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Splenic Artery Aneurysm

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Abstract

Purpose: Splenic artery aneurysm (SAA) is uncommon disease. Reported SAAs are increased because of advanced radiological diagnostic modalities. The aim of this study is to analyze of clinical findings of SAAs and to evaluate of endovascular therapies of SAAs.

Materials and methods: We retrospectively reviewed medical records of 37 consecutive SAA from June 2009 to May 2023. 37 patients were treated by endovascular interventions with coils, plugs, stents and stent grafts.

Results: 37 patients (9 males, 29 females) involved in the study with mean age was 58.1 years. Mean age for male was 69.8years. Mean age for female was 56.3years. 32 patients were diagnosis incidentally. 5 cases were complained abdominal pain. There was 3 pseudoaneurysms and 33 cases were saccular type. 4 patients were had 2 aneurysms. Mean aneurysm size was 2.4cm. Dome to neck ratio range was 1.6 to 2.8. Coil embolizations were performed in 25 cases and plug embolizations in 4 cases. 8 endovascular treatments of SAA with a stent graft. 4 complications were noted. There was 1 endoleak and treated by additional stent. Distal flow of splenic artery was not noted in 3 patients. 2 patients showed splenic infarction. 1 focal infarction patient was recovery after 1 year. Other 34 patients had no complications. There was no splenic artery aneurysm associated mortality.

Conclusion: In endovascular era, with the development of modern endovascular technologies, endovascular treatment of SAAs should be attempted as first line treatment, especially in ruptured aneurysms and even if relatively asymptomatic small aneurysms.

Keywords: Splenic artery aneurysms; Endovascular treatment; Complication

Introduction

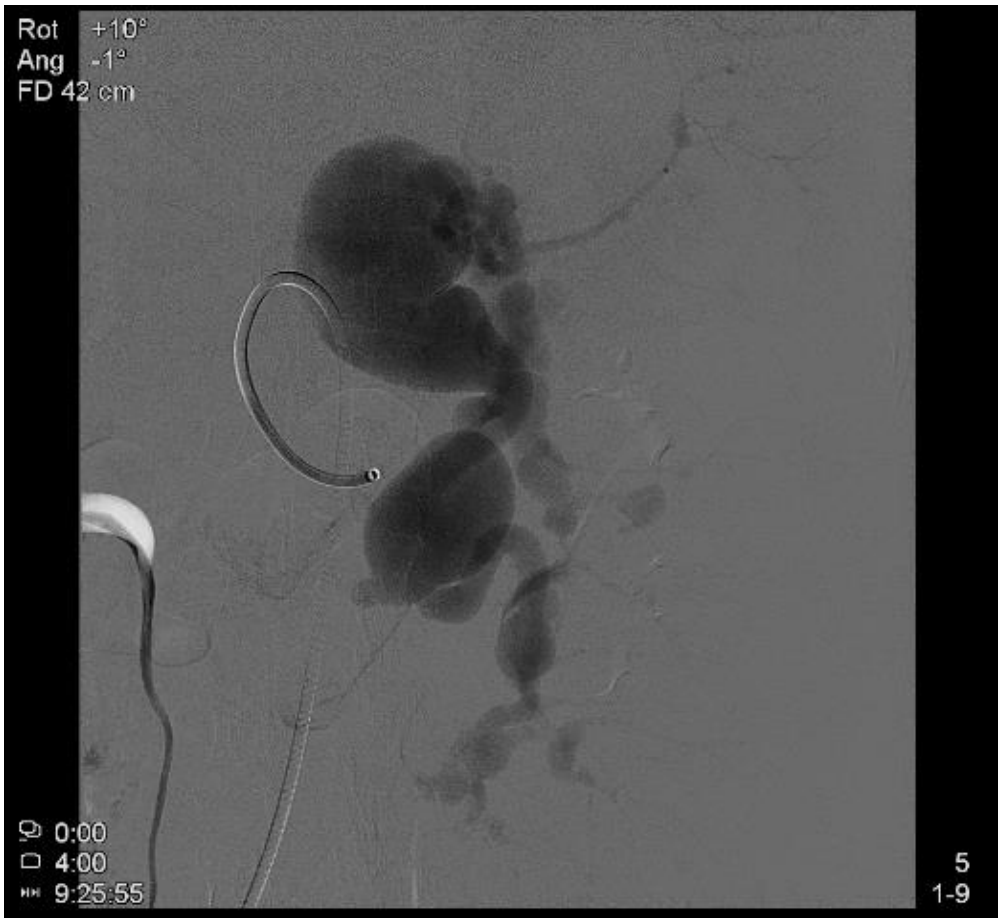
Aneurysms is defined as an artery with an increased 50% diameter of artery than expected and result in mortality and morbidity [1,2]. Splenic Artery Aneurysm (SAA) is uncommon. Large autopsy study revealed that an incidence of SAA is between 0.01 and 0.98%. The prevalence of SAA is not clear because most of SAA is asymptomatic [3]. Now more often diagnosed due to the increased use of cross-sectional imaging and an aging population [4,5]. Rare but clinically important vascular condition because of potential life-threatening disease. Recently SAA is extreme challenge in both emergency diagnosis and treatment. SAA is the most frequent visceral artery aneurysms, constituting 50–70% of visceral artery aneurysms [6]. In addition, SAA is the third most frequent intraabdominal aneurysms, following abdominal aorta and iliac artery aneurysms [6,7].

