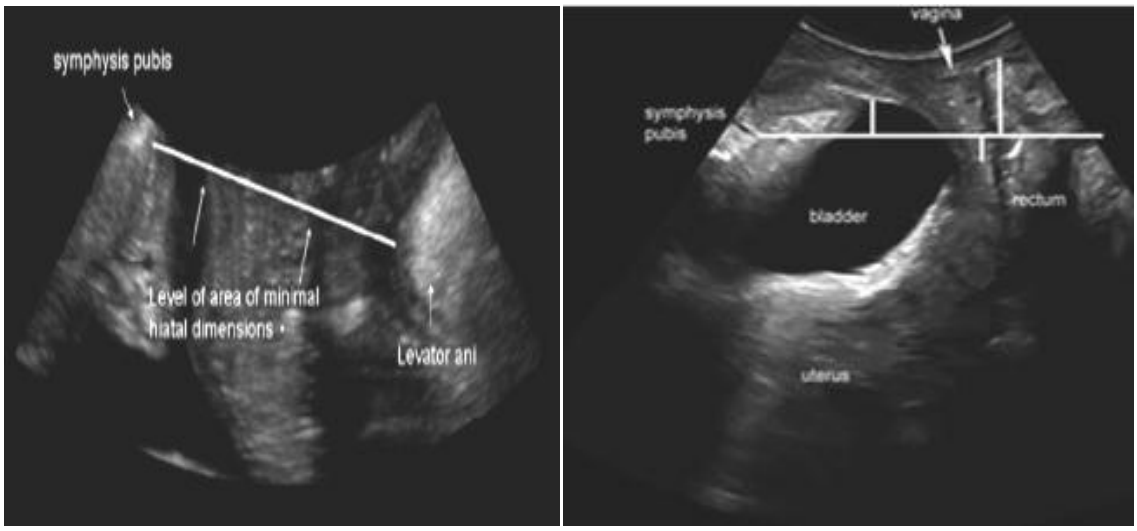


Fig .4. Transperineal ultrasound showing midsagittal view and reference lines at rest and during valsalva.

ANAL SPHINCTER COMPLEX

The axial T2WI images with small FOV which include the visualization of oflevator hiatuswith urethra anteriorly and anal sphincter posteriorly .The external sphincter is seen as hypoechoic structure surrounding the thehyperechoic internal anal sphincter. The entirelength of the anal canal is evaluated for integrity, signal intensity,abnormal deviations and abnormal collections were noted. Using the transvaginalprobe ,which is placed on the perineal body in a vertical orientation

the entire length of the anal canal is spanned. The internal sphincter appears as well defined circular structure uniformly hypoechoic and surrounding this is the external sphincter whichis slightly hyperechoic .**Fig.5.**

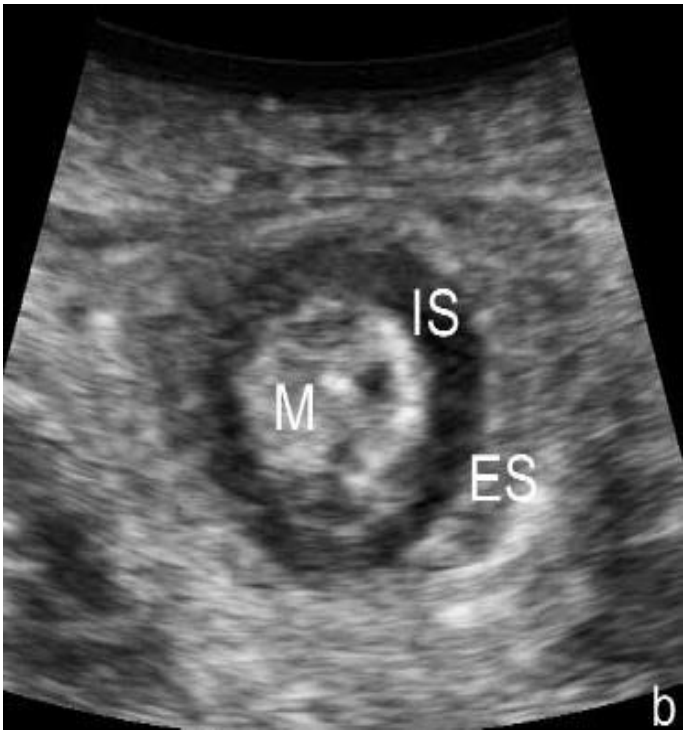


Fig.5.Transperineal ultrasound showing transverse view of midanal canal.

The sonographic signs of anal sphincter integrity which includes

1.Mucosal star pattern-The hyperechoic mucosal folds of the empty anal canal. The limbs of the star deviates to one side in case of levator muscle damage in that side. This mucosal star pattern is lost if there is sphincter tear.

2. ES or IS sphincter discontinuity,

3.Thickening of the ES at the 12-o'clock position,

4.Thinning of the IS in the area of rupture in conjunction with thickening opposite the rupture site (the "half-moon" sign).

AIMS AND OBJECTIVES

To compare the measurements of pelvic floor during rest and valsalva in patients with pelvic floor dysfunction, measured using transperineal two-dimensional(2D) ultrasound and magnetic resonance imaging.

The following parameters were compared namely

1..Bladder base below PCL line.

2.Uterus below PCL line.

3. "H" line

4.Anal sphincter integrity.

REVIEW OF LITERATURE

1.Suzan.R.Brukkusis et al[5] study evaluated the correlation in degree of prolapse between clinical examination and dynamic MRI study and perineal ultrasonogram. The standard clinical classification of prolapse staging is POP-Q (pelvic organ prolapse quantification) which was compared with dynamic MR and transperineal ultrasound Agreement between the above three methods showed correlation only with anterior compartment.

Hence based on this study, anterior and middle compartment were included in my study for detecting the correlation between dynamic MRI and transperineal ultrasound.

2.According to H.P.Dietz and AnnekeB.Steensma[6] study regarding the prevalence of abnormalities of puborectalis muscle in gynecologicalpatients. His study done with3D transperineal ultrasound and offline analysis was done with 4D view software.The results of his study concluded that the defect of puborectalis muscle was found in 15.4% of multiparous women who delivered vaginally.Hence only parous women who delivered vaginally were taken as inclusion criteria in my study.

3.According to study by Anneke B. Steensma and karlijn J.Schweitzer[7],they studied specifically about the anal sphincter and its effects. Whether anal sphincter

defects had association with major levator defects. They also studied about the relationship between history of fecal incontinence and sphincter injury and concluded that isolated anal sphincter injury was the most important factor for developing fecalincontinence. The results of my study agreed with their study suggesting the importance of imaging anal sphincter in cases with suspected injury. So that development of fecal incontinence in future could be predicted.

4.Based on the evaluation exhibit by R.Feilding in radio graphics 2002 the MRI parameters for imaging female pelvic floor weakness were followed throughout my study.

5.According to study done by Suzan.R.Brukkusis et al[5] inrelating the symptoms of pelvic floor dysfunction,they concluded that there was poor correlation of symptoms of pelvic floor dysfunction with clinical examination and dynamic MRI imaging.But in my study there was good correlation with the patient'ssymptoms

and MR imaging and dynamic transperineal ultrasound.

6.In 2011,study conducted by Santro et al[8], stressed the importance of ultra sonogramas a procedure which is easy to perform, cost effective approach to pelvic floor imaging.This widely available technique supplements the comprehensive

understanding of thefunction and integrity of pelvic floor and it helps in surgical management. They havelaid down clinical indications for pelvic floor ultrasound like urinary incontinence,symptoms of voiding dysfunctions etc.

The goal of pelvic surgery is to restore anatomy and relieve symptoms. So the additional knowledge from ultrasound pelvic floor, improves the surgical outcome.

7.In study by H.P.Deitz in 2004[9] transperineal ultrasound was focused as an replacing radiological tool in pelvic floor imaging, and stressed the ease of use and easy availability.

There are ranges of other abnormalities incidental or many at times expected can be detected with transperineal approach.

In my study a case of stress urinary incontinence for which transvaginal tape fixation of bladder neck was done. Thetransvaginal tape had migrated into the anterior vaginal wall this was clearly demonstrated with transperenealultrasound.

Likewise another case of Gardner's cyst was identified in my study.

8.In 2000, study by Elena rovice et al [10] studied the normal anal sphincter anatomy

using the high spatial resolution endo anal MR imaging. They concluded that severe atrophyin incontinence patients could be differentiated from age related thinning of the muscle.

9.Beer-gabel[11] et al in 2002,asses the feasibility of dynamic transperineal ultrasound in measuring the extent of puborectalis muscle and its shortening, angle subtended by anorectum and the movement during straining.

10.In 2006,Sharon et al[12] evaluated the clinical significance of the postpartum damageof the anal sphincter using transperineal ultrasound. The study was done on the day of delivery within 6-24 hours in all women who underwent vaginal delivery. Thenat theend of second and six months, sonographic appearance of anal sphincter was reevaluated. They concluded that the transperineal ultrasound findings done immediately after delivery, have relation to the long term anorectal complaints. This study stressedthe potential role for transperineal ultrasound in assessing and predicting the anal sphincter integrity in women undergoing vaginal delivery.

11.S.Hajebrahmi[13] in 2009 compared clinical and transperineal ultrasound findings of women with stress urinary incontinence and the same compared with normal controls.The study evaluated the posterior urethra vesical angle is beta angle,

bladder neck funneling and the urethral hyper mobility. They concluded that for patients withwiderbeta angle >130*, were more common among cases than controls.

12. In 2012,D.V.Valsky et al[14] had done 3D-TPD in women with third or fourth degree tear and its correlation with clinical complaints of incontinence. They had laiddown some sonographic signs of damaged anal sphincter which included irregularity of internal anal sphincter, half moon sign etc. He also studied the integrity of the analsphincter in patients who underwent sphincter repair and concluded that transperinealultrasound to be done for evaluation of anal sphincter integrity and useful tool forfollow up.

He also concluded that certain signs of sphincter damage which was seen in early postpartum period disappeared later and hence transperineal evaluation of anal sphincter integrity has to be postponed in the post partum period.

13.In 1991, Yang et al[15] reported that dynamic imaging of pelvic floor could only be donewith short acquisition sequence and that T1 weighted sequence could be

carried out exclusively in cooperative patients .

14.In 2000, Elena Rociou et al[10] performed a study in 100 healthy volunteers (50 women, 50 men).The anatomic structures reviewed, including multiplevaried patterns in womenwere recorded. The age related variation in thickness of anal sphincter and its length werecompared among men and women and has laid down standard values for thickness of sphincter.

15.In 2002, Julia R.Fielding[3] in his article, practical MR imaging of pelvic floor weakness, described the H and M lines, PCL line. He concluded that MR images providethree-dimensional viewof the pelvic floor which helps in planning of suitable surgicalprocedure.

16 .In 2003, John O, L. Delancey[2], studied the appearance and occurrence of abnormalities in the levatorani muscle seen on magnetic resonance imaging (MRI) in 80 nulliparous women and in 160 women after their first vaginal birth. Abnormalities in the levator animuscle are present on MRI after a vaginal delivery but are not found in nullipara.

17.Milena etal[16] elaborated about the anatomy of anal sphincter complex and that it

comprisesof 1. internal anal sphincter (IAS), 2.the external anal sphincter (EAS) and 3.Puborectalismuscle (PRM). Anatomical discontinuity of the IAS, EAS and PRM are usually associatedwith fecal incontinence The PRM, also known as pubovisceral muscle, forms part of thelevator-ani muscle complex. In women following childbirth thereoccurs anatomical defectsin the PRM and anal sphincter, and most of these defects recover spontaneously.

Endoanalultrasound imaging using two-dimensional and 3-dimensional techniques were used to assess the IAS and EAS. The author discussed the role of transperineal US imaging of theanal sphincter complex using cutaneous approach. The major advantages of transperineal US imaging is that it does not need to be inserted into the anal canal and hence less invasive andalso, it allows visualization of entire sling of the PRM. The entire length of PRM cannot beseen with the endo-anal US imaging and hence is a potential drawback .They had devisedscoring system and had calculated the percentage of average amount of slices that showed defect. This method devised a quantitative analysis of sphincter integrity.

18.In 1993,Abdul H.Sultan et al [17] conductedanorectal neurophysiologic tests and anal endosonography on women before and after delivery to evaluate the incidence of neurologic and mechanical trauma during childbirth. According to their study it was with vaginal deliverythere was frequent association of mechanical disruption of the anal sphincters.External-sphincter damage occurred as part of a direct continuation of perinealdisruption as it was seen only in the presence of a tear or episiotomy .

