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EP27.11

Deep neural networks for predicting pouch of Douglas obliteration based on transvaginal ultrasound sliding sign videos

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Objectives: Recent studies have shown that the transvaginal sonography (TVS) sliding sign technique can be used to determine with high accuracy, whether the pouch of Douglas (POD) is obliterated in women with suspected endometriosis. In this work we investigated the application of state of the art machine learning approaches to image recognition, particularly deep neural networks, for automated interpretation of the 'sliding sign' videos for preoperative prediction of POD obliteration.

Methods: The data set used for model development consists of 53 two-dimensional ultrasound videos that were acquired in Nepean hospital, when evaluating the POD of 30 women presenting with chronic pelvic pain, using dynamic real-time 'sliding sign' techniques in two anatomical locations.

Long Term Recurrent Convolutional Neural Networks (LRCNs) were proposed to use for this video classification task. The trained neural networks would take a sequence of 53 frames of grey-scale images as the input, and extract spatial-temporal features hierarchically through multiple layers of information processing, and finally output with scores for the video being interpreted as negative and positive sliding sign.

Results: Our best performing LRCN model achieved accuracy 92.3%, sensitivity 85.7%, and specificity 94.7% in 10-fold cross-validation for predicting POD obliteration, which seems to be comparable to the performance of an experienced gynecological sonographer/sonologist.

Conclusions: We have demonstrated the potential of using deep neural networks for preoperative prediction of POD obliteration based on TVS 'sliding sign' videos, despite very limited number of training examples. Further work is needed to improve and evaluate the models using larger datasets.

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Endometrioma – the tip of a pelvic disease: TVS findings associated with an ovarian endometriosis

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Objectives: To investigate whether or not an ovarian endometrioma is associated to other appearances of pelvic endometriosis such as adhesions and/or deep infiltrating endometriosis (DIE), thus in order to improve the management of patients with pelvic pain or infertility.

Methods: This is an observational retrospective study on patients who underwent a transvaginal sonographic scan and showed an ovarian cyst with typical appearance of an endometrioma. Patients with previous pelvic surgery and without symptoms were excluded. Other associated sonographic sign of pelvic endometriosis such as adhesion, tubal pathology, adenomyosis and DIE were recorded.

Results: 226 symptomatic patients ≤ 40 years with at least an ovarian endometrioma with a diameter of ≥ 20 mm were included in this study. Mean age was 32.9 ± 4.9 yrs, mean endometriomas diameter was 35.5 ± 16.5 mm, Bilateral endometriomas were observed in 32 patients (14%). Of the 226 patients 41 (18%) showed posterior rectal DIE and 92 (41%) a thickening of at least one uterosacral ligament (USL). 138 patients (61%) showed adhesions and 82 (36%) had myometrial signs of adenomyosis. Only 21 (9%) had a single isolated ovarian lesion with a mobile ovary and without any other ultrasound signs of pelvic endometriomas.

Conclusions: Ovarian endometrioma is a marker for pelvic endometriosis and is rarely isolated. A high percentage of USL involvement has been observed. In a clinical context when there is an ovarian endometrioma an accurate TVS should investigate the extent of the disease to check for other endometriotic lesions in order to choose the most appropriate management to treat patient's pain and infertility not only considering the presence of the ovarian lesion.

EP28: REPRODUCTIVE MEDICINE

EP28.01

The effect of parity on uterine measurements

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Objectives: To present the uterine measurements in women with no previous pregnancy and women with a single pregnancy beyond 20 weeks.

Methods: From Nov 2012 to Jun 2014, 80 women with normal uterine morphology were scanned for their uterine inner and outer measurements during Gynecological examinations. The measurements between the nulligravid and the women with only 1 pregnancy that ended beyond 20 weeks (P1) women were analysed and compared using the SPSS statistical analysis package.

Results: The uterine measurements of 50 nulligravid and 14 women with only 1 pregnancy that ended beyond 20 weeks were compared. The width and the length of the endometrial cavity were 28.3 ± 5.0 mm and 39.5 ± 7.9 mm for the nulligravid women, and 34.7 ± 5.8 mm and 47.3 ± 6.2 mm for the P1 respectively ($p = 0.009$ and 0.03). The outer uterine measurements were also statistically significantly different.

Conclusions: There is a statistical significant difference in the endometrial cavity measurements in women who have no pregnancy and those who have a single pregnancy beyond 20 weeks gestation.

EP28.02

Study on age-related variation in ovarian volume and proportion of endometrial thickness abnormalities in women of advanced and post-reproductive age

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Objectives: To describe the variations in endometrial thickness and the ovarian volume among peri and postmenopausal women.

Methods: A cross-sectional analysis was done in a study population of a longitudinal study. This was a community-based study and included 888 women randomly selected from the Ragama, Sri Lanka. This was done as part of a larger ongoing study, the "Ragama Health Study". All study participants underwent a transvaginal pelvic ultrasound scan and the endometrial thickness and the ovarian size were measured. The ovarian volume was calculated using the formula for a prolate ellipsoid ($0.523 \times h \times w \times l$).