Materials and Methods

We retrospectively reviewed medical records of 37 consecutive SAA from June 2009 to May 2023. 37 patients were treated by endovascular interventions with coils, plugs, stents and stent grafts. The study protocol was approved by the Institutional Review Board of Chonnam National University Hospital. This study was exempted from written informed consent due to retrospective analysis based on medical records by Institutional Review Board. The 3D-derived method uses Synapse picture Archiving and Communication System (PACS) updates to automatically calculate the volume of contrast within an aneurysm. After importing CT angiogram series into Synapse, a 3D reconstruction of the aneurysm is formed. Aneurysms is defined as an artery with an increased 50% diameter of adjacent artery. Statistical analysis was performed using IBM SPSS Statistics ver 19.0 software (IBM Co., Armonk, NY, USA). Continuous data were compared using the Student's t-test and Fisher exact tests.

Results

78 patients (9 males, 69 females) involved in the study with mean age was 58.1 years. Mean age for male was 69.8years and age range was 51 to 80 years. Mean age for female was 56.3 and age range was 26 to 77 years. 32 patients were diagnosis incidentally. 5 cases were complained abdominal pain. 1 case under the impression of metastatic hepatocellular carcinoma and she has two fusiform type of SAAs **(Figure 1)**. This case was symptom aggravated and grave prognosis. Other 4 patients were improved symptom after endovascular intervention. There was 3 pseudoaneurysms **(Figure 2)** and 33 cases were saccular type. 4 patients were had 2 aneurysms. Mean aneurysm size was 2.4 cm and aneurysm size range were 1.2 to 7.2 cm. Dome to neck ratio range was 1.6 to 2.8. At last, follow up period, mean aneurysm size was 2.3 cm in 25 patients. 3 patients had a limited increasing in the diameter of its SAA sac after coil embolization. 11 patients had calcified aneurysm wall **(Figure 3)**. In location of splenic artery aneurysms were extrasplenic 27 cases, juxtasplenic 3 cases and hilar 7 cases. Coil embolizations were performed in 25 cases and plug embolizations in 4 cases. 8 endovascular treatments of SAA with a stent graft. 4 complications were noted. There was 1 endoleak during the stent grafting and treated by additional stent **(Figure 4)**. Distal flow of splenic artery was not noted in 3 patients. 2 patients showed splenic infarction. 1 focal infarction patient was recovery after 1 year **(Figure 5)**. Other 34 patients had no complications. There was no splenic artery aneurysm related mortality.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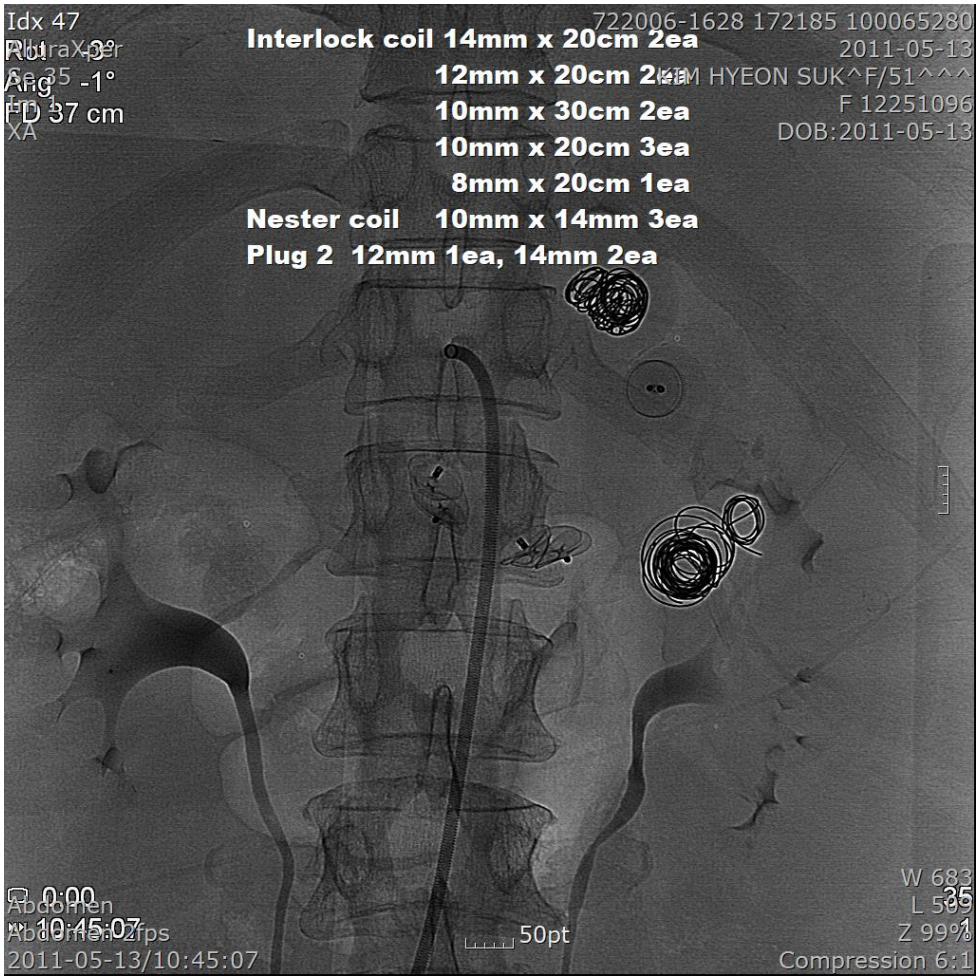

Figure 1: (A) Digital subtraction angiogram demonstrated two fusiform SAAs. (B) SAAs were treated by multiple coils and plugs embolizations.


