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Is it possible to obtain a presurgical Lasmar score for hysteroscopic myomectomy by ultrasound alone?

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KEYWORDS: 3D transvaginal ultrasound; hysteroscopy; Lasmar score; submucous myoma grading; transvaginal sonography

ABSTRACT

Objective *To determine whether a Lasmar score obtained entirely by the use of two-dimensional (2D) and three-dimensional (3D) ultrasound provides results similar to those obtained using the original hysteroscopic technique.*

Methods *This was a prospective study performed on a series of patients presenting with symptomatic submucous fibroids and scheduled for hysteroscopic myomectomy. Ultrasound Lasmar scores were obtained by a single physician, a specialist in ultrasonography, in the luteal phase of the menstrual cycle. 3D images were evaluated by offline examination using multiplanar analysis. Classical Lasmar scores were obtained by a different physician, a specialist in hysteroscopy, during the follicular phase of the subsequent cycle. Surgery was performed by a third physician in the follicular phase who also reported a Lasmar score, which we considered as the gold standard. The concordance between group classifications (I–III, relating to difficulty of hysteroscopic resection) according to the three methods used to obtain the Lasmar score (ultrasound, classical and surgery) was calculated using Cohen's κ statistic.*

Results *Thirty-four women, with a mean age of 43 ± 4.9 years, were enrolled in the study. Thirty-six submucous fibroids were identified by both ultrasound and diagnostic hysteroscopy. The mean diameter of fibroids evaluated was 28 ± 13.2 mm. The concordance between the three methods of classifying patients according to Lasmar score was high: classical vs. surgery, $\kappa = 0.88$; ultrasound vs. surgery, $\kappa = 0.93$; and classical vs. ultrasound, $\kappa = 0.77$.*

Conclusion *The Lasmar score can be obtained solely by ultrasound examination performed in the luteal phase of the menstrual cycle, avoiding office hysteroscopy without a loss of diagnostic accuracy. Copyright © 2012 ISUOG. Published by John Wiley & Sons, Ltd.*

INTRODUCTION

Submucous fibroids are the most common structural cause of excessive menstrual bleeding in women of reproductive age and are also associated with clinical sequelae such as dysmenorrhea and adverse reproductive outcomes[1,2]. At present the treatment of choice is removal of these lesions by hysteroscopy[3,4].

The most widespread techniques for presurgical evaluation are office hysteroscopy (evaluation of the intracavity component of the mass, its location, its relationship with the uterine structures, the characteristics of the endometrium and possible presence of associated endometrial pathologies), transvaginal ultrasound scanning (indispensable for evaluation of the 'myometrial free margin' and presence of any other possibly associated pathology and size of fibroid), sonohysterography and magnetic resonance imaging (in case of a large uterus with multiple fibroids, or if ultrasound scanning is technically difficult)[5]. However, accurately identifying fibroids suitable for hysteroscopic resection remains difficult. Since the intramural extension of submucous fibroids may vary considerably, thus influencing the chance of achieving complete resection, there are currently available two classifications of different types of submucous fibroids for assessing the expected difficulty of surgical treatment: the Wamsteker classification and the more recent Lasmar classification. The first considers only the degree of myometrial penetration of the submucous fibroid and is currently used worldwide[6], whereas the second uses five parameters: size, location, extension of the base in relation to the uterine wall, penetration into the myometrium and lateral wall involvement, each of which is given a score that is used to put patients into one of three levels of surgical difficulty according to their total score[5,7]. These classifications are established during hysteroscopy.

Three-dimensional (3D) ultrasonography is a diagnostic technique that enables detailed assessment of uterine

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cavity morphology, with digital reconstruction of the dataset. This in turn allows visualization of an organ from any chosen angle and in any arbitrary plane, thereby potentially overcoming the limitations of two-dimensional (2D) ultrasonography[1,8,9].