Even when the perineum remained intact there were injuries to the internal sphincter. Theyencountered damage to internal anal sphincter more frequently than the external sphincter.This was explained probably by the shearing forces produced by the infant's head descentduringvaginal delivery.

19.According to Oom DM[18]et al ,Women with sufficient residual sphincter function to maintain continence,though had anatomical defects still did not have symptoms.For such womenlong-term follow-up is necessary to determine whether they have greater risk forincontinence later in life. Since the cumulative effect of subsequent deliveries,the menopause ,the aging process and the coexistence of a neuropathy may all contribute to sphincter weakness in the long term.

Hence the peak incidence of fecal incontinence occurs in the fifth and sixth decades.

20. According to the study by JohansonRB[19], eight out of ten women with forceps deliveryhadanal Sphincterdefects and none of the five women who had a vacuum delivery hadsphincter damage.Their study is consistent withthose of other reports stressing thatforceps deliveryis associated with more trauma to the perineum than vacuum extraction.

21.Study by ComiterCV[20] et al laid certain standard reference lines for evaluation of pelvic floor dysfunction. Two reference lines, namely the M and H lines, are useful in identifying prolapse and pelvic floor relaxation. The H line measures the distance fromthe inferior surface of pubic symphysis to the anorectal junction posteriorly on themidsagittalimage.The normal measurements of the M line and Hiatal lineline in normal women is approximately 2 and 5cm,respectively.

22.As per Gonzalez-Argente et al[21], patients with urinary incontinence also had descent of pelvic viscera involving the middle compartment and posterior compartment. So

assessment of all the three compartments is essential for surgical planning and reconstruction . Imaging the pelvic floor usingMRI andTransperineal ultrasound with proper protocol reduces the risk of repeat surgery and hence the recurrence of patients symptoms.

Although MRI is not essential for assessment of mild pelvic floor dysfunction, it plays an important role in triaging the patients who would benefit from corrective surgery.Due to its superior soft tissue resolution, it gives indepth anatomic information.

Since MRI allows simultaneous visualization of all the 3 compartments of pelvic floor and organs the authors concluded that for complete evaluation of pelvic organ prolapse .

MRI remains the noninvasive dynamic imaging modality of choice which will be useful to surgeons and urogynecologist in decision making . Hence MRI was taken as the gold standard imaging modality of choice for pelvic floor dysfunction and was compared withtransperineal ultrasonography.

23. Courtney and wood field et al[22]stressed thatUltrasound can be used to evaluate women with symptoms of urinary incontinence and fecal incontinence.

Transperineal ultrasound and 3D techniques can also be used to evaluate the pelvic floor. Ultrasound evaluation has the advantages of ready availability and relative ease to perform, with no issue of ionizing radiation. They however discussed the potential pitfall of the transducer compressing pelvic structures like the urethra, the bladder and resulting in inaccurate assessment and distortion of organ position and morphology. The confined field of view of ultrasound limits the global assessment of the pelvic floor.

The anal canal mucosa and submucosa are usually folded in empty state and is hyperechoic. The normal IAS is well defined uniformly hypoechoic measuring approximately 2–3 mm in thickness. Whereas the normal External anal sphincter is poorly defined and heteroechoic with variable thickness . Defects in anal sphincter looks like muscular interruptions. The reported sensitivities and specificities of ultrasound is approximately up to 90% for these findings.

24.According to Stoker J et al study[23] , In MRI the anal sphincter muscles are clearly visualized. They are evaluated in axial and coronal planes. The innermost muscle is theinternal anal sphincter which is of uniformiso to hypo signal intensity on

T2-weighted images.

The outermost muscle is the External anal sphincter . It appears as hypointense on T2-weighted images. The External anal sphincter is very thin and may at times be thinned out in the anterior aspect or posterior aspect as a normal variation.

This finding is a potential pitfall and should not be mistaken for a sphincter defect .

MATERIAL AND METHODS

Study Design: Prospective study

Study duration: 2 years

Study place **:** Barnard Institute of Radiology, Madras Medical College.

Subjects:

The study population consisted of 50parous women with various pelvic floor dysfunction, attending the urogynecology department in Government Kasturba Gandhi Hospital For Women and Children. The study period includes two years from June 2010 to May 2012.

Patient evaluation and selection

Inclusion criteria:

1.Multiparous women with stress incontinence, urge incontinence and fecal incontinence.

2.Age group 50-60 years.Women who underwent vaginal delivery , forceps delivery and post hysterectomy.

Exclusion criteria:

1) Cardiac pacemaker
2) Cochlear implants
3) Claustrophobia
4) Procidentia
5) Non-obstetric perineal injury,anorectal malformation.

The physical examination including the patients age BMI,parity, mode of delivery were recorded. The urogynecologist scored the various defects of the three compartments separately at rest and with maximum strain. The clinical findings were noted along with the patients symptoms.

Patient preparation

1) Partially filled bladder
2) No fasting
3) Coach the patient to do valsaslva.

The study was performed on a 1.5 Tesla super conductive whole body MRI scanner MAGNETOM VISION (SIEMENS MAGNETIC VISION).

During the study the patient is placed on the strong homogenous magnetic field. The hydrogen nuclei, protons, distributed through the entire body tissue generate signals

when stimulated by a radio frequency pulse. These signals are processed into images by a computer.

Coils

1) Torso phased array coil
2) Body coil

Sequence parameters

Imaging with the patient in the supine position is ideal for evaluating symptomatic pelvic floor weakness.

The patient was laid on the MR couch with a body array coil placed around the pelvis.

First a scout image in mid sagittal plane is got which shows theurethra, bladder,

vagina, uterus, analcanal, rectum, and coccyx.

Followed by 3mm-thick sagittal images with a HASTE sequence, is done. This sequence is chosen because of shorter acquisition time so that the patient can hold strain during valsalva maneuver.All patients were taught to do a valsalva technique .

Then , 3-mm thick axial T2-weighted images of the perineum were obtained.

Additional coronal images were also taken in T2 weighted sequence.

PULSE SEQUENCE	PLANE	TR / TE (MSEC)	FOV (CM)	SLICE THICKNESS (MM)	FLIP ANGLE	FREQUENCY * PHASE	Nex
Scout	Sagittal	20/7	360-420	15	1*	150*256	-
HASTE	Sagittal	4.3/80	340	3	107*	256*256	1
T2 FSE	Axial	4500/140	250-300	3	170*	260*256	2
T2 FSE	Coronal	4500/140	250-300	3	170*	260*256	2

PELVIC FLOOR IMAGING WITH TRANSPERINEAL ULTRASOUND FOR EVALUATION OF PELVIC FLOOR

Transabdominal ultrasound was the only modality wasavailable in early eighties.

Then imaging of perineum wasdone using 3.5 -6 MHz curved array abdominal

probe using trans labial/transperinealapproach. The terms trans labial/Transperineal and perineal are considered synonymous and can

be usedinterchangeably.

Imaging done with patient in supine position with flexed and abducted hips. Partially filled bladder is preferable. Empty rectum is a prerequisite because full rectum impairs the accuracy.

The image orientation is symphsis pubis to the left and anorectal canal to the right side of the screen as shown by kohorn and girishke. **Fig .6.**

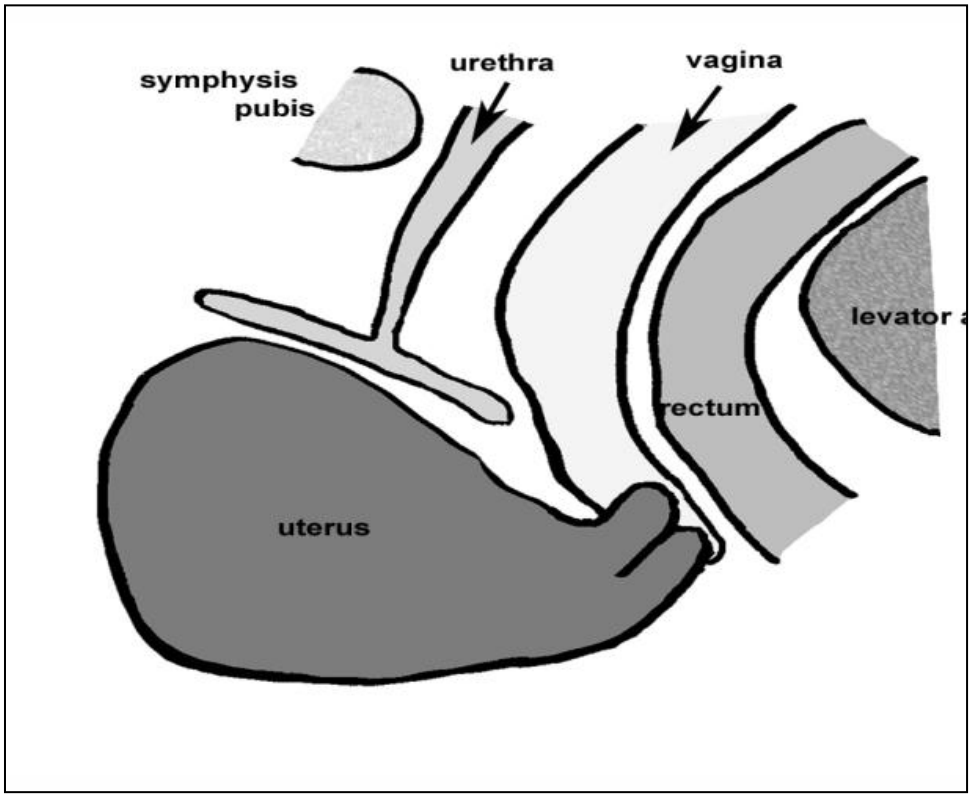


Fig.6. Image orientation for transperinealultrasound inmidsagittal view.

The mid sagittal plane is chosen and data is acquired with acquisition angle of 60° or slightly higher . The inferior margin of the pubic bone ,urethra,vagina,anal canal and levatorani muscle seen from left to right in continuity.

With 2D imaging a single plane is obtained and the entire levatorhiatus is imaged.

Images acquired at rest and with valsalva.

A cineloop function will be helpful for assessment of valsalva maneuver.

RESULTS & STATISTICAL ANALYSIS

The study was conducted on 50 women with pelvic floor dysfunction who attended Urogynecology clinic and the following observations were made.

All the 50 patients were categorized according to their symptoms as those with stress incontinence, urge incontinence and fecal incontinence and they were subjected to both two dimensionaltransperineal ultrasound and dynamic magnetic resonance imaging at the same time.

The following parameters were compared with two modalities and analysed separately.

1.Bladder base below PCL line.

2.Uterus below PCL line.

3. “H” line

4.Anal sphincter integrity.

BLADDER BASE BELOW PCL LINE

Among 50 patients 13 patient were found to have bladder base below PCL line at rest. With valsalva maneuver 30 patients were found to have bladder base below PCL line and remaining 7 were found to be normal.

TABLE NO. 1

S.NO	Parameter	MRI			TransperinealUSG		
		Rest	Valsalva	Normal	Rest	Valsalva	Normal
1	Bladder base below pcl line	13	30	7	13	30	7

INFERENCE :

Among 50 patients TransperinealUSG identifies equally the bladder base below PCL Line both at rest and valsalva in comparison with MRI . Transperineal USG detects equally the normal individuals as compared to MRI.

