Learning curve in the analysis of endometriosis by using magnetic resonance: Comparison with surgical results

Poster No.: C-1250
Congress: ECR 2010
Type: Scientific Exhibit
Topic: Genitourinary
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Keywords: Endometriosis, MRI, Learning Curve
DOI: 10.1594/ecr2010/C-1250

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Purpose

Endometriosis is one of the most prevalent conditions in women, in particular in the reproductive age group. The mean age at diagnosis is 25-29 years, but it is often greater in women who present with infertility rather than pelvic pain. Endometriosis is defined as the presence of endometrial tissue outside the endometrium and the myometrium and the most common locations of endometriosis are the ovaries and the pelvic peritoneum, followed pelvic subperitoneal space, intestinal system and urinary system. Although endometriosis can be asymptomatic, frequently patients may complain pelvic pain, as well as dysmenorrhea, dyschezia, dyspareunia and/or infertility.

Nowadays MRI is used for diagnosis of endometriosis usually in selected patients according to the results of ultrasound and the severity of symptoms; in fact MRI value was well demonstrated in the diagnosing of ovarian endometriomas whereas in other localization remain still debated.

Some endometriotic implants can be difficult to detect and an intensive training may be necessary to correctly diagnose these nodules. The concept of "learning curve" was adapted from the historical observation that individuals who perform repetitive tasks exhibit and improvement in performance as the task is repeated a number of times and this theory has been described by Ericsson et al, who are the proponents of the idea that deliberate practice is fundamental to achieving and maintaining expertise.

The purpose of this study was to determine if Magnetic Resonance Imaging (MRI) accuracy in diagnosing endometriosis is related to radiologist's expertise.

Methods and Materials

30 consecutive female in-patients (mean age 34; range 21-45 years) were studied by using MRI in our Center (A.O.U. Cagliari - Presidio di Monserrato). Each patient was suspected of having endometriosis at clinical examination (pelvic pain, infertility, nodules, or tenderness at physical examination). The patients had presented with one or more of the following symptoms: dysmenorrhea (n = 16), infertility (n = 5), lower abdominal pain (n = 4), hypermenorrhea (n = 2), pain with defecation (n = 2) and abnormal genital bleeding (n = 1).

All examinations were performed with a Gyroscan 1.5-T superconducting magnet. Before each exam, patients were asked to perform an intestinal toilette. In all 30 exams a phased array surface coil was used for imaging of the pelvis. Fifteen
minutes before the examination, 20 mg of hyoscine butylbromide was administered intramuscularly to reduce intestinal peristalsis. The imaging protocol for patients with suspected endometriosis used for this study included anterior and posterior saturation bands covering subcutaneous fat and three T2-weighted sequences (repetition time 4,000 ms, echo time 90 ms, matrix 256x512, three signal acquired 4- to 5-mm-section thickness, field of view, 32 cm.) in different slice orientations (sagittal, coronal and axial planes), followed by three T1-weighted sequences in an identical imaging plane (TR 500 ms, TE 14ms): native T1-weighted without fat suppression and fat suppressed T1-weighted before and after intravenous injection of gadolinium contrast media were also performed.

Each dataset was reviewed for the presence of endometriosis (first analysis). Before starting the study the observer received lectures on gynaecology MRI technique and gynaecological anatomy and more than 20 cases were mentored by experienced colleagues in the 1 months. Radiologist was blinded about clinical symptoms and TV-US results, however the observer knew that patients had or were suspected of having endometriosis.

All patient's data were randomized and were reviewed after 12 and 24 months in order to minimize the "memory effect" and to correctly evaluate the learning curve after an adequate temporal window (second and third analysis). For each patient's dataset analysis the time necessary to complete the report was measured.

Anatomic localization of the lesions. The following 4 topographic localization of endometriosis were analysed in this study: [1] endometriosis in the ovary or endometrioma. [2] Endometriosis of the uterosacral ligaments and the upper portion of the posterior cervix are described by anatomists as "torus uterinus". Torus uterinus is anatomically defined as a small, transverse thickening that binds the insertion of both uterosacral ligaments at the posterior uterus being therefore treated together with lesion of the uterosacral ligaments. [3] Endometriosis of the vaginal fornix. [4] Endometriosis of the Rectum\Sigma\Douglas (by including the recto-vaginal septum and Douglas pouch)

Results

In the first analysis sensitivity and specificity for ovary were 88.9% and 87%; in the second analysis 92.6% and 91.3%. In the first analysis sensitivity and specificity for USL were 62.5% and 76.9%; in the second analysis 80.0% and 84.6%. In the first analysis sensitivity and specificity for vaginal fornix were 63.2% and 64.5%; in the second analysis 73.7% and 82.8%. In the first analysis sensitivity and specificity for rectum\Sigma\Douglas were 40% and 80%; in the second analysis 73.3% and 90%.
**Fig. 1:** MR axial images (T1 and T1-SPIR) indicating an endometrioma of the ovary

**Fig. 2:** Magnetic resonance image (MR) of the pelvis in a 28-year-old woman. A coronal T2-weighted (a), and Sagittal T2 weighted (b) demonstrate nodule with high signal suggestive of endometriotic localization. This nodule, confirmed by surgery, was detected at the first, second and third analysis.
**Fig. 3:** Magnetic resonance image (MR) of the pelvis in a 29-year-old woman with infertility. A axial T2-weighted (a), and sagittal T2-weighted (b) demonstrate nodule with a spiculated morphology in rectovaginal pouch suggestive of endometriotic localization. This nodule, confirmed by surgery, was not detected at the first and 12-months analysis whereas was detected in the third analysis.
Conclusion

The "learning curve" is defined as a graph that represents the progress in the mastery of a skill against the time required for such mastery. This theory has been described by Ericsson et al, who are proponents of the idea that deliberate practice is fundamental to achieving expertise. Prior studies tried to analyze the effect of training and experience in diagnostic accuracy, sensitivity and specificity but to our knowledge, there has been no study that analyzed the learning curve in MRI by using the same observer and the same patient's group in a significant time period (24 months); moreover there are no study that analyzed the learning curve in endometriosis detection by using MRI.

Our results indicate that accuracy of MRI in diagnosing endometriosis increased with radiologist's expertise and the improvement was statistically significant in determining RSD involvement. The diagnosis and detection of deep endometriosis by using Magnetic Resonance Imaging is not simple and it is our opinion that a one year of intensive training, at least, is necessary to acquire adequate experience.

References


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