

Contents lists available at [ScienceDirect](http://www.sciencedirect.com)

International Journal of Surgery Case Reports

journal homepage: www.casereports.com

Scerosing angiomatoid nodular transformation of the spleen presenting rapid growth after adrenalectomy: Report of a case



Yasuo Nagai, Daisuke Satoh*, Hiroyoshi Matsukawa, Shigehiro Shiozaki

Department of Gastroenterological Surgery, Hiroshima City Hiroshima Citizens Hospital, 7-33 Motomachi, Naka-ku, Hiroshima, Japan

ARTICLE INFO

Article history:

Received 14 November 2016
Received in revised form
28 November 2016
Accepted 28 November 2016
Available online 30 November 2016

Keywords:

Scerosing angiomatoid nodular transformation (SANT)
Adrenalectomy
IgG4-associated disease
Glucocorticoid
Hand assisted laparoscopic surgery

ABSTRACT

INTRODUCTION: Scerosing angiomatoid nodular transformation (SANT) is a rare benign lesion with an unknown natural history and pathogenesis. So far fewer than 100 cases were documented, but detailed incidence and prevalence are unknown.

PRESENTATION OF CASE: We report a case of SANT of the spleen in a 37-year-old man that showed rapid growth after adrenalectomy for primary aldosteronism. Computed tomography showed a nodule in the spleen that increased in size from 2.0 cm to 7.0 cm during 3 years of observation.

DISCUSSION: This case is reported because data regarding growth rates and natural history of these lesions are limited and few cases have been reported to show the rapid growth progression seen in this case.

CONCLUSION: Decreases in glucocorticoid concentrations following adrenalectomy may have contributed to the rapid growth of SANT of the spleen, because SANT is considered to be related to immunoglobulin G4-associated disease.

© 2016 The Author(s). Published by Elsevier Ltd on behalf of IJS Publishing Group Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

Scerosing angiomatoid nodular transformation (SANT) is a very rare benign lesion in the spleen, initially described in 2004 by Martel et al. [1]. So far fewer than 100 cases were documented, but detailed incidence and prevalence are unknown. SANT is composed of angiomatoid nodules in a fibrosclerotic background [2]. Histologically, the angiomatoid nodules comprise several types of blood vessels distinguished by their immunohistochemical profiles, including a cord capillary-like type (CD31+CD34+CD8-), small veins (CD31+CD34-CD8-), and a sinusoid-like type (CD31+CD34-CD8+) [1,3].

SANT appears to follow a benign clinical course, with splenectomy being curative, but data regarding the natural history and growth rates of this disease are scarce. The pathogenesis of SANT also remains unclear. SANT has been hypothesized to represent a peculiar hamartomatous transformation of splenic red pulp in response to exaggerated non-neoplastic stromal proliferation [3]. On the other hand, SANT is reportedly associated with Epstein-Barr virus (EBV) infection [2], and immunoglobulin (Ig)G4-related sclerosing disease [5,6]. We report herein a case of SANT of the spleen presenting rapid growth after adrenalectomy for primary aldosteronism. We chose splenectomy by hand assisted laparoscopic surgery (HALS), did not perform minimal invasive surgery such as

tumorectomy, because we could not completely deny a malignant lesion.

We discuss the possible pathogenesis and treatment of SANT.

2. Case report

A 33-year-old man was admitted for SANT. His medical history had laparoscopic adrenalectomy for primary aldosteronism. Physical examination of the abdomen showed no abnormalities. Abdominal computed tomography (CT) performed 1 year after surgery incidentally revealed a hypodense splenic lesion (20 mm) (Fig. 1). Physical examination of the abdomen showed no abnormalities. Laboratory examinations including serum carbohydrate antigen (CA)19-9 and carcinoembryonic antigen (CEA) concentrations were within normal limits. Plain CT showed a low-density, circular lesion with a well-circumscribed border. No cystic changes, necrosis or calcification was evident in the lesion. Contrast-enhanced CT showed delayed enhancement centripetally, with a wheel-like appearance. Abdominal magnetic resonance imaging (MRI) demonstrated a nodule in the spleen with signal hypointensity on T1-weighted imaging, and heterogeneous signal hyperintensity on T2-weighted imaging (Fig. 2).

