



Contents lists available at ScienceDirect

Gynecology and Minimally Invasive Therapy

journal homepage: www.e-gmit.com

Original article

Power morcellation—An emerging risk complicating minimally invasive surgery for uterine mesenchymal neoplasms



Hsuan Chin*, Xin Hui Ada Ng, Su Min Bernard Chern

Department of Obstetrics and Gynaecology, KK Women's and Children's Hospital, Singapore

ARTICLE INFO

Article history:

Received 1 September 2015

Received in revised form

28 December 2015

Accepted 4 January 2016

Available online 23 February 2016

Keywords:

myoma with atypical features

power morcellation

sarcoma

ABSTRACT

Study objective: To determine the local incidence and clinical consequences of myoma, after intraperitoneal dissemination via morcellation.

Materials and methods: An electronic search for laparoscopic myomectomies in the computer database of the KK Women's and Children's Hospital (Singapore) and sarcomas or myomata with atypical features in the National Cancer Registry (Singapore) was performed for a 10-year study period. The identified patients had their medical records traced and their data were extracted and studied in detail.

Results: The incidence of unexpected diagnosis (i.e., variants, atypia, and malignancy) was 0.23%, and the incidence of unexpected sarcoma was 0.10%. One of four patients who underwent a subsequent laparotomy had peritoneal dissemination. She unfortunately was also the only mortality in this study.

Conclusion: Laparoscopic surgery had proven benefits over open surgery, although the dissemination of unexpected malignancy and extrauterine seeding were major concerns. To date, morcellation in the endobag or cutting the specimen using a knife or scissors may be alternative surgical techniques.

Copyright © 2016, The Asia-Pacific Association for Gynecologic Endoscopy and Minimally Invasive Therapy. Published by Elsevier Taiwan LLC. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Background/Introduction

Power morcellation has become a gold standard technique and is used in modern minimally invasive surgery (MIS) for hysterectomy and myomectomy indicated for benign gynecological disease (e.g., uterine fibroids). However, it has a dire consequence if the morcellated tissues are sarcomas or tumors with atypical features. This study aimed to determine the local incidence and clinical consequences of these tumors, after intraperitoneal dissemination via morcellation.

Materials and methods

An electronic search for laparoscopic myomectomies and morcellation was performed for a 10-year study period in KK Women's and Children's Hospital (Singapore). A separate search in the National Cancer Registry (Singapore) during the same period was performed using the keywords: "leiomyosarcoma", "smooth

muscle tumor of uncertain malignant potential" ("STUMP"), "endometrial stromal sarcoma", "cellular leiomyoma", and "atypical leiomyoma". The identified patients who met the study criteria (i.e., sarcomas or myomata with atypical features) and who were operated on for a presumed benign leiomyoma via laparoscopy and morcellation had their medical records traced and their data extracted and studied in detail.

Results

From 2004 to 2013 in our center, 3013 MIS myomectomies were performed with the aid of morcellation. Seven patients were subsequently diagnosed as having malignancy, leiomyoma variants, or atypical lesions on histological examination (Table 1). This finding represents an estimated 0.23% incidence of unexpected diagnosis (i.e., variants, atypia, and malignancy). The incidence of unexpected sarcoma is 0.10%. The ages of patients ranged 32–52 years. Two patients in their early 30s with atypical leiomyoma and cellular leiomyoma were appreciatively younger. The lesion sizes were variable, but all lesions were > 4 cm. There was a mix of solitary and multiple lesions in all categories.

For all seven patients with an unexpected diagnosis, follow-up procedures were offered to complete cancer staging and evaluate

Conflicts of interest: All authors declare no conflicts of interest.

* Corresponding author. Department of Obstetrics and Gynaecology, KK Women's and Children's Hospital, 100 Bukit Timah Road, 229899, Singapore.

E-mail address: crystal.yori@gmail.com (H. Chin).

<http://dx.doi.org/10.1016/j.gmit.2016.01.004>

2213-3070/Copyright © 2016, The Asia-Pacific Association for Gynecologic Endoscopy and Minimally Invasive Therapy. Published by Elsevier Taiwan LLC. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Table 1
Detailed analysis of patients with an unexpected diagnosis, after power morcellation for suspected leiomyoma.

| Patient | Age (y) | Dx | Size of mass | 1 st Peritoneal diagnosis | | 2 nd Peritoneal diagnosis | | Clinical follow up | | |
|---------|---------|-------|----------------------------|--------------------------------------|----------------|--------------------------------------|---------------|--------------------|-----------------------------|----------------|
| | | | | Dx | Interval (mo.) | Dx | Interval (mo) | Status | Treatment | Interval (mo.) |
| 1H | 52 | LMS | Multiple, largest = 5.7 cm | — | 14 | | | Alive | None | 100 |
| 2Y | 43 | LMS | 9 cm | LMS | 1 | LMS | 11 | Deceased | Chemotherapy & radiotherapy | 51 |
| 3L | 42 | STUMP | Multiple, largest = 7 | Declined surgery | | | | Alive | None | 80 |
| 4W | 41 | STUMP | Multiple, largest = 12 cm | — | 2 | | | Alive | None | 10 |
| 5C | 47 | ESS | Multiple, largest = 4.4 cm | — | 1 | | | Alive | None | 76 |
| 6W | 35 | AL | 4.8 cm | Nil | | | | Alive | None | 32 |
| 7L | 32 | CL | Multiple, largest = 4.1 cm | Nil | | | | Alive | None | 62 |

