Uterine intravenous leiomyomatosis with an isolated large metastasis to the right atrium: a case report

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Abstract

Background: An intravenous leiomyomatosis is a special type of uterine leiomyoma characterized by the formation of benign leiomyomatous tissue within the vascular wall. Although histologically benign, intracardiac metastasis can lead to circulatory failure, and death, if untreated. Herein, we report on a case of a uterine intravenous leiomyomatosis with an isolated large adherent metastasis in the right atrium of the heart.

Case Presentation: A 52-year-old Japanese woman sought medical attention at our hospital for lower abdominal pain. A 27-cm uterine mass was detected on clinical imaging, with a 78 × 47-mm mass in the right atrium detected on preoperative echocardiography. Intracardiac mass resection and tricuspid annuloplasty were performed as the first-stage surgery. The pedicle of the tumor was adherent to the wall of the atrium. On histological examination, the tumor was found to consist of spindle-shaped cells with eosinophilic cytoplasm, without atypia, but with a myxoid change, and rich microvascularization of the pedicle. Total abdominal hysterectomy was performed as the second-stage surgery, with confirmation of the diagnosis as uterine intravenous leiomyomatosis with an isolated metastatic lesion to the right atrium. There has been no evidence of tumor recurrence in the 15 months since surgery.

Conclusion: We report a unique case in which a large right atrial leiomyoma was identified following a uterine intravenous leiomyomatosis. Our case exemplifies that intravenous leiomyomatosis metastatic tumors have the potential to grow via their vascularization.

Keywords: Uterus, Intravenous leiomyomatosis, Cardiac metastasis, Right atrium, Case report

Background

Intravenous leiomyomatosis (IVL) is a special type of uterine leiomyoma, characterized by the formation of benign leiomyomatous tissue within the vascular vessels of the uterus. The tumor typically grows along vascular vessels and, thus, can extend to the iliac vein, inferior vena cava and, even to the heart. IVL develops in only 0.1% of women with uterine leiomyomas, with intracardiac involvement identified in 10–40% of IVL cases [1]. IVL with intracardiac involvement was first reported in 1907, with fewer than 300 cases presently documented in the literature, since then [2]. Although histologically benign, intracardiac IVL extension can lead to circulatory failure or death if left untreated [3]. The typical features of IVL include contiguous pelvic and intravenous masses, with sausage-shaped lesions in the inferior vena cava, whereas intracardiac tumors arising from IVL typically show a worm-like appearance [4]. Some studies have reported on isolated intracardiac tumor from uterine IVL that are adherent to the cardiovascular wall [5–8]. Herein, we report such a case of uterine IVL that clinicopathologically preceded IVL metastasis into the right atrium.
Case presentation
The patient provided consent for publication of this case report.

Clinical history
The patient was a 52-year-old Japanese woman, gravida 2, para 2, who sought medical attention at our hospital because of lower abdominal pain. The patient had a past history of uterine leiomyoma and duodenal ulcer, the latter having been managed conservatively with medication. A huge uterine mass was detected by abdominal computed tomography (CT). Magnetic resonance imaging (MRI) revealed the presence of a 27-cm mass in the uterus, indicative of a leiomyoma (Fig. 1a). No tumor was detected in the inferior vena cava, iliac vein, or ovarian vein (Fig. 1a, b). The patient was scheduled for surgery for removal of the uterine tumor. However, during routine preoperative follow-up, a 78 × 47-mm mass was identified in the right atrium of her heart on echocardiography (Fig. 1c). Other features of the echocardiography included a respiratory variation of the diameter of the inferior vena cava of 12 mm, and a left ventricular ejection fraction of 64%, both of which were within normal range. Systemic enhanced CT revealed a 75-mm mass in the right atrium (Fig. 1d), with no evidence of lung metastases. Under a preoperative diagnosis of metastatic lesion or cardiac myxoid tumor, intracardiac mass resection and tricuspid annuloplasty were performed as the first-stage surgery. After surgery for the cardiac mass, gonadotropin releasing hormone agonist therapy was administered for 6 months for the management of the uterine mass. With no change in the tumor size, total abdominal hysterectomy was performed as a second-stage surgery. The diagnosis was confirmed as uterine IVL, with an isolated metastasis to the right atrium. There has been no recurrence of the tumor over the period of 15 months following surgery, with no requirement for anti-estrogen therapy during this period.