The main radiological differential diagnoses were hamartomas, sclerosed hemangioma, and inflammatory pseudotumor. As no sign of malignancy was present, we decided to observe the progress of the lesion without intervening. Two years later, CT showed the mass was appeared to be progressive (50 mm). The next year, the mass had increased in size to 70 mm (Fig. 1). Because malignant

* Corresponding author.

E-mail address: ddd4863@gmail.com (D. Satoh).



Fig. 1. Abdominal computed tomography (CT). a) A 2.0-cm mass is evident in the spleen 1 year after adrenalectomy. b) Three years after adrenalectomy, the mass had increased in size to 5 cm c) The next year, the mass has increased in size to 70 mm.

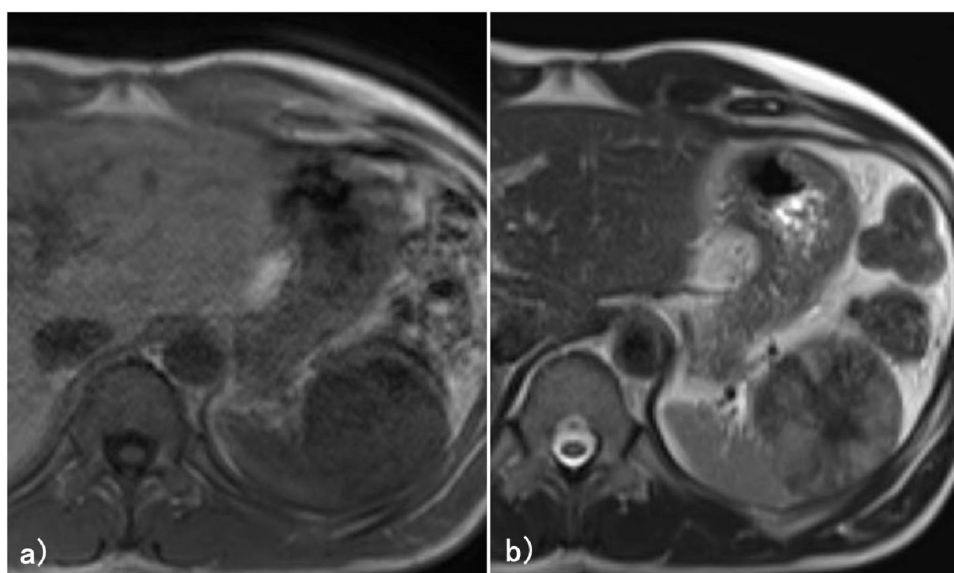


Fig. 2. Magnetic resonance imaging (MRI). a) A signal-hypointense nodule is seen in the spleen on T1-weighted imaging. b) Heterogeneous signal hyperintensity is seen on T2-weighted imaging.

neoplasm could not be completely excluded given such progressive growth, splenectomy was performed.

We chose hand assisted laparoscopic surgery (HALS) by lateral decubitus position, because the tumor located at the spleen and it was not invasive. (Fig. 3)

Gross examination revealed a well-demarcated, solitary lesion measuring 70 × 65 mm, containing a central bulky stellate mass of white compact tissue (Fig. 3). Histopathological findings showed three types of vascular structure in the tumor: capillary-like vessels; dilated sinusoid-like vessels; and ectatic veins. Neither nuclear atypia nor necrosis was present. Immunohistochemical analysis revealed a complex vascular pattern, in which the capillaries showed CD34+/CD8-/CD31+, the dilated sinusoid-like vessels showed CD34-/CD8+/CD31+, and small veins showed CD34-/CD8-/CD31+. In the sclerotic stroma, some plasma cells revealed a IgG4+ status (Fig. 4). EBV was not detected according to EBV-encoded RNA (EBER). The pathological diagnosis was SANT.

