Original Articles

Analysis of perioperative morbidity according to whether the uterine cavity is opened or remains closed during abdominal myomectomy - results of 423 abdominal myomectomy cases

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Summary

For women who desire pregnancy or who wish to retain their uterus, myomectomy is the standard approach for the treatment of fibroids. Abdominal myomectomy seems to be the best choice when there are large subserosal or intramural fibroids (> 5-7 cm), or submucosal fibroids > 3 cm or when multiple fibroids (> 3) are to be removed. When submucosal myomas are present or multiple fibroids are to be removed, opening the uterine cavity during the surgical procedure is more likely to happen. There is lack of published evidence about whether there is any difference in perioperative morbidity and management of those cases where the uterine cavity is opened during the surgical procedure compared with those where the uterine cavity remains closed. *Methods:* We undertook a retrospective review of 423 abdominal myomectomies via either an opened or closed uterine cavity. As a primary outcome we assessed the overall perioperative morbidity rate and as a secondary outcome we compared the necessity of pre and postoperative transfusions, intraoperative bleeding, febrile morbidity, unintended surgical interventions, life-threatening events, need for relaparotomies and duration of hospital stay between the opened and non opened uterine cavity groups. *Results:* The overall perioperative morbidity rate was significantly higher in those cases where the uterine cavity was opened during surgery; however the difference was caused only by the increased risk of intraoperative bleeding. All the other variables, such as febrile morbidity, number of relaparotomies, unintended surgical procedures and life-threatening events did not differ between the two groups. *Conclusion:* Although there is an increased risk of intraoperative bleeding it seems that entering the uterine cavity during abdominal myomectomy can be considered as safe a procedure as in those cases where the uterine cavity remains closed.

Key words: Abdominal myomectomy; Opened uterine cavity; Perioperative morbidity.

Introduction

Uterine fibroids are benign monoclonal smooth muscle tumors of the uterus. Reports of prevalence rates in the literature range from 20% to 50% based on post mortem studies [1]. There are some data from careful pathological examinations which suggest that the prevalence is as high as 77% [2]. Uterine fibroids are clinically apparent in about 25% of women [3]. Myomas have been reported occasionally in adolescents, but most women are in their 30s or 40s when the fibroids become symptomatic, and at the time of the menopause symptoms are relieved in many women. Race is an important epidemiological risk factor as black women are significantly more likely than white women to have myomas [4]. Parity is also an important factor, as having one or more pregnancies decreases the chance of fibroid formation [5, 6].

The exact prevalence of asymptomatic fibroids is unknown. Symptoms attributable to myomas can be abnormal uterine bleeding, pelvic pressure and pain, and reproductive dysfunction [7].

The most characteristic bleeding pattern of myomas is menorrhagia. Those myomas which are located in or intruding into the uterine cavity are more likely to cause menorrhagia.

Increased uterine size can cause pelvic pressure symptoms, such as urinary symptoms or constipation. Very rarely when degeneration occurs or when there is torsion of a pedunculated fibroid acute pain arises.

The influence of myomas on reproduction has been clearly demonstrated and the appearance of uterine fibroids has been linked to infertility. Fibroids were implicated as the sole factor of infertility in < 10% of infertility cases, and 43% of women presenting uterine leiomyomas were found to have had a history of infertility for at least two years [8]. Fibroids of > 5 cm in diameter and those located near the cervix or near the tubal ostia are more likely to cause a problem. Fibroids are also associated with miscarriage. The miscarriage rate is likely to be higher if implantation occurs over a submucosal fibroid or if the fibroid is close to the placenta [9]. The location of the fibroid in relation to the placenta appears to be more important than its size [10, 11].

Several factors determine treatment, such as the presenting symptoms, size and type of fibroids, age and reproductive desires of the patient and the skill of the gynaecologist. Many surgical and non-surgical interventions are available, and although several surgical methods

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are used the most favourable technique worldwide is still abdominal myomectomy. Many studies have confirmed that abdominal myomectomy is not associated with a clinically significant elevated risk of morbidity with respect to abdominal hysterectomy for the same diagnosis [12, 13]. However there is minimal published evidence about whether there is any difference in perioperative morbidity and the consequently required management of those cases when the uterine cavity is opened or remains closed during abdominal myomectomy.