BLADDER BASE BELOW PCL LINE

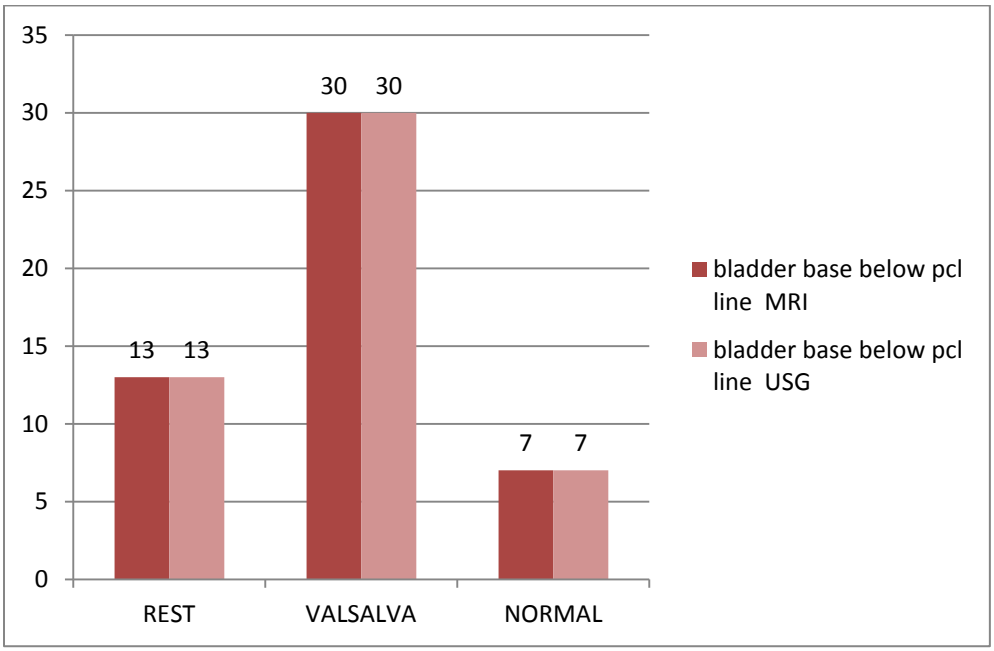


TABLE NO. 2 BLADDER BASE BELOW PCL LINE Paired Samples Statistics

		Mean(cm)	N	Std. Deviation	Std. Error Mean
Pair 1	MRIRES	2.99	13	.473	.131
	USGRES	2.78	13	.463	.129
Pair 2	MRIVALSALVA	1.95	30	.256	.047
	USGVALSALVA	1.74	30	.234	.043
Pair 3	MRINORMAL	.96	7	.053	.020
	USGNORMAL	.83	7	.076	.029

TABLE NO. 3 BLADDER BASE BELOW PCL LINE

DURING VALSALVA AMONG 30 PATIENTS

PARAMETER	>2cm	> 1cm to ≤ 2cm
MRI	14	16
TPU	0	30

INFERENCE:

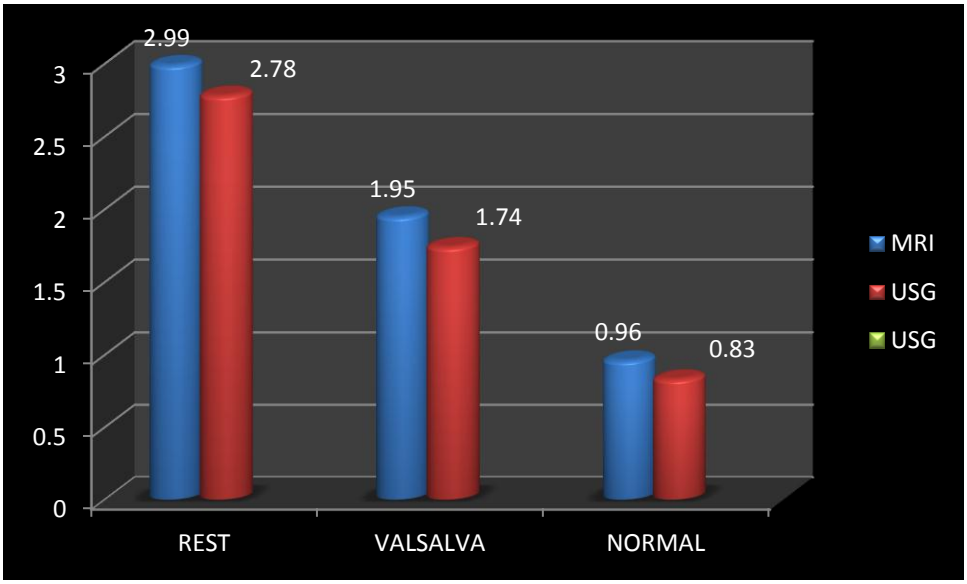
Patients with bladder base below PCL line >2 cm needs surgical intervention

The mean value of bladder base below PCL line at rest using MRI is 2.99cm andwith TransperinealUSG is 2.78cm.Though there is subtle difference between the mean values, it does not make any difference in the treatment options.

Table 2 shows that among 30 patientswho had bladder base below PCL line during valsalva maneuver, 14 of them hadmean value of 2.37 using MRI thus indicating the need for surgical intervention. For the same 14 patients transperineal USGshowed mean value of 1.82cm thus under estimating the surgical need for these patients.Hence the limitation oftransperineal USG regarding this parameter in triaging the patient for surgery has to be recognised.

BLADDER BASE BELOW PCL LINE

MEAN VALUES AT REST ,VALSALVA USING MRI AND TPU



BLADDER BASE BELOW PCL LINE

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	MRIRES & USGRES	13	.995	.001
Pair 2	MRIVALSALVA & USGVALSALVA	30	.946	.001
Pair 3	MRINORMAL & USGNORMAL	7	.354	.437

INFERENCE :

At rest MRI and TPU have correlation of 0.995 suggestive of positive correlation.Duringvalsalva MRI and TPU have correlation of 0.946 suggestive of positive correlation.

BLADDER BASE BELOW PCL LINE

Paired Samples Test

		t	df	Sig. (2-tailed)
Pair 1	MRIRES - USGRES	15.173	12	.001
Pair 2	MRIVALSALVA - USGVALSALVA	14.231	29	.001
Pair 3	MRINORMAL – USGNORMAL	4.500	6	.004

Correlation is significant at the 0.05 level for MRI and TPU at rest,valsalva and for normal patients. P- value<0.001 for MRI rest VS TPU rest and MRI valsalva and TPU valsalva.

UTERUS BELOW PCL LINE

Among fifty women nine were found to have descent of uterus below PCL line at rest.Among fifty women thirty four were found to have descent of uterus below PCL line with valsalva. Among fifty women seven presented with symptoms but found to be normal in both modalities.

Paired Samples Correlations

		N	Pearson Correlation	Sig.
Pair 1	MRIREST & USG REST	9	.987	.001
Pair 2	MRIVALSALVA& USGVALSALVA	34	.947	.001
Pair 3	MRINORMAL& USGNORMAL	7	.778	.039

Paired samples pearson correlation reveals positive correlation in rest ,during valsalva and normal patients.This indicates transperineal ultrasound is equally as effective as MRI in detecting the middle compartment defects.

UTERUS BELOW PCL LINE

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	MRIRES	3.22	9	.432	.144
	USGRES	3.02	9	.438	.146
Pair 2	MRIVALSALVA	1.95	34	.239	.041
	USGVALSALVA	1.74	34	.228	.039
Pair 3	MRINORMAL	.94	7	.079	.030
	USGNORMAL	.80	7	.082	.031

Above paired sample statistics reveal no significant difference between transperineal ultrasound and MRI in measuring the mean values of uterus below PCL line and also no significant difference in the standard deviation and standard error mean.

.

UTERUS BELOW PCL LINE

Paired Samples Test

		Paired Differences				
					95% Confidence Interval of the Difference	
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper
Pair 1	MRIRES – USGRES	.200	.071	.024	.146	.254
Pair 2	MRIVALSALVA – USGVALSALVA	.212	.077	.013	.185	.239
Pair 3	MRINORMAL – USGNORMAL	.143	.053	.020	.093	.192

95% confidence interval difference between the two modalities were less in rest,duringvalsalva and in normal patients

UTERUS BELOW PCL LINE

Paired Samples Test

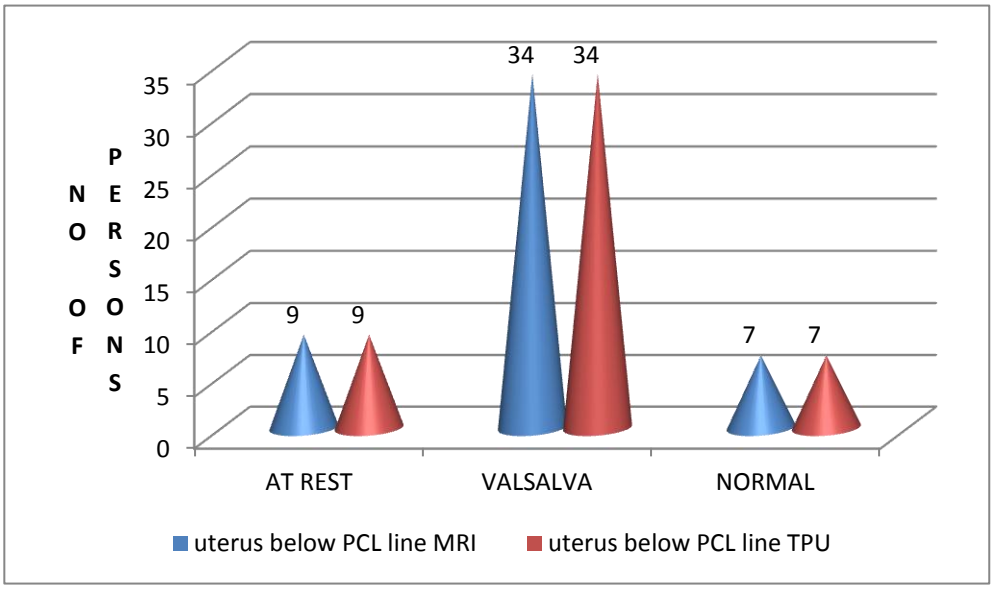
		t	df	Sig. (2-tailed)
Pair 1	MRIRES – USGRES	8.485	8	.001
Pair 2	MRIVALSALVA – USGVALSALVA	16.051	33	.001
Pair 3	MRINORMAL – USGNORMAL	7.071	6	.001

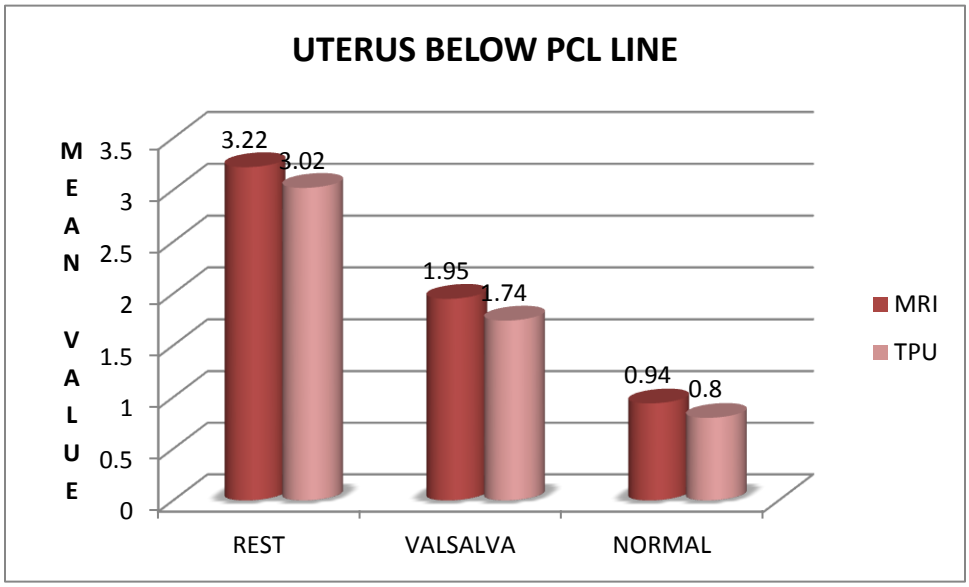
P-value for the above mentioned MRI rest compared with Transpereal ultrasound rest was<0.005.

P-value for MRI valsalva compared with Transpereneal ultrasound valsalva was <0.005.

P-value for patients with normal finding in both modalities was also < 0.005.

UTERUS BELOW PCL LINE





"H" LINE

Among fifty patients the measurement of "H" LINE using both modalities, nine were found to have abnormal "H"line at rest. Remaining 41 were subjected to valsalva maneuver while doing MRI and Transperineal USG. 33 out of 41 were found to have abnormal "H"line. Remaining eight were found to have normal "H" LINE in spite of complaints.

S.NO	PARAMETER	MRI			TPU		
		REST	VALSALVA	NORMAL	REST	VALSALVA	NORMAL
1	"H"LINE	9	33	8	9	33	8

“H” LINE

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	MRIRES & USGRES	9	.963	.001
Pair 2	MRIVALSALVA & USGVALVA	33	.739	.001
Pair 3	MRINORMAL & USGNORMAL	8	.944	.001

Paired sample correlation reveals 0.953 in MRI rest & Trans pereneal ultra sound at rest,during

Valsalva 0.739 and 0.944 in patients with normal “H” line inspite of presenting with symptoms.

This indicates Transperineal ultrasound has positive correlation with gold standard MRI.

