



# Kasabach-Merritt-like phenomenon in a massive uterine leiomyoma presenting with chronic disseminated intravascular coagulation: A case report

Leo Reap<sup>a,\*</sup>, Kathleen McDonald<sup>a</sup>, Archana Balakrishnan<sup>b</sup>, Cynthia Vakhariya<sup>a</sup>

<sup>a</sup> Ascension Providence Hospital, Department of Hematology/Oncology, Department of Gynecological Oncology, 16001 W. Nine Mile Rd., Southfield, MI 48075, United States of America

<sup>b</sup> Michigan State University College of Human Medicine, Department of Hematology/Oncology, Department of Gynecological Oncology, Ascension Providence Hospital, 16001 W. Nine Mile Rd., Southfield, MI 48075, United States of America

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## ABSTRACT

Kasabach-Merritt phenomenon is a process where the presence of vascular irregularity within a Kaposiform hemangioendothelioma or tufted angioma leads to constitutive coagulation factor activation and the development of chronic disseminated intravascular coagulation (DIC). A similar phenomenon has been seen in other tumors but has rarely been described. A 42-year-old woman presented to the hospital following the development of worsening easy bruising and bleeding. She was ultimately found to have a massive uterine fibroid that led to constitutive coagulation cascade activation and subsequent chronic DIC. Following resection, she had complete resolution of DIC and made a full recovery. Although rare, the development of unexplained chronic DIC in a woman should prompt evaluation for the presence of massive uterine fibroids.

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## 1. Introduction

Kasabach-Merritt phenomenon is a process where the presence of irregular vascular architecture, specifically within a Kaposiform hemangioendothelioma or tufted angioma, leads to platelet trapping, coagulation cascade activation, and the development of chronic disseminated intravascular coagulation (DIC) [1]. However, a similar process can occur in other malignancies and disorders that lead to irregular vascular flow or exposure of subendothelial collagen [2]. Herein, we present the fourth reported case of chronic DIC secondary to a massive uterine fibroid with internal cystic degeneration.

## 2. Case

### 2.1. Patient Information

A 42-year-old woman, G1P0010, presented to the outpatient hematology clinic for evaluation of easy bruising of six months' duration. She

*Abbreviations:* CBC, Complete Blood Count; DIC, Disseminated Intravascular Coagulation; DVT, deep vein thrombosis; GERD, Gastroesophageal Reflux Disease; INR, international normalized ratio; PT, Prothrombin Time; PTT, Partial Tissue Thromboplastin Time; WBC, White Blood Cell.

\* Corresponding author.

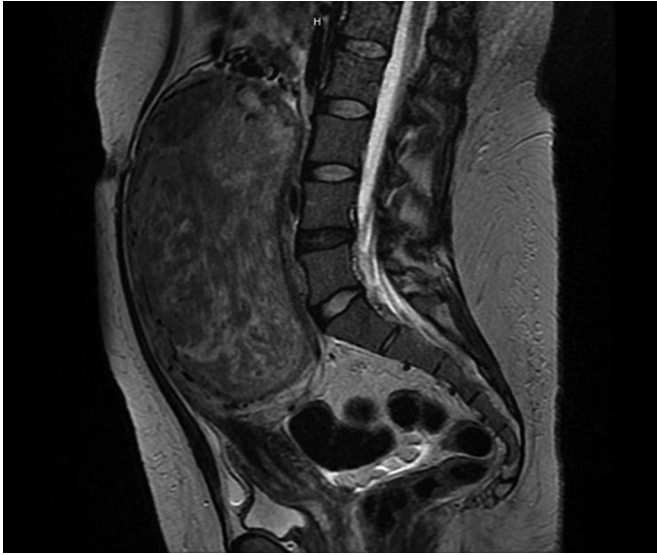
E-mail address: [leo.reap@ascension.org](mailto:leo.reap@ascension.org) (L. Reap).

noted that she developed ecchymoses in her lower extremities with very minimal activity. She had a dental procedure two months prior to presentation and had protracted gingival bleeding. She had never required red blood cell transfusion in the past. Prior to the onset of her symptoms, she never had any prolonged bleeding with previous surgery or with her menses. She had no family history of bleeding or clotting disorders. She reported a past miscarriage at 7 weeks of gestation. Physical examination demonstrated a large abdominal mass palpable above the umbilicus. The mass had been previously noted with MRI undertaken four years before the current presentation (Fig. 1).

