# Comparison of the number of uterine myomas detected by in-office transvaginal ultrasonography removed by laparotomic myomectomy: preoperative work-up concerns*

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**Summary**

*Purpose of investigation:* To assess the ability of detecting the number of uterine myomas by transvaginal ultrasonography (TVS) performed supporting the clinical examination of general gynecologists' office practice. *Methods:* A retrospective comparison of the number of myomas revealed by preoperative in-office TVS and documented after laparotomic myomectomy was conducted in 110 consecutive premenopausal patients referred for surgery. *Results*: The sensitivity of TVS in revealing the exact number of myomas was 59.4% in the whole series. In the subgroup of 88 patients with a preoperative diagnosis of three or fewer myomas TVS missed at least one myoma in 31 (35.2%) cases, achieving a 64.8% sensitivity. Among the 72 women diagnosed with one myoma at preoperative TVS, 19 (26.4%) resulted to have two or more myomas at the end of surgery, reaching a 73.6% sensitivity of TVS in revealing the exact number of myomas. *Conclusions*: In-office TVS reinforces the clinical diagnosis of uterine myomas but it often fails in the detection of their number, resulting in a poor preoperative characterization of patients. The fact that one myoma may be overlooked in one-third of patients theoretically eligible for laparoscopic conservative surgery may motivate the implementation of US diagnosis when laparoscopic myomectomy is considered.

*Key words:* Myoma; Ultrasonography; Myomectomy.

## Introduction

Uterine myomas affect more than 20% of reproductive-aged women [1]. They are a frequent cause of pelvic pain and abnormal uterine bleeding and are thought to be involved in infertility [2].

At present symptomatic uterine myomas represent the most frequent reason for hysterectomy in the United States [3]. However, for patients who desire future pregnancies or wish to preserve their anatomic integrity, minimally invasive procedures are now available to perform conservative surgery. Mini-laparotomic and laparoscopic myomectomy have already resulted to be safe, reliable and reproducible techniques and uterine artery embolization may also be considered a promising approach [3-5].

With the advent of minimally invasive conservative treatments an accurate preoperative assessment of myomas has become a point of utmost importance. The presence or absence of uterine myomas, their number and size, their exact location and their differentiation from adenomyosis, are parameters that should be assessed before treatment.

Transvaginal sonography (TVS) with higher-frequency probes is the most cost-effective procedure to confirm the clinical diagnosis of myomas. TVS has revealed high accuracy in diagnosing number, size and location of myomas if performed by skilled operators using high-quality instruments [6-9].

Since TVS accuracy is highly operator-dependent and influenced by different available machines, surgical treatment often has to deal with a poor-quality preoperative evaluation made by in-office TVS during the clinical examination in general gynaecologic practice. This diagnostic work-up may even underestimate the number of myomas representing the main parameter that should be achieved in preoperative assessment, especially when minimally invasive procedures are planned [10].

The aim of the present study was to evaluate the ability of routine TVS during gynaecologic examination in detecting the correct number of myomas by comparing preoperative ultrasonographic diagnosis with removed myomas in an unselected group of premenopausal patients referred for laparotomic myomectomy.

## Patients and Methods

Clinical data of all consecutive premenopausal patients submitted to laparotomic myomectomy at the authors' institution from June 2006 to August 2007 were collected and retrospectively evaluated.

The only sonographic inclusion criteria used in the study was a preoperative TVS, utilized for planning surgery, which included a written report clearly indicating the number of identified myomas.

To evaluate a group of subjects representative of a general gynaecologic practice we intentionally included office TVS evaluations performed by operators with variable experience, using multifrequence probes 5.5-7.5 MHz of different commercially available scanners.

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Age, indications for surgery, number of myomas identified by TVS and removed after abdominal myomectomy, their site and size, and latency between TVS and surgery were recorded for each patient.

Body mass index (BMI) and previous abdominal surgery were not investigated since TVS is thought not to be affected by these variables.

Preoperative bimanual gynaecological examination confirmed uterine enlargement in all patients scheduled for surgery. The number of myomas detected at TVS was compared with the number of myomas removed during surgery.

