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## First report of splenic myelolipoma in a Schnauzer in Colombia: a case report

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### Abstract

Splenic myelolipoma is a rare tumor in dogs with an unclear origin. A male 13-year-old Schnauzer dog was presented because of a bump on the left side of the abdomen. Clinical examination and abdominal ultrasound revealed a mass in the spleen. A total splenectomy was carried out, and histopathology revealed a splenic myelolipoma. Before surgery, the patient showed high serum alanine aminotransferase levels, which returned to normal eight months after the resection. Unfortunately, the postoperative follow-up showed increased serum cholesterol and triglyceride levels, suggesting liver compromise. This is the first report of a splenic myelolipoma in Colombia.

**Keywords:** spleen; myelolipoma; Schnauzer

Myelolipomas (MLPs) are benign tumors of rare occurrence in domestic animals and are more frequently described in humans. This neoplasm has been reported in the adrenal glands, spleen, and liver of aged humans, primates, domestic animals, and other mammalian and avian species [1]. In humans and primates, MLP occurs most frequently in the adrenal gland, while the hepatic form is the most frequent in small animals, mainly in domestic and wild felines. MLP has been described in other organs, including the adrenal glands and spleen in dogs [2,3]. Although its etiology is unclear, various origins have been described, including chromosomal translocations [4] and metaplastic changes in reticuloendothelial cells of blood capillaries in response to several stimuli (e.g., necrosis, infection, or stress) [5] or a hamartomatous proliferation [6]. MLP has been described in several dog breeds, including Sheltie and Cardigan Welsh corgi. On the other hand, there are no associations of breed or gender predisposition because of the very few case reports. [2,6,7].

Histopathologically, MLP is composed of normal-appearing mature adipocytes accompanied by intermingled myeloid cells, including mature and immature cells of the granulocytic, erythrocytic, and megakaryocytic series [3]. MLP is listed in the group of mesenchymal and stromal tumors of the adrenal cortex according to the latest update of World Health Organization on endocrine tumors [8]. The clinical signs observed in dogs with splenic MLP are varied and nonspecific; they include anorexia, vomiting, abdominal distension, weight loss, and prostration [7,9]. Abnormalities of the size and shape of the spleen are often identified in dogs

by abdominal palpation, diagnostic imaging, or exploratory laparotomy [2]. Macroscopic splenic lesions do not allow for discerning the malignant or benign character of this neoplasm, and its definitive diagnosis is obtained by histopathological analysis [10]. Splenic masses are more common than diffuse splenomegaly in dogs, whereby a splenectomy is performed to remove these masses most of the time [9]. The present report describes the clinical presentation and histopathology findings of a splenic MLP in a Schnauzer canine.

A 13-year-old male Schnauzer, weighing 10 kg, was referred for a lump in the abdomen. On physical examination, abdominal palpation revealed a non-painful mass of hard consistency in the middle portion of the abdominal wall (mesogastrium). Abdominal ultrasound revealed a hypoechoic mass without visualization of the liver. Therefore, laboratory tests and exploratory laparotomy were recommended. Before surgery, a complete blood count, blood biochemistry, coagulation tests, and partial urine analysis were performed. The biochemical profile revealed an elevation in alanine aminotransferase (ALT) (395 IU/L; reference range, 10 to 109 IU/L), but it was decided to perform an exploratory laparotomy.

The laparotomy revealed protrusions, diffuse parenchymal involvement, and a mass in the spleen. A total splenectomy was performed, and the mass removed was sampled for histopathological analysis. The sample was fixed in 10% buffered formalin and stained with hematoxylin and eosin. Postoperative medication included cefadroxil (20 mg/kg, per oral [PO], every 12 hours for 10 days), metronidazole oral suspension (20 mg/kg, PO, every 12 hours for 7 days), meloxicam (0.1 mg/kg, PO, every 24 hours for 6 days), and tramadol (2 mg/kg, PO, every 12 hours for 6 days).

