

Correlation between Hysterosonography and Hysteroscopy in the Diagnosis of Submucosal Fibroids in Women Attending the Gynaecological Endoscopic Surgery and Human Reproductive Teaching Hospital (CHRACERH)

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Abstract

Background: Submucosal myomas can be responsible for abnormal bleeding, spontaneous abortions or even infertility. **Objectives:** This study aimed to study the correlation between the diagnosis and classification of submucosal fibroids at hysterosonography and at hysteroscopy at Gynaecological Endoscopic Surgery and Human Reproductive Teaching Hospital (CHRACERH), Yaoundé, Cameroon. **Methodology:** We conducted a hospital-based cross-sectional study with retrospective data collection. Included were the files of patients in whom a hysteroscopy for uterine cavity evaluation was done from the 1st of January 2020 to the 31st of July 2022. The data collected were analysed using SPSS version 25 and Microsoft Excel 2013. Hysterosonographic findings were compared to those of hysteroscopy using Cohen's kappa inter-observer agreement test. **Results:** A total of 104 women had available hysterosonography results prior to diagnostic hysteroscopy. The ages of the participants ranged from 26 to 65 years with a mean age of 39.92 ± 7.02 years. A total of 69 submucosal fibroids were identified at hysterosonography and 47 (68.1%) were found at hysteroscopy. There was agreement between the two methods in 13/17 (76.5%) cases of FIGO 0 fibroids, 21/30 (70.0%) of FIGO 1 fibroids and 13/22 (59.1%) of FIGO 2 fibroids. The overall agreement was moderate with a kappa coefficient of 0.478 ($p < 0.001$). The best level of agreement was

achieved in classifying FIGO 0 fibroids, and the level of agreement decreased with increasing degree of myometrial involvement. There was an overall statistically significant association between visualisation of fibroids at hysterosonography and at hysteroscopy (OR = 7.44, 95% CI: 2.49 - 22.27, $p < 0.001$).

Conclusion: The results present hysteroscopy as the gold standard for the diagnosis of submucosal myomas, but clinicians need to recognize utility of hysterosonography in certain situations.

Keywords

Submucosal Fibroids, Hysterosonography, Hysteroscopy, Correlation

1. Introduction

Background

Leiomyomas of the uterus are the most common solid pelvic tumours found in women and are estimated to occur in 20% - 50% of women with increased frequency during the late reproductive years [1]. Submucous myomas are a common cause of menstrual disturbances including menorrhagia, dysmenorrhea and intermenstrual bleeding [2], and may cause infertility by interfering with implantation [3].

Properly selected submucous myomas can be removed using operative hysteroscopy with a significant reduction in operative morbidity, post-operative recovery time, and cost compared to abdominal myomectomy [4]. The main factors determining the feasibility of complete and safe hysteroscopic myoma resection appears to be the size of the myoma and the proportion of the myoma protruding into the uterine cavity [4].

Diagnostic hysteroscopy is currently the gold standard investigation used to determine the feasibility of resection of submucous myomas prior to the scheduling of an operative hysteroscopy [5]. It allows direct visualization of the uterine cavity and identification of intracavitary lesions [5].

However, diagnostic hysteroscopy is an invasive and costly procedure which is associated with risks such as uterine perforation and ascending genito-urinary infection [6]. Furthermore, it only provides subjective assessment of myoma size and indirect information about the degree of myoma extension into the endometrial cavity [7].

Ultrasound with sterile saline instillation into the endometrial cavity termed hysterosonography is an established technique that allows visualization of intracavitary lesions such as submucous myomas with an accuracy higher than the conventional two dimensional ultrasound [8]-[10], and is comparable to that of diagnostic hysteroscopy [11]-[13], and with lower cost and a low incidence of complications [14]. Furthermore, hysterosonography allows accurate assessment of myoma number, measurement of myomas size as well as the thickness of the

overlying myometrium, termed the myometrial free margin as well as to detect other uterine and adnexal pathology [12].

The aim of this study was to compare hysterosonography and diagnostic hysteroscopy for the diagnosis and classification of submucous uterine fibroids.

2. Material and Methods

2.1. Study Design

We did a hospital-based cross-sectional study with retrospective data collection.

2.2. Study Period

The study was conducted from the 1st to the 31st of August 2022, with data from women who attended Gynaecological Endoscopic Surgery and Human Reproductive Teaching Hospital from the 1st of January 2020 to the 31st of July 2022.

