JSHD
Journal of Structural Heart Disease

Case Report

Journal of Structural Heart Disease, December 2019, Volume 5, Issue 6:263-267
DOI: https://doi.org/10.12945/j.jshd.2019.005.19

Received: February 07, 2019
Accepted: February 20, 2019
Published online: December 2019

Very Late Thrombosis of an Atrial Septal Defect Occluder Device Causing a Massive Splenic Infarction

Pablo Tome Teixeirense, MD*, João Felipe Barros de Toledo, MD, Luiz Antonio Gubolino, MD, Antoninha Azevedo Bragalha, MD, Camila Alves Pereira, MD

Interventional Cardiology, Incorpi - Hospital dos Fornecedores de Cana de Piracicaba, Piracicaba, Sao Paulo, Brazil

Percutaneous occlusion of atrial septal defect (ASD) has emerged as the first approach of treatment in many cardiac centers, because of lower post-procedure morbidity and shorter hospital stay when compared to open-heart surgery. However, there is scarce information on very late complications.

We present a case of a 19-year-old girl who had a very late systemic thrombotic complication. The patient was treated six years before, with the implant of an Occlutech® Figulla® (Helsinborg, Sweden) 33mm device for closing a secundum ASD. The implant was guided by a 2D transoesophageal echocardiogram.

There were no complications during the procedure. The patient was oriented to take DAPT for 6 months after the procedure, but she decided not to take any medication. Interestingly, there were no thrombotic complications during the first six years follow-up.

The Echocardiograms performed at one (TTE), six (TTE) and twelve months (TOE) after the procedure showed a well-implanted device and no residual shunts.

Six years after the procedure, the patient was taking only contraceptive therapy. She has begun abdominal pain of subtle onset and was taken to the ER. An abdominal ultrasound showed low arterial flow in her spleen. An AngioCT was performed, revealing a large splenic infarction. The patient was anticoagulated, first with Low Molecular Weight Heparin and after with Coumadin for one year, keeping the INR target between 2,5 - 3,5.

There were no additional complications. The first TOE showed one mobile thrombus attached to the left disc of the device, and a new examination after two weeks of therapy revealed its complete resolution.

The patient is under clinical surveillance, was advised to stop contraceptive therapy and a hematologic workup was done after one year of completion Coumadin therapy has not revealed any thrombotic disorder.

Percutaneous closure of ASD is the standard therapy in many cardiac centers. However, complications may occur. Despite rare, late thrombosis can be a potentially catastrophic event. It can be related to incomplete endothelialization of the device, and the predictors for this condition are poorly understood. Candidates for device implantation should be carefully screened for potential thrombotic and allergic conditions prior to choosing the ideal therapy. Close follow-up shall be mandatory in these patients.

Key Words

Atrial septal defect • Septal Closure device • Interventional Cardiology

Case Presentation

Percutaneous occlusion of secundum atrial septal defects (ASD) has emerged as the first choice of treatment in many cardiac centers, because of less post-operative morbidity and shorter hospital stay when compared to surgery [1, 2]. King and Mills performed the first series of cases in 1976 [3]. However, only after the appearance of the Amplatzer Septal Occluder

Fax +1 203 785 3346
E-Mail: jshd@scienceinternational.org
http://structuralheartdisease.org/

ISSN 2326-4004

Accessible online at:
http://structuralheartdisease.org/

* Corresponding Author:
Pablo Tome Teixeirense, MD
Interventional Cardiology
Incorpi - Hospital dos Fornecedores de Cana de Piracicaba
Rua Rafael Aloisi, 60, Piracicaba 13405205, Brazil
Tel. +55 19 992046253; E-Mail: pablo.tome@me.com

Figure 1. The Occlutech® ASD Ocludder.