Eight days after surgery, the patient was admitted to the clinic as the owner reported two episodes of vomiting and anorexia. A replacement fluid therapy with 0.9% normal saline (630 mL, intravenous [IV], every 4 hours), omeprazole (1 mg/kg, IV), and maropitant (1 mg/kg, subcutaneous) was established. The next day, the owner reported that the patient was normal, without vomiting and with a recovered appetite.

Clinical laboratory tests were performed two months after surgery. The serum biochemistry revealed high ALT levels (565.5 U/L; reference range, 10 to 109 U/L). Therefore, a therapeutic plan was established, which consisted of vitamin E (400 IU/PO for 30 days), silymarin (50 mg/PO for 15 days), prednisolone (0.5 mg/kg/PO for 5 days), then 0.25 mg/kg/PO for four continuous days, then the same dose every 48 hours in two doses and then every 72 hours for two doses. In addition, a medicated diet was suggested for dogs with liver problems (Hill's l/d;

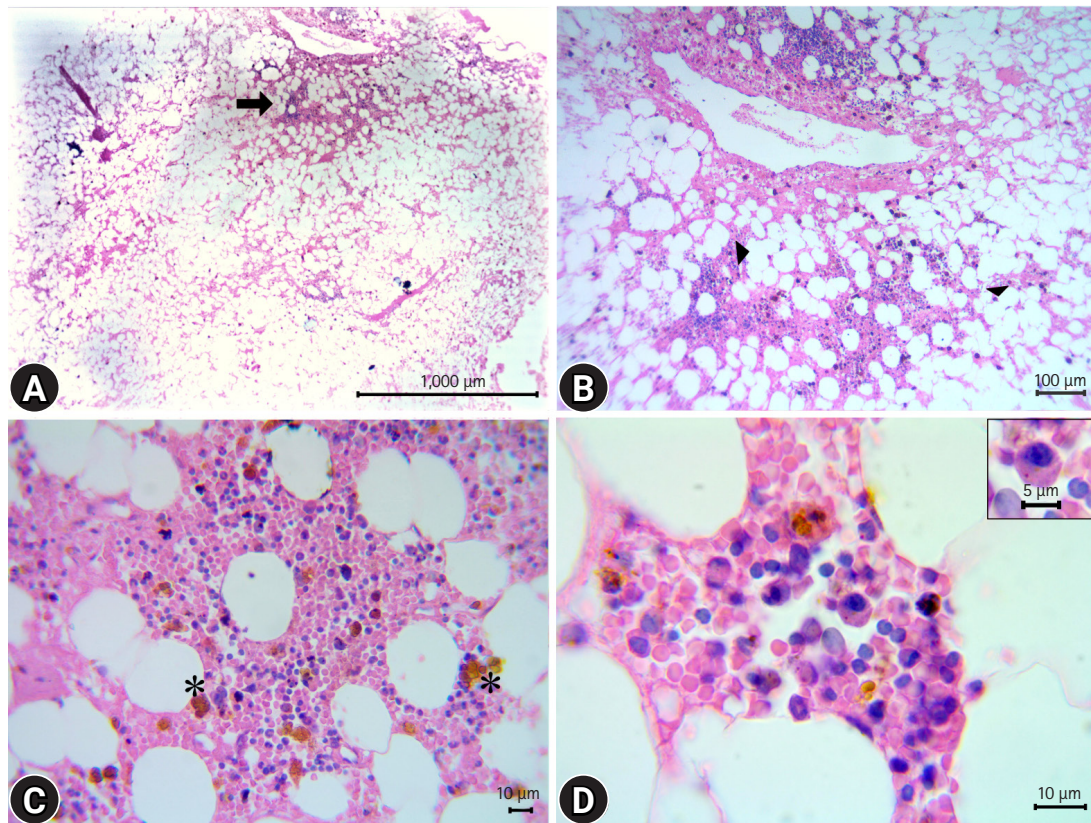
Hill's Pet Nutrition, Inc., USA). Four months after surgery, the ALT levels remained high (300 U/L; reference range, 10 to 109 U/L) but lower than previous tests. The administration was reinstated with vitamin E at the same dose and a medicated diet. Eight months after the procedure, there was a decrease in ALT level (83.2 U/L; reference range, 10 to 109 U/L), but the cholesterol (8.31 nmol/L; reference range, 2.85 to 7.76 nmol/L) and triglycerides (7.63 nmol/L; reference range, 0.6 to 1.2 nmol/L) levels were increased, which contributed to a diagnosis of liver damage.