2.3. Study Setting

This study was carried out at the Gynaecological Endoscopic Surgery and Human Reproductive Teaching Hospital (CHRACERH) which is tertiary health facility located at the Ngouso neighbourhood of Yaoundé, capital city of Cameroon.

2.4. Study Population

Included were symptomatic women who consulted at Gynaecological Endoscopic Surgery and Human Reproductive Teaching Hospital from the 1st of January 2020 to the 31st of July 2022, in whom a hysterosonography was done followed by a diagnostic hysteroscopy with both findings available in patient's medical records.

2.5. Study Procedure

Before the start of our study, Ethical clearance was obtained from the Ethical committee of Gynaecological Endoscopic Surgery and Human Reproductive Teaching Hospital. Data for this study was collected using a pre-tested questionnaire from files of women who consulted at Gynaecological Endoscopic Surgery and Human

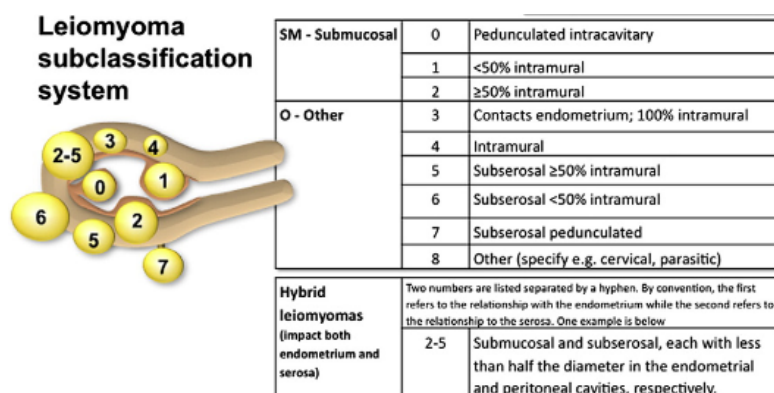


Figure 1. 2011 International Federation of Gynecology and Obstetrics classification of myomas [15].

Reproductive Teaching Hospital from the 1st of January 2020 to the 31st of July 2022, who were diagnosed of submucous myomas and/or endometrial polyps by hysterosonography, and later underwent a diagnostic hysteroscopy under general anaesthesia

Information on sociodemographic characteristics, clinical characteristics, as well as information concerning the submucosal fibroids diagnosed at hysterosonography and hysteroscopy (number, and FIGO Classification) were obtained by using a self-constructed questionnaire. **Figure 1** shows the 2011 FIGO classification of uterine myomas [15].

2.6. Statistics

Data was entered at the end of the collection process into a computer and analysed using SPSS version 25 and Microsoft Excel 2013. Missing data were imputed using the multiple regression method, and cases with more than 10% missing data were excluded from the analysis. Categorical variables were reported as frequencies and percentages, while numerical variables were summarized as means with their corresponding standard deviation (SD) and range. The measure of association was reported as odds ratios with corresponding 95% confidence interval and p-value. Agreement between the two diagnostic tests was calculated using Cohen's kappa for inter-observer agreement [16]. Each observation was independent of others, ensuring that one observer's assessment did not influence another's. The data used for the kappa calculation were categorical, specifically focusing on the presence or absence of submucous myomas. The hypotheses tested for this test were as follows:

- The null hypothesis (H0): there is no concordance between the diagnoses of hysterosonography and hysteroscopy.
- The alternative hypothesis (H1): there is significant concordance between the diagnoses of hysterosonography and hysteroscopy.

The kappa coefficient (κ) was interpreted as follows:

- $\kappa < 0$: concordance below chance.
- $0 \leq \kappa \leq 0.20$: poor agreement.
- $0.21 \leq \kappa \leq 0.40$: moderate agreement.
- $0.41 \leq \kappa \leq 0.60$: substantial agreement.
- $0.61 \leq \kappa \leq 0.80$: near perfect agreement.
- $\kappa \geq 0.81$: perfect agreement.

3. Results

3.1. General Characteristics of the Study Population

3.1.1. Sociodemographic Characteristics

This study was carried out on 104 women who were diagnosed of submucous myomas and/or endometrial polyps by hysterosonography, and later underwent a diagnostic hysteroscopy. All hysterosonographies were performed by radiologists and all hysteroscopies by gynaecologists-hysteroscopists. The ages of the participants ranged from 26 to 65 years with a mean age of 39.92 ± 7.02 years.

