Gynecol Surg (2014) 11:19–22
DOI 10.1007/s10397-013-0826-0

ORIGINAL ARTICLE

# Broad ligament fibroids—a radiological and surgical challenge

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Received: 12 June 2013 / Accepted: 3 December 2013 / Published online: 5 January 2014


**Abstract** Currently, there is limited data on the ease of imaging of broad ligament fibroids and their safe laparoscopic management. We aimed to review all laparoscopic myomectomies over an 8-year period, focusing on intraoperative findings and corresponding pre-operative imaging. All laparoscopic myomectomies performed between 2004 and 2012 were reviewed. Cases with broad ligament fibroids were identified. Presenting symptoms, imaging, intraoperative findings, complications and 6-month follow-up were noted. Ten broad ligament fibroids were identified from 185 cases of laparoscopic myomectomies. Mean broad ligament fibroid diameter was 8.1 cm, and the largest was 15 cm. Mean combined fibroid weight was 267 g (range 30–560 g). Blood loss was associated with the total number of fibroids excised rather than the diameter of the broad ligament fibroid (range 30–400 ml). Accurate pre-operative diagnosis at imaging was made in only one of the ten broad ligament fibroids. Of the remainder, one was thought to be an ovarian mass, one fibroid was missed entirely and seven were reported non-specifically as 'lateral'. This case series indicates the challenge posed by broad ligament fibroids at pre-operative imaging. Underreporting may reflect a lack of awareness of the surgical significance of broad ligament fibroids. There should be a high level of suspicion for location within the broad ligament if a fibroid reported is as lateral. With adequate operator experience, large fibroid size should not contraindicate laparoscopic management of broad ligament fibroids.

**Keywords** Fibroid · Myoma · Broad ligament · Laparoscopy · Myomectomy · Ultrasound

**Synopsis** The anatomical location of the broad ligament fibroid presents a challenge for the unprepared laparoscopic surgeon. This series indicates the radiological challenge in identifying these fibroids pre-operatively.

**Electronic supplementary material** The online version of this article (doi:10.1007/s10397-013-0826-0) contains supplementary material, which is available to authorized users.

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## Background

Uterine fibroids are commonly intramural, submucosal or subserosal. Less frequently subserous or pedunculated fibroids may extend into the peritoneal folds of the broad ligaments to form an intraligamentous fibroid. These broad ligament fibroids are of clinical and surgical importance. Their anatomical location may cause local pressure effects including ureteric obstruction [1]. Excision, however, is associated with risk of surgical complications particularly ureteric and uterine vessel injuries [2] and concealed haematoma formation [3].

Broad ligament fibroids also present a diagnostic challenge on imaging. Appearing adnexal in location, they may be confused with ovarian tumours [4, 5] or may have an alternative histological diagnosis following myomectomy; a suspected broad ligament fibroid was reported as a pelvic schwannoma at histology [6].

With well-established advantages over laparotomy, growing surgical expertise has enabled laparoscopic excision of increasingly large fibroids [7]. There is a paucity of literature on the laparoscopic management of fibroids within the broad ligament however [8]. The probability of complications arising at myomectomy for intraligamentous fibroids is increased compared to fibroids in other locations. Sizzi et al. indicated an 18.8 % complication rate, reporting an odds ratio of 2.43 for developing any complication [2].

Within our unit, several cases of fibroid location within the broad ligament, revealed for the first time intraoperatively, were noted to be inconsistent with their pre-operative imaging

reports. Given the potential complications of intraligamentous myomectomy [2], surgical anticipation is crucial, particularly for the inexperienced laparoscopic surgeon. We therefore aimed to assess the accuracy of pre-operative imaging for broad ligament fibroids within our unit, as well as our associated complication rate at laparoscopic myomectomy.

## Methods

All laparoscopic myomectomies performed between September 2004 and 2012 within a single unit were reviewed. Case notes with broad ligament fibroids were identified. Intraoperative findings were noted, particularly operative time, blood loss, combined fibroid weight and intra- and post-operative complications. Fibroid location at laparoscopy was compared to pre-operative imaging reports, where imaging modality and grade of operator were noted.

Symptoms at presentation and at a 6-month follow-up were documented. All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000.