Histopathological analysis of the spleen mass revealed a mixed neoplastic process, where adipose cells had mixed with hematopoietic cells in various stages of myeloid and erythroid differentiation (Fig. 1). There was an absence of capsule and the quantitative predominance of adipose tissue over myeloid. Histopathological diagnosis was a splenic MLP.

MLPs are usually solitary, slow-growing neoplasias composed of well-differentiated adipocytes and hematopoietic tissue with myeloid, erythroid, and megakaryocytic cells [11]. In dogs, MLPs have been reported in the adrenal glands, spinal cord, and eyes [2,6]. In the present study, a splenic MLP was found in a 13-year-old canine, an unusual finding and one of the few cases in the country. This type of tumor should not be confused with extramedullary hematopoiesis, myeloproliferative disorders, and other tumors (liposarcoma, angiomyolipoma, and teratoma) [5,7]. Therefore, a definitive diagnosis of MLP was made by histopathology because of its representative features.

These neoplasms commonly affect older dogs [7], similar to the present patient. In dogs, there are no specific clinical signs associated with MLP, and it has an incidental diagnosis when found at ultrasound, laparotomy, or post-mortem examination [6]. In this case, the dog showed an abdominal mass confirmed by ultrasound and an elevation of serum ALT. In patients with MLP, elevated liver enzymes have been associated with hepatotoxic injury, chronic anemia, cholestasis, and diffuse hepatocellular injury [2,7]. In this case, the increase in the hepatic enzyme ALT may be associated with nonspecific reactive hepatitis because of the neoplastic process in the spleen. Inflammatory processes have been reported in the spleen due to neoplasms [12], and there is an association between the liver and the spleen, in which there is a metabolic exchange and cell migration. Hence, this intersection of immunity, pathogen clearance, and metabolism can contribute to liver injury [13]. In the same way, the metastasis of MLP to the liver cannot be discarded, but there was no ultrasonographic and anatomic evidence in the present case.

In the present patient, the MLP mass was 8.47 cm, which is similar to the size reported (5 to 10 cm) in dogs [14]. At explor-



**Fig. 1.** Splenic myelolipoma of a canine. (A) A mixed, non-encapsulated neoplastic growth was observed, predominantly adipocytes with clusters of hematopoietic cells in various stages of myeloid and erythroid differentiation (arrow), with a benign expansive growth pattern. Scale bar = 1,000 µm. (B) Tissue of rounded mature adipocytes with a large translucent vacuole within the cytoplasm, differentiated intercellular boundaries, elongated nucleus towards the periphery (arrowheads), mild cellular pleomorphism, anisocytosis, and mild anisokaryosis. Scale bar = 100 µm. (C) Presence of mild generalized hemosiderosis (asterisks), angiogenic and myxoid proliferation. Scale bar = 10 µm. (D) Multifocal moderate mixed-type inflammation with lymphocytes, plasma cells, and neutrophils. Scale bar: 10 µm. Inset: myeloid blastic cell. Scale bar = 5 µm. (A–D) Hematoxylin-eosin.

atory laparotomy, there was no evidence of the implication of other organs or sign of metastasis, which agrees with the behavior of this neoplasia [6]. Surgery has been described as the best treatment for MLPs, with a minor complication rate of 7.2% and a major complication rate of 1% [5] exhibiting a good prognosis; partial spleen removal is recommended whenever possible. A previous report [15] described that surgical intervention is required in tumors larger than 7 cm because of the potential risk of rupture. A total splenectomy was performed in the present patient because of the location and size of the mass.