"H" LINE

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	MRIRES	6.76	9	.559	.186
	USGRES	6.60	9	.550	.183
Pair 2	MRIVALSALVA	5.61	33	.222	.039
	USGVALVA	5.50	33	.204	.035
Pair 3	MRINORMAL	4.67	8	.104	.037
	USGNORMAL	4.48	8	.139	.049

Above paired sample statistics reveal no significant difference between transperineal ultrasoundand MRI in measuring the mean values of measuring " H" LINE and also no significant difference in the standard deviation and standard error mean in the above three pairs.

“H” LINE

Paired Samples Test

		Paired Differences				
					95% Confidence Interval of the Difference	
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper
Pair 1	MRIRES - USGRES	.156	.151	.050	.040	.272
Pair 2	MRIVALSALVA - USGVALVA	.109	.155	.027	.054	.164
Pair 3	MRINORMAL - USGNORMAL	.200	.053	.019	.155	.245

95% confidence interval difference between the two modalities were less in rest,during valsalva and in normal patients.

“H” LINE

Paired Samples Test

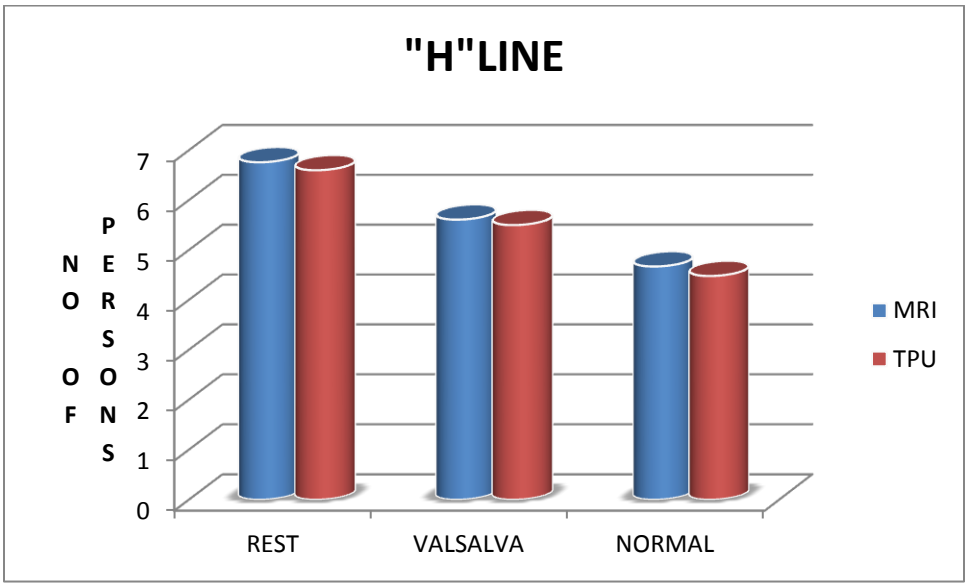
		t	df	Sig. (2-tailed)
Pair 1	MRIRES - USGRES	3.092	8	.015
Pair 2	MRIVALSALVA - USGVALVA	4.047	32	.001
Pair 3	MRINORMAL - USGNORMAL	10.583	7	.001

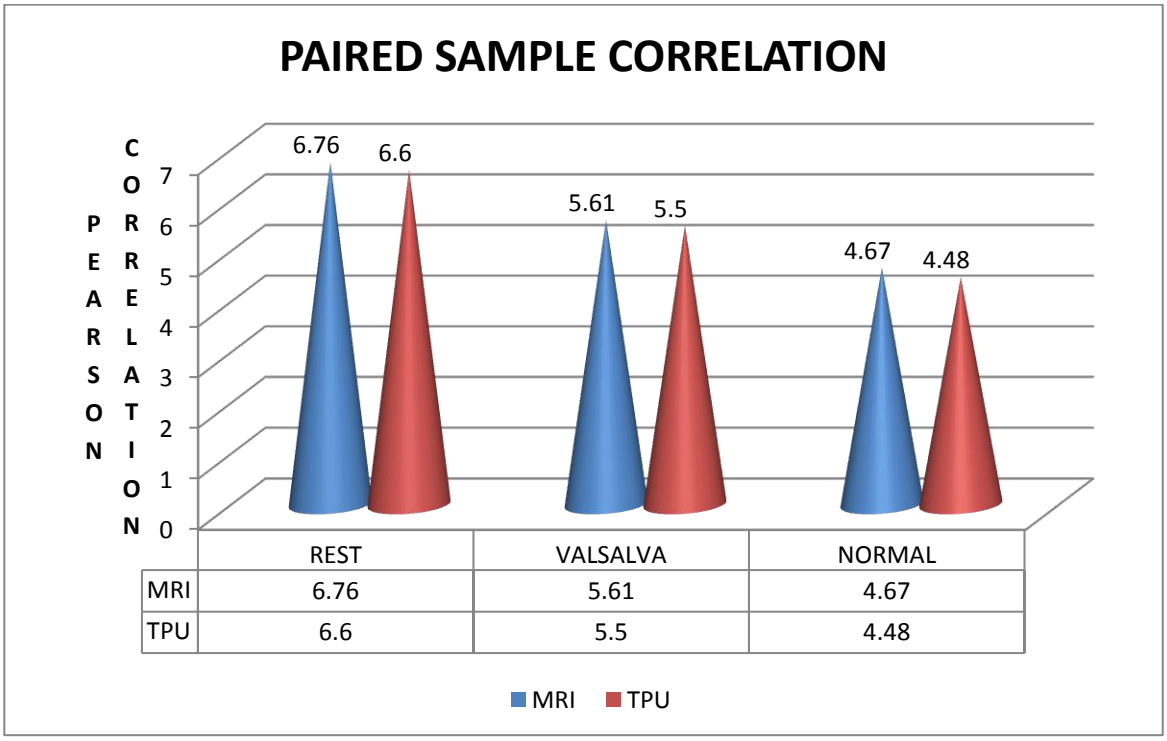
P-value for the above mentioned MRI rest compared with Transpereal ultrasound restwas <0.005.

P-value for MRI valsalva compared with Transpereneal ultrasound valsalva was <0.005.

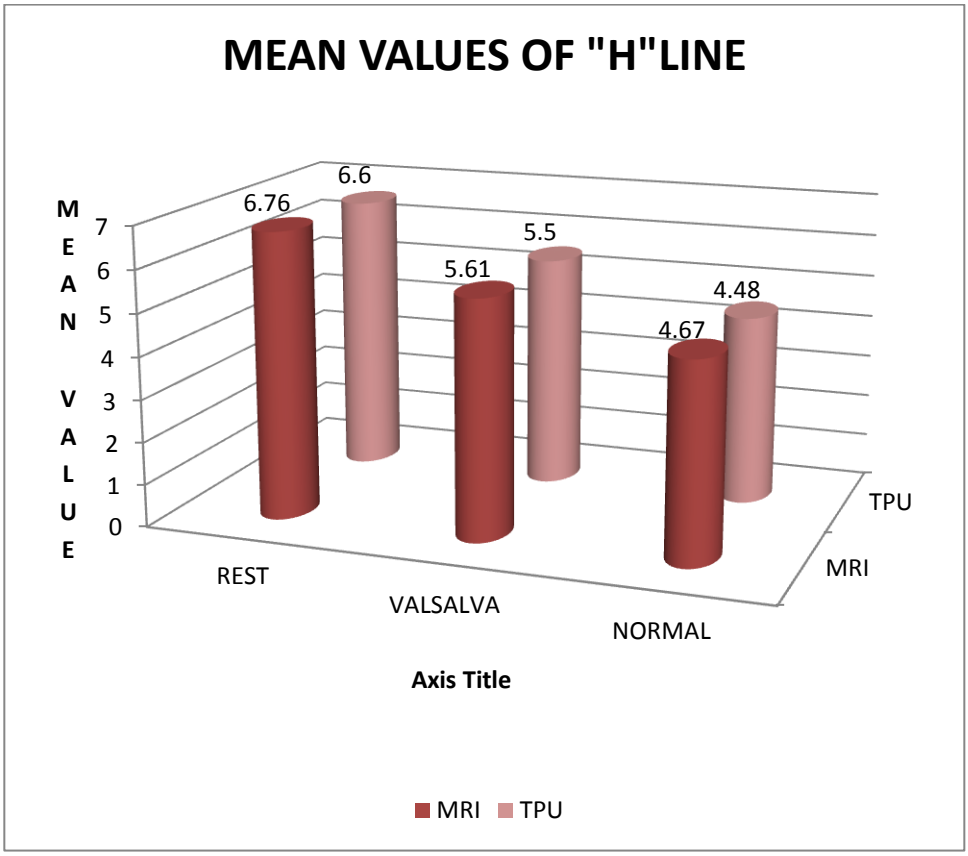
P-value for patients with normal finding in both modalities was also < 0.005

"H"LINE


"H"LINE
NO OF PERSONS
0
1
2
3
4
5
6
7
REST
VALSALVA
NORMAL
MRI
TPU


PAIRED SAMPLE CORRELATION
PEARSON CORRELATION
0
1
2
3
4
5
6
7
6.76
6.6
5.61
5.5
4.67
4.48
REST
VALSALVA
NORMAL
MRI
6.76
5.61
4.67
TPU
6.6
5.5
4.48
MRI
TPU

GRAPHICAL REPRESENTATION OF MEAN VALUES OF H LINE



ANAL SPHINCTER INTEGRITY

Among fifty patients, 7 patients had complaints of fecal incontinence .With both the modalities ten patients were found to have defective anal sphincter. Remaining 40 patients were found to have normal anal sphincter.

Among ten patients with anal sphincter defect, three patients presented without history of fecal incontinence.

S.NO	PARAMETER	MRI		TPU	
		NORMAL(0)	DEFECT(1)	NORMAL(0)	DEFECT(1)
1	ANAL SPHINCTER INTEGRITY	40	10	40	10

0 Represents normal patients. 1. Represents patients with anal sphincter defect

ANAL SPHINCTER INTEGRITY

S.NO	PARAMETER	TOTALDEFECT		MRI		TPU	
				H/O FI	NO H/O FI	H/O FI	NO H/O FI
		MRI	TPU				
1	ANAL SPHINCTER DEFECT	10	10	7	3	7	3

Among ten patients three patients were found to have occult sphincter defect.

ANALSPHINCTER INTEGRITY USG * MRI Crosstabulation

			MRI		
			0	1	Total
USG	0	Count	40	0	40
		% within USG	100.0%	.0%	100.0%
		% within MRI	100.0%	.0%	80.0%
		% of Total	80.0%	.0%	80.0%
	1	Count	0	10	10
		% within USG	.0%	100.0%	100.0%
		% within MRI	.0%	100.0%	20.0%
		% of Total	.0%	20.0%	20.0%
	Total	Count	40	10	50
		% within USG	80.0%	20.0%	100.0%
		% within MRI	100.0%	100.0%	100.0%
		% of Total	80.0%	20.0%	100.0%

ANALSPHINCTER INTEGRITY

Chi-Square Tests

	Value	Exact Sig. (2-sided)
McNemar Test		1.000[a]
N of Valid Cases	50	

a. Binomial distribution used.

Significant of 1.000* in TPU AND MRI

indicates equal effect on given population

ANALSPHINCTER INTEGRITY

Symmetric Measures

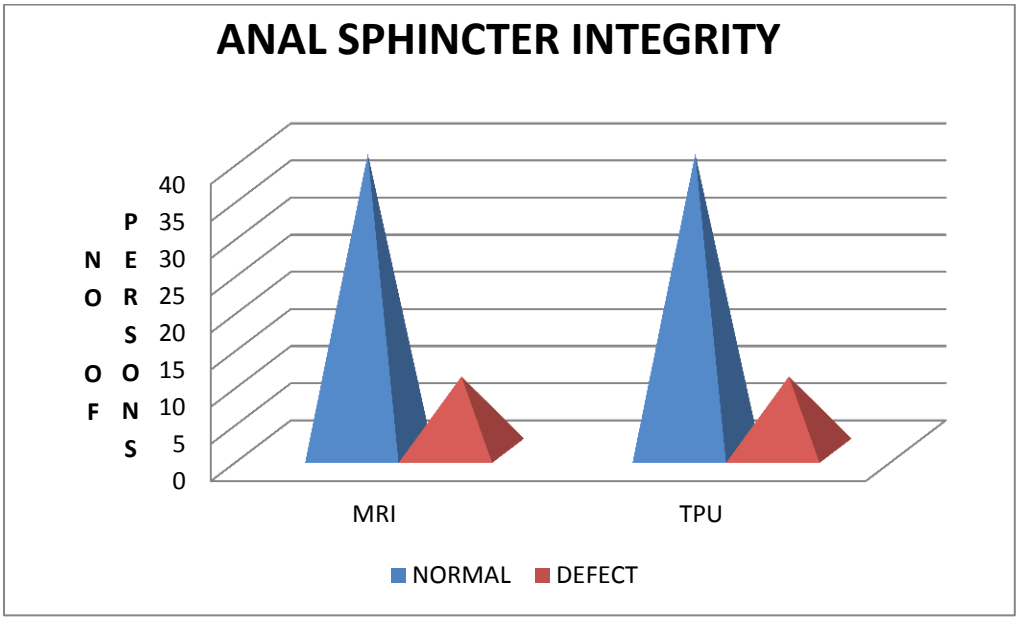
		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Measure of Agreement	Kappa	1.000	.000	7.071	.000
	N of Valid Cases	50			

a. Not assuming the null hypothesis.