### Operative technique

All laparoscopic myomectomies were performed under general anaesthesia. A standard three-port laparoscopy was performed. Intraoperative measures were taken to reduce complications. The ureter was observed closely throughout the procedure. Vasopressin was routinely injected into the broad ligament fibroid to reduce intraoperative bleeding [9]. Depending on the location of the fibroid in relation to the uterine vessels and the ureter, an incision was made on the anterior or posterior leaf of the broad ligament. Blunt dissection was used in combination with careful monopolar and bipolar electrosurgery for coagulation. Care was taken to minimise the risk of thermal injury to surrounding structures, particularly the uterine vessels and ureter.

Following fibroid enucleation, the area was washed to observe haemostasis. Laparoscopic suturing within the broad ligament was limited. Peritoneal closure of the broad ligament was not routinely performed. GnRH analogues were not used. In two cases, due to concern over haematoma development, an absorbable haemostatic cellulose polymer Surgicel® (Ethicon Inc., Johnson & Johnson, USA) was placed into the enucleated cavity. No subsequent complications were reported.

## Findings

Of the 185 laparoscopic myomectomies, ten women with broad ligament fibroids were identified. Mean age was 36 years (ranging from 27 to 52 years; a hysterectomy was culturally unacceptable to the 52-year-old—she felt she could not await menopause due to severe pressure symptoms from a 130-mm fibroid). Median BMI was 24.2 (range 20–29). Most common symptoms included pelvic pain (40 %), pressure symptoms (40 %) and subfertility (20 %). Eight were nulliparous, one had a single vaginal delivery and one had two vaginal deliveries.

All ten women underwent pre-operative ultrasound imaging for fibroid mapping. Only one broad ligament fibroid was reported as situated within the broad ligament. Seven broad ligament fibroids were reported as ‘lateral’ or ‘lateral pedunculated’ (Table 1). Of the 185 cases, an additional 35 fibroids reported as lateral were located outside the broad ligament. There were no false positive reports.

Seniority of the reporting radiologist and route of ultrasound did not improve the detection of the broad ligament fibroids. The majority had a transabdominal ultrasound (81 %, $n=153$), whereas 12 % had both transvaginal and transabdominal. The ultrasound route was not specified in the remainder.

Three women with broad ligament fibroids went on to have a pelvis MRI due to uncertainty of the pelvic mass. One broad ligament fibroid was reported as an ovarian mass on MRI and was booked for a salpingo-ophrectomy. One 60-mm broad

**Table 1** Pre-operative ultrasound imaging for fibroid mapping

| Fibroid diameter (mm) | Fibroid reported on imaging | Imaging modality | Grade of reporter |
|---|---|---|---|
| 50 | Broad ligament | US and MRI | Radiology consultant |
| 60 | Ovarian mass | US and MRI | Radiology consultant |
| 60 | Missed on US | US | Radiology consultant |
| 60 | Lateral subserosal | US | Radiology consultant |
| 60 | Lateral | US and MRI | Radiology consultant |
| 65 | Lateral pedunculated | US | Ultrasonographer |
| 70 | Lateral pedunculated | US | Ultrasonographer |
| 100 | Lateral | US | Radiology consultant |
| 130 | Lateral pedunculated | US | Radiology consultant |
| 150 | Lateral | US | Radiology consultant |

**Table 2** Operative findings at laparoscopic myomectomy for broad ligament fibroids

| Broad ligament myomectomy operative findings | Average (mean) | Minimum | Maximum |
|---|---|---|---|
| Blood loss (ml) | 136 | 30 | 400 |
| Number of fibroids present | 1.8 | 1 | 16 |
| Fibroid diameter (mm) | 81 | 50 | 150 |
| Fibroid weight (g) | 267 | 30 | 560 |
| Operating time (min) | 105 | 50 | 180 |
| Inpatient stay (days) | 1.6 | 1 | 2 |

ligament fibroid was considered to be missed on ultrasound as it was not reported. There were no false positive reports of a broad ligament fibroid.

The operative findings at laparoscopic myomectomy for broad ligament fibroids are detailed in Table 2. One third of operations were for multiple myomectomies. No women had more than one broad ligament fibroid.

Figure 1 demonstrates an association between *blood loss* (dashed red line) and the *number* of fibroids *excised* (grey column). There does not appear to be any correlation between blood loss and the diameter of the broad ligament fibroid (dotted blue line). No blood transfusions were required, and there were no conversions to laparotomy. There were no complications, minor or major.

At 6-month follow-up, symptoms were noted in eight of the ten women. Seven of the eight had complete symptomatic improvement. The presenting complaint in the woman without symptomatic improvement was subfertility; she was yet to conceive at 6-month follow-up. In this case, a total of three subserosal myomas were excised including a 10-cm broad ligament fibroid.