MLPs are uncommon to rare neoplasms in dogs [6] with no specific clinical signs. The diagnosis can be achieved with an ultrasound examination and histopathology analysis. An evaluation of post-surgical biochemical alterations can help improve the therapeutic management and the animal's prognosis. Here, a clinical case of a splenic MLP in a 13-year-old Schnauzer was reported, being the first histopathological report of this pathol-

ogy in Colombia.

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## References

1. Capen C. Endocrine Glands. In: Maxie MG, ed. *Pathology of Domestic Animals*. 5th ed. pp. 325–428, Elsevier Saunders, Philadelphia, 2007.
2. Cubillos CC, Köhler C, Fromme V, Leitner S, Hauber E, Schwede M, Alef M, Kiefer I. [Multiple choristoma and a myelolipoma in a Sheltie]. *Tierarztl Prax Ausg K Kleintiere Heimtiere* 2018;46:187–194.
3. Stalker MJ, Hayes MA. Liver and Biliary System. In: Maxie MG, Jubb KVF, Kennedy PC, Palmer N, eds. *Jubb, Kennedy, and Palmer's Pathology of Domestic Animals*. 5th ed. pp. 386–388, Elsevier Saunders Company, Edimburgh, 2007.
4. Chang KC, Chen PI, Huang ZH, Lin YM, Kuo PL. Adrenal myelolipoma with translocation (3;21)(q25;p11). *Cancer Genet Cytogenet* 2002;134:77–80.
5. Zeng Y, Ma Q, Lin L, Fu P, Shen Y, Luo QY, Zhao LH, Mou JH, Xiao HL. Giant myelolipoma in the spleen: a rare case report and literature review. *Int J Surg Pathol* 2016;24:177–180.
6. Valli VE, Bienzle D, Meuten DJ. Tumors of the Hemolymphatic System. In: Meuten DJ, ed. *Tumors in Domestic Animals*. 5th ed. John Wiley & Sons Inc., Ames, 2016. Epub ahead of print. doi: 10.1002/9781119181200.ch7.
7. Al-Rukibat RK, Bani Ismail ZA. Unusual presentation of splenic myelolipoma in a dog. *Can Vet J* 2006;47:1112–1114.
8. Lam AK. Lipomatous tumours in adrenal gland: WHO updates and clinical implications. *Endocr Relat Cancer* 2017;24:R65–R79.
9. Nelson R, Couto CG. *Medicina Interna En Pequeños Animales*. 4th ed. Elsevier Health Sciences, London, 2010.
10. Daleck CR, De Nardi AB, Rodaski S. *Oncologia em Cães e Gatos*. 1st ed. pp. 52–73, Roca, São Paulo, 2009.
11. Prater MR, Bender H, Sponenberg P. Intra-abdominal mass aspirate from an aged dog. *Vet Clin Pathol* 1998;27:54.
12. Ferri F, Zini E, Auriemma E, Castagnaro M, Coppola LM, Peano A, Martella V, Decaro N, Kuhnert P, Ferro S. Splenitis in 33 dogs. *Vet Pathol* 2017;54:147–154.
13. Li L, Duan M, Chen W, Jiang A, Li X, Yang J, Li Z. The spleen in liver cirrhosis: revisiting an old enemy with novel targets. *J Transl Med* 2017;15:111.
14. Schwarz LA, Penninck DG, Gliatto J. Canine splenic myelolipomas. *Vet Radiol Ultrasound* 2001;42:347–348.
15. Zattoni D, Balzarotti R, Rosso R. The management of bilateral myelolipoma: case report and review of the literature. *Int J Surg Case Rep* 2015;12:31–36.