The majority of women were in the age group >40 years (N = 52, 50%), were married (N = 69, 66.3%), self-employed (49, 47.1%) and resided in urban areas (N = 87, 83.7%). This is shown in **Table 1**.

Table 1. Socio-demographic characteristics of patients undergoing hysterosonography and hysteroscopy at CHRACERH from 1st of January 2020 to the 31st of July 2022.

VARIABLES	FREQUENCY (n)	PERCENTAGE (%) N = 104
Age (in years)		
20 - 30	11	10.6
31 - 40	41	39.4
>40	52	50.0
Marital status		
Married	69	66.3
Single	34	32.7
Divorced	01	0.9
Occupation		
Civil servant	32	30.8
Housewife	18	17.3
Self-employment	49	47.1
Student	05	04.8
Place of residence		
Rural	17	16.3
Urban	87	83.7

Civil servant = teacher, nurse, medical doctor, magistrate, etc.; Self-employment = farmer, tailor, hairdresser, trader, etc.

3.1.2. Clinical Characteristics

A total of 33 (35.6%) women had been pregnant at least once. Sixty-seven women were nulliparous and the parity ranged from 0 to 4 with a mean parity of 0.52 ± 0.9 SD.

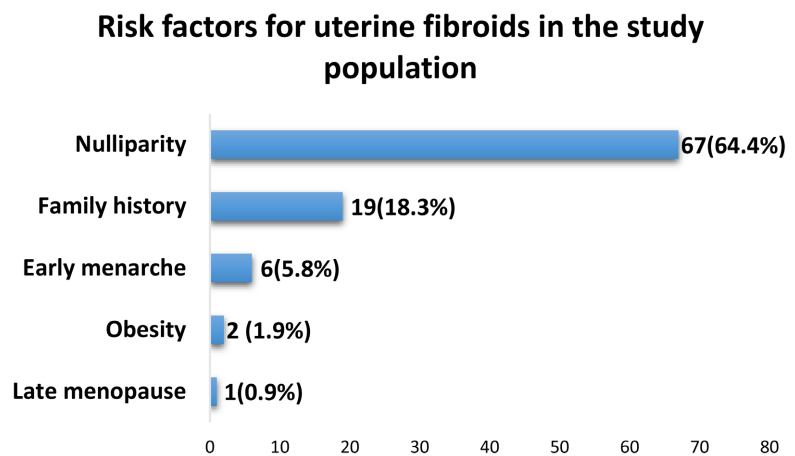


Figure 2. Risk factors for uterine fibroids on patients undergoing hysterosonography and hysteroscopy at CHRACERH from 1st of January 2020 to the 31st of July 2022.

The major risk factors for uterine fibroids in our study population were nulliparity (N = 67, 64.3%), family history (N = 19, 18.3%), and obesity (N = 2, 1.9%). This is shown in **Figure 2**.

The major clinical presentations of uterine fibroids in our study population were infertility (N = 44, 42.3%), menorrhagia (N = 33, 31.7%), metrorrhagia (N = 29, 27.9%) and dysmenorrhea (N = 18, 17.3%), as shown in **Figure 3** below.

Clinical presentation of the study population

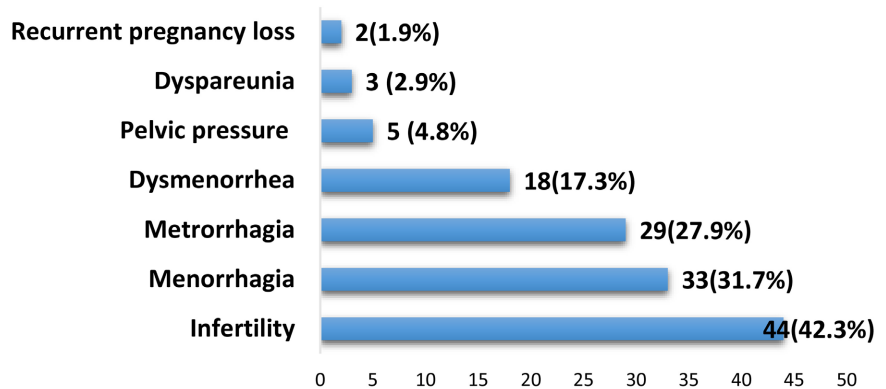


Figure 3. Clinical presentation of patients undergoing hysterosonography and hysteroscopy at CHRACERH from 1st of January 2020 to the 31st of July 2022.