### 2.2. Diagnostic Assessment and Clinical Course

Initial CBC demonstrated a hemoglobin level of 13.7 g/dL, platelet count of 191,000, and WBC count of 6900. Prolongation of PTT was seen at 43.1 s, PT 16.2 s, and international normalized ratio (INR) of 1.26. Complete correction of her coagulopathy with mixing studies suggested factor deficiency. Fibrinogen level was low at 75 mg/dL. Factor VIII level was 127%. Von Willebrand factor activity level was normal. Platelet function assay was normal. Peripheral smear demonstrated 2–3 schistocytes per HPF. A presumptive diagnosis of chronic DIC was made, but the source could not be clearly identified.

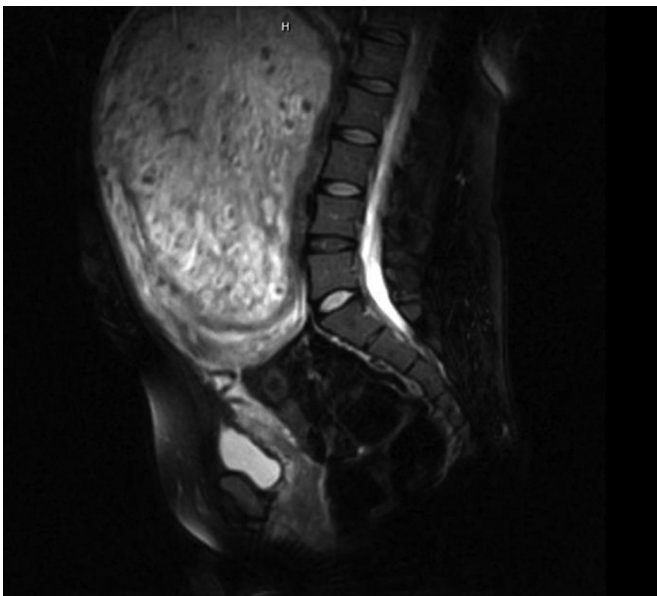
Over the following 4 months, she reported spontaneous regression of her bruising.



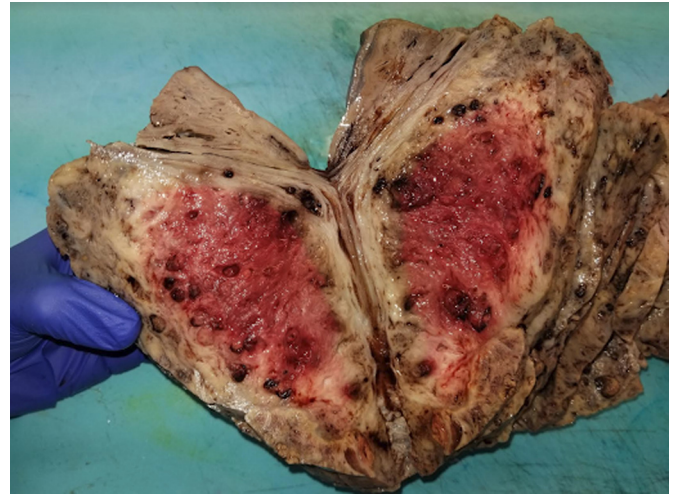
**Fig. 1.** Sagittal T2-weighted pelvic MRI obtained four years before the current presentation, demonstrating a  $18 \times 15 \times 9$  cm vascular-dominant heterogeneously enhancing pelvic mass consistent with a large leiomyoma.

One month later, she developed recurrence of her symptoms and reported significant ecchymosis in her right lower extremity after carrying out minor household chores. Laboratory evaluation at that time demonstrated a PT of 17.9, INR 1.47, PTT 14.3, and a fibrinogen level less than 60 mg/dL. She denied heavy menses or any other recent bleeding.

