Spontaneous Isolated Superior Mesenteric Artery Dissection in a 44-Year-Old Female: a Rare Presentation of Polyarteritis Nodosa

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DISCLOSURE: None

Abstract

BACKGROUND: Spontaneous isolated superior mesenteric artery dissection (SISMAD) is a rare vascular condition where the superior mesenteric artery is affected by dissection without involving other arteries. Its incidence is estimated at 0.06% to 0.08% globally. The possible causes include polyarteritis nodosa (PAN), an autoimmune disease affecting medium-sized arteries. SISMAD can manifest with various clinical presentations, from asymptomatic to acute bowel ischemia, warranting consideration when common causes of acute abdomen are ruled out.

CASE SUMMARY: This is the case of a 44-year-old female Filipino, hypertensive, who complained of abdominal pain, initially managed as intestinal amoebiasis. Abdominal examination showed a soft, non-tender abdomen with no guarding, making the symptoms disproportionate to physical examination. Due to persistence of symptoms despite a full antibiotic course, further workup was done. Computed tomography (CT) scan of the whole abdomen with contrast revealed an isolated dissection of the proximal superior mesenteric artery (SMA) with thrombosis which was confirmed on CT angiography. The diagnosis of PAN was established based on the correlation of clinical presentation, laboratory findings and imaging results. Conservative management was done and to address the thrombosis, anticoagulation with heparin was initiated. The patient was also given methylprednisolone pulse therapy and cyclophosphamide with good response. Resolution of symptoms noted and she was eventually discharged improved.

CONCLUSION: SISMAD and PAN are independently rare conditions. This unique case involved both diseases in a 44-year-old Filipino female, and to date, there have been no reported similar cases worldwide. Early diagnosis of the disease requires a high degree of suspicion and pattern recognition. This is crucial for timely treatment and improved prognosis. Furthermore, close surveillance is important to identify potential relapses even after symptom resolution.

KEYWORDS: Superior mesenteric artery dissection, SMAD; spontaneous isolated superior mesenteric artery dissection, SISMAD; polyarteritis nodosa, PAN

INTRODUCTION

Spontaneous isolated superior mesenteric artery dissection (SISMAD) is an uncommon cause of abdominal pain and represents the most common type of mesenteric artery dissection.[1] While a superior mesenteric artery (SMA) dissection is commonly seen in association with aortic dissection, isolated lesions are rare.[2,3] Clinical presentation ranges from an asymptomatic incidental finding to acute bowel ischemia or fatal rupture.[2] The potential causes of SISMAD include trauma, congenital connective tissue disorders, segmental arterial mediolysis, arteriosclerosis, cystic medial necrosis and vasculitis.

Polyarteritis nodosa (PAN) is a rare form of necrotizing medium-vessel vasculitis that can cause widespread organ involvement, commonly the skin, renal, neurologic, gastrointestinal and musculoskeletal systems. Presentation may be focal or systemic in which most cases in literature manifest with constitutional symptoms such as fever, weight loss, malaise, as well as arthralgias, myalgias and renal involvement. Involvement of the gastrointestinal system usually is associated with increased morbidity and mortality.[4]

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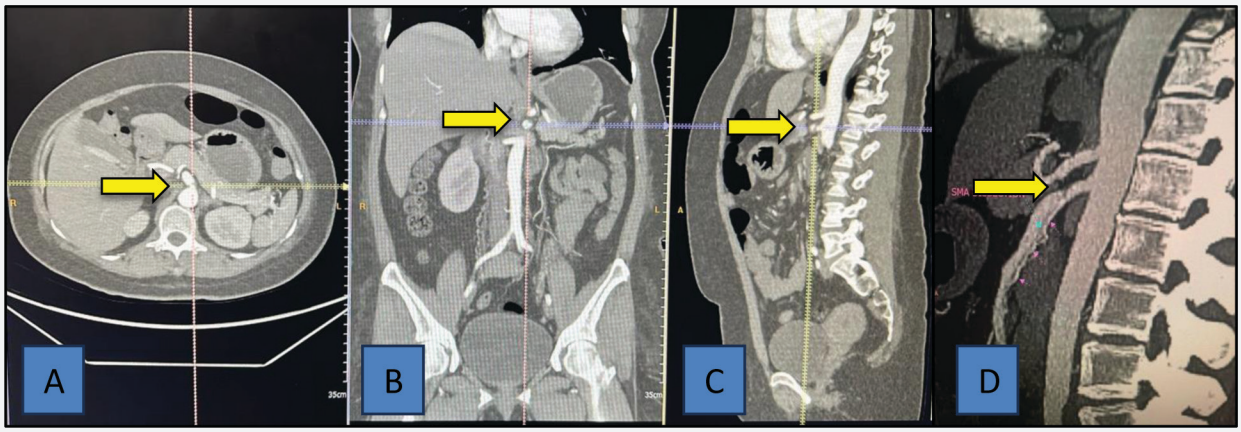