Using the asymptotic standard error assuming the null hypothesis.

Kappa value 1 means equal outcome of two variables in given population

Exact significance of transperineal ultrasound and dynamic MRI is 1.000. this indicates reliability of transperineal ultrasound in detecting the defect is equally as effective as dynamicMRI.


ANAL SPHINCTER INTEGRITY
NO OF PERSONS
40
35
30
25
20
15
10
5
0
MRI
TPU
NORMAL
DEFECT

DISCUSSION

For women with pelvic floor dysfunction, pelvic MRI, allows direct imaging of the Pelvic organs , with its superior soft-tissue contrast resolution. .MRI can be used to Diagnose pelvic floor dysfunction without ionizing radiation and administration of contrast material.

Being a noninvasive examination it provides valuable details on the severity and extent of cystocele and uterine prolapse.

Because of the well known and accepted advantages of MRI in imaging pelvic floor , our study was conducted using tranperineal ultrasonography with MRI as gold standard.

The purpose of this study was to review pelvic floor anatomy , evaluation of Transperineal ultrasonographic technique and to provide an overview of the current clinical use of transperineal ultrasonography in the evaluation of the anterior,middle and posterior pelvic floor compartments.

Total of 50 women who attended the urogynecological clinic at Government Kasturba Gandhi Hospital for women and children and Rajiv Gandhi Government General Hospital with complaints of stress ,urge urinary incontinence, fecal incontinence and

feeling of fullness invagina . Patients who had undergone hysterectomy for various reasons now presenting with complaints of vault prolapse were also included in the study. Out of 50 women we had one patient who had undergone transvaginal tape (TVT) as a sling procedure for fixing the bladder neck.
The patients who had procidentia were excluded from our study due to technical difficulty in performing the transperineal approach. Apart from that patients with metallicimplants like aneurysm clipping, metallic prosthesis, cardiac pacemaker and who were claustrophobic were excluded from the study.

All our patients underwent clinical examination including prolapse quantification using POP-Q by urogynecologist and the patients were categorized as those having cystocele,uterine descent ,rectocele and those with lost anal sphincter tone. All 50 patients after getting consent were first explained about the procedure and they were taught to do valsalva maneuver . Then all of them were subjected to transperineal ultrasonography both at rest and with valsalva . Images were stored (both static and dynamic) and was reviewed by a radiologist who was blinded to this study. Simultaneously on the same day each patient were subjected to MRI .
examination which included evaluation in rest and dynamic state. The images were reviewed by another radiologist who was blinded to this study.

Out of fifty patients four patients with complete perineal tear underwent surgery for sphincter repair.Regarding the parameters taken for comparison , bladder base below PCL line was chosen as a representative of anterior compartment, uterus below PCL line as a measure of middle compartment and anal sphincter integrity along with thickness of puborectalis muscle as representative of posterior compartment were studied simultaneously with both imaging modalities.

As per the study by Suzan.R.Brukkusis clinical classification of prolapse staging in POP-Q (pelvic organ prolapse quantification) compared with dynamic MR and transperineal ultrasound agreement between the above three methods showed good correlation only with anterior compartment. Hence based on this study,parameters representing the anterior and middle compartment were included in our study for detecting the correlation between dynamic MRI and transperineal ultrasound.

Among 50 patients 13 patient were found to have bladder base below PCL lineat rest. With valsalva maneuver 30 patients were found to have bladder base below PCL line and remaining 7 were found to be normal. According to study Suzan.R.Brukkusis et al in relating the symptoms of pelvic floor dysfunction, they concluded that there was poor correlation of symptoms of pelvic floor dysfunction with clinical examination and dynamic MRI imaging.

But in my study there was good correlation with the patient's symptoms and MR imaging and dynamic transperineal ultrasound in 43 out of 50 patients.

But in 7 out of 50 patients ,though they had symptoms there were no positive clinical findingsand transperineal ultrasound and MRI were normal. So we conclude that there is good correlation between clinical examination, MRI and transperineal ultrasound . Since there are other causes for stress and urge incontinence like idiopathic stress incontinence, neurologicalcauses which could be attributed to the patients symptoms .

Among 50 patients Transperineal USG equally identified the descent of bladder below PCL line at rest and during valsalva maneuver in comparison with MRI.Transperineal USG equally detected the normal individuals as compared to MRI.

The mean value of bladder base below PCL line at rest using MRI is 2.99cm and with Transperineal USG is 2.78cm .Though there is subtle difference between the mean values, it does not confer anydifference in the treatment options.But among 30 patients who had bladder base below PCL line during valsalva maneuver, 14 of them had mean value of 2.37cmwith MRI thus indicating the need for surgical

intervention. For the same 14 patients transperineal USG showed mean value of 1.82 cm thus under estimating the surgical need for these patients .

Though transperineal ultrasound were able to detect the abnormality it could not quantify the exact defect and hence this limitation has to be borne in mind while planning for surgery.

So transperineal USG can be used for diagnosis of cystocele but for deciding surgical correction MRI evaluation is necessary.

Among fifty women, nine were found to have descent of uterus below PCL line at rest.

Among fifty women thirty four were found to have descent of uterus below PCL line with valsalva. Out of fifty women, seven presented with symptoms but found to be normal in both modalities. Hence factors other than anatomical disruption responsible for uterine descent has to be considered for patients with symptoms but negative findings in both modalities.

P-value for uterine descent below PCL Line using MRI at rest compared with

Transperineal ultrasound at rest is <0.005. P-value for MRI valsalva compared with Transperineal ultrasound valsalva is is<0.005 thus indicating good correlation

between the two modalities with regard to this parameter. Among 50 patients the measurement of "H" LINE using both modalities, 9 were found to have abnormal "H"line at rest. Remaining 41 were subjected to valsalva maneuver while doing MRI and Transperineal USG. 33 out of 41 were found to have abnormal "H"line. Remaining eight were found to have normal "H" LINE in spite of complaints. P-value for"H"line using MRI at rest compared with Transperineal ultrasound at rest is <0.005. P-value for "H"line MRI valsalva compared with Transperineal ultrasound valsalva is <0.005 thus indicating good correlation between the two modalities with regard to this parameter.

Among fifty patients , 7 patients had complaints of fecal incontinence . With both

the modalities ten patients were found to have defective anal sphincter.

Remaining 40 patients were found to have normal anal sphincter. Among ten

patients with anal sphincter defect, three patients presented without history of fecalincontinence.

Exact significance of transperineal ultrasound and MRI is 1.000 in detecting

anal sphincter defect. This indicates reliability of transperinealultrasound in

detecting the defect is equally as effective as MRI.

Moreover for three patients who did not complain of fecal incontinence were found to have defective sphincter. Thus this kind of multicompartmental imaging helps to identify occult findings so that patients would be informed about the development of fecal incontinence in future.

CONCLUSION

1.There were no significant difference between transperineal ultrasound and dynamic Magnetic resonance imaging in measuring the bladder base below PCL line while at rest and during valsalva. Transperineal ultrasound has positive correlation with dynamicmagnetic resonance imaging in measuring the the descent of the bladder base below the PCL line.

2.Transperineal ultrasound is equally as effective as dynamic magnetic resonance imaging in measuring the descent of the uterus below the PCL line while doing the procedure at rest and during valsalva.

3.Transperineal ultrasound is equally as effective as dynamic Magnetic resonanceimaging in measuring the " H" line while doing the procedure at rest and during valsalva.There were no significant difference between transperineal ultrasound and dynamic magnetic resonance imaging in measuring "H"line while doing the procedure at rest and duringvalsalva.

4.Transperineal ultrasound is equally as effective as dynamic magnetic resonance imaging in assessing the anal sphincter integrity.

5.Transperineal ultrasound is an accessible tool to assess the occult sphincter defect in patients without history of fecal incontinence.

6.Hence Transperineal ultrasound has significant positive correlation with above four parameters in comparison with gold standard dynamic Magnetic resonance imaging in measuring pelvic floor dysfunction ,Transperineal ultrasound can be used as screening tool to evaluate women with pelvic floor dysfunction. Women found to have pelvic floor dysfunction by transperineal ultrasound who needs surgical intervention can be confirmed with gold standard dynamic magnetic resonance imaging.

7.Hence transperineal ultrasound is cost effective, no radiation, reproducible, non invasive investigation modality ,which can be used as a screening tool for all women withpelvic floor weakness.

8.The limitation of transperineal ultrasound is measuring the length of bladder base below PCL line,uterus below PCL line, and "H"line in patients with pelvic floor weakness during valsalva.MRI detects the abnormal length (>2cm) accurately.In treatmentpoint of view the length in centimeter is very important but Transperineal ultrasound detects the abnormality but accuracy of length could not be ascertained.

So Transperineal ultrasound can be used as screening tool for evaluation of women with various pelvic floor dysfunction.

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PROFORMA

Validation of two-dimensional perineal ultrasound and magnetic resonance imaging measurements of pelvic floor dysfunction

S.NO		MRD NO:
1	Patient Name	
2	Age (in years)	
3	Sex	Female
4	Education	
5	Name of Hospital	
6	Contact number	
7	Address:	
8	Name of respondent (patient or attendant)	
9	Duration of symptoms	
10	Date of admission	
11	Date of Discharge	
	History	
12		
	Presenting complaints	
13		
	Clinical examination:	

MRI Findings:

No	Parameters	At rest	Valsalva
1	Bladder base below PCL line		
2	Uterus below PCL line		
3	H Line		
4	Anal spincter integrity		

Transperineal ultrasound findings:

No	Parameters	At rest	Valsalva
1	Bladder base below PCL line		
2	Uterus below PCL line		
3	H Line		
4	Anal spincter integrity		

ஆராய்ச்சி ஒப்புதல் கடிதம்

ஆராய்ச்சி தலைப்பு:

தன்னரியாநீர் மற்றும் மலம்கசிதல் மற்றும் கரவிட நுகைவுபோன்ற பாதிப்புகள் உள்ள பெண் நோயாளிகளுக்கு எம்.ஆர்.ஐ. ஸ்கேன் மற்றும் அல்ற்றாசௌந்து ஸ்கேன் (ஊடொலி ஆய்வகம்) எடுத்து இந்த இரு வேறுபட்ட கருவிகளின் ஆராய்ச்சி முடிவுகள் ஒத்தகருத்துடயதாக வருகின்றதா என்பதே இந்த ஆராய்ச்சியின் நோக்கமாகும்.

பெயர்: தேதி:

வயது: உள்நோயாளி எண்:

பால்: ஆராய்ச்சி சேர்க்கை எண்:

1. இந்த ஆராய்ச்சியின் விவரங்களும், அதன் நோக்கங்களும் எனக்குத் தெளிவாக விளக்கப்பட்டன.
2. எனக்கு விளக்கப்பட்ட விஷயங்களைப் புரிந்து கொண்டு நான் எனது சம்மதத்தைத் தெரிவிக்கிறேன்.
3. இந்த ஆராய்ச்சியில் பிறரின் நிர்பந்தமின்றி என் சொந்த விருப்பத்தின் பேரில் தான் பங்குபெறுகிறேன் மற்றும் நான் இந்த ஆராய்ச்சியில் இருந்து எந்நேரமும் பின்வாங்கலாம் என்பதையும் அதனால் எந்த பாதிப்பும் ஏற்படாது என்பதையும் புரிந்து கொண்டேன்.
4. நான் என்னுடைய சுயநினைவுடனும் முழு சுதந்திரத்துடனும் இந்த மருத்துவ ஆராய்ச்சியில் என்னை சேர்த்துக்கொள்ள சம்மதிக்கிறேன்.
5. நோயின் தன்மை பற்றியும், எம்.ஆர்.ஐ. சோதனை பற்றியும் எனக்குத் தெளிவாக எடுத்துரைக்கப்பட்டது.
6. எனது நோய் பற்றிய ஆவணங்களைப் பயன்படுத்திக்கொள்ள முழுமனதுடன் சம்மதிக்கிறேன்.
7. இந்த ஆராய்ச்சிக் கட்டுரை வெளியிடப்ப்படும்பொழுது என்னைப் பற்றிய தனிப்பட்ட தகவல்கள் வெளியிடப்பட மாட்டாது என்றும் அறிந்து கொண்டேன்.