She was admitted to the hospital two weeks later, found to have a right peroneal vein DVT. Fibrinogen level was found to be critically low, less than 40 mg/dL. D-dimer was greater than 5000 ng/mL. No source of bleeding was apparent and hemoglobin was stable at 9.2 g/dL. She was started on heparin and had improvement in her DIC parameters, including an increase in her fibrinogen level to over



**Fig. 2.** Sagittal T2-weighted pelvic MRI obtained in the current episode demonstrating a  $22 \times 15 \times 23$  cm vascular-dominant heterogeneously enhancing pelvic mass consistent with a large leiomyoma, significantly enlarged from prior and displaying increased vascular enhancement.



**Fig. 3.** Gross examination of the surgical specimen revealed a partially cystic, partially solid whorled mass that was well demarcated from the myometrium. Multiple areas of clotted blood were noted throughout the cystic components, as seen here.

200 mg/dL. Further investigation revealed factor VII activity of 114%, von Willebrand factor antigen 188%, lupus anticoagulant was negative, protein C total was 98%, function was 127%, protein S function was 122%, suggestive of increased coagulation activity.

CT of the abdomen/pelvis demonstrated a  $25 \times 23 \times 18$  cm fundal uterine fibroid -comparable to a 32-week gestation fetus in size - noted to have significantly increased in size compared to 4 years prior ( $18 \times 15 \times 9$  cm at that time [Fig. 1]). She was discharged home on enoxaparin 1 mg/kg per day. Subsequent MRI confirmed the presence of a  $22 \times 15 \times 23$  cm vascular-dominant uterine fibroid with heterogeneous enhancement causing displacement of intra-abdominal, retroperitoneal structures, and even compromise of the liver with displacement of bowel loops (Fig. 2).

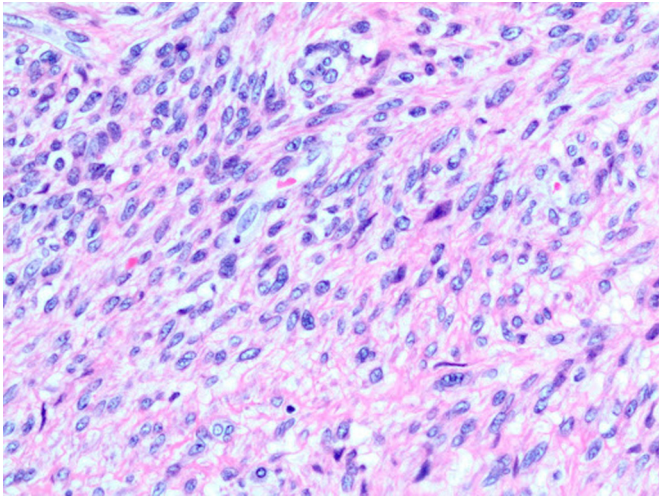
She was evaluated by gynecological oncology, who deemed she was appropriate for hysterectomy. She underwent successful extrafascial hysterectomy with left internal iliac artery ligation. Pathology demonstrated an 18 cm partially cystic, partially solid benign leiomyoma with patchy areas of increased cellularity, multiple intravascular thrombi, and multiple areas of degeneration, infarction, and hemorrhagic change. There was a large whorled area filled with clotted blood. The largest area of intravascular thrombus was noted to be 1 cm in length. The gross surgical specimen weighed 3237 g, or 7.13 pounds (Figs. 3, 4 and 5).

Her postoperative course was complicated by hypotension and suspected ongoing intra-abdominal blood loss. She was taken back to



**Fig. 4.** Gross examination of the surgical specimen from the serosal surface. It was 18 cm in length and the gross surgical specimen weighed 3237 g. It was comparable to a 32-week gestation fetus in size.





**Fig. 5.** Microscopic view of the tumor, demonstrating uterine leiomyoma with patchy areas of increased cellularity, multiple intravascular thrombi (the largest up to 1 cm [not shown]) and with areas of degeneration, infarction, and hemorrhagic change.

the operating room, where no isolated site of bleeding was seen. Blood was noted inside the peritoneal cavity that had not clotted. The blood was evacuated and her right internal iliac artery was ligated as well to prevent recurrence of intra-abdominal bleeding. No active bleeding points were identified.