Figure 1. SMA Dissection. Axial (A), Coronal (B), Sagittal (C, D) views on CT scan showing the proximal SMA dissection with an intimal flap and thrombosed false lumen. (yellow arrows)

Here we describe the case of a 44-year-old female who presented with abdominal pain that was out of proportion to physical examination findings suggestive of mesenteric ischemia from isolated SMA dissection with thrombosis and was eventually diagnosed with PAN.

OBJECTIVES

General Objective

To present a rare case of a 44-year-old female who presented with spontaneous isolated superior mesenteric artery dissection (SISMAD) with thrombosis and uncovered the etiology of polyarteritis nodosa (PAN)

Specific Objectives

To present the incidence of SISMAD, its diagnosis and clinical relevance

To present the clinical approach in diagnosis of PAN

To discuss the current management approach of SISMAD in patients with PAN

THE CASE

The patient is a 44-year-old female, hypertensive with good control, no significant medical hospitalizations and no history of smoking or illicit drug use. She presented with a 10-day history of unremitting epigastric pain described as sharp, severe and constant, associated with food intake. No episodes of fever, nausea, vomiting, diarrhea, or history of this type of pain in the past. Alteration in bowel movement was noted, attributed to poor appetite and food fear. There was significant weight loss of five kilograms in the past month. Furthermore, she complained of intermittent bilateral lower extremity pain, but tolerated the condition. On physical examination, vital signs were within normal limits with no significant blood pressure difference in both upper and lower extremities. The patient had no rashes upon inspection. Cardiovascular and pulmonary exams were unremarkable. Abdominal examination showed a soft, non-tender abdomen with normoactive bowel sounds. No rebound tenderness, guarding or peritoneal signs were noted. It was noteworthy that abdominal pain over the epigastric area was out of proportion to examination findings.

Initial workup showed the presence of *Entamoeba spp*. cysts on fecalysis. She was given metronidazole and diloxanide, which afforded no relief despite completion. This prompted us to do a CT scan of the whole abdomen with contrast. An isolated dissection with visualized intimal flap and thrombosed false lumen of the proximal SMA (Figure 1.0) with a normal abdominal aorta, renal, celiac, inferior mesenteric and both renal arteries were seen. CT angiography of the abdomen showed thrombosis of the distal SMA (Figure 2A), with narrowing of branches on the left side by 50% (Figure 2B). The middle colic artery arising from the SMA is relatively small as well as the right colic artery, with a totally occluded ileocolic artery (Figure 2B), suggestive of vasculitis. There was no radiological evidence of bowel ischemia. To evaluate any other aneurysms or dissections elsewhere, CT scans of the brain and chest were done and were unremarkable.

Further workup showed significantly elevated CRP (36.84 mg/L) and ESR (45 mm/hour). c-ANCA, p-ANCA, ANA, C3 and C4 were unremarkable. Investigation for infection which included human immunodeficiency virus (HIV), hepatitis, pulmonary tuberculosis and procalcitonin were negative. Creatinine and liver function tests were normal. Since the patient complained of bilateral lower extremity pain, electromyography and nerve conduction studies were done but were normal. Consistent with the history, physical examination, abdominal CT scan findings and elevation of acute phase reactants in the absence of systemic infection, vasculitis was suspected.