(ASO) [4, 5], the method has gained wider acceptance. Nevertheless, complications have been described. More common are device embolization, cardiac erosion, atrioventricular block, atrial arrhythmias, inflammatory and allergic reactions to components of the devices (mainly nickel) and device thrombosis [6-11]. The last is commonly related to device implantation and should decline after its endothelialization (up to 6 months). In general, adult patients are treated with dual antiplatelet therapy (Aspirin plus Clopidogrel), starting with a loading dose of 300mg of Clopidogrel and 300mg of ASA two to four days before the procedure, and continuously for six months after treatment, using data from coronary angioplasty protocols [12], since there are no trials to date that have investigated the best antiplatelet therapy in this specific setting. Preoperative management may vary from different centers, but generally involve collecting general hematologic tests (complete blood count, coagulation profile), Thorax X-Ray and echocardiogram. During the procedure, patients receive intravenous heparin to maintain the Activated Clotting Time (ACT) between 200-250 seconds, antibiotic prophylaxis, and in post-procedure an echocardiogram is generally made in the first 24 hours to check device position, presence of residual shunts, evidence of new pericardial effusion and valve function. In the long term evolution, TTE is performed in one and six months, and a TOE is performed after one year of treatment.

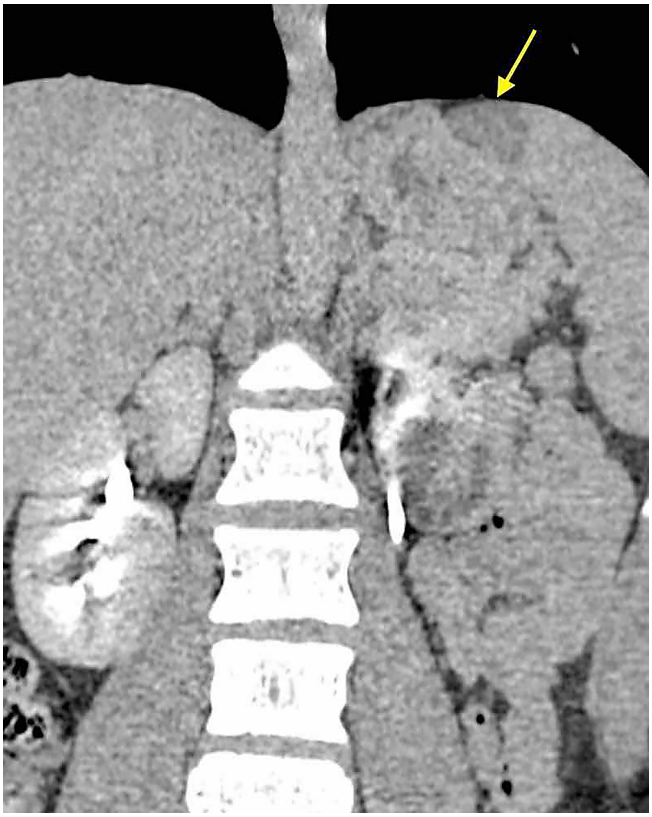


Figure 2. CT Scan showing apical splenic infarction (arrow), 6 years after ASD closure.

Pedra et al. [13] reported mid-term outcomes of secundum ASD closure with the Figulla® Occlutech® device in an observational, single-arm study that included 200 consecutive patients treated in two Brazilian referral centers. For children, the antiplatelet protocol included Aspirin in a dose of 3-5 mg/Kg (max: 200mg/day), started a couple of days before the procedure. Heparin was given (100-150 IU/Kg) during the device implantation to maintain the ACT greater than 200 seconds. Anmar and Hegazy [14] published the results of the closure of 17 ASDs in patients with less than two years of age, using the Occlutech® Figulla® Flex occluder. For this subsetting (small children), antiplatelet protocol included Aspirin in a dose of 5mg/Kg before the index procedure and for six months after the implant.

Nevertheless, there is scarce data on very late complications, mainly because of the lack of trials to investigate very long term treatment evolution.