She had an uneventful postoperative course and had complete correction in her coagulopathy.

### 2.3. Follow-Up and Outcomes

One month postoperatively, she reported complete resolution of her symptoms and felt well. Hemoglobin was stable at 12.2 g/dL and platelets were 230,000. Coagulation studies demonstrated a PTT 34.7 s, PT 13.0 s, and INR 0.95. D-dimer was negative, consistent with complete resolution of her chronic DIC.

## 3. Discussion

Uterine leiomyomas are an exceedingly common gynecological tumor, occurring in up to 30–40% of women during their lifetime [3]. As leiomyomas progressively enlarge, they tend to outgrow their blood supply and degenerate internally, disrupting laminar blood flow through the tumor vasculature [4]. There are several types of degeneration, including hyaline, cystic, myxoid, or red degeneration that can occur with or without dystrophic calcification. Though hyaline degeneration is the most common and occurs in 60% of tumors, cystic degeneration is seen only in approximately 4% and thought to be an extreme sequela of edema [5]. Despite being incredibly common, leiomyomas very rarely cause DIC [4].

Chronic DIC is thought to occur due to the presence of a constant weak or intermittent exposure to a pro-coagulant substance and can occur in the setting of other malignancies [6]. Also known as compensated DIC, some patients are asymptomatic and the condition is identified when an elevated D-dimer and fibrin degradation products are noted in the absence of another etiology. Unlike in acute DIC, which is associated with prolonged PTT, PT and thrombin time, chronic DIC can have normal or only mildly deranged coagulation studies [6]. The pathophysiology behind this phenomenon is that coagulation factors and platelets are consumed, and the consumption is balanced against hepatic and endothelial production of clotting factors; therefore, coagulation studies are normal or slightly elevated [6,7]. Patients who are symptomatic are more likely to have thrombus rather than bleeding. This is consistent with our case, where DVT developed several months

prior to decompensation of DIC. This may have in part been caused by mass effect on the venous circulation. DVTs are most commonly seen in uterine fibroids when the mass exceeds 1000 g [8].

Chronic DIC has classically been described in the setting of underlying malignancy, retained products of conception, aneurysm and liver disease [9–11]. Further review of the literature identifies reports of chronic DIC presenting in the setting of renal mass and left atrial thrombus. A similar phenomenon is seen in several other disorders of vascular disruption. This case mirrors what is seen in Kasabach-Merritt phenomenon, where the presence of irregular vascular architecture specifically within a Kaposiform hemangioendothelioma or tufted angioma leads to platelet trapping, clotting factor consumption, and subsequent DIC [1].

Though DIC is commonly seen in the setting of metastatic disease, it is seldom seen in isolated non-metastatic solid organ tumors [2,10]. This case report, along with previous case reports, suggests that development of DIC in a solid organ likely depends upon the size of the tumor, the degree of vascular flow that the tumor possesses, the amount of platelet exposure to subendothelial collagen, and/or the degree of turbidity of blood flow through irregular vessels [2,10]. Clot formation then leads to obstruction and infarction of distal vessels. This disrupts blood flow and damages the endothelium, leading to further exposure of subendothelial collagen and activation of coagulation factors. This cycle perpetuates a smoldering, persistent form of DIC.

Thus, in the setting of a rapidly enlarging or massive leiomyoma, internal degeneration of a tumor may act as a nidus for clot formation, promoting platelet adhesion and subsequent consumptive coagulopathy. In this case, there was clear evidence of this process in the excised leiomyoma, with multiple intravascular thrombi with areas of degeneration, infarction, and hemorrhage. Though acute DIC has been described during extensive myomectomy, chronic DIC from internal degeneration appears to be a relatively rare phenomenon [12]. To our knowledge and best review of the literature, this appears to be only the fourth documented case to date. [13–15].

## Contributors

Leo Reap, Kathleen McDonald, Archana Balakrishnan provided conceptualization, Writing - original draft, review & editing.

Dr. Vakhariya was involved in supervision of the manuscript, responsible for review and editing of the final product.

## Conflict of Interest

The authors declare that they have no conflict of interest regarding the publication of this case report.

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## Patient Consent

Obtained.

## Provenance and Peer Review

This case report was peer reviewed.