The list of potential differentials included PAN, microscopic polyangiitis (MPA) and Churg-Strauss syndrome (CSS). However, MPA is typically associated with rapidly advancing glomerulonephritis and lung complications, neither of which were observed in the patient. Additionally, CSS usually involves high levels of eosinophils, asthma and allergic rhinitis, which were not present in this case.[5] Diagnosis was then geared

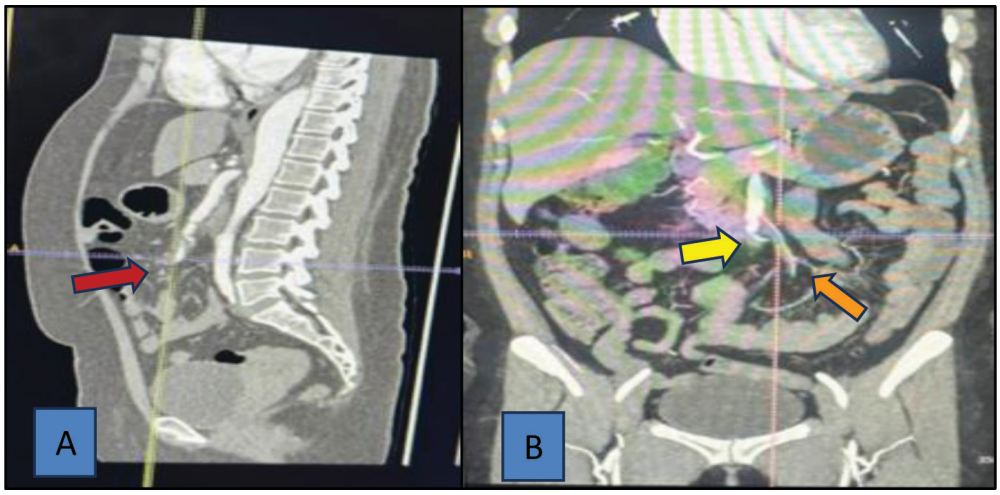

Figure 2. A. Distal SMA thrombosis (red arrow). B. Totally occluded ileocolic artery (yellow arrow) Markedly narrowed jejunal and ileal branches (orange arrow).

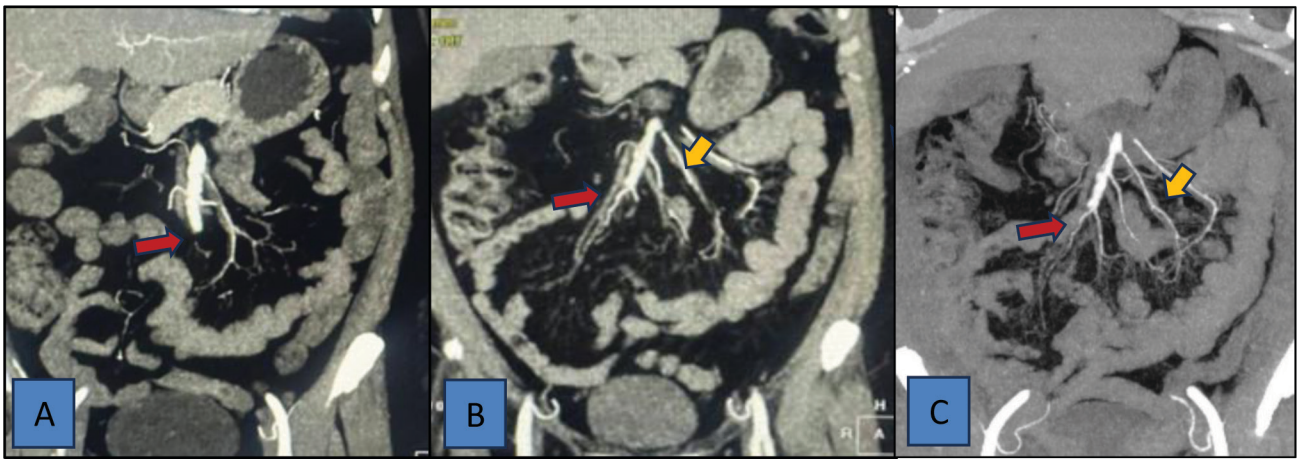

Figure 3. A. Pre-intervention CT scan (coronal view) of distal SMA thrombosis (red arrow). B. Post-intervention comparative CT (coronal view) with beginning recanalization (red arrow). There is improved narrowing of the vascular lumen in the jejunal and ileal branches (yellow arrows). C. Repeat CT angiography after six months showing further recanalization of the ileocolic branches (yellow arrow).

towards PAN since she is a known hypertensive with five-kilogram weight loss and bilateral lower extremity myalgia, whose workup revealed an isolated dissection of the proximal SMA with thrombosis of distal SMA. These fulfilled four of the 1990 American College of Rheumatology (ACR) criteria for PAN with a sensitivity of 82.2% and a specificity of 86.6%.[6]