Gross and microscopic findings
An ovoid, gray-white colored mass, with a tough texture, was removed (78 × 58 × 55 mm in size). The mass was adherent to the wall of the right atrium via a pedicle (Fig. 2a, b). Histologically, the tumor consisted of spindle-shaped cells, with eosinophilic cytoplasm, lacked atypia, and was accompanied by a myxoid change. The pedicle adhering to the right atrium was richly microvascularized (Fig. 2c, d). Immunohistochemical staining was positive for α-smooth muscle actin (α-SMA), desmin (focal), and estrogen receptor (ER), but negative for progesterone receptor (PgR) and CD10 (Fig. 2e, f).

Macroscopically, the uterus was enlarged and the cut surface showed a white solid mass with a “worm-like” appearance (Fig. 3a). Histopathologic examination

![Fig. 1 Clinical imaging findings: a and b T2-weighted MRI revealed a 27-cm mass in the uterus. No tumor was detected in the iliac vein (A, red arrows) or in the inferior vena cava (B, red arrows). c Echocardiography imaging revealed a 78 × 47-mm mass (asterisk) in the right atrium. d Enhanced computed tomography imaging confirmed a 75-mm mass (asterisk) in the right atrium.](image-url)
revealed multiple benign leiomyomatous tissues within
the vascular vessels (Fig. 3b, c). Immunohistochemical
stains were positive for α-SMA, desmin (focal), ER, and
PgR, but negative for CD10 (Fig. 3d, e). Peritoneal cyto-
logy was negative for malignancy.

Discussion and conclusions
IVL has the potential to grow along blood vessels, ex-
tending to the iliac vein, inferior vena cava, and even to
the heart. Typically with IVL, the pelvic and intravenous
masses are continuous and the intravenous lesions do
not invade or adhere to the vessel wall [4].

In the present case, however, the intracardiac meta-
stasis arising from the uterine IVL was isolated and was
adherent to the endocardium of the atrium, with no
evidence of tumor occurrence in the inferior vena cava,
internal iliac vein or ovarian vein. The tumor of the right
atrium was an independent metastasis of the uterine
IVL, mimicking a primary cardiac myxoma. In the
presence of uterine IVL, it is necessary to distinguish the
nature of the intracardiac mass, regardless of the
absence of its continuity with the uterus. Of note, the
intracardiac tumor in the present case was larger than
the diameter of the inferior vena cava and, thus, was
considered to have developed within the heart. This
differs from the report by Maneyama et al. [9] in which a
spontaneous migration of a residual IVL to the heart, via
the blood stream after hysterectomy, was described. The
intracardiac tumor of the present case was adherent to
the wall of the right atrium wall via a richly vascularized
pedicle. This microvasculature is what likely allowed the
tumor to grow.

A summary of previous reports [5–8] on the occur-
rence of an isolated cardiac metastasis from uterine IVL
is provided in Table 1. The tumor diameter of the
present case was more than twice that of previously re-
ported cases. The intracardiac mass was identified after
hysterectomy for IVL in 3 of 5 cases, with uterine fi-
broids identified in the other 2 cases. Of note, in all pre-
viously reported cases, there was concurrent evidence of
lung metastases, which was not the case for our patient.
Tumor progression after surgery was not identified in
any of these previous cases. Ordulu et al. [10] reported
the expression of HMGA2 protein, a driver for tumor

![Fig. 2](image_url)

The macroscopic and microscopic findings and immunohistochemical staining of the intracardiac tumor: a and b Macroscopically, the tumor was a 78 x 58 x 55-mm mass, with a pedicle (red arrows) clinging to the right atrium. b The cut surface showed a gray-white colored solid mass. c and d Microscopically, the rich microvasculature of the pedicle was shown (red arrows). d The tumor consisted of spindle-shaped cells, with eosinophilic cytoplasm, lacked atypia, and was accompanied by a myxoid change (high power view). e and f Immunohistochemically, the tumor cells were positive for (e) desmin and (f) ER.
The macroscopic and microscopic findings and immunohistochemical staining of the uterine mass: 

- **a** Macroscopically, the cut surface presented as a gray-white colored mass, with a "worm-like" appearance (red arrows).
- **b** Microscopically, the uterine large myoma presented spindle-like smooth muscle cells without atypia and mitosis. **c** and **d** The tumor showed a growth of benign leiomyomatous tissues within vascular vessels (C, H&E; D, Elastica van Gieson). **e** Immunohistochemically, the tumor was positive for α-SMA.