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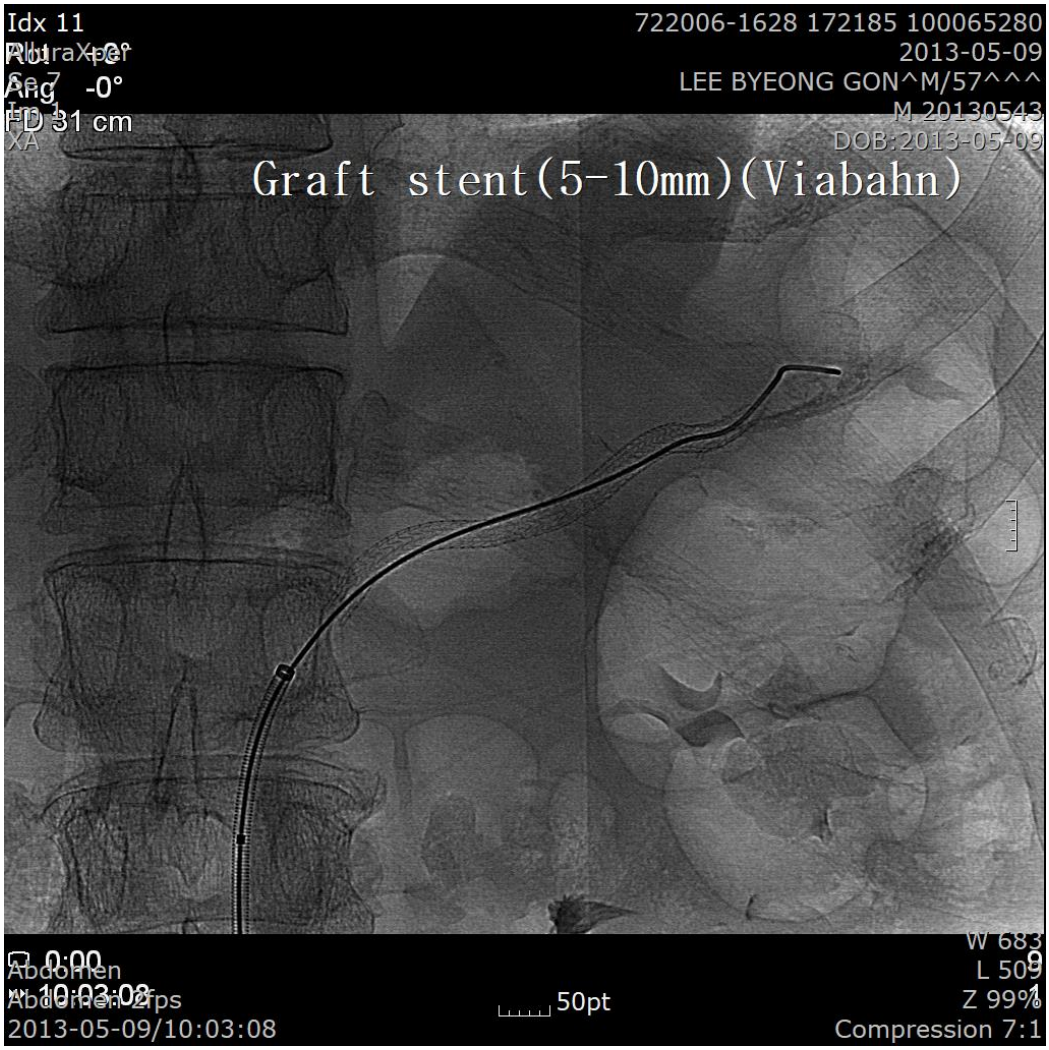

Figure 2: (A) Digital subtraction angiogram demonstrated pseudoaneurysm. (B) Pseudoaneurysm was excluded by stent-graft.