Since the patient initially presented with SISMAD, anticoagulation with unfractionated heparin (UFH) drip was initiated. Close monitoring was done with activated partial thromboplastin time (aPTT) checks every six hours, aiming for a level at least twice the baseline. After a 48-hour period, the therapeutic approach transitioned to subcutaneous enoxaparin administered every 12 hours. To address vasculitis, the patient was started on methylprednisolone pulse therapy at one gram per day for three days and cyclophosphamide one gram infusion (vasculitis protocol), exhibiting good response. Furthermore, supportive interventions such as complete bowel rest, adequate analgesia, intravenous hydration and total parenteral nutrition were provided. Close monitoring for signs of bleeding, including blood pressure and heart rate were also done. The ten-day hospital course was uneventful with drastic improvement of abdominal symptoms and no untoward complications.

A repeat CT angiogram of the mesenteric vessels was done prior to discharge, which showed improvement as evidenced by the beginning recanalization of the ileocolic artery and increase in vascular lumen of the jejunal and ileal branches (Figure 3). She was then maintained on rivaroxaban 20 mg once daily and was further advised to continue prednisone at one milligram per kilogram body weight per day with cyclophosphamide IV infusion. In a case report by Moris, et al., surveillance for SMA dissection includes an office visit two to four weeks after hospitalization to assess for symptoms of mesenteric ischemia and repeating a CTA of the abdomen and pelvis at 6-month

intervals to assess improvement or persistence of dissection. The majority of reports indicate complete or near-complete resolution within six months, allowing for discontinuation of anticoagulation.[7] The same recommendations were given to the index case.

The patient was compliant with recommended followup schedules; initially weekly, then bi-weekly, followed by monthly check-ups and subsequently spaced every three months, considering the improvement in clinical condition. After six months of induction with concomitant tapering of prednisone, a repeat CT scan of the whole abdomen showed interval improvement with persistence of irregularity of distal SMA and further recanalization of the right ileocolic artery (Figure 3C). Currently, the patient is on azathioprine and low-dose steroids to maintain remission.

DISCUSSION

SISMAD is a rare but potentially life-threatening vascular disorder with an incidence of 0.06%-0.08% of all cases of acute abdominal pain globally.[8] With recent advances in technology, cases of ISMAD have increased over the past decade with majority of the cases reported in Asia.[3,9-10] The mean patient age of diagnosis was 55 years old with a male preponderance (89%).[9] This patient did not belong to the common demographic since she was a 44-year-old female.

The presumed process of SMA dissection is thought to involve a tear in either the intimal layer or vasa vasorum, leading to hemorrhage within the medial and adventitial layers.[11] Hemodynamic studies have further revealed that the distribution of wall shear stress in the SMA can result in degenerative changes in the anterior wall. These changes encompass thinning of media, a reduction in smooth muscle cell count and elastin level, accumulation of trans-lamellar mucoid extracellular matrix, fragmentation of elastic fibers and loss or disorganization of smooth muscle cell nuclei.[8,12] Additionally, potential causes of SMA dissection include congenital connective tissue disorders, segmental arterial mediolysis, arteriosclerosis, cystic medial necrosis and vasculitis.[11] In the present case, PAN has been identified as the immediate cause.

PAN is a rare disease with an incidence of 3-4.5 in every 100,000 population.[10] It is an inflammatory vasculitis that affects small- and medium-sized vessels. Although there is an association of PAN with hepatitis B, intravenous drug use and hairy cell leukemia;[13] these associations are not found in the index case. The clinical manifestations of PAN are attributed to inflammation of the vessel wall which causes aneurysm formation, rupture and thrombosis.[5] Gastrointestinal (GI) involvement is frequent in PAN, affecting 14%-65% of patients - as seen in the index case.[14] When involving the GI tract, the small bowel or gallbladder are most commonly affected, and this usually presents as postprandial abdominal pain from ischemia.[15]

Collectively, the index patient presented with SISMAD with thrombosis which has been rarely reported in association with PAN. That even up to date, there has been no published case of PAN presenting as SISMAD.

