

Case report

Symptomatic uterine leiomyomatosis with intracaval and intracardiac invasion: Video case report

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ABSTRACT

Background: Fibroid is the most prevalent benign tumor of the female genital tract. Intravenous and intracardiac leiomyomatosis (IVL and ICLM, respectively) are rare complications that present with symptoms of pulmonary thromboembolism and heart failure and whose etiology, despite controversial, is a direct vascular invasion by a primary uterine leiomyoma.

Case presentation: We present the case of a 31-year-old female patient with a previous history of pelvic pain and dysmenorrhea, whose ultrasound showed an enlarged and heterogeneous uterus. Complete hysterectomy was performed, and the anatomopathological examination showed leiomyomas without evidence of malignancy. One month later, the patient manifested dyspnea and chest pain. A neoplastic thrombus was identified, extending from the inferior vena cava to the right atrium, for which we proceeded with cavo-atrial thrombectomy under Normothermic Cardiopulmonary Bypass (CPB) with Warm Blood Cardioplegia (WBC). A metastatic lung injury of non-malignant histology was also detected.

Discussion: Uterine leiomyoma is a very common benign tumor of the female genital tract. IVL with ICLM are rare and difficult-to-treat complications, whose etiology is a direct vascular invasion by a primary uterine leiomyoma, although it is still controversial. The incidence of ICLM is 10 to 30% of IVL cases. The main symptoms of ICLM are dyspnea, syncope, edema of the lower extremities and palpitations. Treatment is based on complete surgical removal of the tumor thrombus. Studies demonstrated that the one-stage procedure is safer from the patient's perspective and that CPB with WBC reduced intraoperative blood loss and total operative time, ensuring a less traumatic postoperative.

Conclusions: Most patients with uterine leiomyoma are asymptomatic and acute complications are rare. In ICLM clinical manifestations are related to heart failure and flow obstruction. Because of the severity of the condition and the curative potential of treatment, surgery is morbid but highly recommended. The use of CPB with WBC improved the postoperative period and increased the patient's quality of life.

1. Background

Uterine leiomyoma is the most common benign tumor of the female genital tract (Okolo, 2008), and is the leading cause of hysterectomy in

premenopausal women (Csatlós et al., 2010). Despite many patients being asymptomatic, we describe the case of a young patient who presented with complications of intravenous and intracardiac leiomyomatosis (IVL and ICLM, respectively) accompanied by thoracic symptoms,

Abbreviations: CPB, Cardiopulmonary bypass; ICLM, Intracardiac Leiomyomatosis; ICU, Intensive Care Unit; IVC, Inferior vena cava; IVL, Intravenous Leiomyomatosis; MRI, Magnetic Resonance Imaging; PCOS, Polycystic Ovary Syndrome; PO, Postoperative; RCC, Red Cell Concentrate; SIRS, Systemic Inflammatory Reaction; VTE, Venous Thromboembolism; WBC, Warm Blood Cardioplegia.

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in addition to lung metastasis.

The incidence of ICLM is 10 to 30% of IVL cases (Miro et al., 2021). The IVL etiology is still controversial, but the most accepted theory is a direct invasion by a primary fibroid. Patients usually have a history of uterine myoma or previous myomectomy/hysterectomy (Deng and Song, 2020; Liu et al., 2009; Miro et al., 2021).

Clinical manifestations are symptoms of pulmonary thromboembolism and heart failure, such as dyspnea, syncope, edema of the lower extremities and palpitations (Li et al., 2013; Liu et al., 2009). Tumor recurrence rates can be substantially reduced with the total removal of the tumor (Miro et al., 2021).

2. Case presentation

We present a case of a 31-year-old Black female patient that reported pelvic pain and dysmenorrhea. Nulliparous, obese, without other comorbidities. In another service, a Transvaginal Ultrasound evidenced an enlarged heterogeneous uterus. In May 2017, a complete hysterectomy was performed. The surgical specimen weighed 13,9 pounds, and its anatomopathological examination showed leiomyomas without evidence of malignancy.

In June 2017, the patient presented with dyspnea and chest pain. A Transthoracic Echocardiogram showed a thrombus in the right atrium. After sternotomy, the lesion was considered unresectable at that time. The biopsy performed resulted in fusocellular neoplasm, without atypia, richly vascularized, with areas of stromal fibrohyalinization, and the immunohistochemical analysis revealed angioleiomyoma.

The patient was referred to our service, where a Magnetic Resonance Imaging (MRI) of the Chest, Abdomen and Pelvis was performed. The main findings were a vascularized lesion in the lumen of the inferior vena cava (IVC), extending for approximately 19 cm, from 8 cm above the confluence of the common iliac veins to its outlet in the right atrium, with an external component around the right gonadal vein (Fig. 1). MRI also demonstrated a nodule on the lingula, measuring 2.5 cm, whose Percutaneous Biopsy evidenced neoplasm with smooth muscle differentiation of gynecological/Müllerian type without criteria for malignancy. On Intraoperative Transesophageal Echocardiography (TEE), a mass was demonstrated partially filling the lumen of the IVC and projecting to the right atrium, suggestive of a tumor. Aspects of anatomy and cardiac function were normal.