Although conservative surgery was performed in all cases by transverse soprapubic incision, several expedients were used to detect and remove all myomas. When there were uterine adhesions extensive lysis was the first endoabdominal surgical step to obtain complete uterine mobilization. When possible the uterine body was pulled toward and through the abdominal wall to individualize subserosal or partially intramural myomas by visual inspection. To succeed in this, anterior or fundal myomas were grasped with a Collins/Pozzi tenaculum or, in absence of reachable nodes, the fundal myometrium was deeply sewed by an absorbable cross-stitch and the uterus was pulled keeping it under tension.

After the visual inspection of the exteriorised part of uterus, all the uterine regions were accurately explored by finger touch to detect intramural or submucosal myomas.

Whenever the uterine body was too large for immediate exteriorization, intraabdominal enucleation of the larger myomas was performed with eventual morcellation by cold-knife to avoid enlargement of the opening. After enucleation of the intramural myomas, myometrial *fovea* was accurately explored to individuate eventual small adjacent myomas.

Surgical techniques to remove the myomas and suture the myometrium have been described previously [5, 11].

Definitive histological analyses of excised specimens were available for all patients.

Results are expressed as mean ± SD or mean and range, or percentage in some cases. For statistical analysis the *t*-test was used. Probability values of < .05 were considered significant.

## Results

One hundred and thirty-three consecutive patients with clinical and TVS diagnoses of uterine myomas underwent conservative laparotomic surgery during the study period.

One hundred and ten patients comprised the study group because the TVS report and/or surgical description did not document the number of single myomas in 23 cases.

The mean age of treated patients was 37.8 years (range 25-52). The main indication for surgery was abnormal uterine bleeding in 39 cases (35.4%), pelvic pain or abdominal pressure in 52 (47.3%), and infertility in 19 (17.3%).

A total of 346 myomas were removed with a mean of 3.1 myomas for patient. Definitive histological analysis of excised specimens confirmed the diagnosis of uterine myomas in all cases. In 57 patients (51.8%) multiple myomas were excised during surgery (max 20). The size of the largest myoma ranged from 15 mm to 180 mm (mean 52 mm) (Table 1).

Table 1. — *Size, and location of removed myomas (n = 346).*

| | N | % |
|---|---|---|
| *Size (mm)* | | |
| < 20 | 37 | 10.7 |
| 20-50 | 199 | 57.5 |
| > 50 | 98 | 28.3 |
| Unknown | 12 | 3.5 |
| *Site of myomas with respect to uterine body* | | |
| Fundal | 139 | 40.1 |
| Anterior | 68 | 19.7 |
| Posterior | 73 | 21.1 |
| Lateral | 25 | 7.2 |
| Isthmic | 12 | 3.5 |
| Unknown | 29 | 8.4 |
| *Site of myomas with respect to uterine wall* | | |
| Intramural | 240 | 69.4 |
| Subserosal | 58 | 16.7 |
| Submucosal | 27 | 7.8 |
| Unknown | 21 | 6.1 |

The mean latency ± SD between TVS and myomectomy was 67.8 ± 39.6 days (range: 2-184).

The number of myomas removed during surgery agreed with that detected by TVS in 63 cases (57.3%).

In four cases of multiple myomas diagnosed by TVS (4 myomas detected in 3 cases and 5 in one case), one was not found during surgery, resulting in a false sonographic finding. Only one of these, cleared by histological analysis, turned out to be adenomyosis, while the surgeon could not find any pathological aspect matching the diagnosed myoma in the other three cases.

In 43 patients (39.1%) there was at least one myoma missed by TVS. The sensitivity of TVS in diagnosing the exact number of existent myomas was 59.4% in the whole series.

Considering the subgroup of 88 patients with a TVS diagnosis of three or fewer myomas the number of the detected and removed myomas corresponded in 57 cases whereas in the remaining 31 (35.2%) there was at least one missed by TVS. The sensitivity of TVS in diagnosing the exact number of existent myomas in this cohort of patients was 64.8%.

Finally, among the 72 women diagnosed with only one myoma at preoperative TVS, 19 (26.4%) resulted to have two or more myomas during surgery, achieving a 73.6% sensitivity of TVS in diagnosis of the exact number of myomas.