The aims of this study were to determine whether a Lasmar score obtained entirely with ultrasound, using both 2D and 3D imaging (the 'ultrasound Lasmar score'), and the subsequent division into three groups relating to the expected difficulty of resection, provides results similar to those from a Lasmar score obtained with the original technique described by Lasmar *et al.*[7] (the 'classic Lasmar score'), and to compare both with the score obtained at surgery, considered to be the gold standard.

Table 1 Presurgical Lasmar score classification of submucous fibroids[5,7]

Characteristic	*Score*
Penetration into myometrium	
0	0
≤ 50%	1
> 50%	2
Size	
≤ 2 cm	0
> 2–5 cm	1
> 5 cm	2
Location within uterus	
Lower third	0
Middle third	1
Upper third	2
Extension of base	
≤ One third of base	0
> One third to ≤ two thirds of base	1
> Two thirds of base	2
Lateral wall involvement	
Absent	0
Present	1

METHODS

Inclusion criteria were submucous fibroids with a diameter of ≤ 5 cm, myometrial-free margin of at least 3 mm, presence of associated symptoms and desire for conservative treatment. Exclusion criteria were contraindications for surgery, postmenopausal status and myometrial-free margin less than 3 mm. Lasmar score ≥ 7 was not considered an absolute contraindication to surgery[10]. Ethics committee approval was not necessary because the diagnostic and surgical procedures offered to patients did not differ from those currently used in internationally accepted clinical practice.

The Lasmar score was calculated in accordance with the original description (Table 1)[7]. The score considers the origin and extension of the base of the fibroid with respect to the wall of the uterus, the size of the fibroid and the topography of the uterine cavity and the degree of penetration of the fibroid into the myometrium. A score ranging from 0 to 2 is given for each parameter and the scores added up. Patients are put into one of three classes of surgical difficulty according to their final score:

Group I (score 0–4): low-complexity hysteroscopic myomectomy;
Group II (score 5–6): complex hysteroscopic myomectomy, for which the use of gonadotropin-releasing hormone (GnRH) analog and/or two-stage surgery may be considered;
Group III (score 7–9): it is recommended that an alternative non-hysteroscopic technique be used.

The ultrasound Lasmar score was obtained by a single clinician (M.T.), who is experienced in this field of ultrasonography, during the luteal phase of the menstrual cycle and the classic Lasmar score was obtained by a second clinician with experience in hysteroscopic procedures (B.F.) during the early follicular phase of the subsequent cycle. Operators independently calculated the Lasmar score for each patient, blinded to each other's findings. A third clinician (M.C.) performed all the operative hysteroscopies and also reported a Lasmar score, which was considered to be the gold standard. Surgery was performed in the early follicular phase without previous administration of GnRH analogs. Ultrasound examination and hysteroscopy were performed in different, specific phases of the menstrual cycle (luteal or follicular) in order to maximize the diagnostic performance of both procedures.

Ultrasound scans were performed using a Mylab 70 ultrasound machine (Esaote, Genoa, Italy) equipped with a 5–9-MHz multifrequency volume endovaginal probe. At the beginning of the scan a standard 2D ultrasound examination of the uterus and ovaries was performed. Next a 3D examination was performed with insonation technique standardized according to the following criteria: a mid-sagittal view of the uterus was obtained filling 75% of the screen, 3D box size was set to include the uterus from the fundus to the cervix, sweep velocity was adjusted to maximum quality and the volume rendering box was made as narrow as possible in the sagittal plane and adjusted to display the uterine corpus in the coronal plane. Each volume dataset was stored on the hard disk of the ultrasound machine and made available for offline analysis by one of the authors (M.T.).

The 3D volumes were manipulated using multiplanar visualization, enabling the operator to achieve planes not necessarily attainable with 2D ultrasound. The volume was manipulated to visualize the fibroid in its widest diameter (Figure 1). For 3D assessment of the intramural extension of submucous myomas (G2, G1 or G0 according to the Wamsteker classification)[6] and for measurement we used the techniques described by Leone *et al.* (Figure 2)[11,12]. The topography was assessed taking into account the position of the portion of fibroid protruding into the uterine cavity. To evaluate the portion of uterine wall occupied by fibroids (extension of fibroid according to Lasmar classification), the uterus was examined in a coronal view in the section in which the greatest area of fibroid was identified. The level for the correct plane is the base of the fibroid at the endomyometrial junction.

