Reproductive Medicine and Biology 2004; **3**: 33–37

Original Article

Surgery results using different uterine wall incision directions in laparoscopic myomectomy of the intramural myoma

MINETO MORITA, YASUYUKI ASAKAWA, ICHIRO UCHIIDE, MASAHITO NAKAKUMA and HARUMI KUBO

First Department of Obstetrics and Gynecology, Toho University School of Medicine, Tokyo, Japan

Objective: To study clinical outcomes for different uterine wall incision directions, comparing vertical incision and transverse incision in laparoscopic myomectomy of the intramural myoma.

Methods: Laparoscopic myomectomies were performed on 50 women with intramural myomas. Using a table of random numbers, they were randomly divided into a vertical incision group (25 women) and a transverse incision group (25 women) according to the direction of incisions in the uterine wall. The numbers of enucleated myoma, operation duration, amount of bleeding, and numbers of sutures were compared. The Mann–Whitney *U*-test was used for analysis.

Results: For the transverse incision group, the amount of bleeding (137.6 ± 88.1 mL) was a significantly lower value ($P = 0.0426$) than for the vertical incision group (235.8 ± 169.4 mL). In addition, in cases where the maximum myoma nucleus diameter was 7 cm or larger, operation duration (129.0 ± 32.5 min) and amount of bleeding (158.9 ± 87.1 mL) showed significantly lower values ($P = 0.0067$ and $P = 0.0002$, respectively) for the transverse incision group than did operation duration (362.3 ± 147.3 min) and amount of bleeding (362.3 ± 147.3 mL) for the vertical incision group.

Conclusion: Transverse incision of the uterine wall is useful to reduce the amount of bleeding in the laparoscopic myomectomy of the intramural myoma. Transverse incision also shortens operation duration in cases where the myoma nuclei are large. (Reprod Med Biol 2004; **3**: 33–37)

Key words: intramular myoma, laparoscopic myomectomy, transverse incision, vertical incision.

INTRODUCTION

THE PRINCIPAL METHOD used to treat uterine myoma is still surgery. Since Semm and Mettler[1] reported on laparoscopic myomectomy in 1980, there have been many reports[2–5] on the usefulness of laparoscopic surgery. However, the problem of greater amounts of bleeding during myomectomy than during hysterectomy has been reported[6,7] and the same problem is of concern in laparoscopic myomectomy. Laparoscopic surgery has more limitations than laparotomy, and various contrivances are needed in order to perform surgery safely. From the report by Igarashi[8] we consider the direction of the incisions in the uterine wall to be important in the laparoscopic myomectomy we perform. In the present study, we have made vertical incisions parallel to the longitudinal axis of the uterus, and transverse incisions at a right angle to the longitudinal axis of the uterus, prior to performing laparoscopic myomectomies, and compared and studied the clinical results of both types of incisions.

Correspondence: Dr Mineto Morita, First Department of Obstetrics and Gynecology, Toho University School of Medicine, 6-11-1, Omori Nishi, Ota-ku, Tokyo, 143–8541, Japan. Email: mmorita@med.toho-u.ac.jp
Received 20 November 2003; accepted 30 January 2004.

MATERIALS AND METHODS

FIFTY PATIENTS WITH intramural myoma were operated under laparoscopy. Using a table of random numbers, we divided them randomly into a vertical incision group (25 women) and a transverse incision group (25 women) according to the direction of incisions in the uterine wall. In all cases, patients had hypermenorrhea and we observed intramural myomas of 4 cm or more. Prior to surgery, we administrated gonadotrophin releasing hormone analog to all patients

Table 1 Patients' characteristics

	Vertical incision (n = 25)	Transverse incision (n = 25)
Mean age in years (range)	33.2 ± 3.9 (25–39)	36.1 ± 6.5 (21–52)
Mean gravidity (range)	0.8 ± 1.6 (0–5)	0.5 ± 0.8 (0–2)
Mean parity (range)	0.3 ± 0.7 (0–2)	0.2 ± 0.6 (0–2)
Mean myoma diameter in cm (range)	6.4 ± 2.1 (4–10)	7.1 ± 1.9 (4–10)