The mean latency between TVS and surgery was 67.1 days (range: 2-178) in the group with the correct number of myomas evaluated by TVS and 68.1 days in the other (range: 5-184). There was no statistical difference in latency comparing the two groups (difference -1.0; C.I. 95% from -15.2 to 13.2; t = -0.140; $p = 0.889$).

Figures 1 and 2 display the mean number of myomas missed by TVS, respectively, versus the number of myomas preoperatively detected and those removed during surgery.

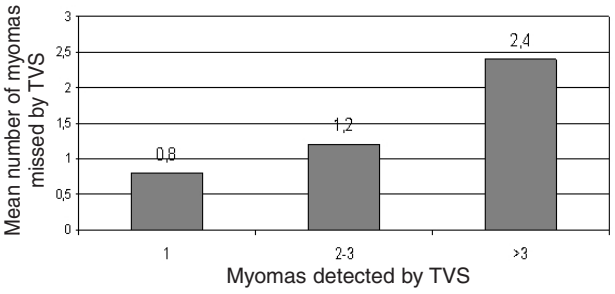


Figure 1. — Mean number of myomas missed by TVS in relation to number of myomas detected by TVS (106 patients, excluding 4 false-positives).

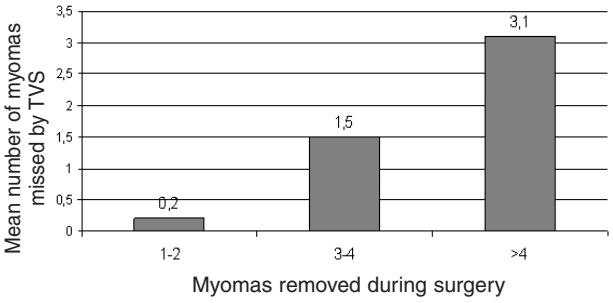


Figure 2. — Mean number of myomas missed by TVS in relation to the number of myomas removed during surgery (106 patients, excluding 4 false-positives).

## Discussion

The standard treatment of uterine myomas is surgical removal. At present different therapeutic approaches already validated or under investigation are available but a preoperative diagnostic pathway has to be worked-up when considering the chosen surgical option.

Obviously when hysterectomy is planned an accurate preoperative characterisation of number, site and size of myomas is not required.

Similarly precise uterine mapping is not necessary when a patient is referred for laparotomic myomectomy since identification of all existent myomas by inspection and finger touch during surgery is possible.

In recent years new minimally invasive surgical techniques have been developed, resulting in effective conservative treatment of myomas [3-5].

Among all options, laparoscopy is considered of utmost interest since it produces minimal surgical trauma with reduced postoperative pain, fast recovery and optimal aesthetic results [12-14].

From a technical point of view laparoscopic illumination and magnification can reveal subserosal or intramural myomas able to distort the uterine profile but, conversely to open surgery, they do not allow localisation of smaller deep intramural myomas, denying direct palpation of the uterine walls.

Thus if all myomas are not documented during the preoperative work-up a considerable risk of leaving them *in situ* exists which may result in subsequent recurrence.

The above-mentioned issues outline the need for accurate preoperative identification and mapping of all myomas every time laparoscopic surgery is planned.

TVS represents the most cost-effective procedure to confirm a clinical diagnosis of myomas [6-9].

The presence or absence of uterine myomas, their number and size, their exact location relative to the endometrial cavity, and their differentiation from adenomyosis are parameters that can be accurately assessed before treatment when TVS is performed by skilled sonographists using advanced equipment. The low-cost and non-invasiveness are further recognized advantages of TVS which, for these reasons, is considered the first method of choice to preoperatively investigate uterine myomas.

At present the majority of obstetrician-gynaecologist practitioners have introduced TVS at the completion of routine clinical examination of patients [15, 16].

Unfortunately the technique remains highly operator-dependent and there is considerable variability in image quality between commercially available sonographic equipment [17, 18]. As a consequence the indication for surgical intervention is more often established on the basis of a poor-quality in-office TVS supporting a clinical examination where the number and characterisation of myomas are inaccurate [19].