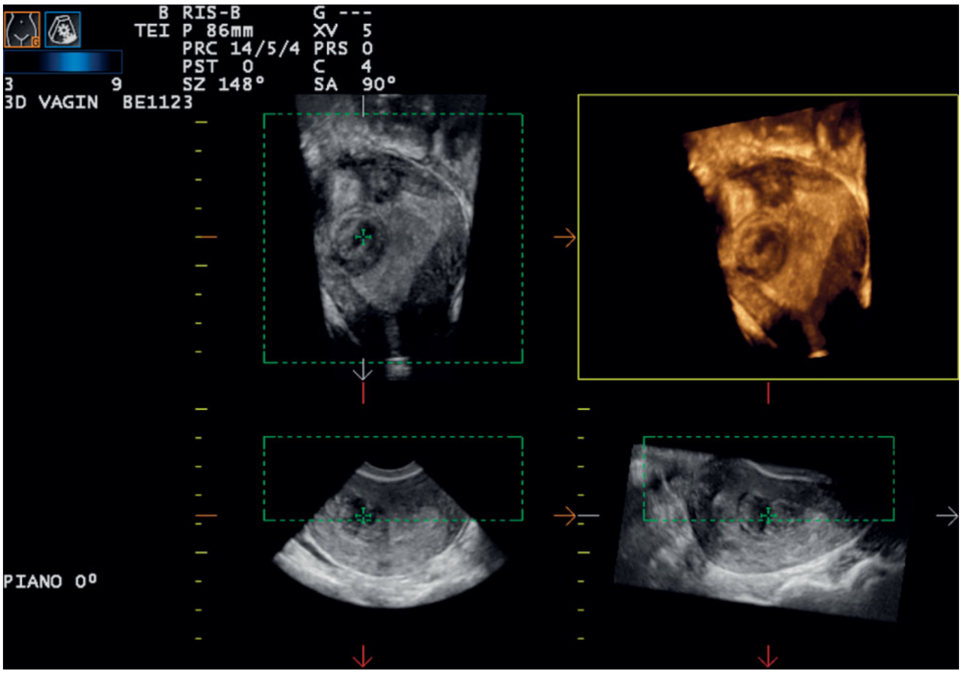

Figure 1 Manipulation of three-dimensional ultrasound volume with multiplanar technique in order to examine the uterine cavity and protrusion of fibroids.

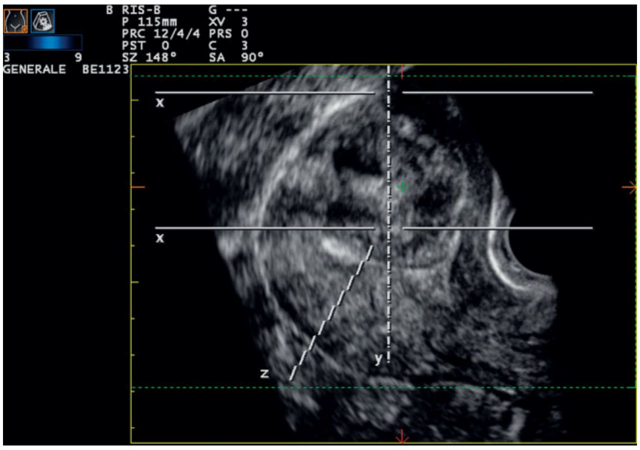

Figure 2 Evaluation of fibroid protrusion with multiplanar imaging of the uterine cavity according to previously published guidelines[12].