### Table 1 Cardiac metastasis of intravenous leiomyomatosis

| Case (year) | Age (years) | Past history | Symptoms       | Size (mm) | Adhere          | Metastasis         | Treatment       | Prognosis (follow-up) |
|-------------|-------------|--------------|----------------|-----------|-----------------|--------------------|------------------|-----------------------|
| Present case (2018) | 52          | Uterine leiomyoma | Abdominal pain | 78        | Anterior wall of RA | Heart             | TR + TH + TVP + GnRHa | PFS (14 months)       |
| Thukkani et al., (2005) [5] | 36          | TH + USO for IVL | Abdominal swelling | 15        | TV | Heart, lung     | TR + USO + TVP + GnRHa | PFS                          |
| Baboci et al., (2014) [7] | 51          | TH for IVL | Shortness of breath | NA | Anterior wall of RA, TV, chordae tendineae | Heart, lung | TR + TVP | PFS (2 years) |
| Lin and Liu, (2014) [8] | 43          | TH + BSO for IVL | Palpitation, chest distress | 15 | Heart, lung | None | PFS                          |
| Zhang and Lang, (2016) [6] | 40          | Uterine mass | None | 30 | Chordae tendineae, papillary muscles | Heart, lung | TR + TH + BSO + GnRHa | PFS (2 months)       |

RA Right atrium, TR Tumor resection, TH Total hysterectomy, TVP Tricuspid valvuloplasty; GnRHa Gonadotropin releasing hormone agonist, PFS Progression free survival, USO Unilateral salpingo-oophorectomy, IVL Intravenous leiomyomatosis, TV Tricuspid valve, NA Not available, BSO Bilateral salpingo-oophorectomy
metastasis [11], in 58% of IVL cases, which is higher than the 32% in cases with typical uterine leiomyoma. Regional chromosomal alterations of variable frequencies were also observed in IVL, showing overlaps with uterine leiomyosarcoma [12]. Thus, IVL has an intermediate biological propensity between a benign and malignant status. Recurrence of IVL tends to occur in younger patients. Du et al. [1] have suggested that young patients should be treated using hysterectomy and salpingo-oophorectomy if the patient does not wish to maintain fertility. Mizoguchi et al. [13] pointed out that anti-estrogen therapy may be an effective treatment if the patient has not yet entered menopause. These results suggest that IVL treatment requires tumor reduction and blockage of blood flow and estrogen to limit continued growth of the tumor and possible metastasis.

In conclusion, we report a unique case in which a right atrial leiomyoma was identified following a uterine leiomyoma. The uterine IVL had an isolated large metastasis to the right atrium that was adherent to the endocardium via a richly vascularized pedicle. Our case exemplifies that IVL metastatic tumors have the potential to grow via their vascularization.

Abbreviations
CT: Computed tomography; ER: Estrogen receptor; IVL: Intravenous leiomyomatosis; MRI: Magnetic resonance imaging; PgR: Progesterone receptor; α-SMA: α-smooth muscle actin

Acknowledgements
We would like to thank Editage (www.editage.jp) for English language editing.

Authors’ contributions
MiY: conceptualization, pathologic diagnosis, immunohistochemical analysis, and writing of manuscript. YN, SI: collection of clinical data. TK, RK: radiologic analysis. MAY (the last author): pathologic diagnosis and immunohistochemical analysis. EK: radiologic analysis. YN, SI: collection of clinical data. TK, RK: radiologic analysis.

Funding
This work was supported by Sekiguchi Memorial Award (grant no. 18-C-1-02) at Saitama Medical University and Grants-in-Aid from the Ministry of Education, Science, Sports and Culture of Japan (Research Project Numbers: 18 K06997).

Availability of data and materials
All data generated or analyzed during this study are included in this published article.

Ethics approval and consent to participate
The patient provided consent for publication of the case report.

Consent for publication
Written informed consent was obtained from the patient for the publication of this case report.

Competing interests
The authors declare that they have no competing interests.

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