After discussion with general and cardiovascular surgery and given the risk of venous system obstruction and pulmonary thromboembolism, we indicated cavo-atrial thrombectomy under Normothermic Cardiopulmonary Bypass (CPB) with Warm Blood Cardioplegia (WBC) to manipulate the atrium without excessive bleeding, ensuring a safer treatment.



Fig. 1. MRI showing extension of the thrombus in the IVC to the right atrium.

3. Surgical procedure

We proceeded with cavo-atrial thrombectomy in a one-stage technique under Normothermic CPB with WBC. First, a midline laparotomy was performed to control the intra-abdominal tumor site and to remove the venous invasion in the right ovarian vein. The structures were dissected and repaired (Fig. 2). The cardiovascular team proceeded with sternotomy, followed by cannulation of the superior vena cava, right iliac vein, and ascending aorta, to enter in CPB with WBC to perform the atriotomy and manipulate the atrium without excessive bleeding, controlling the distal part of the tumor and preventing embolism. The Cell Saver equipment was used to perform intraoperative blood recovery, minimizing the need for transfusion.

Then, the IVC was opened and the tumor thrombus that extended from the IVC to the right atrium was removed through the IVC opening. In addition, the right uterine vein filled by the neoplastic thrombus was also resected, constituting the surgical specimen (Fig. 3). Finally, IVC and the right atrium were sutured, and circulation was restored. Drains were placed in the right iliac fossa and left costal margin.

It totaled 9 h of surgery and 12 h of anesthesia. The patient remained on CPB for 16 min and in anoxia for 5 min, with an estimated blood loss of 3 L, and no Red Cell Concentrate (RCC) was applied.

4. Pathologic examination

The immunohistochemical profile and the morphological findings were compatible with a mass of mature smooth muscle tissue, without atypia, with an extremely low proliferative index estimated by the Ki67 antigen, suggestive of richly vascularized Müllerian leiomyoma.

5. Post-surgical recovery

The patient was extubated on the first postoperative day (1st PO) and drug prophylaxis for venous thromboembolism (VTE) was started. The patient was discharged from the Intensive Care Unit (ICU) on the 3rd PO. On the 6th PO Day, the patient evolved with pulmonary thromboembolism, receiving full anticoagulation. The patient was discharged from the hospital on the 12th PO, without further complications. No tumor recurrence was diagnosed during follow-up.

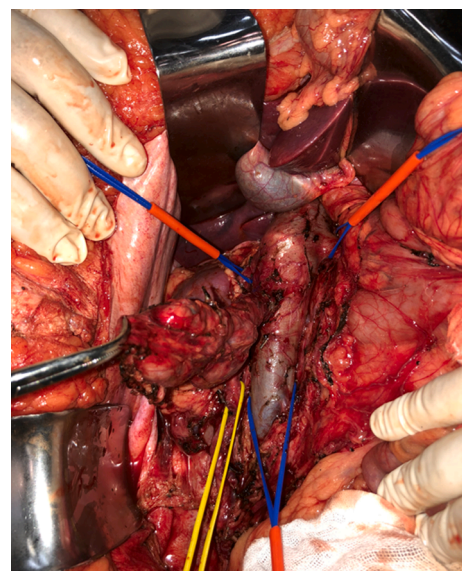


Fig. 2. Renal veins and IVC (blue vessel loops) and ureter (yellow loop). On the left, the neoplastic thrombus within the right. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)



Fig. 3. Surgical piece consisting of the neoplastic thrombus and the right ovarian vein (Fig. 3).

6. Discussion

In the current literature, uterine leiomyoma is one of the most common diseases in women of reproductive age. Fibroids are more symptomatic and have a greater capacity for complications in Black women and this is assumed to be related to circulating estrogen levels and its metabolism (Faria et al., 2008). Relevant complications are renal failure, infertility, intraperitoneal hemorrhage, and thromboembolism (Gupta and Manyonda, 2009). Rarely, tumor cells may progress to the intravenous system (IVL), and 10 to 30% of these cases can reach the right chambers of the heart (ICLM) (Miro et al., 2021) and pulmonary arteries. Also, fibroids may present with benign lung metastasis that do not progress when the primary disease is treated (Ki et al., 2013; Ma et al., 2016).

The origination of IVL is controversial, but there are two main theories that explain its etiology: direct vascular invasion by a primary uterine leiomyoma and origin of the tumor from the venous walls. The first theory is usually the most accepted since tumor cells are positive for estrogen- and progesterone-receptors; patients have a history of uterine myoma/myomectomy/hysterectomy; and tumor bases are often connected to the uterine wall (Deng and Song, 2020; Liu et al., 2009; Miro et al., 2021). According to the medical literature, there are 4 categories to describe the progression of uterine leiomyoma through the venous system. In stage I, the tumor penetrates the wall of the uterine vein but is confined to the pelvic cavity. In stage II, the tumor extends into the abdominal cavity. In stage III, the tumor reaches the renal vein and may extend into the right atrium, configuring the ICLM. In stage IV, the tumor reaches the pulmonary arteries and/or there is pulmonary metastasis (Ma et al., 2016). The case reported is classified as stage IV.