This procedure is obviously possible only for the portion of fibroid involving the anterior or posterior wall of the uterus. We then separately selected the area of fibroid and the area of the uterine wall and used dedicated software to calculate the proportion of wall affected. The algorithm calculates the number of pixels that are contained within the area outlined. Precise evaluation of the area is not made by explicit formulae, but rather by an algorithm that calculates the exposed areas as follows: all the points of the contour are generated by interpolating the straight segments between two consecutive points of the contour. The set of points of the contour thus generated are arranged in order of increasing Y and increasing X. Added to each Y co-ordinate are the X segments that join the two borders inside the contour and the result is the sum of all the pixels inside the contour. To calculate the area, it is only necessary to multiply by the unit area of one pixel (Figure 3).

Office hysteroscopy was performed on all women, with a rigid 30° hysteroscope and a 5-mm diameter diagnostic sheath (Storz Endoscopy, Germany). Normal saline was used to distend the uterine cavity to an intrauterine pressure of about 100 mmHg. The size of the fibroid was determined by its visualization and comparison with the length of the hysteroscope. Protrusion into the cavity was determined by visualization of the angle between the fibroid and the uterine wall.

For hysteroscopic surgery, one-step resection was performed using the cold-loop Mazzon technique[5]. The distending solution used was 5% sorbitol to an intrauterine pressure of 100 mmHg. The findings on surgery were considered as the gold standard because, as it is performed in the operating room under general anesthesia, it allows the operator more time in which to evaluate the uterine cavity than does diagnostic hysteroscopy, which is done on an outpatient basis, without anesthesia, and thus requires a certain speed of execution. Also, surgery allows for a more accurate assessment of the intramural portion of the removed fibroid by studying the extension of the bed of the fibroid into the uterine wall after myomectomy.

Statistical analysis

The demographic and clinical characteristics of the patients are given using the standard indicators of descriptive statistics. A dedicated database was set up for data collection and Cohen's κ for interobserver agreement was calculated to assess the concordance between group classifications according to the three methods used to

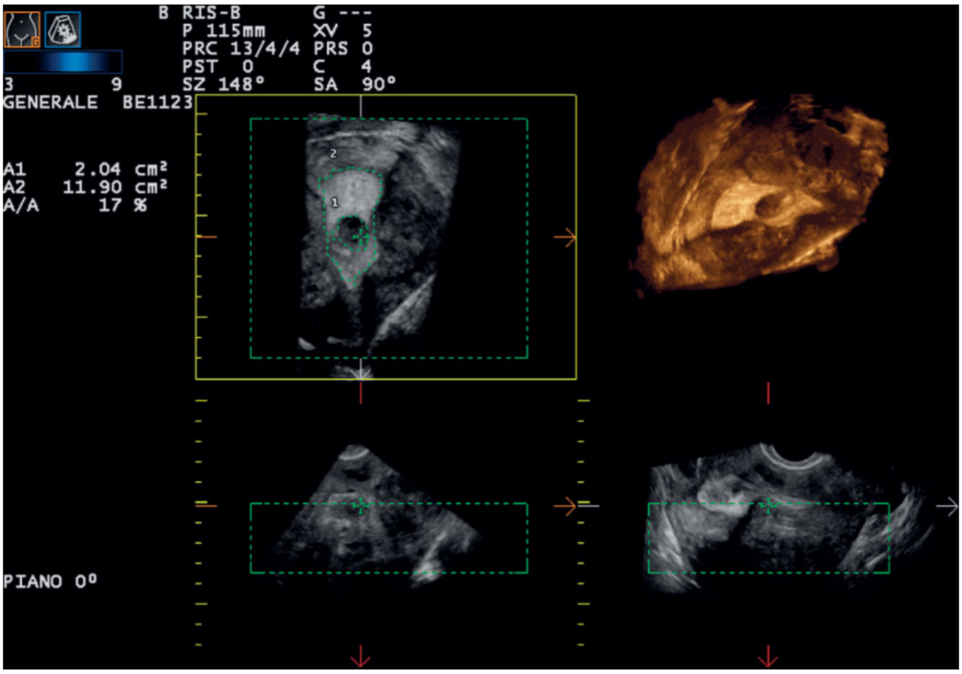

Figure 3 Evaluation of area occupied by a uterine fibroid compared with area of the wall by means of multiplanar imaging of the uterine cavity and use of dedicated software.

obtain the Lasmar score. Statistical analysis was carried out using the Statistical Package for the Social Sciences (SPSS) software, version 9.0 (SPSS Inc., Chicago, IL, USA).