3. Discussion

SANT of the spleen is rare and mostly recognized as an incidental finding on routine medical imaging, as in this case. The patients are usually asymptomatic but sometimes an abdominal discomfort or pain can be observed. Zhixin et al. reviewed 127 patients with SANT. In this report, a slight female preponderance is evident, and predominantly affects middle-aged adults according to a review [7]. Although the exact nature of this disease remains unclear, SANT is considered benign and does not present with recurrence or malignant behavior [8]. In our case, the splenic lesion displayed a rapid growth in size from 20 mm to 70 mm during 3 years after adrenalectomy. Surprisingly, CT showed no lesion in the spleen just before adrenalectomy, and CT 1 year after adrenalectomy revealed a 20-mm lesion in the spleen. Although growth of SANT on follow-up imaging is reportedly common [9], few reports have shown such rapid growth as seen in the present case. Of course, these findings

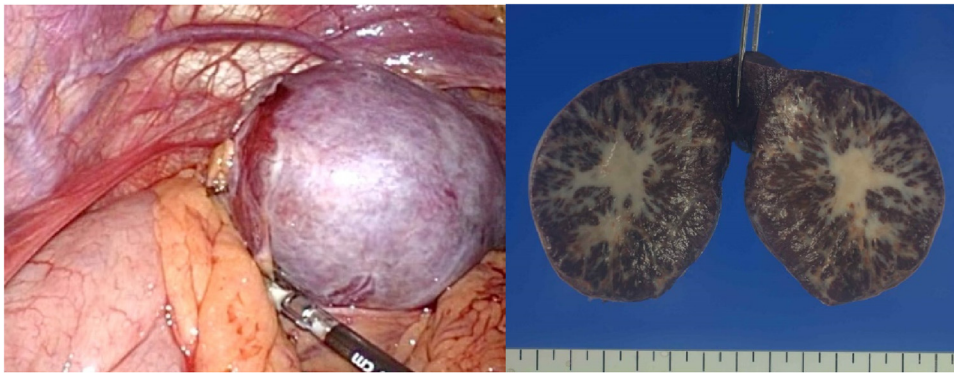


Fig. 3. Gross examination reveals a well-demarcated, solitary lesion, measuring 70 × 65 mm, which contains a central bulky stellate mass of white compact tissue.

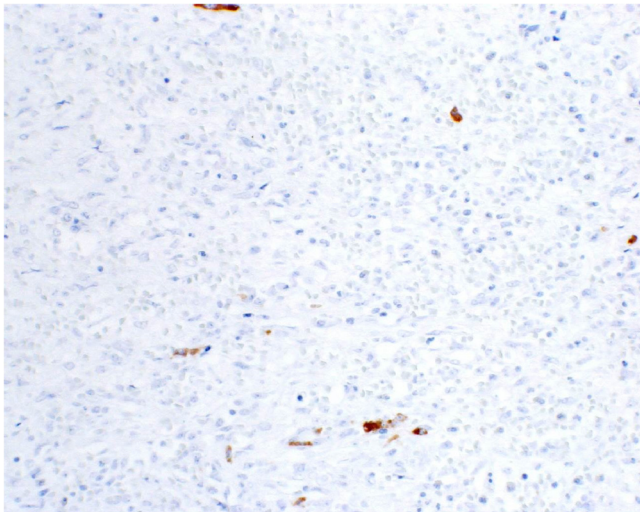


Fig. 4. Immunohistochemical examination reveals positive staining for IgG4 (original magnification, ×200).

may have been coincidental, but the possibility that adrenalectomy facilitated the impressive growth dynamics of SANT must be considered.