We undertook a retrospective review of 423 women who underwent abdominal myomectomy at our Institute between 1990 and 2004 either with an opened or closed uterine cavity to compare perioperative morbidity and to define the safety of those cases where the uterine cavity is opened during the surgical procedure.

Materials and Methods

Hospital charts were reviewed for all women who had undergone abdominal myomectomy at the 1st Department of Obstetrics and Gynecology, Semmelweis University, Budapest, Hungary from 1990 through 2004. Patients were identified by manually going through the operating theatre and medical records under the procedure code for abdominal myomectomy. In all of these cases the removal of fibroids via laparotomy was the route of choice because the patients had either large subserosal or intramural fibroids (> 5-7 cm), submucosal fibroids (> 3) cm or multiple fibroids (> 3) to be removed. Patient age, indications for surgery, type, size and number of removed fibroids, entry into the uterine cavity during the procedure, perioperative complications, and duration of hospital stay were recorded and analysed.

The most frequent indications for myomectomy were determined; these included menorrhagia, pelvic pain, infertility, recurrent spontaneous abortion, size larger than 16 weeks and/or growth of the fibroid and asymptomatic fibroids diagnosed by routine bimanual or ultrasound examination in which cases surgery was performed based on the desires of the patients.

The type (submucosal, intramural, subserosal or intraligamental) of each fibroid was determined. If multiple fibroids were present and located in different layers, the position of each fibroid was recorded.

Perioperative complications that developed before and within seven to ten days after surgery were identified including the necessity of preoperative transfusion, intraoperative bleeding and necessity of postoperative transfusion, postoperative febrile morbidity, unintended major surgical procedures, life-threatening events and need for relaparotomy.

During the surgical procedure a vertical incision was performed on the uterus to avoid damaging the fallopian tubes and uterine arteries. In those cases where the fibroid was located in a lateral position we preferred transverse incisions parallel to the arcuate vessels. To prevent postoperative adhesions we minimised the number of serosal incisions and, if possible, enucleated more fibroids from a single incision. However, we tried to avoid tunnelling within the myometrium which is known to make haemostasis difficult. We performed the incision through the pseudocapsule of the fibroid in order not to lose valuable muscle tissue and to prevent bleeding.

When the uterine cavity was opened during the procedure a special "raindrop" or "tennis racket" shaped drain with a cervical output was placed into the uterine cavity as in the cases of metroplasty [14] in order to avoid intrauterine adhesions (Figures 1-3). The uterine cavity was closed by suturing the endometrial layer with single stitches over the drain to prevent its eversion (Figure 4). The drain was removed nine or ten days postoperatively. When the uterine cavity was opened prophylactic antibiotics were administered during the surgical procedure.

The incision for the removed fibroids was closed in two layers with 2-0 or 3-0 absorbable sutures. The outer layer was closed by using a continuous suture with the purpose of avoiding postoperative adhesions (Figure 5).

Statistical analyses were performed by Statistica Software (StatSoft Inc., Tulsa, OK). The Student's t-test was used to compare mean values and the chi-square test for comparison of proportions. Statistical significance was set at $p < 0.05$.

Results

Between January 1, 1990 and December 31, 2004, 423 abdominal myomectomies suitable for the above-mentioned criteria were carried out at our Institute. Over the study period, the annual number of operations increased significantly; compared to the four annual myomectomies in the initial years, in 2004 there were 104 myomectomies, indicating a 26-fold increase.

From the 423 abdominal myomectomies the uterine cavity was entered during the surgical procedure in 92 (21.7%) cases and in 331 (78.3%) cases the uterine cavity remained closed.

The patients who underwent myomectomy were between 20 and 55 years of age. There was no significant difference in the mean age between the opened and non-opened uterine cavity groups, 34.8 vs 34.3 years, respectively.