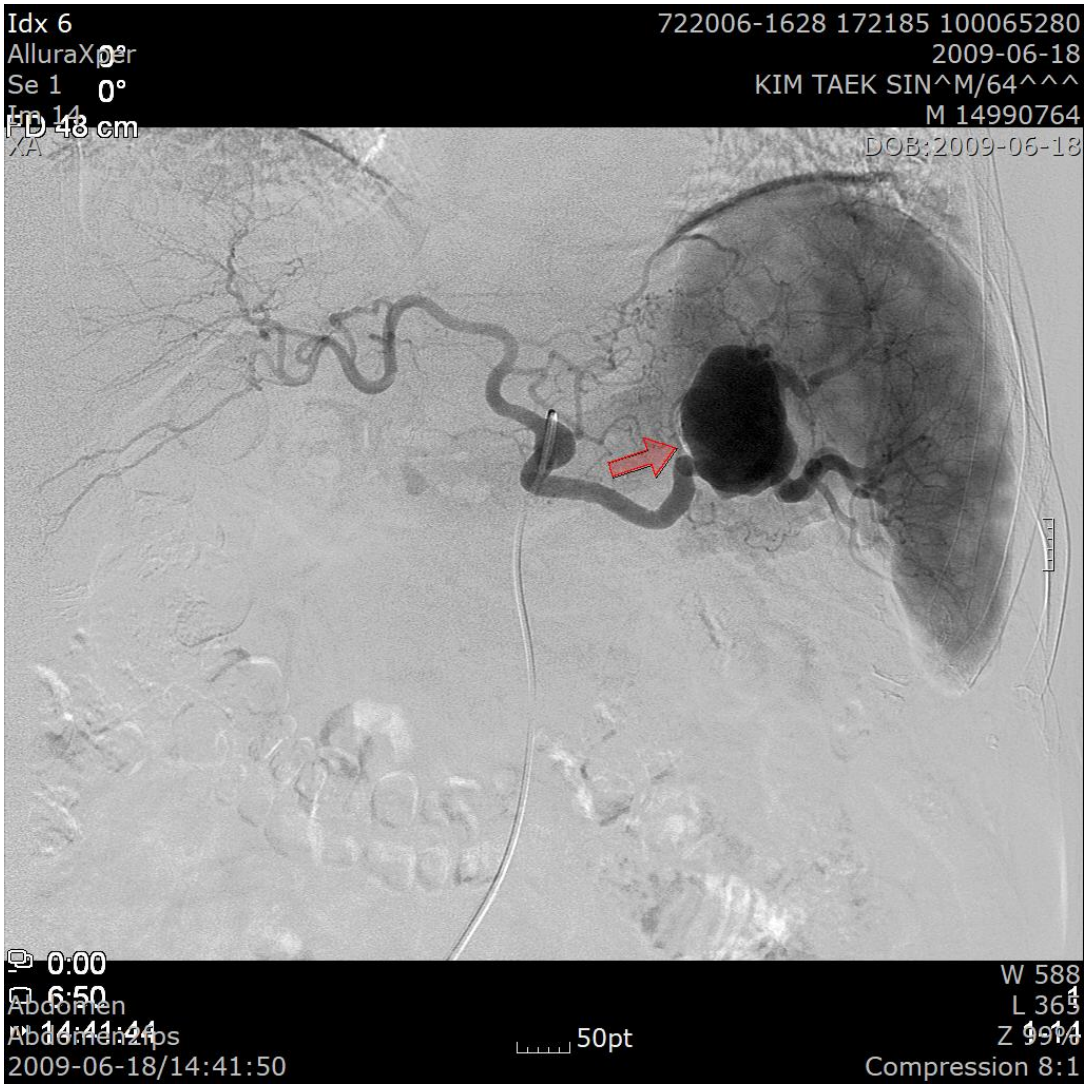
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Figure 3: (A) Angiography showed 7.2cm sized SAA with calcified aneurysm wall(arrow). (B) There was no flow disturbance after coil embolization.