AL = atypical leiomyoma; CL = cellular leiomyoma; Dx = diagnosis; ESS = endometrial stromal sarcoma; LMS = leiomyosarcoma; STUMP = smooth muscle tumor of uncertain malignant potential.

potential iatrogenic peritoneal dissemination. Staging laparotomy was performed for three patients with cancer. One STUMP patient declined surgery, whereas the other patient underwent a total hysterectomy and bilateral salpingo-oophorectomy. Both patients with cellular leiomyoma and atypical leiomyoma were not keen for surgeries after discussion.

Discussion

Uterine myomata are the most common benign uterine neoplasm and typically occur in the middle to late reproductive years. Myomectomy, as a conservative management option, is the primary treatment for symptomatic myomata. It is often requested, even when there is no further desire for pregnancy because of social or religious reasons. Myomectomy is increasingly performed by reproductive surgeons^{1,2} because myomata may contribute to infertility and may be responsible for serious complications during pregnancy.³ Since 1979, laparoscopic myomectomy has been performed.⁴ It has gained importance over the years because laparoscopic surgeries reduce operative blood loss, is associated with less of a hemoglobin drop, more patients are fully recuperated by Day 15, and it has fewer overall complications, compared to open myomectomy.⁵ In addition, it is cosmetically more desirable and appealing for younger women who have not had previous open abdominal surgeries.

Power morcellation has advanced MIS and allows a greater number of fibroids and larger fibroids to be removed laparoscopically. A power morcellator is a hollow cylindrical instrument that penetrates the abdominal wall, with sharp cutting blades on its end through which a grasper can be inserted to pull the myoma into the cylinder to cut out extractable pieces. However, morcellation is associated with the spreading of the cellular material of the morcellated tissue. Loose fibroid fragments may become infarcted, necrotic, or parasitic and disseminated if they are left behind.⁶ Disseminated disease reportedly occurs in more than one-half of patients.⁷ Of note, at least six of 3013 cases of myoma morcellation in our study were associated with the subsequent development of disseminated peritoneal leiomyomatosis. In the year 2013, we reported a miniseries that was managed in our center.⁸ Of the four patients who underwent a subsequent laparotomy, only one patient had peritoneal dissemination. She was unfortunately the only mortality in our study with a survival of 51 months.

In addition, there is a concern of disseminating unexpected malignancy with increased mortality.^{9,10} Morcellation is an

independent risk factor for tumor recurrence. It is prognostically associated with a shorter disease-free interval and overall survival. Only morcellation, size, and mitosis were significant factors, based on multivariate analysis.¹¹ Unexpected diagnosis of variant leiomyoma, atypia, and malignancy occurred in 0.23% of patients with a presumed preoperative diagnosis of benign uterine leiomyoma who underwent morcellation in our study. The incidence of unexpected sarcoma was 0.10%. This rate was similar to the incidence reported by Seidman et al⁷ but lower than the incidence quoted by Leibsohn et al,¹² Parker et al,¹³ and Kho et al¹⁴ (Table 2).

Uterine sarcomas are rare and represent approximately 7.8% of all invasive uterine cancers locally (4.9% leiomyosarcomas; 2.9% endometrial stromal sarcomas).¹⁵ They are aggressive tumors with a high rate of recurrence.¹⁶ Moreover, there is no reliable preoperative diagnostic tools to differentiate uterine sarcomas from their benign counterparts.¹⁷ Our 10-year data showed a local sarcoma prevalence rate of 0.65% in all patients undergoing MIS or laparotomy hysterectomies and myomectomies. This is higher than the unexpected postmorcellation sarcoma rate of 0.10%. This finding demonstrates the importance of preoperative risk stratification.

In a safety communication notice, the United States Food and Drug Administration (Silver Spring, MD, USA) recently discouraged the use of laparoscopic power morcellation during hysterectomy or myomectomy for the treatment of women with uterine fibroids. One of the largest suppliers of the device subsequently suspended its sale until the medical community redefines the role of morcellation. Despite decades of experience, the understanding of the short- and long-term sequelae of the morcellation is limited. Hence, during preoperative counseling with patients who are undergoing laparoscopic myomectomy and hysterectomy for which morcellation is anticipated, it is imperative to include the possible risk of recurrence at extrauterine locations, despite the surgeon's best efforts, and possible dissemination of unexpected malignancy with an associated increase in mortality.