கையொப்பம்

Validation of two-dimensional Perineal ultrasound and Magnetic resonance imaging measurements of pelvic floor dysfunction

PARAMETER : ANAL SPHINCTER INTEGRITY

SI : STRESS INCONTINENCE , UI : URINARY INCONTINENCE, FI: FAECAL INCONTINENCE

S.NO	NAME	AGE	PARITY	BMI	COMPLAINTS	MRI		TRANSPERINEAL USG	
						INTACT	DEFECT	INTACT	DEFECT
1	S.VEERAMAL	59	5	24	SI,UI	I		I	-
2	R.MANI	51	4	32	UI,SI	I		I	-
3	S.JANAKI	52	3	28	UI	I		I	-
4	V.MUTHUMANI	54	3	25	UI,SI	I		I	-
5	M.KANNAKI	53	4	29	SI,UI	I		I	-
6	R.RAJALAKSHMI	56	5	28	UI,SI	I		I	-
7	D.LATHA	51	3	23	SI	I		I	-
8	S.NIRMALA	53	3	32	SI,UI,FI	-	D	-	D
9	R.AMBIKA	57	4	31	UI,SI	I		I	-
10	N.NEELAVENI	54	3	27	UI,SI	I		I	-
11	R.SARASU	59	6	24	UI,SI	-	D	-	D
12	K.SAROJA	56	3	27	UI,SI	I		I	-
13	S.VALLI	58	4	24	SI,UI	I		I	-
14	M.VASANTHA	53	3	26	UI,SI	I		I	-
15	S.SHANTHI	51	3	28	SI	I		I	-
16	L.KUPPU	57	4	28	UI,FI	-	D	-	D
17	D.VALLIYAMMAL	55	4	33	SI,UI,FI	-	D	-	D
18	R.SARALABAI	52	3	31	UI	I		I	-
19	L.KAMALA	57	5	27	UI,SI	I		I	-
20	V.RAHAMATH	56	3	23	SI,UI	I		I	-
21	K.THENMOZHI	55	6	22	UI,SI	I		I	-
22	P.PANKAJAM	58	3	26	SI	I		I	-
23	M.CHELLAM	60	6	27	SI,UI,FI	-	D	I	D
24	S.VISALAKSHI	59	3	21	SI,UI	I		I	-
25	C.RAJATHI	54	4	31	UI,SI	I		I	-

Validation of two-dimensional perineal ultrasound and magnetic resonance imaging measurements of pelvic floor dysfunction

PARAMETER : ANAL SPHINCTER INTEGRITY

SI : STRESS INCONTINENCE , UI : URINARY INCONTINENCE, FI: FAECAL INCONTINENCE

S.NO	NAME	AGE	PARITY	BMI	COMPLAINTS	MRI		TRANSPERINEAL USG	
						INTACT	DEFECT	INTACT	DEFECT
26	L.CHAMUNDI	60	6	32	SI,UI,FI	-	D	-	D
27	R.THILAGA	52	3	28	UI,SI	I	-	I	-
28	S.KALAIVANI	53	4	25	UI,SI	I	-	I	-
29	P.YAMUNA	54	3	29	UI	I	-	I	-
30	S.LAKSHMI	58	3	28	UI,SI	I	-	I	-
31	S.KALESHVARI	51	6	23	SI,UI	-	D	-	D
32	V.NAVAMANI	55	4	32	SI,UI,FI	-	D	-	D
33	J.KAVERI	59	3	31	UI,SI	I	-	I	-
34	S.CHANDRA	60	5	27	UI,SI	I	-	I	-
35	V.DEIVANAI	53	3	24	UI	I	-	I	-
36	D.FATIMA	57	6	27	UI,SI	-	D	-	D
37	R.MARY	51	3	24	SI	I	-	I	-
38	V.USHA	59	6	26	UI,FI	-	D	-	D
39	R.GEETHA	53	3	27	UI,SI	I	-	I	-
40	R.CHINNAMMAL	58	4	24	UI,SI	I	-	I	-
41	S.GUNA	56	5	26	UI	I	-	I	-
42	H.SUNDARI	52	4	28	UI,SI	I	-	I	-
43	C.AKILA	54	3	28	UI	I	-	I	-
44	G.CHITRA	60	3	33	SI,UI	I	-	I	-
45	K.BHUVANA	57	4	31	SI,UI	I	-	I	-
46	C.MAHESHVARI	53	5	27	SI,UI	I	-	I	-
47	S.LALITHA	55	3	23	UI	I	-	I	-
48	R.HAMSA	58	3	22	SI	I	-	I	-
49	C.VEDHA	51	4	26	UI,SI	I	-	I	-
50	T.RANJITHAM	58	3	27	SI,UI	I	-	I	-

Three Patients without h/o FI were found to have sphincter defect.

Occult sphincter defect can be detected by transperineal USG and MRI.USG can be used as a screening tool to detect occult sphcinter defect.

Validation of two-dimensional perineal ultrasound and magnetic resonance imaging measurements of pelvic floor dysfunction

PARAMETER : “H”LINE

S.NO	NAME	AGE	PARITY	BMI	COMPLAINTS	MRI (cm)			TRANS PERINEAL USG (cm)		
						REST	VALSALVA	NORMAL ≤5	REST	VALSALVA	NORMAL ≤5
1	S.VEERAMAL	59	5	24	SI,UI	-	5.3	-	-	5.6	-
2	R.MANI	51	4	32	UI,SI	-	5.6	-	-	5.5	-
3	S.JANAKI	52	3	28	UI	-	5.3	4.7	-	5.7	4.5
4	V.MUTHUMANI	54	3	25	UI,SI	-	5.2	-	-	5.3	-
5	M.KANNAKI	53	4	29	SI,UI	-	5.7	-	-	5.5	-
6	R.RAJALAKSHMI	56	5	28	UI,SI	-	5.6	-	-	5.4	-
7	D.LATHA	51	3	23	SI	-	-	4.8	-	-	4.6
8	S.NIRMALA	53	3	32	SI,UI,FI	7.3	-	-	7.1	-	-
9	R.AMBIKA	57	4	31	UI,SI	-	5.7	-	-	5.5	-
10	N.NEELAVENI	54	3	27	UI,SI	-	5.5	-	-	5.7	-
11	R.SARASU	59	6	24	UI,SI	7.1	-	-	6.9	-	-
12	K.SAROJA	56	3	27	UI,SI	-	5.4	-	-	5.5	-
13	S.VALLI	58	4	24	SI,UI	-	5.7	-	-	5.8	-
14	M.VASANTHA	53	3	26	UI,SI	-	5.5	-	-	5.3	-
15	S.SHANTHI	51	3	28	SI	-	-	4.6	-	-	4.4
16	L.KUPPU	57	4	28	UI,FI	-	5.8	-	-	5.6	-
17	D.VALLIYAMMAL	55	4	33	SI,UI,FI	6.8	-	-	6.5	-	-
18	R.SARALABAI	52	3	31	UI	-	5.3	-	-	5.2	-
19	L.KAMALA	57	5	27	UI,SI	-	5.8	-	-	5.6	-
20	V.RAHAMATH	56	3	23	SI,UI	-	5.3	-	-	5.2	-
21	K.THENMOZHI	55	6	22	UI,SI	-	5.9	-	-	6.1	-
22	P.PANKAJAM	58	3	26	SI	-	-	4.7	-	-	4.5
23	M.CHELLAM	60	6	27	SI,UI,FI	7.4	-	-	7.2	-	-
24	S.VISALAKSHI	59	3	21	SI,UI	-	5.5	-	-	5.4	-
25	C.RAJATHI	54	4	31	UI,SI	-	5.4	-	-	5.2	-

SI : STRESS INCONTINENCE , UI : URINARY INCONTINENCE, FI: FAECAL INCONTINENCE

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Validation of two-dimensional Perineal ultrasound and Magnetic resonance imaging measurements of pelvic floor dysfunction

PARAMETER : “H”LINE

S.NO	NAME	AGE	PARITY	BMI	COMPLAINTS	MRI (cm)			TRANS PERINEAL USG (cm)		
						REST	VALSALVA	NORMAL	REST	VALSALVA	NORMAL
26	L.CHAMUNDI	60	6	32	SI,UI,FI	7.2	-	-	7.1	-	-
27	R.THILAGA	52	3	28	UI,SI	-	5.5	-	-	5.4	-
28	S.KALAIVANI	53	4	25	UI,SI	-	5.6	-	-	5.3	-
29	P.YAMUNA	54	3	29	UI	-	-	4.8	-	-	4.7
30	S.LAKSHMI	58	3	28	UI,SI	-	5.5	-	-	5.4	-
31	S.KALESHVARI	51	6	23	SI,UI	-	5.9	-	-	5.7	-
32	V.NAVAMANI	55	4	32	SI,UI,FI	6.7	-	-	6.6	-	-
33	J.KAVERI	59	3	31	UI,SI	-	5.6	-	-	5.4	-
34	S.CHANDRA	60	5	27	UI,SI	5.8	-	-	5.5	-	-
35	V.DEIVANAI	53	3	24	UI	-	5.4	-	-	5.3	-
36	D.FATIMA	57	6	27	UI,SI	-	5.8	-	-	5.7	-
37	R.MARY	51	3	24	SI	-	-	4.6	-	-	4.3
38	V.USHA	59	6	26	UI,FI	6.1	-	-	6.3	-	-
39	R.GEETHA	53	3	27	UI,SI	-	5.8	-	-	5.6	-
40	R.CHINNAMMAL	58	4	24	UI,SI	-	5.5	-	-	5.3	-
41	S.GUNA	56	5	26	UI	-	5.9	-	-	5.7	-
42	H.SUNDARI	52	4	28	UI,SI	-	5.7	-	-	5.5	-
43	C.AKILA	54	3	28	UI	-		4.5	-		4.3
44	G.CHITRA	60	3	33	SI,UI	-	6.1	-	-	5.8	-
45	K.BHUVANA	57	4	31	SI,UI	-	5.8	-	-	5.6	-
46	C.MAHESHVARI	53	5	27	SI,UI	6.4	-	-	6.2	-	-
47	S.LALITHA	55	3	23	UI	-	5.2	-	-	5.3	-
48	R.HAMSA	58	3	22	SI	-		4.7	-		4.5
49	C.VEDHA	51	4	26	UI,SI	-	5.7	-	-	5.4	-
50	T.RANJITHAM	58	3	27	SI,UI	-	5.8	-	-	5.6	-

SI : STRESS INCONTINENCE , UI : URINARY INCONTINENCE, FI: FAECAL INCONTINENCE

1.There were no significant difference between transperineal USG and MRI in measuring “H” line 2.Out of 50 patients 9 were found to have abnormal “H” line at rest. Remaining 41 were subjected to valsalvameneuvare 33 were found to have abnormal “H”LINE.Remaining 8 were found to have normal “H” LINE.