## References

- [1] P. Mahajan, J. Margolin, I. Jacobas, Kasabach-Merritt phenomenon: classic presentation and management options, *Clin. Med. Insights Blood Disorder.* 10 (2017), 1179545X1769984. <https://doi.org/10.1177/1179545X17699849>.
- [2] M. Levi, Clinical characteristics of disseminated intravascular coagulation in patients with solid and hematological cancers, *Thromb. Res.* 164 (2018) S77–S81, <https://doi.org/10.1016/j.thromres.2018.01.016>.

- [3] E.A. Stewart, Uterine fibroids. Solomon CG, ed. *N. Engl. J. Med.* 372 (17) (2015) 1646–1655, <https://doi.org/10.1056/nejmcp1411029>.
- [4] A. Taneichi, H. Fujiwara, Y. Mizoguchi, et al., Disseminated intravascular coagulopathy caused by uterine leiomyoma with sarcoma-like findings on magnetic resonance imaging, *Case Rep. Obstet. Gynecol.* 2014 (2014) 1–4, <https://doi.org/10.1155/2014/978743>.
- [5] C. Kaushik, A. Prasad, Y. Singh, B. Baruah, Case series: cystic degeneration in uterine leiomyomas, *Indian J. Radiol. Imaging* 18 (1) (2008) 69, <https://doi.org/10.4103/0971-3026.35820>.
- [6] M. Levi, Diagnosis and treatment of disseminated intravascular coagulation, *Int. J. Lab. Hematol.* 36 (3) (2014) 228–236, <https://doi.org/10.1111/ijlh.12221>.
- [7] M. Levi, H. ten Cate, Disseminated intravascular coagulation, *N. Engl. J. Med.* 341 (8) (1999) 586–592, <https://doi.org/10.1056/nejm199908193410807>.
- [8] M. Shiota, Y. Kotani, M. Umemoto, et al., Deep-vein thrombosis is associated with large uterine fibroids, *Tohoku J. Exp. Med.* 224 (2) (2011) 87–89, <https://doi.org/10.1620/tjem.224.87>.
- [9] Q. Shao, R. Tian, X. Zhang, et al., Chronic disseminated intravascular coagulation induced by left atrial thrombus in a patient with giant “normal” heart, *Medicine.* 95 (51) (2016) e5501, <https://doi.org/10.1097/md.0000000000005501>.
- [10] M. Somashekhar, P. Kadamba, M. Wakodkar, Chronic disseminated intravascular coagulation presenting as renal mass, *J. Indian Assoc. Pediatr. Surg.* 13 (4) (2008) 144, <https://doi.org/10.4103/0971-9261.44767>.
- [11] I. Duran, I.F. Tannock, Disseminated intravascular coagulation as the presenting sign of metastatic prostate cancer, *J. Gen. Intern. Med.* 21 (11) (2006) C6–C8, <https://doi.org/10.1111/j.1525-1497.2006.00506.x>.
- [12] X.-L. Li, X.-J. Wan, Q. Zhang, et al., Laparoscopic myomectomy complicated by disseminated intravascular coagulation: a case report and review of the literature, *Eur. J. Obstet. Gynecol. Reprod. Biol.* 155 (1) (2011) 115–116, <https://doi.org/10.1016/j.ejogrb.2010.12.033>.
- [13] M.G. Harris, P. Bannatyne, P. Russell, K. Atkinson, K.A. Rickard, H. Kronenberg, Chronic consumptive coagulopathy with a uterine leiomyoma, *Aust. N. Z. J. Obstet. Gynaecol.* 22 (1) (1982) 54–58, <https://doi.org/10.1111/j.1479-828x.1982.tb01401.x>.
- [14] R. Caputo, A. Kanbour-shakir, Chronic disseminated intravascular coagulation caused by a uterine leiomyoma. A case report, *J. Reprod. Med.* 38 (9) (1993) 737–740.
- [15] K. Kitao, N. Ohara, T. Funakoshi, et al., Consumptive coagulopathy that developed in a pregnant woman with degenerated uterine leiomyoma: case report, *Clin. Exp. Obstet. Gynecol.* 32 (4) (2005) 250.