Table 2
Different studies reporting the incidence of unexpected sarcoma.

| Study | Year | Incidence of unexpected sarcoma (%) |
|------------------------------|------|-------------------------------------|
| Leibsohn et al ¹² | 1990 | 0.49 |
| Parker et al ¹³ | 1994 | 0.23 |
| Seidman et al ⁷ | 2012 | 0.27 |
| Kho et al ¹⁴ | 2014 | 0.09 |
| Our study | 2015 | 0.10 |

Whether the pros of laparoscopic surgeries can outweigh the cons of dissemination of unexpected malignancy and extrauterine seeding or whether banning the morcellation procedure will solve the issue are hotly debated topics, especially in the world of gynecology endoscopy. Complete abandonment of power morcellation will deprive many women from benefiting from MIS surgeries. While waiting for the development of more effective diagnostic tools to differentiate between sarcomas and benign myoma,¹⁸ alternative treatment options (e.g., vaginal hysterectomy, abdominal hysterectomy, laparoscopically assisted vaginal hysterectomy, natural orifices gynecological endoscopic surgeries) and their risks and benefits should be discussed with patients.

Morcellation in a specimen bag may minimize the risk of spread in the peritoneal cavity. However it requires significant laparoscopic skills and experience. There are potential concerns such as insufficient bag size, reduced visualization, disruption of the morcellator by the bag, and morcellation of the bag and surrounding organs leading to visceral injuries. Further studies are required to evaluate the safety and feasibility of this technique.

Conclusion

Laparoscopic surgery had proven benefits over open surgery. However, the concern of disseminating unexpected malignancy raised a significant issue. Informed consent is crucial at this moment. Patients should be warned about an unexpected malignancy that may spread and worsen the prognosis if power morcellation is considered the best option for benign uterine fibroids. Alternative treatment options should be discussed.

References

1. Sudik R, Husch K, Steller J, Daume E. Fertility and pregnancy outcome after myomectomy in sterility patients. *Eur J Obstet Gynecol Reprod Biol.* 1996;65:209–214.
2. Seiner P, Farina C, Todros T. Laparoscopic myomectomy and subsequent pregnancy: results in 54 patients. *Hum Reprod.* 2000;15:1993–1996.
3. Tropeano G. The role of uterine artery embolization in the management of uterine fibroids. *Curr Opin Obstet Gynecol.* 2005;17:329–332.
4. Semm K. New methods of pelviscopy (gynecologic laparoscopy) for myomectomy, ovariectomy, tubectomy and adnectomy. *Endoscopy.* 1979;11:85–93.
5. Jin C, Hu Y, Chen XC, et al. Laparoscopic versus open myomectomy—a meta-analysis of randomized controlled trials. *Eur J Obstet Gynecol Reprod Biol.* 2009;145:14–21.
6. Sinha R, Sundaram M, Lakhota S, Kadam P, Rao G, Mahajan C. Parasitic myoma after morcellation. *J Gynecol Endosc Surg.* 2009;1:113–115.
7. Seidman MA, Oduyebo T, Muto MG, Crum CP, Nucci MR, Quade BJ. Peritoneal dissemination complicating morcellation of uterine mesenchymal neoplasms. *PLoS ONE.* 2012;7:e50058.
8. Chin H, Ong XH, Yam KL, Chern B. Extra-uterine fibroids – a diagnostic challenge and a long term battle. *BMJ Case Rep.* 2014. <http://dx.doi.org/10.1136/bcr-2014-204928>.
9. Einstein MH, Barakat RR, Chi DS, et al. Management of uterine malignancy found incidentally after supracervical hysterectomy or uterine morcellation for presumed benign disease. *Int J Gynecol Cancer.* 2008;18:1065–1070.
10. Hagemann IS, Hagemann AR, LiVolsi VA, Montone KT, Chu CS. Risk of occult malignancy in morcellated hysterectomy: a case series. *Int J Gynecol Pathol.* 2011;30:476–483.
11. George S, Barysaukas C, Serrato C, et al. Retrospective cohort study evaluating the impact of intraperitoneal morcellation on outcomes of localized uterine leiomyosarcoma. *Cancer.* 2014;120:3154–3158.
12. Leibsohn S, d'Ablaing G, Mishell Jr DR, Schlaerth JB. Leiomyosarcoma in a series of hysterectomies performed for presumed uterine leiomyomas. *Am J Obstet Gynecol.* 1990;162:968–974.
13. Parker WH, Fu YS, Berek JS. Uterine sarcoma in patients operated on for presumed leiomyoma and rapidly growing leiomyoma. *Obstet Gynecol.* 1994;83:414–418.
14. Kho K, Nezhath CH. Evaluating the risks of electric uterine morcellation. *JAMA.* 2014;311:905–906.
15. Chua KS, Seow A, Lee HP, Shanmugaratnam K. Cancer incidence in Singapore 1993–1997. Singapore Cancer Registry Report No. 5.
16. Denschlag D, Masoud I, Stanimir G, Gilbert L. Prognostic factors and outcome in women with uterine sarcoma. *Eur J Surg Oncol.* 2007;33:91–95.
17. Sagae S, Yamashita K, Ishioka S, et al. Preoperative diagnosis and treatment results in 106 patients with uterine sarcoma in Hokkaido, Japan. *Oncology.* 2004;67:33–39.
18. Sato K, Yuasa N, Fujita M, Fukushima Y. Clinical application of diffusion weighted imaging for preoperative differentiation between uterine leiomyoma and leiomyosarcoma. *Am J Obstet Gynecol.* 2014;210:368.e1.