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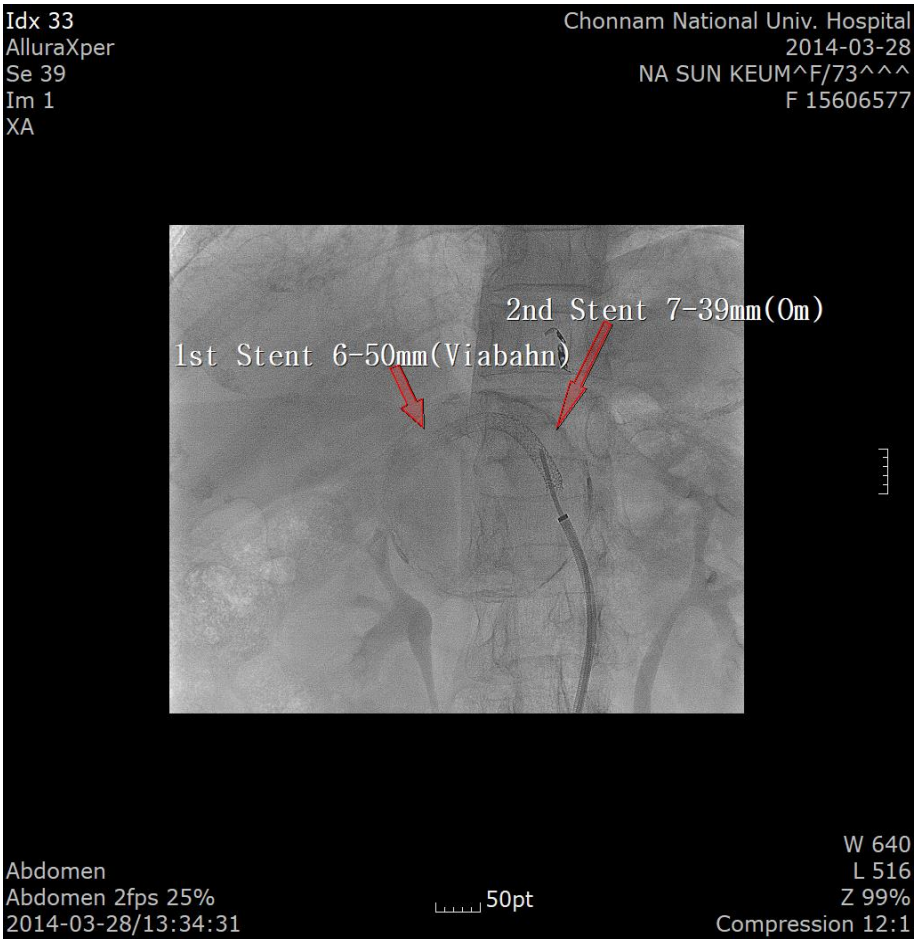

Figure 4: (A) Angiography showed endoleak after stent graft. (B) This endoleak was treated by additional stent.