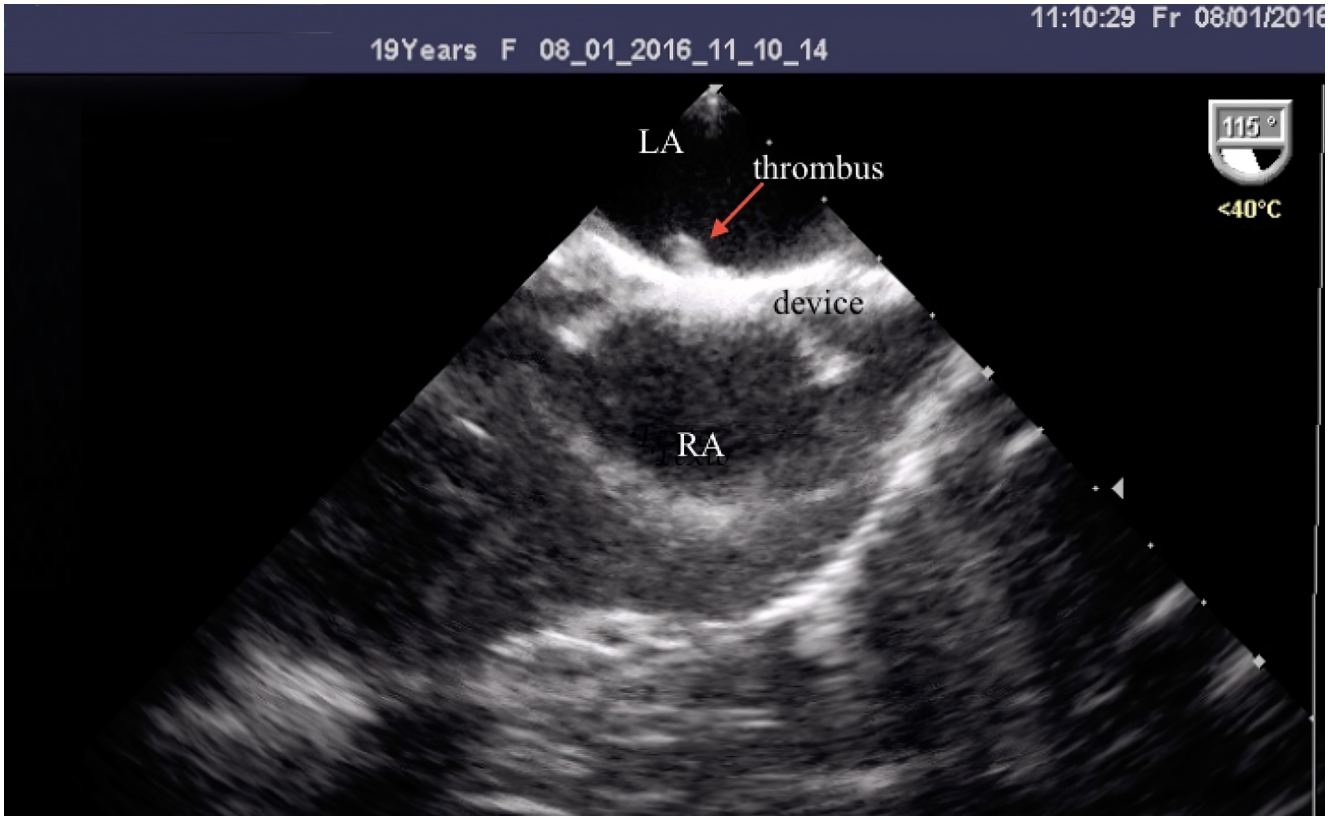


Figure 3. TOE showing mobile thrombus attached to the occluder's left atrial disk.

We present a case of a 19-year-old female who presented with a very late systemic thrombotic complication after percutaneous treatment of a large size ASD.

