

The impact of hysteroscopic myomectomy on fertility and pregnancy outcomes of infertile women according to characteristics of submucous fibroids

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Summary

Purpose of investigation: To assess fertility and pregnancy outcomes in infertile patients after hysteroscopic myomectomy according to characteristics of submucous fibroids. **Materials and Methods:** The authors included 56 infertile women, who were diagnosed with a submucous uterine fibroid, and assessed their fertility and pregnancy outcomes after hysteroscopic myomectomy, which was the exposure of interest. The control group consisted of 63 women who underwent a hysteroscopic polypectomy. The submucous fibroid and endometrial polyp were diagnosed preoperatively using 2D ultrasound, and the diagnosis was confirmed during hysteroscopy. All myomectomies and polypectomies were performed using a resectoscope with a bipolar loop electrode. In the first postoperative year, the authors analyzed the rates of pregnancy, spontaneous abortion, preterm and term deliveries, as well as mode of delivery according to type, size, location, and number of submucous fibroids or polyps in each group. **Results:** In the first postoperative year, pregnancy occurred in 30.4% of patients. The greatest proportion of pregnancies occurred after removal of type 1 submucous fibroids, fibroids < 3 cm, and those localized on the posterior wall of the uterine corpus. Spontaneous abortion occurred in 7.1% of pregnancies, while delivery occurred in 19.6%. Term delivery occurred in 16.1%, while preterm delivery occurred in 3.6%. Vaginal delivery occurred in 14.3% of women, while caesarean section was performed in 5.4% of women. There were not significant differences in rates of pregnancy and delivery according to type, size, and localization of the fibroid or endometrial polyp. **Conclusion:** For infertile patients, in whom infertility is caused by a submucous fibroid, hysteroscopic myomectomy increases the pregnancy rate, and leads to good reproductive outcomes.

Key words: Hysteroscopy; Fibroid; Myomectomy; Pregnancy; Infertility.

Introduction

Fibroids are the most common benign tumours of the uterine muscle tissue, with an incidence of 5-18% in women of the general population [1]. Submucous fibroids represent 5% of all uterine fibroids. Fibroids have been associated with 5-10% cases of infertility, while in 1-2.4% they have been the only cause of infertility [2]. The exact etiology of uterine fibroids is still unknown, however, many etiological factors, such as hormones, growth factors, and genetic factors, have been associated with fibroid incidence. The etiology of fibroids is currently considered as unicellular, which implies they arise when a mutation occurs in one myometrial cell due to abnormalities of chromosomes 7, 12, and 14. These chromosomes are responsible for regulating myometrial cell growth [3]. Mitogenic growth factors are increased in women with submucous fibroids, and can be estrogen and progesterone effectors [4]. Submucous fibroids can be the cause of reduced fertility, preterm birth, fetal malpresentation, postpartum hemorrhage, and puerperal infections [1]. The association between endometrial polyps and subfertility is

controversial, as many women with polyps have successful pregnancies [5].

The aim of this study was to assess the fertility and pregnancy outcomes after hysteroscopic myomectomy in infertile women according to characteristics of submucous fibroids.

Materials and Methods

This was a prospective study conducted during a three-year period at the Obstetrics and Gynecology Clinic "Narodni Front" in Belgrade. The study group was composed of 56 consecutive infertile women with a submucous fibroid who underwent a hysteroscopic myomectomy, and were followed for one year thereafter. All patients who underwent a hysteroscopic myomectomy completed the study, and hence the authors did not have a loss to follow up. The control group was composed of 71 consecutive infertile women with an endometrial polyp who underwent a hysteroscopic polypectomy. All of these patients were also followed for one year postoperatively. However, the authors lost eight women to follow up, as they did not regularly attend their scheduled follow up appointments. Hence, 63 women were analyzed in the control group. The data were collected during surgery and follow-up appointments in the first postoperative year