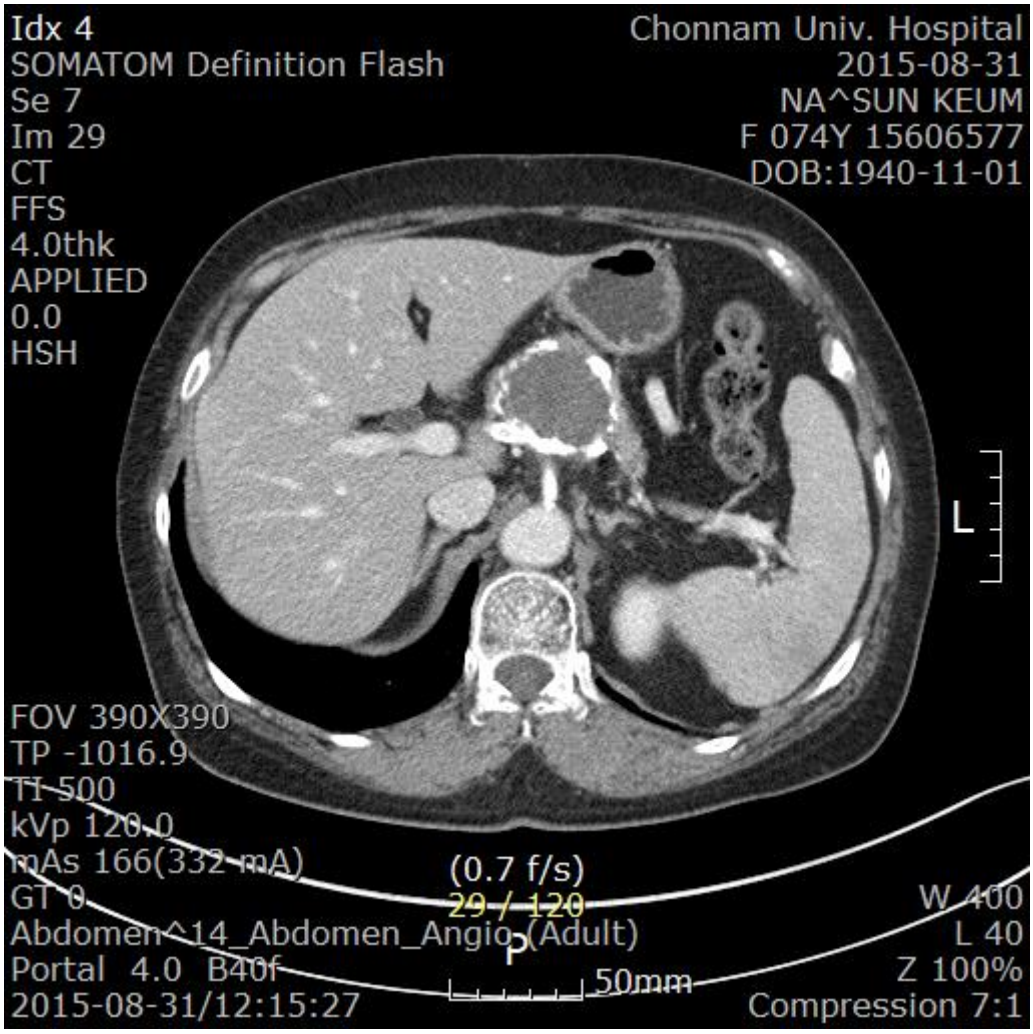

Figure 5: Spleen focal infarction was recovery after 1 year.