Table 2 Comparison of intraoperative parameters

	Vertical incision (n = 25)	Transverse incision (n = 25)	P-value
Mean number of myomas (range)	1.4 ± 0.9 (1–4)	1.4 ± 0.9 (1–4)	NS
Mean operation duration in min (range)	134.8 ± 36.0 (65–192)	123.0 ± 31.7 (68–175)	NS
Mean estimated blood loss in mL (range)	235.8 ± 169.4 (35–620)	137.6 ± 88.1 (30–400)	0.0426
Mean number of stitches (range)	4.9 ± 1.3 (3–7)	5.2 ± 1.2 (3–8)	NS

NS, not significant.

for 3–4 months to reduce the size of the uterine myoma nuclei and decrease the amount of bleeding during surgery by decreasing the uterine blood flow. All laparoscopic procedures were performed by the same surgeon with the same team.

Operative technique

Laparoscopy was performed under general anesthesia with endotracheal intubation. Patients were placed in the dorsolithotomy position. A Foley catheter was placed after a uterine manipulator was fixed on the cervix to allow uterine movement. Pneumoperitoneum was established with a Veress needle, achieving and maintaining intra-abdominal pressure at 10 mmHg. A first 10-mm port was placed through the umbilicus, and a video laparoscope was introduced. Two 5-mm ports laterally on either side of the upper abdomen and one 12-mm port suprapubically were placed under direct laparoscopic vision.

After we carried out intra-abdominal observation and confirmed the positions and sizes of the uterine myomas, 100X vasopressin solution was locally injected into the area surrounding each myoma nucleus. We incised the myometrium using a hook type ultrasonic incision and coagulation system (Harmonic Scalpel; Ethicon Endo-Surgery, Cincinnati, Ohio, USA). We checked the bleeding from the incised regions using bipolar forceps. We sutured the incision wounds in the myometrium with Z stitches using a curved needle and 2–0 polyglycolic acid sutures.

We also sutured the uterine serosa with figure-8 sutures using a curved needle and 2–0 polyglycolic acid sutures. We also adhered Interceed (TC7; Johnson and Johnson Medical, Arlington, Texas, USA) or Tacho-Comb (Nycomed Pharma, Linz, Austria) to the sutured surface of the uterus.

Data analysis

All data were statistically analyzed according to Mann–Whitney U-tests. Differences with a probability below 0.05 were regarded as statistically significant.

RESULTS

IN ALL CASES, we were able to complete laparoscopic surgery successfully and did not observe any complications during or after surgery. In addition, there were no cases in which blood transfusion was done as a result of copious bleeding.

No statistically significant differences were seen between the two groups ($P > 0.05$) with respect to age, gravidity, parity, and greatest diameter of the enucleated myoma (Table 1).

Comparison of the number of enucleated myoma nuclei/patient, operation duration, amount of bleeding, and number of suture stitches for the two groups showed no statistically significant differences for these factors. However, the amount of bleeding in the transverse incision group (137.6 ± 88.1 mL) was a significantly lower value ($P = 0.0426$) than the amount of

Table 3 Intraoperative parameters: myoma diameter under 7 cm

	Vertical incision (n = 14)	Transverse incision (n = 11)	P-value
Mean number of myomas (range)	1.0 ± 0.0 (1)	1.7 ± 1.1 (1–4)	NS
Mean operation duration in min (range)	110.7 ± 23.2 (65–135)	115.5 ± 28.9 (68–168)	NS
Mean estimated blood loss in mL (range)	136.4 ± 108.5 (35–380)	110.5 ± 81.7 (30–300)	NS
Mean number of stitches (range)	4.0 ± 0.8 (3–5)	4.9 ± 1.4 (3–8)	NS

NS, not significant.

Table 4 Intraoperative parameters: myoma diameter over 7 cm

	Vertical incision (n = 11)	Transverse incision (n = 14)	P-value
Mean number of myomas (range)	2.0 ± 1.2 (1–4)	1.2 ± 0.7 (1–4)	NS
Mean operation duration in min (range)	165.4 ± 24.2 (120–192)	129.0 ± 32.5 (85–175)	0.0067
Mean estimated blood loss in mL (range)	362.3 ± 147.3 (215–620)	158.9 ± 87.1 (45–400)	0.0002
Mean number of stitches (range)	6.1 ± 0.7 (5–7)	5.5 ± 0.9 (4–7)	NS

NS, not significant.