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from the patients' medical charts. The submucous fibroid, or the polyp in the control group, was diagnosed with 2D transvaginal ultrasonography, and the diagnosis confirmed during hysteroscopy. The inclusion criteria were 20- to 38-year-old infertile women, who had one to three submucous fibroids, measuring from 1 to 5 cm in diameter, the women did not have other causes of infertility, and their partners had normal sperm analysis. The mean of three perpendicular measurements on ultrasound was used as the size of the fibroid or polyp. The exclusion criteria were women who had intramural fibroids or other coexisting factors of infertility. Video-assisted fibroid or polyp resection was performed using a 8.5-mm resectoscope with a bipolar loop electrode, and a 4-mm, 12-degree telescope. A SurgMaster electrosurgical unit was used as a source of bipolar energy. Cervical dilation was achieved with 10-mm Hegar dilators. Normal saline solution (0.9% NaCl) was used as the distension medium for the endometrial cavity. Intracavitary pressure of the distension medium was regulated using a hystero-flow digital pump. A 90-degree loop electrode was used at 60-65 V to resect the fibroid, while a 40 V intensity was used for coagulation, at a 120-160 ml/minute distension fluid flow rate and 80-120 mmHg perfusion pressure. The resection was accomplished by shaving layers of the fibroid beginning at the top of the tumour towards the base, removing it completely from its base. Neither vasoconstrictors nor antibiotics were used preventatively. To assist with regeneration of the atrophied endometrium, the patients were treated with estrogen-progesterone therapy for one month postoperatively. If the fibroids were > 4 cm preoperatively, the authors treated the patients with a GnRH agonist, once per month for two months. Follow up ultrasound was performed in first, third, sixth, and 12th postoperative month. Patients were divided into three groups according to the myoma classification (type 0, type 1, and type 2). Submucous fibroids were classified based on European Society of Gynaecological Endoscopy. Type 0 submucous fibroid is completely in the uterine cavity, while type 1 has a < 50% extension of submucous fibroid into myometrium, and type 2 has a > 50% extension into myometrium [6]. The authors analyzed the following: patient's age, infertility type and duration, preoperative and one year postoperative obstetric history, submucous fibroid type, size and location, histopathological findings, proportion of fibroid recurrence in the first postoperative year, proportion of operative and postoperative complications, pregnancy rate in the first postoperative year, rate of pregnancy outcomes including spontaneous abortion, preterm and term deliveries, and mode of delivery (vaginal or caesarean). The authors used descriptive and inferential statistics to analyze the data. The descriptive methods they used included a) measures of central tendency, the mean, and median, b) measures of variability, standard deviation, and standard variance, and c) grouping and tabulation of data. The authors used the following inferential statistical methods: a) χ^2 test and b) Fishers Exact test. Statistical analysis was performed with SPSS software statistics version 17.0.

Results

The present study included 56 consecutive infertile patients with a submucous fibroid, who underwent a hysteroscopic myomectomy. There were 44 patients (78.6%) with primary infertility, while there were 12 (21.4%) with secondary infertility. Complete hysteroscopic myomectomy was achieved in all patients. Hysteroscopy lasted for 32.2 \pm 8 minutes on average, ranging from 10 to 55 minutes. Histopathological examination confirmed leiomyoma in 49 (87.5%) patients, while a fibromyoma was diagnosed in

seven (12.5%) cases. The control group was composed of 63 consecutive infertile women who underwent a hysteroscopic polypectomy. There were 39 (61.9%) patients with primary infertility, while there were 24 (38.1%) with secondary infertility. Complete hysteroscopic polypectomy was achieved in all patients. Hysteroscopy lasted for 7.38 \pm 2.7 minutes on average, ranging from 5 to 18 minutes. Histopathological examination confirmed endometrial polyp in all cases. The baseline characteristics of infertile patients with submucous fibroids and endometrial polyps are shown in Table 1.