The clinical manifestation of ICLM is diverse, depending on the extension and size of the tumor thrombus (Miro et al., 2021). Approximately 13% of the patients have little or no compromise of venous return, being asymptomatic. Common reported symptoms are dyspnea, syncope, edema of the lower extremities and palpitations, followed by

ascites, fatigue, jugular stasis, chest and abdominal pain and hepatomegaly, symptoms of pulmonary thromboembolism and heart failure. (Li et al., 2013; Liu et al., 2009) The prolapse into the right ventricle can obstruct the flow and cause sudden death (Miro et al., 2021).

The diagnosis of ICLM can be difficult by the no specificity of the initial symptoms, so clinical suspicion is necessary in women with a previous history of uterine leiomyomatosis, symptoms of right-sided heart failure, intracardiac thrombus or pulmonary embolism. (Castagneto Gissey et al., 2017) Differential diagnosis are right atrial myxoma, thrombus-in-transit, renal cell carcinoma, hepatocellular carcinoma, lymphoma, and metastatic cardiac tumors. (Castagneto Gissey et al., 2017; Li et al., 2013).

The surgery can be performed in one or two stages. On the two-stage technique, a separate approach to intracardiac and intra-abdominal tumor is made, with an interval of 7 days to 2 years. (Li et al., 2013) This procedure is recommended for patients who cannot tolerate a one-stage surgery, in emergencies, when the tumor is adhered to the vascular wall or intracardiac structures, or when its size is too extensive. The disadvantages of a two-stage surgery are more intraoperative blood loss; longer total operation time; as well as longer postoperative hospital stays and increased risk of recurrence. (Deng and Song, 2020; Liu et al., 2009; Luciani et al., 2009) The one-stage surgery is performed with simultaneous sternotomy and laparotomy and necessarily occurs with collaboration of a joint surgical team. The advantages of this procedure are complete resection and reduced risk of tumor embolism due to incomplete tumoral removal; reduced hemodynamic complications throughout the surgical interval; better control of bleeding; possibility of proper structures reconstruction; prevention of a second general anesthetic risks; and greater economic benefits. (Deng and Song, 2020; Liu et al., 2009; Miro et al., 2021).

In cases of ICLM, CPB is usually the approach of choice. (Liu et al., 2018) Studies described lower intraoperative blood loss and shorter total operative time, as well as greater possibility of atrial manipulation and subhepatic veins evaluation. (Deng and Song, 2020; Luciani et al., 2009; Ma et al., 2016) The procedure without the protection of CPB have increased risk of massive blood loss, notably when there are multiple strands of tumor, tumor adhesions to the IVC requiring extensive venotomy or dilated tumor larger than the size of IVC (Li et al., 2016).

After complete removal of the tumor lesion, studies did not observe recurrence of the disease (Miro et al., 2021). However, in some cases complete removal is not possible. Hence, the removal of the ovaries can inhibit tumor growth as its closely related to circulating estrogen levels and as there are estrogen and progesterone receptors on the IVL cells surface. (Castagneto Gissey et al., 2017; Ma et al., 2016).

7. Conclusions

Uterine myoma is the most common tumor of the female genital tract. Benign and often asymptomatic, it usually does not present major risks. Rarely, complications such as IVL and ICLM can develop, causing clinical manifestations of heart failure and obstruction of cardiac flow that may progress to sudden death.

In these situations, despite morbid procedures, surgery is highly recommended due to the severity of the condition and the curative potential of the complete treatment. In the case reported, the use of CPB with WBC reduced the surgical repercussions, improving the postoperative period and increasing the patient quality of life.

8. Additional file

Additional file 1. File format: mp4. Title: Symptomatic Uterine Leiomyomatosis with Intracaval and Intracardiac Invasion Video Case Report.mp4. Description: Video case report demonstrating the surgical procedure of cavo-atrial thrombectomy assisted by CPB and WBC. It totaled 9 hours of surgery and 12 hours of anesthesia, with 16 minutes of CPB and 5 minutes in anoxia. We estimated a blood loss of 3 liters. No

Red Cell Concentrate (RCC) was applied. File size: 92,1 MB.

CRedit authorship contribution statement

Débora Faciochi Cassol: Data curation, Writing – original draft, Writing – review & editing. **Frederico José Ribeiro Teixeira Junior:** Conceptualization, Formal analysis. **Sérgio Dias do Couto Netto:** Conceptualization, Formal analysis. **Lenira Chierentin Rengel:** Data curation. **Luciana Ragazzo:** Data curation. **Fábio Antonio Gaiotto:** Data curation. **Edivaldo Massazo Utiyama:** Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.gore.2022.101127>.

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