3.2. Paraclinical Data

3.2.1. Hysterosonography

In our sample, most fibroids visualised at hysterosonography were classified FIGO 1 (N = 30, 43%), followed by FIGO 2 (N = 22, 32%), and then FIGO 0 (N = 17, 25%), as shown in **Figure 4** below.

Classification of fibroids on Hysterosonography

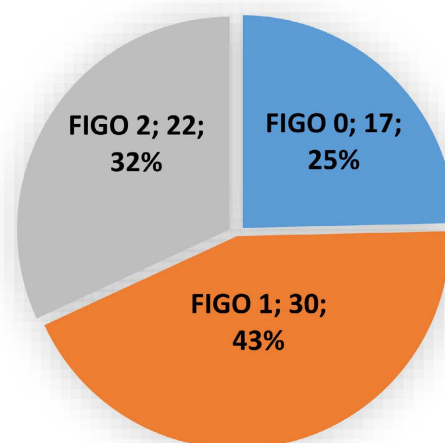


Figure 4. Classification of fibroids in patients undergoing hysterosonography at CHRACERH from 1st of January 2020 to the 31st of July 2022. FIGO 0 = Pedunculated intracavitary fibroid; FIGO 1 = Fibroid <50% intramural; FIGO 2 = Fibroid > 50% intramural.

3.2.2. Hysteroscopy

Most fibroids visualised at hysteroscopy were classified FIGO 1 (N = 21, 45%), followed by FIGO 2 (N = 13, 28%), and then FIGO 0 (N = 13, 27%). This is shown in **Figure 5** below.

Classification of fibroids at Hysteroscopy

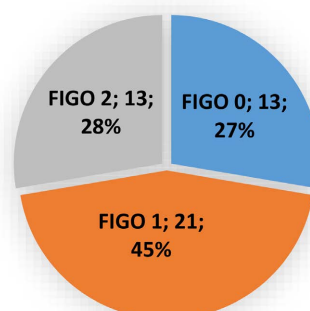


Figure 5. Classification of fibroids in patients undergoing hysteroscopy at CHRACERH from 1st of January 2020 to the 31st of July 2022. FIGO 0 = Pedunculated intracavitary; fibroid; FIGO 1 = Fibroid < 50% intramural; FIGO 2 = Fibroid > 50% intramural.

3.2.3. Correlation between Hysterosonography and Hysteroscopy

A total of 44 (63.8%) submucosal fibroids out of 69 visualised at hysterosonography were confirmed at hysteroscopy. Concerning the sub-types, 13 fibroids were classified as FIGO 0, 21 as FIGO 1 and 13 as FIGO 2 by both hysterosonography and hysteroscopy (27.6%, 44.8%, and 27.6% of the types of fibroids respectively). Generally, there was fair agreement between hysterosonography and hysteroscopy in the diagnosis of 44/69 submucosal fibroids with a kappa inter-observer value of 0.47. The best level of agreement (moderate) was achieved in classifying FIGO 0 fibroids (76.5% agreement, kappa = 0.47), and the level of agreement decreased with increasing degree of myometrial involvement (from FIGO 0 to FIGO 2). There was an overall association between visualisation of fibroids at hysterosonography and at hysteroscopy (OR = 7.44, 95% CI: 2.49 - 22.4, $p < 0.001$), as well as with the different sub-types. These results are summarised in **Table 2**, and **Table 3** below.

Table 2. Correlation between findings at Hysterosonography and at Hysteroscopy at CHRACERH from 1st of January 2020 to the 31st of July 2022.

		Fibroids at HSK			Total	OR (95% CI)	p-value	Kappa
		YES	NO					
Fibroids at HSN	YES	44 (63.8%)	25 (36.2%)	69 (100.0%)	7.44 (2.49 - 22.27)	<0.001*	0.478	
	NO	3 (8.6%)	32 (91.4%)	35 (100.0%)				
Total		47 (45.2%)	57 (54.8%)	104 (100.0%)				

*Significant p-value; HSK = Hysteroscopy; HSN = Hysterosonography; CI = Confidence interval; OR = Odds ratio; Kappa test interpretation = 0.01 - 0.20 (Slight agreement), 0.21 - 0.40 (Fair agreement), 0.41 - 0.60 (Moderate agreement), 0.61 - 0.80 (Substantial agreement), 0.81 - 1.0 (Perfect agreement).