In the first postoperative year, 17 (30.4%) of 56 women who underwent hysteroscopic myomectomy became pregnant. In 13 (76.5%) cases, pregnancy occurred spontaneously, while in four (23.5%) the pregnancy occurred after intrauterine insemination. Spontaneous abortion occurred in four (7.1 %) cases in the first trimester. Two of these patients had type 1 fibroid on the posterior wall of the uterine corpus, measuring < 3 cm, while the other two patients had type 2 fibroid on the anterior wall of the uterine corpus, also measuring < 3 cm. Two (3.6 %) patients with a type 1 fibroid, measuring < 3 cm, on the posterior wall of the uterine corpus had an ectopic pregnancy. The greatest rate of pregnancies occurred after resection of a type 1 fibroid, followed by resection of fibroid < 3 cm, resection from the posterior wall of the uterine corpus, and lastly resection of one fibroid. The pregnancy occurrence rate did not significantly differ according to the following submucous fibroid characteristics: fibroid type ($p = 1.000$), fibroid size ($p = 0.707$), fibroid number ($p = 0.580$), and fibroid location ($p = 0.729$). Submucous fibroid characteristics and pregnancy rates are shown in Table 2.

Twenty-three (36.5%) of 63 women, who underwent hysteroscopic polypectomy, became pregnant. Spontaneous pregnancy occurred in 19 (82.6%) cases, while in four (17.4%) cases, pregnancy occurred as a result of intrauterine insemination. The greatest proportion of pregnancies occurred in women with polyps >1 cm, followed by women with only one polyp, then in women with a polyp on the posterior uterine wall. The pregnancy rate was significantly higher in patients with only one polyp removed compared to those in whom two polyps removed ($p = 0.031$). The proportion of pregnancies in the first postoperative year was greater in the control group than in the study group, but these differences were not statistically significant ($p = 0.607$). First trimester spontaneous abortions occurred in six (9.25%) women. Four of these six women had a polyp < 1 cm localized on the posterior uterine wall. Two patients had polyps > 1 cm localized in the uterine fundus. The proportion of spontaneous abortions was greater in the control than in the study group, but these differences were not statistically significant ($p = 0.854$). Three (4.7%) patients had an ectopic pregnancy. Endometrial polyp characteristics and pregnancy rates are presented in Table 3.

The pregnancy outcomes in the 17 pregnancies that oc-

Table 1. — Baseline characteristics of patients with submucous fibroids and polyps

Characteristic	Patients with fibroids	Patients with polyps	P ^a
	Mean±SD	Mean±SD	
Age (years)	32.1±4.5	28.8±4.5	0.117
Duration of infertility (years)	2.6±1.4	1.7±0.6	0.001
Duration of hysteroscopy (minutes)	32.2±8.0	7.38±2.7	<0.001
Size (centimeters)	2.30±1.1	1.12±0.5	<0.001
Time between surgery and conception (months)	4.8±1.3	3.1±1.2	0.001

SD – standard deviation; a: based on results of Mann Whitney test

Table 2. — Submucous fibroid characteristics and pregnancy rates

Fibroid Characteristic		Patients	Pregnancy Rates	P ^a
		N (%)	N (%)	
Type	0	10 (17.9)	3 (17.6)	1.000
	1	35 (62.5)	11 (64.7)	
	2	11 (19.6)	3 (17.6)	
Size	< 3 cm	47 (83.9)	15 (88.2)	0.707
	≥ 3 cm	9 (16.1)	2 (11.8)	
Number	1	46 (82.1)	15 (32.6)	0.580
	2	8 (14.3)	2 (25.0)	
	3	2 (3.6)	0	
Location	Fundus	9 (16.1)	2 (11.8)	
	Corpus – posterior wall	22 (39.3)	9 (52.9)	
	Corpus – anterior wall	13 (23.2)	3 (17.6)	
	Corpus – lateral wall	2 (3.6)	0 (0.0)	
	Lower segment – posterior wall	10 (17.9)	3 (17.6)	
Total		56 (100.0)	17 (30.4)	