The aim of the present study was to evaluate the usefulness of in-office TVS for detection of the correct number of myomas during the preoperative clinical-sonographic work-up for patients scheduled for conservative surgery.

The number of myomas was the leading sonographic variable analysed in our study as it should be the main outcome of preoperative TVS uterine mapping.

Our data confirm in-office TVS as a useful tool to confirm the existence of uterine myomas but, at the same time, describe it as often failing to correctly detect the number with a 39.1% underestimation rate in all patients.

Previous papers [20] and our results (Figures 1 and 2) revealed that the increment in number of myomas makes it hard to distinguish them singularly by TVS with a rapid decrease in the ability to detect their real number.

For this reason we intentionally focused on the subgroup of patients with three or less myomas at TVS examination which, moreover, could represent a reasonable indication for a laparoscopic approach. However, in our experience, even among this cohort of patients, TVS missed at least one myoma in more than one-third of cases and revealed a sensitivity of 64.8% in diagnosing the exact number of existent myomas.

Considering our results some aspects of the study should be interpreted as methodological bias and deserve particular considerations.

To the best of our knowledge, this is the first study in the literature that considers the number of myomas removed by laparotomic myomectomy as the standard of comparison. We suppose, in fact, that laparotomic exploration with meticulous and systematic palpation of the

uterine walls during surgery could lead to localisation and removal of all myomas, obtaining similar outcomes to authors who used pathological analysis after hysterectomy to establish the number of existent myomas.

The lack of standardisation with regard to ultrasound diagnosis of myomas could be indicated as another methodological bias in the present series. Truly, as previously outlined, we intentionally included TVS performed by several operators with different equipment to create an unselected group of patients representative of general gynaecologic practices where often a poor-quality in-office TVS supporting clinical examination represents the basis for surgical intervention.

The above-mentioned considerations along with the overlooking rate in TVS detection of myomas observed in our experience might explain some previous studies where the recurrence rate after laparoscopic myomectomy was higher compared with the laparotomic procedure. For example Doridot *et al.* [21] reported that the cumulative rate of myoma recurrence within five years appears to be greater after laparoscopy than after laparotomy. In a retrospective review of 114 laparoscopic myomectomies, Nezhat *et al.* [22] reported a 33.3% recurrence rate after an interval of 27 months and suggested that smaller intramural fibroids are hard to visualise and may be overlooked resulting in a higher recurrence rate respect to laparatomic removal.

The only randomised study in the literature comparing laparotomic and laparoscopic myomectomy showed no statistically significant differences in the recurrence rate between the two groups [23]. Given the randomised nature of the study, we believe that a single skilled or a small group of operators were entitled to perform both follow-up and preoperative work-up of patients to reduce the well noted operator-influenced bias of TVS.

In our opinion, in-office TVS supporting clinical examinations remains a reliable first-hand method to confirm clinically suspected uterine myomas and should be considered acceptable in case of planned hysterectomy or laparotomic myomectomy.

On the contrary the fact that one myoma may be overlooked in one-third of patients theoretically eligible for conservative laparoscopic surgery may motivate the implementation of US diagnosis through skilled specialists with proper equipment when laparoscopic myomectomy is considered.

In young patients with multiple myomas or large volume uteri who are scheduled for conservative advanced laparoscopic procedures, myoma mapping is mandatory and MRI should be taken into consideration since in some reports it clearly outperforms TVS [20, 24, 25]. Dueholm *et al.* [20] in a double-blinded study found that the sensitivities of MRI and TVS were equally accurate in the detection of myomas but MRI was superior in the mapping, when uterine volume exceeded 375 ml, or when the number of myomas increased.

However the elevated costs of MRI and the high prevalence of the pathology are not cost-effective for routine use in all patients scheduled for laparoscopic myomectomy.

In conclusion today the use of in-office TVS supporting clinical examination is implemented in the diagnosis of uterine myomas but it is far from being considered a reliable diagnostic tool to propose conservative laparoscopic surgery, adding poor information to clinical evaluation of uterine enlargement.

In our opinion patients scheduled for laparoscopic surgery should be preoperatively evaluated by experienced sonographists and offered counseling to clarify the technical aspects of conservative myomectomy managed by the laparoscopic route, including the possibility of recurrence.

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