Analysing the indications for surgery and the likelihood of entering the uterine cavity during surgery we found that in case of menorrhagia significantly more surgical procedures were associated with opening the uterine cavity, whereas in other types of indications no significant difference was found (Table 1).

Table 1. — *Mean age and indication pattern of abdominal myomectomy in the opened and non-opened uterine cavity groups.*

	Non opened uterine cavity	Opened uterine cavity	p
Age (mean)	34.3	34.8	0.4563[c]
Indication (No./all %)			
Menorrhagia	65/331 (19.6%)	41/92 (44.6%)	< 0.0001[a]
Pain	100/331 (30.2%)	25/92 (27.2%)	0.5721[a]
Infertility	97/331 (29.3%)	28/92 (30.4%)	0.8336[a]
Habitual abortion	3/331 (0.9%)	3/92 (3.3%)	0.12[b]
Size and/or growth	12/331 (3.6%)	1/92 (1.1%)	0.3144[b]
Other	113/331 (34.1%)	25/92(27.2%)	0.2074[a]

[a]Pearson's χ^2-square, [b]Fisher's exact test, [c]Student's t-test.

The largest removed myoma was subserosal in 128 cases, intramural in 338 cases, submucosal in 19 cases and intraligamental in five cases. Sixty-seven patients had more than one type of fibroid in the uterus. In cases of subserosal and intramural fibroids the uterine cavity remained closed in a significantly higher percentage of the cases (85.2% vs 14.8% and 79.3% vs 20.7%, respectively), whereas in cases of submucosal fibroids the

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Figure 1. — Removal of submucosal myoma with opening of the uterine cavity.

Figure 2. — Site after enucleation of submucosal myoma.

Figure 3. — Position of the tennis racket shaped drain in the uterine cavity.

Figure 4. — Suturing of the endometrial layer above the drain.

Figure 5. — Suturing of the outer layer of the myometrium with continuous stitches.

uterine cavity was opened in a significantly higher percentage of the procedures (63.2% vs 36.8%). In all cases of intraligamental fibroids the uterine cavity remained closed (Table 2).

We formed four groups according to the size of the largest removed fibroid (size of the dominant removed fibroid < 30 mm, 30-50 mm, 50-70 mm, and > 70 mm) and compared the percentage of those cases where the uterine cavity was opened during the procedure or remained closed. None of the groups showed any significant difference in this regard (Table 2).

There was no significant difference in the number of removed fibroids between the opened and non-opened uterine cavity groups (1.9 vs 2.2).

Analysing the complications we found that in the opened uterine cavity group significantly more bleeding occurred during the surgical procedure (220 ml vs 180 ml mean intraoperative blood loss) and significantly more patients needed postoperative blood transfusions (23.9% vs 6.7%). No patient needed a preoperative blood transfusion due to low haemoglobin levels in the non-opened uterine cavity group and only one patient required a pre-

Table 2. — *Analysis of opened and non opened uterine cavity cases according to location, size and number of removed fibroids.*

	Non-opened uterine cavity	Opened uterine cavity	p
No. of removed fibroids (mean ± SD)	2.2 ± 1.9	1.9 ± 1.6	0.3995[c]
Location - no. of cases (%)			
Subserosal	109/128 (85.2%)	19/128 (14.8%)	0.0233[a]
Intramural	268/338 (79.3%)	70/338 (20.7%)	0.3014[a]
Submucosal	7/19 (36.8%)	12/19 (63.2%)	< 0.0001[b]
Size (no./all cases (%))			
< 30 mm	17/19 (89.5%)	2/19 (10.5%)	0.1782[b]
30-50 mm	109/131 (83.2%)	22/131 (16.8%)	0.0979[a]
50-70 mm	79/109 (72.5%)	30/109 (27.5%)	0.0899[a]
> 70 mm	126/164 (76.8%)	38/164 (23.2%)	0.5728[a]

[a]Pearson's χ^2-square, [b]Fisher's exact test, [c]Student's t-test.