a: based on results of Fisher's Exact Test

Table 3. — Endometrial polyp characteristics and pregnancy rates

Polyp Characteristic		Patients	Pregnancy Rates	P ^a
		N (%)	N (%)	
Size	≤1 cm	39 (61.9)	9 (23.1)	0.007
	>1 cm	24(38.1)	14 (58.3)	
Number	1	41 (65.1)	19 (46.3)	0.031
	2	22 (34.9)	4(31.6)	
Location	Fundus	10 (15.8)	3 (30.0)	
	Corpus – posterior wall	28 (44.4)	14 (50.0)	
	Corpus – anterior wall	16 (33.3)	4 (25.0)	
	Corpus – lateral wall	9 (25.4)	2 (22.2)	
Total		63 (100.0)	23 (36.5)	

a: based on results of Fisher's Exact Test

curring after submucous fibroid resection included the following: 11 (64.7%) live births, four (23.5%) spontaneous abortions, and two (11.8%) ectopic pregnancies. The great-

est rate of deliveries occurred after resection of a type 0 fibroid, followed by resection of fibroid ≥ 3 cm, resection from the posterior wall of the lower uterine segment, and

lastly resection of one fibroid. Nine of 11 deliveries were term, while two were preterm deliveries. The greatest proportion of term deliveries occurred after resection of submucous fibroid type 0, followed by resection of fibroid ≥ 3 cm, resection from the lower segment, and lastly resection of one fibroid. The proportion of preterm deliveries was the highest after resection of type 2 fibroids, after resection from uterine fundus, resecting fibroids < 3 cm, and after resecting only one fibroid. The overall rates of delivery, as well as rates of term and preterm delivery, did not significantly differ according to the following submucous fibroid characteristics: fibroid type (0.236); fibroid size ($p = 1.000$), fibroid number ($p = 1.000$), and fibroid localization ($p = 0.727$). The characteristics of the submucous fibroids and delivery rates after fibroid resection are shown in Table 4.

The pregnancy outcomes in 23 pregnancies that occurred after hysteroscopic polypectomy, included the following: 14 (60.9%) live births, six (42.9%) spontaneous abortions, and three (13.0%) ectopic pregnancies. Ten of 14 deliveries were term, while four were preterm deliveries. The overall rates of delivery, as well as rates of term and preterm delivery, did not significantly differ according to the following endometrial polyp characteristics: polyp size ($p = 0.847$), and polyp localization ($p = 0.974$). The characteristics of the endometrial polyps and delivery rates are shown in Table 5.

After hysteroscopic myomectomy in 56 women, cesarean section was performed in three (5.4%) women, while 11 (19.6%) women delivered vaginally. After hysteroscopic polypectomy in 63 women, caesarean section was performed in four (6.3%) women, while ten (15.8%) women delivered vaginally. The rates of vaginal delivery and cesarean section did not significantly differ according to the submucous fibroid characteristics and polyp characteristics. There was no statistically significant difference in the percentage of cesarean delivery as well as in the percentage of vaginal delivery ($p = 0.986$), between a group of patients who had undergone hysteroscopic myomectomy and groups of patients who had undergone hysteroscopic polypectomy.

Two (3.6%) patients who underwent hysteroscopic resection of submucous fibroid had intraoperative complications: uterine perforation ($n=1$, 1.8%) and heavy uterine bleeding ($n=1$, 1.8%). The uterine perforation was managed laparoscopically, while the heavy uterine bleeding was managed with prostaglandins. There was one fibroid recurrence six months postoperatively in a patient with type 1 submucous fibroid, < 3 cm, which was resected again. Two (3.2%) patients who underwent hysteroscopic polypectomy had intraoperative complication. These included a perforation of the uterus during dilatation of the cervical canal, which were managed laparoscopically. The polyps recurred at six months postoperatively in two patients which were managed with a repeat polypectomy. The

percentage of intraoperative and postoperative complications in patients who underwent hysteroscopic myomectomy was approximately similar to patients who underwent hysteroscopic polypectomy.