While angiography is the gold standard for diagnosing arterial pathologies, ultrasonography (US) and CT scan are usually used initially, however, an added advantage of CT scan over US is the ability to classify ISMAD, which has the potential to drive the treatment of choice.[16] SISMAD exhibits pleomorphic characteristics, thus proper classification is needed for an effective approach. There are five classifications proposed over the recent years, including those drafted by Sakamoto, et al.,[17] Yun, et al.,[18] Zerbib, et al.,[19] Luan, et al.[20] and Li, et al.[21] The main difference between the five classifications appears to be the distinction of subtypes. Luan's classification simply categorized SISMAD into four types based on location and length of dissection (Figure 4).[20] Our patient had a dissection localized to the curved part of the SMA, thus classifying her under Type B. However, features of true and false lumen

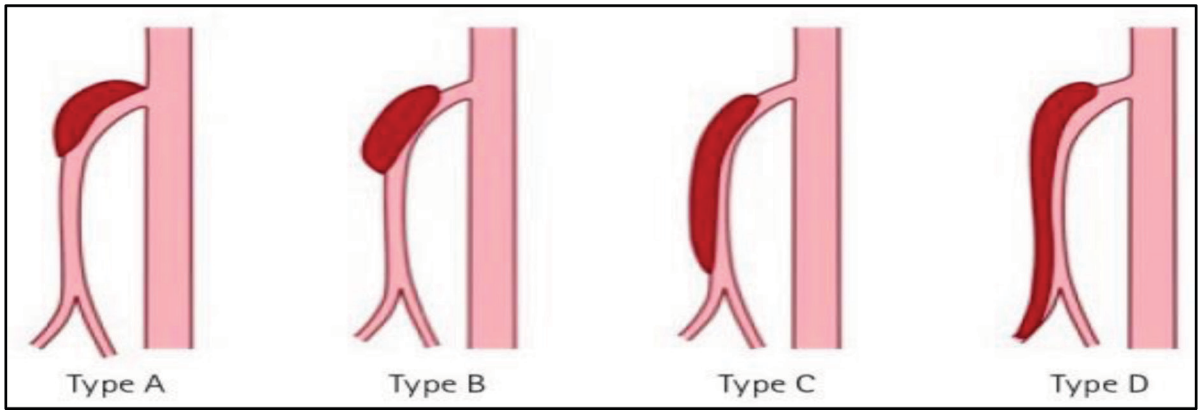

Figure 4. Luan classification.[20] Type A: Dissection localized to the curved part of the SMA and extended proximally to the SMA ostium; Type B: Dissection limited to the curved part of the SMA; Type C: Dissection localized to the curved part and extended distally, but the ileocolic artery or distal ileal artery was not involved; Type D: Dissection localized to the curved part and extended distally to the ileocolic artery or distal ileal artery.