RESULTS

Thirty-four symptomatic women with submucous fibroids were invited to join the study, all of whom agreed to take part. The mean age was 43 ± 4.9 years. Twelve (35.3%) patients were nulliparous and 22 (64.7%) parous. Twenty-nine women (85.3%) presented with a history of abnormal vaginal bleeding, 25 (73.5%) with menorrhagia and seven (20.6%) with infertility; all were scheduled for hysteroscopic myomectomy. All patients had at least one symptom, and many had more than one. None of the women withdrew from the study. Thirty-six submucous fibroids were identified by both ultrasound and diagnostic hysteroscopy (two patients showed two fibroids). The mean diameter of the fibroids was 28 ± 13.2 mm. Of these 36 fibroids, 15 were entirely in the posterior uterine wall, 12 entirely in the anterior uterine wall, five in the posterior wall and partially in the lateral wall and four in the anterior wall and partially in the lateral wall. Four fibroids were located in the inferior third, 26 in the middle third and six in the superior third of the uterus.

Three-dimensional ultrasonography was successful in all women. Diagnostic hysteroscopy was successful in all cases; clear views of the uterine cavity were obtained and both tubal ostia were identified in every case. There were no operative complications associated with diagnostic hysteroscopy. All hysteroscopic myomectomies were successfully performed without any complications in a single surgical session and all patients were discharged on the day of surgery.

Table 2 Distribution of patients in the three groups of Lasmar score classification based on the three different modalities used to calculate the score

	Classification at:		
Group	*Surgery*	*Diagnostic hysteroscopy (classical)*	*Ultrasound*
I	24 (70.6)	26 (76.5)	25 (73.5)
II	9 (26.5)	7 (20.6)	8 (23.5)
III	1 (2.9)	1 (2.9)	1 (2.9)

Data are given as *n* (%).

Table 2 shows the division of patients into the three classification groups according to each of the modalities used to calculate the Lasmar score. The surgeon confirmed the classification made by ultrasound Lasmar score in 33 out of 34 cases and that made by classical Lasmar score in 32 out of 34 cases. For both the ultrasound and classical scores, the women who were misclassified were put in Group I, whereas at surgery they were put in Group II because the surgeon judged the extension of the fibroid to be greater than one third and the degree of protrusion less than 50%. The concordance between the three methods to classify patients according to the Lasmar score obtained was high: classical vs. surgery, $\kappa = 0.88$; ultrasound vs. surgery, $\kappa = 0.93$; and classical vs. ultrasound, $\kappa = 0.77$. We also considered Cohen's κ between diagnostic hysteroscopy and 3D ultrasound regarding the Wamsteker classification and both of them with surgery (hysteroscopy vs. surgery, $\kappa = 0.59$; ultrasound vs. surgery, $\kappa = 0.63$; and hysteroscopy vs. ultrasound, $\kappa = 0.48$).

DISCUSSION

The intramural extension of submucous fibroids influences the chance of achieving complete resection in one surgical session, as does the position and diameter of the fibroid itself. Moreover, it is advisable to use expert surgeons for hysteroscopic resection of fibroids with intramural extension, as it is technically difficult and is associated with a high risk of complications[3]. The Lasmar classification not only tries to classify submucous fibroids but also attempts to identify the degree of technical difficulty expected when carrying out the hysteroscopic procedure[7]. Moreover, the final scores obtained show a higher correlation with completeness of the myomectomy, time spent in surgery and fluid deficit[7].