Discussion

Etiological factor of true SAA is unclear, but arteriosclerosis [6], portal hypertension [8,9], multiparity, medial degeneration [10,11], and fibromuscular dysplasia [12]. Other etiological factors of false or pseudo-SAAs are intra-abdominal infectious or inflammatory conditions [7,13], and vasculitis, surgery, iatrogenic intervention, and trauma [14]. Mortality rates in rupture of SAA is 40% [1]. Such high mortality rate is depending on location, etiology, and other contributing factors. Determination of rupture risk is primarily by diameter of SAA (aneurysmal size). Rupture rate of splenic artery is between 3% to 10% [15]. Treatment options of SAAs are elective repair, observation, and emergent repair. The goal of SAA treatment is preventing rupture and exsanguination. Treatment modalities of SAAs are surgical treatment and endovascular intervention. Consideration factor of determination of treatment modalities are patient characteristics (age, gender, presence of comorbidities), aneurysm characteristics (size, anatomic location), collateral circulation and pathogenesis [16]. Surgical management of SAA is viable alternative in the endovascular area. Laparoscopic for splenic artery aneurysms was performed [17]. Methods of surgical treatment are aneurysmectomy and bypass grafting [18,19], aneurysmectomy and end-to-end anastomosis [20], and ligation [21]. Treatment modalities of

endovascular treatment are deployment of coils and glue, particle or gelfoam injection, placement of covered stents, Flow-Diverting Stents (FDS), and stent graft **[22,23]**. Open surgery shift to endovascular intervention. Marked changes in treatment modalities occurred over the past decade with the advent of endovascular therapies. Immediate benefits of endovascular therapy are shorter hospital stay, local anesthesia and/or conscious sedation use, avoidance of major incisions, faster recovery, and patients with comorbidities prohibitive to open surgical management **[24]**. Drawbacks of endovascular therapy are access-related injury, contrast toxicity, end-organ embolization, and need for prolonged postembolization imaging surveillance **[24]**. The choice of treatment modality is individualized to the clinical scenario, and optimal results can be achieved with knowledge of the endovascular armamentarium. Endovascular embolization therapy uses nitinol coils, cyanoacrylate glue, plug, and stent graft **[23]**. Often limited by relatively large aneurysmal size and wide-necked splenic artery aneurysm treated using neurovascular comaneci neck-bridging device **[25]**. Open and endovascular approaches have similar rates of technical and clinical success, as well as mortality during follow-up. However, periprocedural morbidity was significantly higher in cases treated by open surgery. Although longer-term follow-up is needed to access the durability of the endovascular treatment, initial successful outcomes and low reintervention rates make it a safe and feasible approach. Conventionally indications of splenic artery aneurysm the presence of a symptomatic aneurysm regardless its diameter or of an asymptomatic aneurysm with a maximum diameter larger then 2cm and in persons undergoing liver transplantation **[26]**. In endovascular era, with the development of modern endovascular technologies, endovascular treatment of SAAs should be attempted as first line treatment, especially in ruptured aneurysms and even if relatively asymptomatic small aneurysms.

References

1. Yadav S, Sharma P, Singh PK, et al. Giant splenic artery aneurysm: a rare but potentially catastrophic surgical challenge. Int J Sug Case Rep. 2015;3:533-536.
2. Oakley E, Ho JD, Johnson V, VanCamp J, Melson T, Hick JL. Splenic artery aneurysm: An important cause of hemoperitoneum and shock. J Emg Med. 2014;46:e65-e67.
3. Tsokos M, Nolting RO, Lockemann U. Sudden, unexpected death sue to splenic artery aneurysm rupture. Am J Forensic Med Pathol. 2005;26:83-85.
4. Lui B., Zhou L., Ming Liu M, Xiaoyan Xie. Giant preripancreatic artery aneurysm with emphasis on contrast-enhanced ultrasound: report of two cases. J Med Ultrasonics. 2005;42:103-108.
5. Alabousi A, Patlas MN, Scaglione M, Romano L, Soto JA. Cross-Sectional Imaging of Nontraumatic Emergencies of the Spleen. Curr Probl Diagn Radiol 2014;254-267.
6. Akbulut S, Otan E. Management of Giant Splenic Artery Aneurysm Comprehensive Literature Review. Medicine. 2015;94:27.
7. Agrqwal GA, Johnson PT, Fishman EK. Splenic artery aneurysms and pseudoaneurysm: clinical distinctions and CT appearances. AJR Am J Roentgenol. 2007;188:992-9.
8. Kaya M, Baran S, Guya C, Kaplan MA. Prevalence and predictive factors for development of splenic artery aneurysms in cirrhosis. Indian J Gastroenterol. 2016;35(3):201-206.
9. Chen JS, Chung SC, Wang SN, Chang WT, Kuo KK, Lee KT, et al. Natural course of splenic artery

aneurysm with associated spontaneous splenorenal shut in non-cirrhotic liver: An 18-year observational follow-up and review of literature. Kaohsiung J Med Scien. 2013;29:55-58.