Validation of two-dimensional Perineal ultrasound and Magnetic Resonance imaging measurements of pelvic floor dysfunction

PARAMETER : UTERUS BELOW PCL LINE

SI : STRESS INCONTINENCE , UI : URINARY INCONTINENCE, FI: FAECAL INCONTINENCE

S.NO	NAME	AGE	PARITY	BMI	COMPLAINTS	MRI (cm)			TRANS PERINEAL USG (cm)		
						REST	VALSALVA	NORMAL ≤1 (cm)	REST	VALSALVA	NORMAL ≤1 (cm)
1	S.VEERAMAL	59	5	24	SI,UI	-	2.3	-	-	1.9	-
2	R.MANI	51	4	32	UI,SI	-	1.8	-	-	1.5	-
3	S.JANAKI	52	3	28	UI	-	1.6	-	-	1.4	-
4	V.MUTHUMANI	54	3	25	UI,SI	-	1.8	-	-	1.5	-
5	M.KANNAKI	53	4	29	SI,UI	-	1.9	-	-	1.7	-
6	R.RAJALAKSHMI	56	5	28	UI,SI	2.4	-	-	2.2	-	-
7	D.LATHA	51	3	23	SI	-	1.7	-	-	1.6	-
8	S.NIRMALA	53	3	32	SI,UI,FI	-	2.3	-	-	2.1	-
9	R.AMBIKA	57	4	31	UI,SI	-	1.9	-	-	1.7	-
10	N.NEELAVENI	54	3	27	UI,SI	-	1.6	-	-	1.4	-
11	R.SARASU	59	6	24	UI,SI	3.2	-	-	3.1	-	-
12	K.SAROJA	56	3	27	UI,SI	-	1.4	-	-	1.2	-
13	S.VALLI	58	4	24	SI,UI	-	1.8	-	-	1.5	-
14	M.VASANTHA	53	3	26	UI,SI	-	1.7	-	-	1.5	-
15	S.SHANTHI	51	3	28	SI	-	-	0.9	-	-	0.8
16	L.KUPPU	57	4	28	UI,FI	3.1	-	-	2.8	-	-
17	D.VALLIYAMMAL	55	4	33	SI,UI,FI	3.4	-	-	3.2	-	-
18	R.SARALABAI	52	3	31	UI	-	-	1	-	-	0.9
19	L.KAMALA	57	5	27	UI,SI	-	1.9	-	-	1.8	-
20	V.RAHAMATH	56	3	23	SI,UI	-	2	-	-	1.8	-
21	K.THENMOZHI	55	6	22	UI,SI	-	2.2	-	-	1.9	-
22	P.PANKAJAM	58	3	26	SI	-	-	1	-	-	0.8
23	M.CHELLAM	60	6	27	SI,UI,FI	3.7	-	-	3.6	-	-
24	S.VISALAKSHI	59	3	21	SI,UI	-	1.7	-	-	1.6	-
25	C.RAJATHI	54	4	31	UI,SI	-	1.9	-	-	1.7	-

Validation of two-dimensional Perineal ultrasound and Magnetic Resonance imaging measurements of pelvic floor dysfunction

PARAMETER : UTERUS BELOW PCL LINE

S.NO	NAME	AGE	PARITY	BMI	COMPLAINTS	MRI (cm)			TRANS PERINEAL USG (cm)		
						REST	VALSALVA	NORMAL ≤(1cm)	REST	VALSALVA	NORMAL ≤ 1(cm)
26	L.CHAMUNDI	60	6	32	SI,UI,FI	3.8	-	-	3.5	-	-
27	R.THILAGA	52	3	28	UI,SI	-	1.9	-	-	1.8	-
28	S.KALAIVANI	53	4	25	UI,SI	-	1.7	-	-	1.6	-
29	P.YAMUNA	54	3	29	UI	-	-	1	-	-	0.8
30	S.LAKSHMI	58	3	28	UI,SI	-	2.1	-	-	1.9	-
31	S.KALESHVARI	51	6	23	SI,UI	2.8	-	-	2.6	-	-
32	V.NAVAMANI	55	4	32	SI,UI,FI	3.4	-	-	3.2	-	-
33	J.KAVERI	59	3	31	UI,SI	-	1.8	-	-	1.7	-
34	S.CHANDRA	60	5	27	UI,SI	-	2.3	-	-	2	-
35	V.DEIVANAI	53	3	24	UI	-	1.7	-	-	1.4	-
36	D.FATIMA	57	6	27	UI,SI	3.2	-	-	3	-	-
37	R.MARY	51	3	24	SI	-	-	1	-	-	0.9
38	V.USHA	59	6	26	UI,FI	-	2.1	-	-	1.8	-
39	R.GEETHA	53	3	27	UI,SI	-	-	0.9	-	-	0.7
40	R.CHINNAMMAL	58	4	24	UI,SI	-	1.9	-	-	1.7	-
41	S.GUNA	56	5	26	UI	-	2.1	-	-	1.9	-
42	H.SUNDARI	52	4	28	UI,SI	-	2.1	-	-	1.8	-
43	C.AKILA	54	3	28	UI	-	2.1	-	-	1.9	-
44	G.CHITRA	60	3	33	SI,UI	-	2.1	-	-	1.8	-
45	K.BHUVANA	57	4	31	SI,UI	-	2.3	-	-	2.1	-
46	C.MAHESHVARI	53	5	27	SI,UI	-	2.2	-	-	2.1	-
47	S.LALITHA	55	3	23	UI	-	2.1	-	-	1.9	-
48	R.HAMSA	58	3	22	SI	-	-	0.8	-	-	0.7
49	C.VEDHA	51	4	26	UI,SI	-	2.1	-	-	1.9	-
50	T.RANJITHAM	58	3	27	SI,UI	-	2.3	-	-	2.1	-

SI : STRESS INCONTINENCE , UI : URINARY INCONTINENCE, FI: FAECAL INCONTINENCE

No significant difference between transperineal USG & MRI in measuring mean values of uterus below PCL line.

At rest : 9 were found to have uterus below pcl line. Valsalva :34: normal : 7

Validation of two-dimensional Perineal ultrasound and Magnetic Resonance imaging measurements of pelvic floor dysfunction

PARAMETER : BLADDER BASE BELOW PCL LINE

SI : STRESS INCONTINENCE , UI : URINARY INCONTINENCE, FI: FAECAL INCONTINENCE

S.NO	NAME	AGE	PARITY	BMI	COMPLAINTS	MRI (cm)			TRANS PERINEAL USG (cm)		
						REST	VALSALVA	NORMAL ≤1 (cm)	REST	VALSALVA	NORMAL ≤ 1 (cm)
1	S.VEERAMAL	59	5	24	SI,UI	2.5	-	-	2.3	-	-
2	R.MANI	51	4	32	UI,SI	-	1.8	-	-	1.5	-
3	S.JANAKI	52	3	28	UI	-	1.6	-	-	1.4	-
4	V.MUTHUMANI	54	3	25	UI,SI	-	1.8	-	-	1.5	-
5	M.KANNAKI	53	4	29	SI,UI	-	1.9	-	-	1.7	-
6	R.RAJALAKSHMI	56	5	28	UI,SI	2.4	-	-	2.2	-	-
7	D.LATHA	51	3	23	SI	-	1.7	-	-	1.6	-
8	S.NIRMALA	53	3	32	SI,UI,FI	-	2.3	-	-	2.1	-
9	R.AMBIKA	57	4	31	UI,SI	2.3	-	-	2.1	-	-
10	N.NEELAVENI	54	3	27	UI,SI	-	1.6	-	-	1.4	-
11	R.SARASU	59	6	24	UI,SI	3.2	-	-	3.1	-	-
12	K.SAROJA	56	3	27	UI,SI	-	1.4	-	-	1.2	-
13	S.VALLI	58	4	24	SI,UI	-	1.8	-	-	1.5	-
14	M.VASANTHA	53	3	26	UI,SI	-	1.7	-	-	1.5	-
15	S.SHANTHI	51	3	28	SI	-	-	0.9	-	-	0.8
16	L.KUPPU	57	4	28	UI,FI	3.1	-	-	2.8	-	-
17	D.VALLIYAMMAL	55	4	33	SI,UI,FI	3.4	-	-	3.2	-	-
18	R.SARALABAI	52	3	31	UI	-	-	1	-	-	0.9
19	L.KAMALA	57	5	27	UI,SI	-	1.9	-	-	1.8	-
20	V.RAHAMATH	56	3	23	SI,UI	-	2	-	-	1.8	-
21	K.THENMOZHI	55	6	22	UI,SI	2.7	-	-	2.5	-	-
22	P.PANKAJAM	58	3	26	SI	-	-	1	-	-	0.8
23	M.CHELLAM	60	6	27	SI,UI,FI	3.5	-	-	3.3	-	-
24	S.VISALAKSHI	59	3	21	SI,UI	-	1.7	-	-	1.6	-
25	C.RAJATHI	54	4	31	UI,SI	-	1.9	-	-	1.7	-

Validation of two-dimensional Perineal ultrasound and Magnetic Resonance imaging measurements of pelvic floor dysfunction