Table 3. FIGO specific observed agreement for fibroids on Hysterosonography and at Hysteroscopy at CHRACERH from 1st of January 2020 to the 31st of July 2022.

	Fibroids at HSN N = 69	Fibroids at HSK N = 47	Percentage found on both
FIGO 0	17	13	76.5%
FIGO 1	30	21	70.0%
FIGO 2	22	13	59.1%

4. Discussion

This study showed a fair overall agreement between hysterosonography and diagnostic hysteroscopy in the diagnosis of submucosal fibroids with a kappa value of 0.47. We noticed that the best level of agreement was achieved in classifying FIGO 0 fibroids (76.5% agreement, kappa = 0.47). These are the fibroids that are considered the most suitable for hysteroscopic resection with a high probability of achieving complete resection in a single procedure with a low risk of complications.

A study by Salim *et al.* [7] in the United Kingdom compared hysterosonography and hysteroscopy for the classification of submucosal fibroids. Their results were better than ours, and showed substantial overall agreement between the two diagnostic modalities with a kappa value of 0.80. Their results, similar to ours, showed that the best level of agreement (92%) was achieved in cases with FIGO 0 fibroids. However, the level of agreement decreased with increasing degree of myometrial involvement. In cases of discordant findings, the differences were random with no clear tendency of either method to overestimate myometrial involvement. They attributed this finding to the fact that hysteroscopy can only assess the segment of the fibroid protruding into the cavity, while ultrasound can also provide information about the part of the fibroid buried within the myometrium.

Another study conducted by Sherif *et al.* [17] in Egypt equally showed substantial overall agreement between hysterosonography and hysteroscopy in classifying submucosal fibroids with a kappa value of 0.71. Similar to our study, their best level of agreement was achieved in classifying FIGO 0 fibroids (87.5%), with the level of agreement also decreasing with increasing degree of myometrial involvement. Unlike our study, they found that diagnostic hysteroscopy had a tendency to underestimate the degree of intra-cavitary involvement. A possible explanation may be that diagnostic hysteroscopy requires the creation of high intrauterine pressure in order to allow proper cavitory distension. This high pressure may reduce the portion of the fibroid protruding into the cavity by forcing the fibroid outwards towards the myometrium. The gentle installation of saline into the cavity using a fine catheter at the time of hysterosonography does not raise the intrauterine pressure to such an extent and thus may reflect a more accurate relationship between the myoma and the cavity. This explanation is supported by Leone *et al.* [18] who also suggest that the findings of hysterosonography and hysteroscopy should only be compared at similar intrauterine pressure never exceeding

50 mmHg [12] [18]. This low level of agreement may also be explained by the fact that hysterosonography is a dynamic examination whose interpretation may depend on the angle of view, the resolution of the hysterosonograph and the subjectivity of the operator's interpretation of the result. In our context of low-income countries, the time that elapses between the examination and the performance of the hysteroscopy may allow fibromatous pathology to evolve.

5. Conclusion

In conclusion, the results of the present study show a fair overall agreement between hysterosonography and diagnostic hysteroscopy in diagnosing and classifying submucosal fibroids with a Cohen's kappa value of 0.47. The highest level of agreement was achieved in classifying FIGO 0 fibroids (76.5% agreement, kappa = 0.47), becoming more discordant with increasing myometrial involvement. Hysterosonography should be considered as a less invasive and more cost-effective alternative to diagnostic hysteroscopy for the pre-operative assessment of submucosal fibroids and the selection of cases considered candidates for safe hysteroscopic resection.

Author Contributions

All authors were involved in developing the manuscript, and PME conceptualized and validated the manuscript, PME and HLM drafted the first version of this manuscript, PME, CHM, VNA and SRN collected the data, HLM and RD did the statistical analysis. All authors have contributed to writing and revising the manuscript.

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Conflicts of Interest

The authors declare no competing interests.

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Abbreviations

- CHRACERH: Centre Hospitalier de Recherche et d'Application en Chirurgie Endoscopique et Reproduction Humaine/Gynaecological Endoscopic Surgery and Human Reproductive Teaching Hospital.
- CI: Confidence Interval.
- FIGO: Fédération Internationale de Gynécologie et d'Obstétrique/International Federation of Gynecology and Obstetrics.
- HSK: Hysteroscopy.
- HSN: Hysterosonography.
- OR: Odds Ratio.
- SD: Standard Deviation.
- SPSS: Statistical Package for Social Sciences.