The final aim of this study was to see if the Lasmar score obtained with ultrasound is as predictive as the original score, and in this regard our data showed very good overall agreement between the classic Lasmar and ultrasound Lasmar scores. Moreover, agreement between the ultrasound Lasmar score and that obtained at surgery is better than that between the classic Lasmar score and that obtained at surgery. These results could be explained by considering that with the classic Lasmar classification, the degree of fibroid protrusion into the cavity and the portion of the uterine wall occupied by the fibroid is based on the subjective impression of the operator during office hysteroscopy rather than on an objective measurement[13]. On the other hand, with 3D ultrasound the subjective impression can be replaced by offline evaluation of the images. At the end of the procedure, the operator can choose the best way to correctly assess the true protrusion of fibroid[13]. Furthermore, the software utilized for our offline evaluation can calculate the proportion of the area occupied by fibroid compared with the entire uterine wall, a procedure that allows the operator to obtain quantifiable data. While several papers discuss evaluation of fibroid protrusion[12–14], this is the first study to our knowledge that uses ultrasound to evaluate the extension of the fibroid with respect to the uterine wall.

For a more precise evaluation of the degree of fibroid protrusion, several authors have proposed 3D saline contrast sonohysterography, which has proved to be a reproducible method for measuring the diameter of submucous fibroids and has also demonstrated a good level of agreement among different operators in assessing the degree of protrusion of the fibroid into the uterus[12,13,15,16]. Based on these results we performed the ultrasound scan in the luteal phase because ultrasound images are easier to interpret in this period of the menstrual cycle owing to the increased thickness and echogenicity of the endometrium, which works as a contrast medium.

We also analyzed the concordance between the ultrasound, hysteroscopy and surgical procedures regarding evaluation of fibroid protrusion: as reported above, we found a lower Cohen's κ between ultrasound scan and office hysteroscopy and between each of these and surgery (hysteroscopy vs. surgery, $\kappa = 0.59$; ultrasound vs. surgery, $\kappa = 0.63$; and hysteroscopy vs. ultrasound, $\kappa = 0.48$). We decided to show these data separately because, overall, they do not dramatically influence the final score of the Lasmar classification (both classical and ultrasound). In fact, the degree of penetration of fibroid into the cavity is only one of the parameters constituting the final score. Moreover, the Lasmar score is used to assign each fibroid to one of three classifications of difficulty, and the majority of differences in the final score do not translate into a change in the class of difficulty.

Our data show that ultrasound performed in the luteal phase can provide an adequate preoperative evaluation of all aspects of submucous fibroid (dimension, degree of protrusion, extension and location); for cases in which the endometrium is too thin (i.e. during estro–progestin therapy) it is essential to use a saline solution and to perform 3D sonohysterography. We argue that the Lasmar score could be obtained in the majority of cases solely with ultrasound, thereby avoiding the routine use of diagnostic hysteroscopy. This could be good for women because diagnostic hysteroscopy is invasive, causes a certain degree of discomfort for the patient and has several disadvantages such as not being able to measure the size of the fibroid. Hence, it is based on the physician's subjective impression. Consequently, patients could be spared an invasive investigation without it negatively affecting the quality of the preoperative diagnosis. Furthermore, diagnostic hysteroscopy is expensive and, as a result, a preoperative work-up that does not routinely include it can provide financial benefits for the public, as well as being a time-saver for physicians. The use of hysteroscopy for the evaluation of submucous fibroids could thus be limited to selected cases, for example, when there is suspicion of concomitant endometrial pathology, thereby necessitating endometrial biopsy.

Our study has some limitations, the most important being that our series only included cases with at most two submucous fibroids. Therefore, our data are not applicable to patients with multiple submucous fibroids. Another limitation could be the relatively small number of patients enrolled in the study, which we nevertheless feel is offset by the good agreement between the classical, ultrasound and surgical Lasmar scores.

In conclusion, our data show that the Lasmar score for hysteroscopic myomectomy can be obtained solely by ultrasonography performed in the luteal phase of the menstrual cycle, thus avoiding office hysteroscopy without loss of diagnostic accuracy. Nevertheless, if there is a need for an endometrial biopsy, office hysteroscopy remains mandatory. Obviously, these encouraging data must be supported by other larger clinical trials that also include patients with multiple submucous fibroids.

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