The pathogenesis of SANT has not been fully elucidated. Martel et al. speculated that SANT may represent a peculiar hamartomatous transformation of splenic red pulp in response to exaggerated non-neoplastic stromal proliferation [1]. Such transformation may result in small vessel outflow failure, leading to nodular or hyperplastic changes of the proximal vascular tract. Zhang et al. proposed that SANT represents a vascular malformation rather than hemangioma [10], because immunochemical staining of specimens from SANT showed negative results for glucose transporter 1. SANT has previously been reported to be associated with EBV infection [11,12]. On the other hand, SANT is considered to be related to IgG4 associated disease [13–15]. The presence of a significantly higher number of IgG4+ plasma cells and an increased IgG4/IgG ratio has been reported in some studies [13–15]. In our case, EBV was not detected by EBER, and although we did not measure serum IgG4 levels, immunochemical staining for IgG4 yielded positive results, supporting the possibility that SANT was related to IgG4-associated disease. IgG4-associated disease is the term used to refer to a condition characterized by lymphoplasmacytic infiltration, fibrosis and increased numbers of IgG4+ cells present in tissue [16]. This disease has an allergic background and is immune-mediated. Up-regulated responses of T helper 2 and T regulatory cells and the associated cytokines play major roles in disease progression [17], and frequently affect the pancreas, salivary glands and lymph nodes, but

can involve almost any tissue. No international consensus has been reached regarding diagnostic criteria for the disease, but the typical histopathology is lymphoplasmacytic infiltration with abundant IgG4-positive plasma cells. Elevated serum IgG4 concentrations support the diagnosis. The treatment of choice is corticosteroids. In this case, serum cortisol levels decreased from 21.4 ng/dl before adrenalectomy to 4.0 ng/dl after adrenalectomy. We would like to emphasize that the rapid growth of the lesion in the spleen was consistent with the time period in which serum cortisol levels decreased, which might indicate that rapid growth of SANT resulted from decreased serum concentrations of cortisol. Considering that SANT of the spleen can be related to IgG4-associated disease, corticosteroids might be useful for treating SANT. While objective evidence is lacking and this possibility remains no better than a hypothesis, we believe our findings are helpful for possible treatment of patients with SANT.

In conclusion, we have reported the case of a unique patient with rapid growth of SANT after adrenalectomy. SANT is considered to show some relationship to IgG4-related disease, so corticosteroids may be effective, supported by our findings. However, further studies are needed to elucidate the pathogenesis of SANT.

Conflict of interest statements

Daisuke Satoh and co-authors have no conflicts of interest to declare.

Funding

We have no sources of funding.

Ethical approval

I confirm ethical approval has given.

Consent

I confirm that I have obtained signature to publish a case report from the patient.

Our work has been reported in line with the SCARE criteria.

Author contribution

No specific contributions.

Registration of research studies

This is not research.

Guarantor

Daisuke Satoh.