PARAMETER : BLADDER BASE BELOW PCL LINE

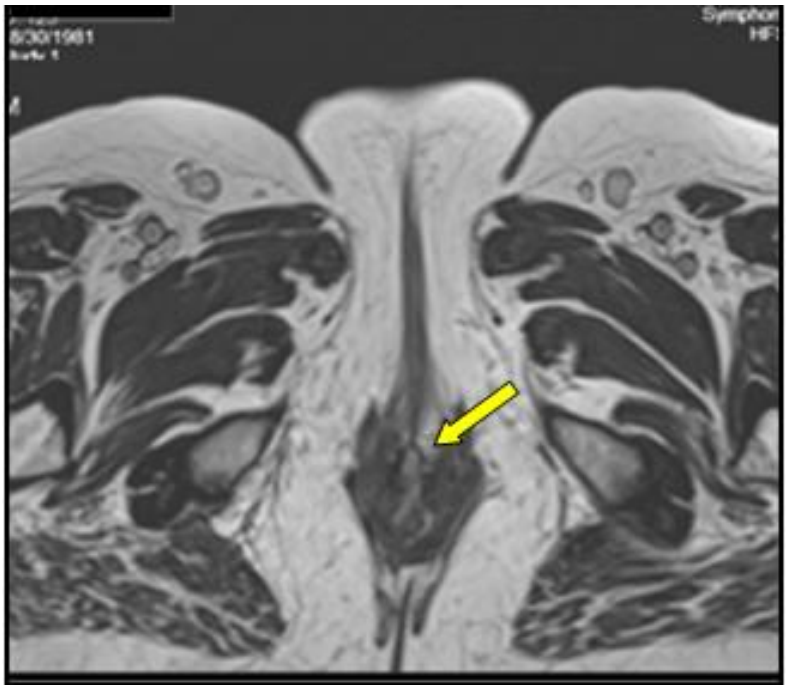
SI : STRESS INCONTINENCE , UI : URINARY INCONTINENCE, FI: FAECAL INCONTINENCE

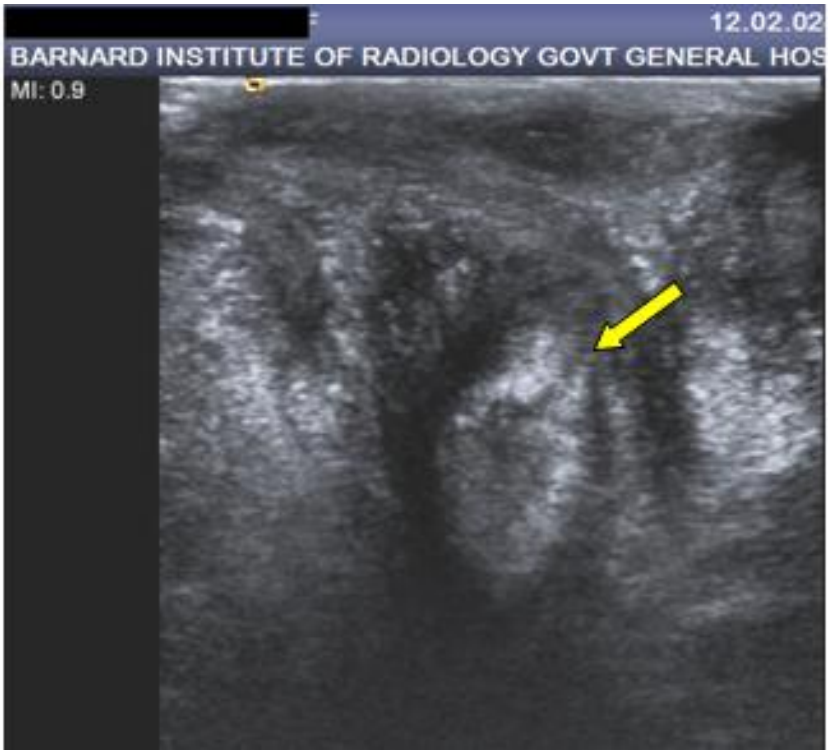
S.NO	NAME	AGE	PARITY	BMI	COMPLAINTS	MRI (cm)			TRANS PERINEAL USG (cm)		
						REST	VALSALVA	NORMAL	REST	VALSALVA	NORMAL
26	L.CHAMUNDI	60	6	32	SI,UI,FI	3.8	-	-	3.5	-	-
27	R.THILAGA	52	3	28	UI,SI	-	2.1	-	-	1.9	-
28	S.KALAIVANI	53	4	25	UI,SI	-	1.7	-	-	1.6	-
29	P.YAMUNA	54	3	29	UI	-	-	1	-	-	0.9
30	S.LAKSHMI	58	3	28	UI,SI	-	2.1	-	-	1.9	-
31	S.KALESHVARI	51	6	23	SI,UI	2.8	-	-	2.6	-	-
32	V.NAVAMANI	55	4	32	SI,UI,FI	3.4	-	-	3.2	-	-
33	J.KAVERI	59	3	31	UI,SI	-	1.8	-	-	1.7	-
34	S.CHANDRA	60	5	27	UI,SI	-	2.3	-	-	2	-
35	V.DEIVANAI	53	3	24	UI	-	1.8	-	-	1.5	-
36	D.FATIMA	57	6	27	UI,SI	3.2	-	-	3	-	-
37	R.MARY	51	3	24	SI	-	-	1	-	-	0.8
38	V.USHA	59	6	26	UI,FI	-	2.4	-	-	1.9	-
39	R.GEETHA	53	3	27	UI,SI	-	-	0.9	-	-	0.9
40	R.CHINNAMMAL	58	4	24	UI,SI	-	1.9	-	-	1.7	-
41	S.GUNA	56	5	26	UI	-	2.1	-	-	1.9	-
42	H.SUNDARI	52	4	28	UI,SI	-	2.3	-	-	2	-
43	C.AKILA	54	3	28	UI	-	2.1	-	-	1.9	-
44	G.CHITRA	60	3	33	SI,UI	-	2.1	-	-	1.8	-
45	K.BHUVANA	57	4	31	SI,UI	-	2.3	-	-	2.1	-
46	C.MAHESHVARI	53	5	27	SI,UI	2.6	-	-	2.4	-	-
47	S.LALITHA	55	3	23	UI	-	2.1	-	-	1.9	-
48	R.HAMSA	58	3	22	SI	-	-	0.9	-	-	0.7
49	C.VEDHA	51	4	26	UI,SI	-	2.1	-	-	1.9	-
50	T.RANJITHAM	58	3	27	SI,UI	-	2.3	-	-	2.1	-

No significant difference between transperineal USG & MRI in measuring mean values of bladder below PCL line.

At rest : 13 were found to have uterus below pcl line. Valsalva :30: normal : 7.

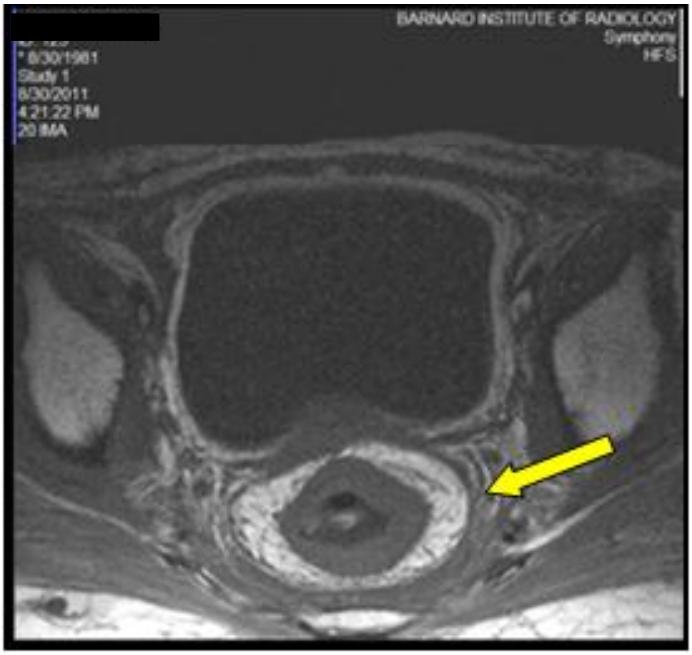
CASE 1 :COMPLETE PERINEAL TEAR

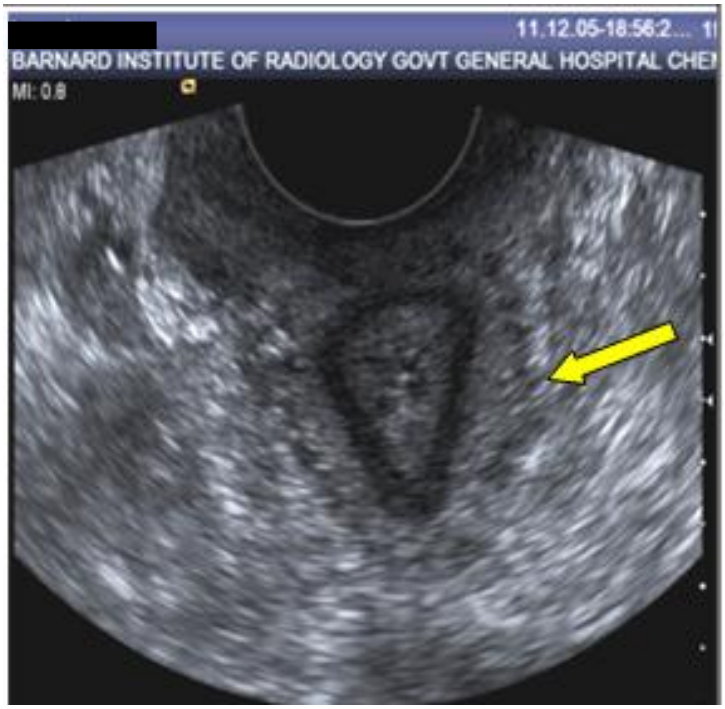




CASE 2: FOCAL TRACTION OF IAS

CASE 3:RADIATION FIBROSIS





INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI -3

Telephone No : 044 25305301
Fax : 044 25363970

CERTIFICATE OF APPROVAL

To
Dr. Sudha .K
PG in MD Radio Diagnosis
Madras Medical College
Chennai -3

Dear Dr. Sudha .K

The Institutional Ethics committee of Madras Medical College, reviewed and discussed your application for approval of the proposal entitled "Validation of two dimensional perineal ultrasound magnetic resonance imaging measurements of pelvic floor dysfunction " No.29072012.

The following members of Ethics Committee were present in the meeting held on 24.07.2012 conducted at Madras Medical College, Chennai -3.

1.	Dr. S.K. Rajan. M.D.,FRCP.,DSc	-- Chairperson
2.	Prof. Pregna B. Dolia MD Vice Prinicpal, Madras Medical College, Chennai-3 Director , Inst. of Biochemistry, MMC, Ch-3	-- Member Secretary
3.	Prof. Kalaiselvi MD Prof of Pharmacology ,MMC, Ch-3	-- Member
4.	Prof. C. Rajendiran, MD Director , Inst. of Internal Medicine, MMC, Ch-3	-- Member
5.	Prof. MD Ali M.D,. D.M., Prof & HOD, Dept. of MGE, MMC, Ch-3	-- Member
6.	Prof. S. Deivanayagam MS Prof of Surgery, MMC, Ch-3	-- Member
7.	Thiru. S. Govindsamy. BABL	-- Lawyer
8.	Tmt. Arnold Soulina MA MSW	-- Social Scientist

We approve the proposal to be conducted in its presented form.

Sd/ Chairman & Other Members

The Institutional Ethics Committee expects to be informed about the progress of the study, and SAE occurring in the course of the study, any changes in the protocol and patients information / informed consent and asks to be provided a copy of the final report.

Member Secretary, Ethics Committee

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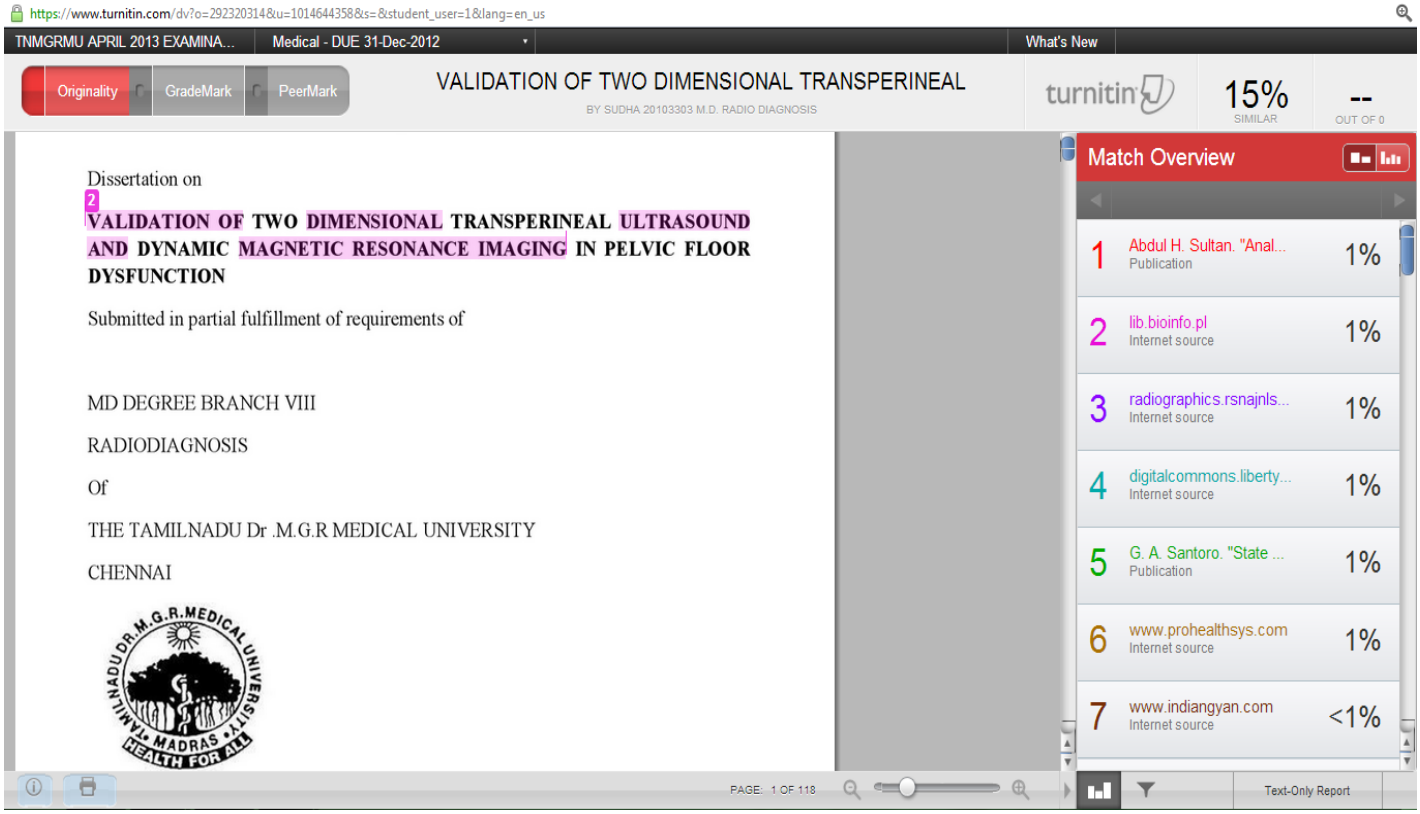

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Author	Sudha 20103303 M.D. Radio Diagnosis
E-mail	sudhadav08@gmail.com
Submission time	24-Dec-2012 02:14PM
Total words	13689

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1 Dissertation on VALIDATION OF TWO DIMENSIONAL TRANSPERINEAL ULTRASOUND AND DYNAMIC MAGNETIC RESONANCE IMAGING IN PELVIC FLOOR DYSFUNCTION Submitted in partial fulfillment of requirements of MD DEGREE BRANCH VIII RADIODIAGNOSIS Of THE TAMILNADU Dr .M.G.R MEDICAL UNIVERSITY CHENNAI MADRAS MEDICAL COLLEGE AND GOVERNMENT GENERAL HOSPITAL CHENNAI 600003 APRIL 2013 2 CERTIFICATE This is to certify that Dr. K.SUDHA has been a post graduate student during the period May 2010 to April 2013 at Barnard Institute of Radiology, Madras Medical College, Government General Hospital, Chennai. This Dissertation titled "VALIDATION OF TWO DIMENSIONAL PERINEAL ULTRASOUND AND DYNAMIC MAGNETIC RESONANCE IMAGING...