Discussion

The impact of hysteroscopic myomectomy on reproductive outcomes in infertile women has been studied extensively. Little data are available about fertility after hysteroscopic myomectomy for submucous myoma [1]. The reported pregnancy rate after hysteroscopic myomectomy varies in the existing literature. The reasons for this variation include differences in sample size, fibroid characteristics and the duration of postoperative patient follow-up, as well as co-existence of multiple infertility factors [7]. Submucous fibroids and endometrial polyps may decrease a woman's fertility for several reasons, such as deformity of the endometrium, altered endometrial vascularisation, disturbance of fertilized egg implantation, and disruption of sperm and/or fertilized egg transportation [5, 8]. In the present study, pregnancy occurred in 30.4% of cases after hysteroscopic myomectomy and in 36.5% of cases after hysteroscopic polypectomy. The greatest pregnancy rate occurred after the resection of type 1 submucous fibroid, fibroids < 3 cm, single fibroids, and those localized on the posterior uterine wall. Pregnancy rate did not statistically differ according to type, size, and localization of the resected submucous fibroid. The average time span between the hysteroscopic myomectomy and conception was 4.8 ± 1.3 months. The interval between hysteroscopic polypectomy and conception was 3.6 ± 1.5 months. Other studies have shown that resection of submucous fibroid increased the pregnancy rate [9]. A retrospective study found that 41.6% of cases became pregnant when the submucous fibroid was the only cause of infertility, while 26.3% became pregnant when there was one additional factor for infertility, and 6.3% became pregnant if two or more additional infertility factors were present [10]. Another retrospective study found a pregnancy rate of 29.7% after hysteroscopic myomectomy, which was higher when the submucous fibroid was the only cause of infertility (40%), if it was completely in the endometrial cavity (33.3%), and when its size was > 3 cm (50%) [1]. In another study, the pregnancy rate after hysteroscopic myomectomy was 59.7%, and it did not significantly differ according to type, size, and localization of the fibroid. The rate of spontaneous conception was 60% in an average postoperative follow-up of 23 ± 10 months [10]. Other authors found that the pregnancy rate after hysteroscopic myomectomy was 85.8%, and there were no significant differences in pregnancy rate and outcomes according to type, size, number, and localization of fibroid. The pregnancy rate was 82.05% after type 0 fibroid, 87.09% after type 1, and 88.2% after type 2 fibroid [11]. The pregnancy rate within six months after hysteroscopic

Table 4. — Submucous fibroid characteristics and delivery rates

Fibroid Characteristic		Patients	Total deliveries N (%)	Term deliveries N (%)	Preterm deliveries N (%)	P ^a
		N				
Type	0	10	3 (30.0)	3 (30.0)	0 (0)	0.236
	1	35	7 (20.0)	6 (17.1)	1 (2.9)	
	2	11	1 (9.1)	0 (0.0)	1 (9.1)	
Size	<3 cm	47	9 (19.1)	7 (14.6)	2 (4.3)	1.000
	≥3 cm	*	2 (22.2)	2 (22.2)	0 (0.0)	
Number	1	46	10 (21.7)	8 (17.4)	2 (4.3)	1.000
	2	8	1 (12.5)	1 (12.5)	0 (0.0)	
	3	2	0 (0.0)	0 (0.0)	0 (0.0)	
Location	Fundus	*	2 (22.2)	1 (11.1)	1 (11.1)	0.727
	Corpus – posterior wall	22	5 (22.7)	4 (18.2)	1 (4.5)	
	Corpus – anterior wall	13	1 (7.7)	1 (7.7)	0 (0.0)	
	Corpus – lateral wall	2	0 (0.0)	0 (0.0)	0 (0.0)	
	Lower segment – posterior wall	10	3 (30.0)	3 (30.0)	0 (0.0)	
Total		56	11 (19.6)	9 (16.1)	2 (3.6)	