Table 3. — *Perioperative morbidity associated with opened and non opened uterine cavities during abdominal myomectomy.*

	Non-opened uterine cavity (no./all cases (%))	Opened uterine cavity (no./all cases (%))	p
Preoperative transfusion	0/331	1/92	0.2174[b]
Postoperative transfusion	22/331 (6.7%)	22/92 (23.9%)	< 0.0001[a]
Febrile morbidity	15/331 (4.5%)	1/92	0.2126[b]
Unintended surgical procedure	0/331	0/92	
No. of relaparotomies	7/331 (2.1%)	2/92 (2.2%)	1.000[b]
Life-threatening events	0/331	0/92	
Length of stay in hospital (mean no. of days)	6.9	9.3	< 0.0001[c]
Overall morbidity	37/331 (11.2%)	22/92 (23.9%)	0.0077[a]

[a]Pearson's χ^2-square, [b]Fisher's exact test, [c]Student's t-test.

operative blood transfusion in the opened uterine cavity group, thus there was no significant difference between the compared groups in this regard (Table 3).

There was also no significant difference in febrile morbidity between the compared groups. Febrile morbidity was defined based on the criteria used by Sawin *et al.* [13] as occurrence of infection after surgery which was not present on admission or initiation of antibiotics > 24 hours after surgery (Table 3).

There were no unintended surgical procedures in either group. An unintended surgical procedure was defined based on the criteria used by Sawin *et al.* [13] as unplanned removal, injury or repair of an organ during the operative procedure. The percentage of relaparotomies did not differ significantly between the compared groups (Table 3). In all cases the indication for relaparotomy was postoperative bleeding. Surgery included steps to reach haemostasis and none of the cases required hysterectomy.

No life-threatening events were observed in either group. Life-threatening events were defined according to the definition of Sawin *et al.* [13] as cardiopulmonary arrest, resuscitation, unplanned admission to intensive care unit or death (Table 3).

The length of hospital stay (9.3 vs 6.9 days) and the overall morbidity rate (23.9% vs 11.2%) were significantly higher in those cases where the uterine cavity was opened during the surgical procedure. The results are summarised in Tables 1, 2 and 3.

Discussion

Many surgical and non-surgical interventions are available for the treatment of uterine fibroids. Medical treatment has an inconsequential role in managing patients with uterine fibroids. However gonadotrophin releasing hormone (GnRH) agonists produce a significant reduction in uterine size and after discontinuation of the medication there is a rapid resumption. In addition the consequent severe hypo-oestrogenism can cause significant symptoms, and most importantly bone loss which can lead to osteoporosis with long-term use.

Surgery has long been the main mode of therapy. For women who have completed childbearing hysterectomy offers a good treatment option as data suggest that women are satisfied with symptom relief and experience improved quality of life after hysterectomy [15, 16]. Hysterectomy also prevents the chance of recurrence. However the number of women who wish to retain their uterus for other reasons (concerns about sexual dysfunction and dyspareunia [12]) is increasing, as well as for those who desire future pregnancies myomectomy is the route of choice. For multiple myomas or a significantly enlarged uterus the abdominal route is the best choice. For women with submucosal fibroids hysteroscopic myomectomy may be performed. For women with a uterine size of 16 weeks' gestation or less and a small number of subserosal or intramural fibroids 8 cm or less in diameter, laparoscopy may be an option [7, 17].

Myolysis is a variation of the laparoscopic or hysteroscopic technique in which the fibroid tissue is destroyed by the use of cryotherapy, laser or electrical energy rather than removed [18].

Women whose primary problem is bleeding and who have completed childbearing can be treated by endometrial ablation alone or in combination with hysteroscopic myomectomy. Uterine artery embolisation with polyvinyl alcohol microspheres positioned by a catheter passed through the right femoral artery is a novel technique and further long-term studies need to be done to assess the role of this method among the therapeutic options.

Although several surgical methods are available the most favourable technique worldwide is still abdominal myomectomy. During abdominal myomectomy difficulty achieving haemostasis can occur and may result in the formation of postoperative adhesions. Bleeding can be sufficiently heavy as to require hysterectomy. For many years it was believed that abdominal myomectomy was associated with greater operative blood loss, longer surgical time and higher risk of postoperative haemorrhage than hysterectomy [19]. Today many studies have confirmed that abdominal myomectomy is not associated with a clinically significant elevated risk of morbidity with respect to abdominal hysterectomy for the same diagnosis [12, 13].