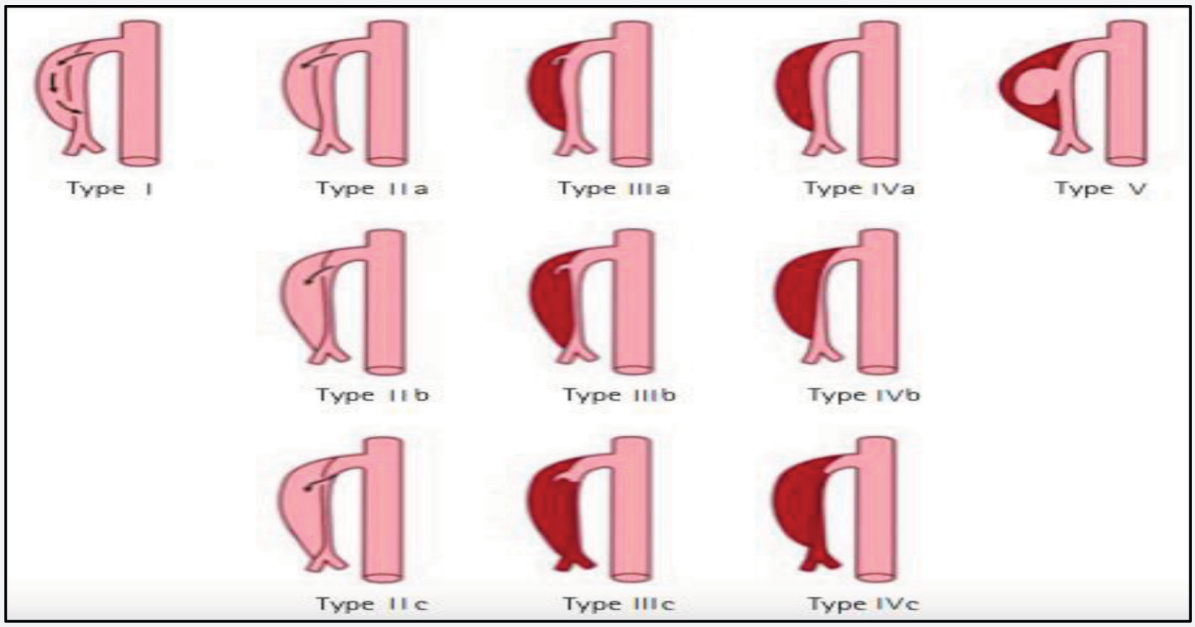

Figure 5. Li classification.[21] Type I: Patent false lumen with both entry and re-entry; Type II: 'cul-de-sac'-shaped false lumen with no re-entry (subdivided into IIa, patent true lumen; IIb, severe stenosis of the true lumen; and IIc, occlusion of the true lumen); Type III: thrombosed false lumen with an ULP (subdivided into IIIa, patent true lumen; IIIb, severe stenosis of the true lumen; and IIIc, occlusion of the true lumen); Type IV: Completely thrombosed false lumen with no ulcer like projections (subdivided into IVa, patent true lumen; IVb, severe stenosis of the true lumen; and IVc, occlusion of the true lumen); Type V: dissecting aneurysm.

such as thrombosis and stenosis are not considered in this classification.[17]

The Li classification system (Figure 5), on the other hand, takes the latter into consideration. Moreover, this system is more precise and complete compared to other systems.[21] The index patient had thrombosis of the distal SMA (Figure 2A) with subsequent total occlusion of the true lumen, classifying her as type IIIc.

Despite the different classification systems to guide its management, this continues to be a controversial topic due to sparse cases and lack of data. Surgical revascularization, despite being a definitive treatment, is often used as a last resort or, emergent in cases where arterial rupture and bowel infarction is suspected.[16,22-23]

Conservative management is the first-line option in up to 87% of cases, with a success rate reaching up to 97%.[13,23] It primarily includes pain management, bowel rest, nasogastric suction, intravenous fluid administration, nutritional support and hypertension control.[18] In some cases, with severe compression of the true lumen (>80%) and pseudoaneurysm of >20 mm in diameter, endovascular approach is appropriate to seal off the false lumen and re-establish flow.[24-26] However, these indications were not seen in the index case. A meta-analysis by Ullah, et al., emphasized the use of anticoagulation therapy with either unfractionated heparin or low-molecular-weight heparin, followed by transition to a direct oral anticoagulant for long-term management,[24] and Kang, et al., with the use of warfarin.[27] Conservative approach and anticoagulation with heparin were done in the patient wherein improvement of symptoms was noted in the ten-day hospitalization course.

The optimal therapy of PAN remains uncertain. As with other disease entities, extent and severity of organ involvement are important factors in determining the course of management. SISMAD can lead to bowel infarction and acute peritonitis. This classifies the case as severe PAN requiring aggressive immunosuppression.[28] The patient was started on methylprednisolone pulse therapy at one gram per day for three days. Concurrently, intravenous cyclophosphamide, an alkylating agent, was started. Kidney function, signs of bone marrow suppression and presence of infection were closely monitored since these are among the most common toxicities of cyclophosphamide treatment. Remission induction provides more rapid control of disease which was achieved in this case as evidenced by complete resolution of abdominal pain. Long term use of cyclophosphamide was avoided due to its toxicity, thus was shifted to another immunosuppressive agent in the maintenance phase. Drug options include methotrexate, mycophenolate, or azathioprine, which were used in this case.[28]

CONCLUSION

PAN and SISMAD are independently rare cases; with an incidence of 3-4.5 in 100,000 and 0.06% to 0.08% of the population worldwide, respectively. This case presented a unique combination of PAN and SISMAD in a 44-year-old Filipino female. To date, no reported cases have been published locally and internationally. Early diagnosis of the disease

requires a high degree of suspicion and pattern recognition, enabling timely treatment and improving prognosis while preventing severe complications associated with both illnesses. Furthermore, monitoring patients even after symptom resolution is crucial to identify potential complications or relapses which can occur years after the initial presentation.

Despite its lower clinical probability, it remains crucial to consider uncommon diagnoses until conclusively ruled out highlighting that abdominal symptoms may not exclusively derive from GI etiologies. In this specific case, the investigation revealed a vasculitis origin - PAN.

Declaration

Informed consent was obtained prior to writing this case report.

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