10. Jalbout NA, Moreland AJ. Syncope in middle aged femals:Splenic artery aneurysm revisited. Clin Imaging 52. 2018:8-10.
11. Ha JF, Phillips M, Fulkner K. Splenic artery aneurysm rupture in pregnancy. Eur J Obstet Gynecol Reprod Biol. 2009;146:133-137.
12. Unlu C, van den Heuvel D, Leeuwis JW, de Vries JP. Ruptured Aneurysm of the Splenic Artery Associated with Fibromuscular Dysplasia. Ann Vasc Surg. 2014;28:1799.e15-1799.e18.
13. Ohyama Y, Ishida H, Yoshida C, Konno J, Hoshino T, Watanabe H, et al. Pseudoaneurysm in a chronic pancreatitis patient: report of a case, with emphasis on contrast-enhanced sonograms. J Med Ultrasonics. 2010;37:75-79.
14. Christine E. Nembhard, John O. Hwabejire, Augustine C. Obirieze, Edward E. Cornwell, Wendy R. Freene, Suranarayana M. Siram. Trauma associated splenic artery aneurysm: An analysis of the National Trauma Data Bank. Ameri J Surg. 2016;211:739-743.
15. Karaman K, Onat L, Sirvanci M, Olga R. Endovascular stent graft treatment in a patient with splenic artery aneurysm. Turk Soci Radio. 2005;11:119-121.
16. Batagini NC, El-Arousy H, Clari G, Kirksey L. Open versus Endovascular Treatment of Visceral Artery Aneurysms and Pseudoaneurysms. Ann Vasc Surg. 2016;35:1-8.
17. Obuchi T, Sasaki A, Nakajima J, Nitta H, Otsuka K, Wakabayashi G. Laparoscopic Surgery for Splenic Artery Aneurysm. Surg Laparosc Endosc Percutan Tech. 2009;19:4.
18. Kim YJ, Johna S. Laparoscopic Excision of Splenic Artery Aneurysm. JSLS. 2013;17:132-134.
19. Akbulut S, Otan E. Management of giant splenic artery aneurysm comprehensive literature review. Medicine. 2015;94:27.
20. Zhang Y, Liu Z, Shen G, Zhang J, Assa CR, Hong B. Treatment of distal splenic artery aneurysm by laparoscopic aneurysmectomy with end-to-end anastomosis. Medicine. 2017;96:19.
21. Wei YH, Xu JW, Shen HP, Zhang GL, Ajoodhea H, Zhang RC, et al. Laparoscopic ligation of proximal splenic artery aneurysm with splenic function preservation. World J Gastroenterol. 2014;20(16):4835-4838.
22. Aoki M, Hagiwara S, Miyazaki M, Kaneko M, Murata M, Nakajima J, et al. Genuine splenic artery aneurysm rupture treated by N-butyl cyanoacrylate and metallic coils under resuscitative endocascular balloon occlusion of the aorta. Acute Med Surg. 2016;3(3):286-289.
23. Gung LJ, Wang JF, Wei BJ, Gao K, Hung Q, Zhai R. Endovascular treatment of splenic artery aneurysm with a stent-graft. Medicine 2015;94:e2073.
24. Ulka Sachdev-Ost. Visceral Artery Aneurysms: Review of Current Management Options. Mt Sinai J Med. 2010;77:296-303.
25. Julian Maingard, Hong Kuan Kok, Emma Phelan, Caitriona Logna, Dinesh Ranatunga, Duncan Mark Brooks, et al. Endovascular Treatment of Wide-Necked Visceral Artery Aneurysms using the Neurovascular Comaneci Neck-Bridging Device: A Technical Report. Cardiovasc Intervent Radiol. 2017;40:1784-1791.

26. Walter Dorigo, Raffaele Pulli, Leonidas Azas, Aaron Fargion, Domenico Angiletta, Giovanni Pratesi, et al. Early and Intermediate Results of Elective Endovascular Treatment of True Visceral Artery Aneurysms. Ann Vasc Surg. 2016;30:211-218.

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