a: based on results of Fisher's Exact Test

Table 5. — Endometrial polyp characteristics and delivery rates

Polyp Characteristic		Patients	Total deliveries N (%)	Term deliveries N (%)	Preterm deliveries N (%)	P ^a
		N				
Size	≤ 1 cm	39	5 (12.8)	4 (10.3)	2 (5.1)	0.847
	>1 cm	24	9 (37.5.2)	6 (25.0)	2 (8.3)	
Number	1	41	12 (29.3)	9 (21.9)	3 (7.3)	0.018
	2	22	2 (11.1)	1 (5.5)	1 (5.5)	
Location	Fundus	10	1 (10.0)	1 (10.0)	0 (0.0)	0.974
	Corpus – posterior wall	28	10 (35.7)	7 (25.0)	3 (10.7)	
	Corpus – anterior wall	16	1 (6.3)	1 (6.3)	0 (0.0)	
	Corpus – lateral wall	*	2 (22.2)	1 (11.1)	1 (11.1)	
Total		63	14 (22.2)	10 (15.8)	4 (6.3)	

a: based on results of Fisher's Exact Test

polypectomy was 57.4% for polyps located at the utero-tubal junction, 28.5% for posterior wall polyps, 18.8% for lateral wall polyps, and 14.8% for anterior uterine wall polyps [12]. In the present study, there were 7.1% spontaneous abortions, 16.1% term deliveries, 3.6% preterm deliveries, 14.3% vaginal deliveries, and 5.4% cesarean deliveries in patients after hysteroscopic myomectomy. The term deliveries occurred in 30.0% patients with type 0 fibroid and in 17.1% of patients with type 1 fibroid. Another study found that term deliveries occurred in 35.7% patients with type 0 fibroid, in 28.5% patients with type 1 fibroid,

and in 25% of patients with type 2 fibroid after hysteroscopic myomectomy [13]. The rate of spontaneous abortion was not statistically dependent on fibroid type, but it was significantly associated with fibroids localized on the anterior uterine wall. Preterm deliveries were significantly associated with fibroids localized on the uterine fundus. The rate of cesarean deliveries was not associated with fibroid characteristics [13]. In the present study the rates of vaginal delivery and cesarean section did not significantly differ according to the submucous fibroid characteristics, as well as to the endometrial polyp characteristics. A retro-

spective study found that the pregnancy rate was 33.8% after hysteroscopic resection of submucous fibroid, with 50% live births, 41.6% spontaneous abortions, and 8.4% fetal losses. The time from hysteroscopy to conception was 9.9 months, while the postoperative follow-up was 28.7 months [14]. Spontaneous abortion rate in the first trimester of pregnancy was 6% after hysteroscopic polypectomy and there was no statistical difference between patients with small or larger polyps [15]. The present study showed that 3.6% patients had intraoperative complications during hysteroscopic myomectomy and 3.2% after hysteroscopic polypectomy. There were no cases of Asherman's syndrome in the first postoperative year after hysteroscopic myomectomy and polypectomy. In others studies, the complication rate during hysteroscopic myomectomy and hysteroscopic polypectomy was 5.4% and 2.4%, respectively [1, 15].

Conclusion

The authors found that hysteroscopic myomectomy had a low incidence of complications, and it was a surgical procedure with good reproductive outcomes in infertile patients when the only cause of infertility was a submucous fibroid. The pregnancy rates and pregnancy outcomes after hysteroscopic myomectomy do not depend on type, size, and localization of the submucous fibroid. Hysteroscopic myomectomy does not significantly impact the mode of delivery.

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