We assumed that when submucosal myomas are present or multiple fibroids are to be removed opening the uterine cavity during the surgical procedure is more likely to occur. Although several studies have compared

the perioperative morbidity of abdominal myomectomy and hysterectomy cases there is minimal published evidence about whether there is any difference in perioperative morbidity and the consequent required management of those cases when the uterine cavity is opened or remains closed during the surgical procedure. To determine perioperative morbidity and safety of the opened uterine cavity cases we undertook a retrospective review of 423 women who had undergone abdominal myomectomy at our Institute between 1990 and 2004 with either an opened or closed uterine cavity.

Of the procedures 21.7% were associated with opening the uterine cavity. It is a little bit less than what was observed in the study of Sawin *et al.* who analysed 197 abdominal myomectomies and found that the uterine cavity was opened in 29% of the cases [13].

Opening the uterine cavity occurred significantly more often when the indication for surgery was menorrhagia. Other types of indications did not cause any differences in the likelihood of opening the uterine cavity. This may be explained by the fact that the type seems to be the most important factor in determining bleeding symptoms. Submucosal myomas, those in or partially intruding into the endometrial cavity, are most likely to cause menorrhagia [7]. This association is supported by our results as in cases of submucosal fibroids significantly more procedures were associated with opening the uterine cavity. In cases of intramural, subserosal and intraligamental fibroids the uterine cavity remained closed in a significantly higher percentage.

Interestingly, the size of the major removed fibroids did not affect the likelihood of opening the uterine cavity. We even found in the > 70 mm group that in a significantly higher percentage of the procedures the uterine cavity remained closed.

Analysis of perioperative morbidity patterns is the most important consideration in determining whether those cases where the uterine cavity is opened during surgery can be considered as procedures as safe as those cases where the uterine cavity remains closed. Moreover our overall morbidity rate in both groups was much lower (11.2% and 23.9%) than was reported for abdominal myomectomy in the study of Sawin and colleagues as they reported a 38% overall perioperative morbidity rate [13].

In the opened uterine cavity group the intraoperative bleeding and postoperative transfusion rate was significantly higher whereas febrile morbidity and the number of relaparotomies did not differ between the two groups. However the hospital stay was significantly longer in cases when the uterine cavity was opened, mostly because removal of the metroplasty drain was performed on the ninth or tenth postoperative day.

The overall morbidity rate was significantly higher in the opened uterine cavity group, but the difference was due only to the higher intraoperative bleeding and postoperative transfusion rate. Taking into consideration all the other factors the perioperative morbidity rate did not differ between the groups.

Conclusion

For women who desire future pregnancies or who wish to retain their uterus for other reasons, myomectomy is the standard approach for the treatment of uterine fibroids. Previously hysterectomy was considered a safer procedure than myomectomy, but a number of studies analysing the perioperative morbidity of these procedures have shown that myomectomy should be considered as safe as hysterectomy. The type, number and size of the fibroids may all influence management options. In our opinion abdominal myomectomy should be the route of choice when there are large subserosal or intramural fibroids (> 5-7 cm), submucosal fibroids > 3 cm, when multiple fibroids (> 3) are to be removed or when entering the uterine cavity is to be expected. In those cases where the uterine cavity is opened during the surgical procedure we recommend to place a "tennis racket" shaped drain into the uterine cavity to avoid postoperative intrauterine adhesions. It seems that entering the uterine cavity and suturing the endometrial layer basically does not affect perioperative morbidity, although an increased risk of intraoperative bleeding and higher necessity of postoperative transfusion should be taken into consideration. In those cases where the uterine cavity is expected to be opened during surgery it would be useful to prepare for the need of either an intra or postoperative transfusion. Except for the increased haemorrhagic risk, cases where the uterine cavity is opened during the surgical procedure can be considered as safe as for those cases where the uterine cavity remains closed during surgery.

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