Results: The mean age of the study population was 59.45 yrs (SD=7.601) and 85.8% (n=762) of them had undergone menopause. The prevalence of an endometrial thickness (ET) > 10 mm among premenopausal women was 14.98% while 0.9% (n=1) had an ET > 15 mm. Among postmenopausal women an ET > 4 mm was seen in 16.01%. This included 1.3% (n=10) who had an ET > 10 mm. The mean of average ovarian volumes of the study population, according to age is shown in the figure.

Conclusions: The study demonstrated the proportion of asymptomatic women with a thickened endometrium among perimenopausal and postmenopausal women (>15 mm and >4 mm respectively) that necessitate evaluation is around 1%. It also described the age related changes in ovarian volume.

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EP28.03

Evaluation of ovarian vascularisation in the diagnosis of polycystic ovary syndrome by three-dimensional power Doppler ultrasonography

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Objectives: To evaluate the whether there are differences in 3D power Doppler indices between women with polycystic ovary syndrome (PCOS) and women with normal ovary (NO). And to disclose the role of 3D power Doppler imaging in the diagnosis of PCOS.

Methods: 175 women were classified into two groups according to the 2003 Rotterdam consensus criteria from 2010 to 2014. The PCOS group comprised women (n=124) with oligo-anovulation, clinical and/or biochemical features of hyperandrogenism, and polycystic ovary morphology at 2D imaging, whereas the NO group comprised women (n=51) with regular menstrual cycles and proven fertility. Pulsatility index (PI) and resistance index (RI) of the uterine artery and ovary were measured by 2D Doppler imaging, while vascularisation index (VI), flow index (FI), mean gray value (MG) and vascularisation flow index (VFI) were measured by 3D power Doppler. Follicle number per ovary (FNPO), ovarian volume (OV) were measured by 2D and 3D imaging.

Results: The PCOS group showed a higher mean OV, FNPO, ovarian PI, RI and VFI ($p < 0.001$). However, No difference in MG, VI, FI were found between the groups. Also, VFI in the PCOS group were positively correlated with hormonal parameters.

Conclusions: Restrictively, 3D power Doppler indices may be useful as one of the diagnostic criteria for PCOS.

EP28.04

Sonohisterosalpingography (HyCoSy) with Sonovue: 2D versus 3D

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Objectives: To investigate de tubal patency in infertile patients.

Methods: Between 28 06 2010 and 08 02 2016 a number of 244 HyCoSy were carried out in order to investigate tubal patency in infertile patients. We used for each patient: 2,5 ml of Sonovue solution, diluted in 20 ml of normal saline, instilled on a 5 Fr catheter, the balloon being filled with 1 ml saline in the uterine cavity. The passage of the solution was evaluated with the help of a contrast software transvaginal ultrasound: after a 2D evaluation of the uterine cavity filling and of the tubal passage, a unique 3D volume was stored.

Results: Bilateral periovarian discharge was found in 185 patients through 2D HyCoSy. Out of this group, the bilateral periovarian discharge was seen in only 135 patients (72.97%) through 3D HyCoSy. Out of the 59 patients considered through 2D HyCoSy as not having a patency in at least one of the interstitial portions of the Fallopian tubes, the volumes stored through 3D HyCoSy indicated the partial presence of contrast substance in the tube in 4 patients. Out of the 59 patients, 40 had a chromopertubation with similar results to those of HyCoSy in a number of 36 cases (90%).

Conclusions: 3D HyCoSy can represent a complementary method in the cases which lack an obvious tubal patency on 2D HyCoSy.

EP28.05

Three-dimensional sonographic screening for uterine abnormalities during routine ultrasound assessment in patients undergoing in vitro fertilisation

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Objectives: This study evaluates the role of three-dimensional (3D) ultrasound as a screening tool for assessment of uterine abnormalities, in patients undergoing routine ultrasound examination during In Vitro Fertilisation (IVF) cycle.

Methods: Volumes of uteri, of all consecutive IVF patients undergoing routine vaginal ultrasound measurements of follicular diameter using 3D equipment, were obtained by sonographers. An expert operator used multiplanar display for off-line measurements of length, width and anterior-posterior diameters of the uterus, endometrial thickness and junctional zone (JZ) minimal and maximal thickness and for uterine anatomy assessment.

Results: Between January 2015 and April 2015, 140 volumes were obtained. Mean length, width, anterior-posterior diameter of the uterus and endometrial thickness were 42.7 ± 7.2 mm, 37.5 ± 7.3 mm, 47.8 ± 8.3 mm, 6.4 ± 2.6 mm respectively. Uterine anatomy was visualised in 130/140 (92.8%) volumes, and appeared normal in 116. In 14 patients uterine abnormalities were suspected (arcuate in 12, septated in one and unicornuate in one) and further evaluation was required. JZ was visualised in 78/140 (55.7%) examinations. While mean minimal and maximal JZ thicknesses were 2.2 ± 1.3 mm and 3.9 ± 1.2 mm respectively, in two cases they were increased suggesting adenomyosis. The duration of volume acquisition and manipulation was 60 seconds.

Conclusions: This study demonstrates the feasibility of incorporating 3D sonographic evaluation of uterine anatomy and JZ thickness into routine ultrasound assessment, during controlled ovarian hyperstimulation for IVF cycle. This simple and low cost examination may serve as a screening tool to identify patients in need of further evaluation for possible uterine abnormalities.