Table 5 Intraoperative parameters for the vertical incision group

	Under 7 cm (n = 14)	Over 7 cm (n = 11)	P-value
Mean number of myomas (range)	1.0 ± 0.0 (1)	2.0 ± 1.2 (1–4)	NS
Mean operation duration in min (range)	110.7 ± 23.2 (65–135)	165.4 ± 24.2 (120–192)	0.0006
Mean estimated blood loss in mL (range)	136.4 ± 108.5 (35–380)	362.3 ± 147.3 (215–620)	0.0006
Mean number of stitches (range)	4.0 ± 0.8 (3–5)	6.1 ± 0.7 (5–7)	0.0001

NS, not significant.

bleeding (235.8 ± 169.4 mL) in the vertical incision group (Table 2).

In addition, we carried out a comparative study of the two groups by classifying the maximum diameter of myoma nuclei as that of 7 cm or more and that of less than 7 cm. First, in cases where the maximum myoma nucleus diameter was less than 7 cm, there were no statistically significant differences between the two groups in the number of enucleated myoma nuclei/patient, operation duration, amount of bleeding, and number of suture stitches. In cases where the maximum myoma nucleus diameter was 7 cm or more, the operation duration (129.0 ± 32.5 min) and amount of bleeding (158.9 ± 87.1 mL) for the transverse incision group were significantly less (P = 0.0067 and P = 0.0002, respectively) than the operation duration (362.3 ± 147.3 min) and amount of bleeding (362.3 ± 147.3 mL) values for the vertical incision group (Table 3).

Furthermore, when we divided the vertical incision group into a group of women with maximum myoma nucleus diameters of 7 cm or more, and another group of women with myoma nucleus maximum diameter of less than 7 cm, and studied them, we found no statistically significant differences in the number of enucleated myoma nuclei. However, there were statistically significant differences for operation duration (165.4 ± 24.2 min), amount of bleeding (362.3 ± 147.3 mL) and number of suture stitches (6.1 ± 0.7) for the group of women with maximum myoma nucleus diameters of 7 cm (P = 0.0006, P = 0.0006, P = 0.0001, respectively) than for operation duration (110.7 ± 23.2 min), amount of bleeding (136.4 ± 108.5 mL) and number of suture stitches (4.0 ± 0.8) for the group of women with maximum myoma nucleus diameters of less than 7 cm (Table 4). When we studied the vertical incision group by dividing them into a group with maximum myoma nucleus diameter of 7 cm or more and another group with maximum myoma nucleus diameter of less than 7 cm, we did not find any significant differences between these two groups for each of the parameters of

Table 6 Intraoperative parameters for the transverse incision group

	Under 7 cm (n = 11)	Over 7 cm (n = 14)	P-value
Mean number of myomas (range)	1.7 ± 1.1 (1–4)	1.2 ± 0.7 (1–4)	NS
Mean operation duration in min (range)	115.5 ± 28.9 (68–168)	129.0 ± 32.5 (85–175)	NS
Mean estimated blood loss in mL (range)	110.5 ± 81.7 (30–300)	158.9 ± 87.1 (45–400)	NS
Mean number of stitches (range)	4.9 ± 1.4 (3–8)	5.5 ± 0.9 (4–7)	NS

NS, not significant.

number of enucleated myoma nuclei, operation duration, amount of bleeding, and number of suture stitches (Tables 5 and 6).

DISCUSSION

AN ANATOMICAL UNDERSTANDING of the blood vessel system distribution is needed for prevention of bleeding during surgery, and it is important to perform operations that are reasonable from the viewpoint of surgical theory. Incision of the uterine wall is essential when performing enucleation of intramural myomas, and controlling the bleeding from the uterine wall is important. In 1913, Sampson[9] performed a detailed study of the anatomy of intramyometrial arteries and veins; later further studies were done by Faulkner[10] in 1945, and by Farrer-Brown *et al.*[11–13] in 1970, clarifying the facts that transverse arcuate arteries exist in the myometrium, and in particular that the right and left arcuate arteries join at the median line in a mutually anastomose formation.