References

- [1] M. Martel, W. Cheuk, L. Lombardi, B. Lifschitz-Mercer, J.K. Chan, J. Rosai, Sclerosing angiomatoid nodular transformation (SANT): report of 25 cases of distinctive benign splenic lesion, *Am. J. Surg. Pathol.* 28 (2004) 1268–1279.
- [2] I. Weinreb, D. Bailey, D. Battaglia, M. Kennedy, B. Perez-Ordóñez, CD30 and Epstein–Barr virus RNA expression in sclerosing angiomatoid nodular transformation of spleen, *Virchows Arch.* 451 (2007) 73–79.
- [3] S. Önder, K. Kosemehmetoglu, Ç. Himmetoglu, P. Firat, A. Uner, Sclerosing angiomatoid nodular transformation (SANT) of spleen: a case report describing cytology, histology, immunoprofile and differential diagnosis, *Cytology* 23 (2012) 129–132.
- [5] S. Kashiwagi, T. Kumasaka, N. Bunsei, Y. Fukumura, S. Yamasaki, K. Abe, et al., Detection of Epstein–Barr virus-encoded small RNA-expressed myofibroblasts and IgG4-producing plasma cells in sclerosing angiomatoid nodular transformation of the spleen, *Virchows Arch.* 453 (2008) 275–282.
- [6] H.H. Kim, Y.H. Hur, Y.S. Koh, J.C. Kim, H.J. Kim, J.W. Kim, et al., Sclerosing angiomatoid nodular transformation of the spleen related to IgG4-associated disease: report of a case, *Surg. Today* 43 (2013) 930–936.
- [7] Z. Cao, Q. Wang, J. Li, J. Xu, J. Li, Multifocal sclerosing angiomatoid nodular transformation of the spleen: a case report and review of literature, *Diagn. Pathol.* 10 (2015) 95.
- [8] H.J. Lee, S.Y. Choi, S.M. Huang, J.Y. Sul, J.M. Kim, Sclerosing angiomatoid nodular transformation(SANT) in spleen: a case report, *Korean J. Pathol.* 45 (2011) 111–114.
- [9] H.J. Kim, K.W. Kim, E.S. Yu, J.H. Byun, S.S. Lee, J.H. Kim, J.S. Lee, Sclerosing angiomatoid nodular transformation of the spleen: clinical and radiologic characteristics, *Acta Radiol.* 53 (2012) 701–706.
- [10] S. Zhang, W. Yang, X.U. Hongyan, W.U. Zhuqiang, Sclerosing angiomatoid nodular transformation of spleen in a 3-year-old child, *Indian Pediatr.* 52 (2015) 1081–1083.
- [11] M. Vyas, M. Deshmukh, T. Shet, N. Jambhekar, Splenic angiomatoid nodular transformation in child with inflammatory pseudotumor-like areas, *Indian J. Pathol. Microbiol.* 54 (2011) 829–831.
- [12] M.Q. Zhang, J.K. Lennerz, L.P. Dehner, L.M. Brunt, H.L. Wang, Granulomatous inflammatory pseudotumor of the spleen: association with Epstein–Barr virus, *Appl. Immunohistochem. Mol. Morphol.* 17 (2009) 259–263.
- [13] Y. Nagai, N. Hayama, T. Kishimoto, M. Furuya, Y. Takahashi, M. Otsuka, et al., Predominance of IgG4+ plasma cells and CD68 positivity in sclerosing angiomatoid nodular transformation (SANT), *Histopathology* 53 (2008) 495–498.
- [14] T.T. Kuo, T.C. Chen, L.Y. Lee, Sclerosing angiomatoid nodular transformation of the spleen (SANT): clinicopathological study of 10 cases with or without abdominal disseminated calcifying fibrous tumors, and the presence of a significant number of IgG4+ plasma cells, *Pathol. Int.* 59 (2009) 844–850.
- [15] S. Kashiwagi, T. Kumasaka, N. Bunsei, Y. Fukumura, S. Yamasaki, K. Abe, et al., Detection of Epstein–Barr virus-encoded small RNA-expressed myofibroblasts and IgG4-producing plasma cells in sclerosing angiomatoid nodular transformation of the spleen, *Virchows Arch.* 53 (2008) 275–282.
- [16] O. Ardila-Suarez, A. Abril, J.A. Gómez-Puerta, IgG4-related disease: a concise review of the current literature, *Reumatol. Clin.* (2016), <http://dx.doi.org/10.1016/j.reuma.2016.05.009>, pii: S1699-258X(16)30053-5.
- [17] L. Vasaitis, IgG4-related disease: a relatively new concept for clinicians, *Eur. J. Intern. Med.* 27 (2016) 1–9.

Open Access

This article is published Open Access at sciendo.com. It is distributed under the [IJSCR Supplemental terms and conditions](#), which permits unrestricted non commercial use, distribution, and reproduction in any medium, provided the original authors and source are credited.