## Discussion

Anatomical location within the broad ligament has previously been associated with an increased complication risk at myomectomy [2]. Ultrasound, as the first-line imaging tool for uterine structural abnormalities such as fibroids [10], plays an important role in pre-operative planning for such procedures.

This case series indicates the challenge posed on ultrasound in accurately identifying fibroids within the broad ligament. We illustrate general underreporting of broad ligament fibroids; of the 185 cases, there were no false positive reports. This may reflect a lack of awareness among radiologists of the surgical significance of broad ligament location. Standardising ultrasound criteria for broad ligament fibroids may improve detection. Various standards can be applied to adnexal masses that are suspected to be broad ligament fibroids, such as size, vascularity and anatomical relationship to the uterine arteries or other pelvic sidewall structures. Ultimately though, the rarity of broad ligament fibroids, and the potential for misdiagnosis as ovarian or retroperitoneal tumours [4–6], makes the development of standardised ultrasound criteria extremely difficult.

In the future, it may be useful to regard 'lateral fibroids' with suspicion for location within the broad ligament; seven of the ten broad ligament fibroids were reported as lateral (the remaining 35 of the total 42 lateral fibroids were outside the broad ligament). If reported as lateral, one may further direct radiologists to specifically look for broad ligament fibroids on ultrasound or MRI. In these cases, standardising ultrasound technique with a combined use of transvaginal and abdominal ultrasounds, with the use of colour imaging, would be recommended.

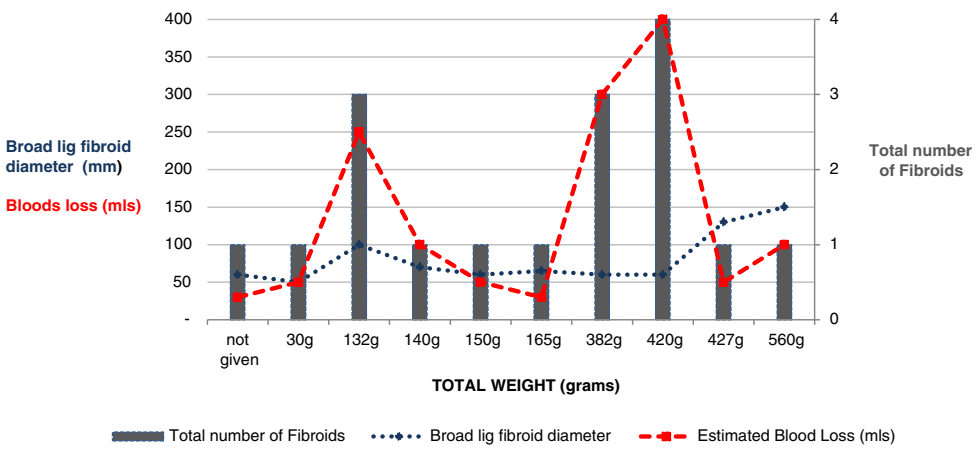


**Fig. 1** Total specimen weight (*x-axis*) compared to blood loss and broad ligament fibroid size (*primary y-axis*) and total number of fibroids (*secondary y-axis*)

An assessment of improvement in the reporting of broad ligament fibroids following these implementations may be of interest. Alternatively, given the superior sensitivity of MRI in assessing uterine fibroids [11], a prospective study evaluating all lateral fibroids by MRI may improve the positive predictive value for broad ligament fibroids.

The limitations of our study are its small cohort size and retrospective analysis of a relatively uncommon condition. Our complication rates can therefore not be extrapolated to larger populations. This case series does, however, illustrate that the complication risk may not be as high as previously suggested [2], with the prerequisite of an experienced laparoscopic surgeon and adequate intraoperative precautions.

In addition, multiple ultrasound machines were used and replaced over the 8 years. We therefore are unable to comment on the effect of specific technologies on the accuracy and sensitivity of identifying fibroids within the broad ligament. Conclusions could not be drawn on the influence of the seniority of the reporting radiologist, the ultrasound route or the accuracy of MRI modality on the detection of broad ligament fibroids.

## Conclusion

This case series highlights two main learning points:

1. Broad ligament fibroids are frequently underreported at pre-operative ultrasound. There should be a level of suspicion of broad ligament location if a fibroid is reported as lateral. Discussion with a radiologist may be considered.
2. Broad ligament fibroids can be managed laparoscopically given adequate operator expertise. Large size should contradict laparoscopic myomectomy of a broad ligament fibroid [8].

**Conflict of interest** The authors declare that they have no conflict of interest.

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