From these anatomical viewpoints, transverse incision is considered a reasonable direction for incision of the uterine wall. We studied and compared the clinical outcomes for transverse and vertical incisions. As a result, we found a significant decrease of bleeding in the group for which the direction of uterine incision wounds was transverse. Furthermore, when we carried out an additional study according to the size of uterine myomas, we found a shortening of operation duration in addition to a decrease of the amount of bleeding, for the group with large diameter uterine myomas of 7 cm or larger. From these data we were able to confirm that transverse incisions performed according to surgical theory in relation to the anatomical transit of arteries and veins in the myometrium, are more useful than vertical incisions.

In addition, transverse incisions are useful for the suturing of incision wounds after myomectomy has been performed. The surgical principle for the suturing of incision wounds is to place the needle through in a vertical direction relative to the incision wound to ligate the wound. Suturing in the vertical direction relative to transverse incisions places the sutures parallel to the longitudinal axis of the uterus. Arcuate arteries and radial arteries run transversely through the uterine myometrium; therefore suturing parallel to the longitudinal axis of the uterus provides very effective hemostasis of these arteries or their branchings in cases where they have been cut. On the contrary, in cases of vertical incision of the uterine wall, suturing will be in the transverse direction. Ligation of cut arcuate arteries and radial arteries or their branchings is difficult when suturing is done in the transverse direction.

Regarding this point, transverse incisions are considered more useful than vertical incisions.

As a result of social and other factors, the need for laparoscopic myomectomy has increased. The number of cases in our research is small, but the direction in which the myometrium should be incised when performing myomectomy is an important factor in carrying out operations smoothly. We believe that transverse incisions should be used.

REFERENCES

1 Semm K, Mettler L. Technical progress in pelvic surgery via operative laparoscopy. *Am J Obstet Gynecol* 1980; **138**: 121–127.
2 Gordon AG, Magos AL. The development of laparoscopic surgery. *Baillieres Clin Obstet Gynaecol* 1989; **3**: 429–449.
3 Dubuisson JB, Lecuru F, Foulot H, Mandelbrot L, Aubriot FX, Mouly M. Myomectomy by laparoscopy: a preliminary report of 43 cases. *Fertil Steril* 1991; **56**: 827–830.
4 Hasson HM, Rotman C, Rana N, Sistos F, Dmowski WP. Laparoscopic myomectomy. *Obstet Gynecol* 1992; **80**: 884–888.
5 Mais V, Ajossa S, Guerriero S, Mascia M, Solla E, Melis GB. Laparoscopic versus abdominal myomectomy: a prospective, randomized trial to evaluate benefits in early outcome. *Am J Obstet Gynecol* 1996; **175**: 654–658.
6 Verkauf BS. Myomectomy for fertility enhancement and preservation. *Fertil Steril* 1992; **58**: 1–15.
7 Wallach EE. Myomectomy. In: Thompson JD, Rock JA,

(eds). *Te Linde's Operative Gynecology*, 7th edn. Philadelphia: JB Lippincott, 1992; 647–662.

[8] Igarashi M. Value of myomectomy in the treatment of infertility. *Fertil Steril* 1993; **59**: 1331–1332.

[9] Sampson JA. The influence of myomata on the blood supply of the uterus, with special reference to abdominal uterine bleeding. *Surg Gynecol Obstet* 1913; **16**: 144–180.

[10] Faulkner RL. An injection study of uterine blood vessels. *Am J Obstet Gynecol* 1945; **49**: 1–9.

[11] Farrer-Brown G, Beilby JO, Tarbit MH. The blood supply of the uterus. 1. Arterial vasculature. *J Obstet Gynaecol Br Commonw* 1970; **77**: 673–681.

[12] Farrer-Brown G, Beilby JO, Tarbit MH. The blood supply of the uterus. 2. Venous pattern. *J Obstet Gynaecol Br Commonw* 1970; **77**: 682–689.

[13] Farrer-Brown G, Beilby JO, Tarbit MH. The vascular patterns in myomatous uteri. *J Obstet Gynaecol Br Commonw* 1970; **77**: 967–975.