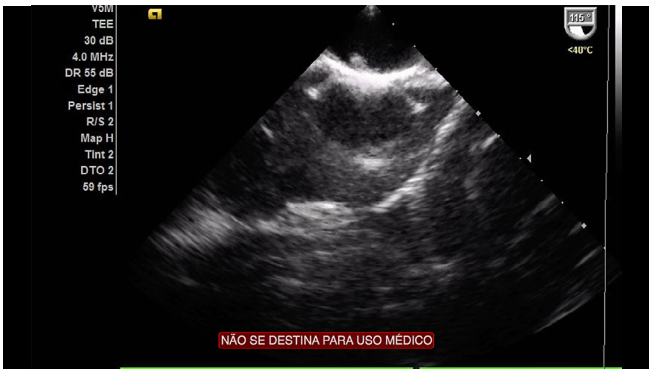
The patient had been treated six years before, with implantation of a 33mm Occlutech® Figulla® ASD occluder (Figure 1). The implant was guided by the 2-D transoesophageal TOE. There were no complications during the procedure or in the postoperative period. The patient was advised to take DAPT (ASA plus Clopidogrel) for 6 months after the procedure, but she decided personally not to take any medication, and even so, she had not any immediate and late thromboembolic complications.

Transthoracic echocardiograms (TTE) performed at one and six months, as well as a transoesophageal echocardiogram (TOE) at twelve months after the procedure showed a well-implanted device, no residual shunts and no signs of thrombus.

Six years after the procedure, the patient was taking only contraceptive therapy and never smoked. The initial symptom was acute abdominal pain. An abdominal ultrasound showed low arterial spleen flow. An AngioCT was performed, revealing a large splenic apical infarction, and multiple small ischemic areas in the spleen (Figure 2). Anticoagulation was initiated, first with Low Molecular Weight Heparin (LMWH) and after with Coumadin for one year, keeping the INR target between 2,5 to 3,5.

There were no additional complications. The first TOE showed one mobile thrombus attached to the left disc of the device (Figure 3 & Video 1), and a new examination after two weeks of therapy revealed the complete resolution of the thrombus.

After one year of anticoagulation, the patient had a complete hematologic workup, including Factor V Leiden, Prothrombin G20210A mutation, Protein C and S, Antithrombin III, Antiphospholipid antibodies (Anticardiolipin and Lupus anticoagulant) and Homocysteine, that have not shown any disorder. After that, she was prescribed ASA and Clopidogrel indefinitely, although the patient refused to take the medications.



Video 1. Shows the mobile thrombus on the occluder's left atrial disk. View supplemental video at https://doi.org/10.12945/j.jshd.2019.005.19.vid.01.

Discussion

Krumsdorf et al. [15] have investigated the incidence and clinical course of thrombus formation on atrial septal defect (n=407) and patent foramen ovale (n=593) closure devices in 1,000 consecutive patients, between august 1992 and January 2003. The mean age was 48 ± 15 years and nine different devices were used, Amplatzer (ASD and PFO devices) being the most used in this series (41% of all devices). During a follow-up period of 1 to 108 months (mean 36 ± 17 months), a thrombus formation was detected in 20 of 1,000 (2%) patients. The TOE had been performed four weeks and six months after closure in 71% of the patients. Of the 20 patients with documented thrombus formation, 17 had good outcomes with the disappearance of the thrombus following anticoagulation therapy with heparin (n=1), warfarin (n=12), or both (n=4). In three patients the thrombus was removed surgically. Coagulation disorders such as protein C and protein S deficiency and activated protein C resistance were not identified in the thrombus cases, and hyperactivity of factor VIII and thrombocytosis was found in two patients. A wire device frame fracture was also observed in 3 of the 20 (15%) thrombus patients. The authors related atrial septal aneurysm (n=4) and post-procedural paroxysmal atrial fibrillation (n=4) as significant predictors for thrombus formation.

Other hypotheses for this late complication could be incomplete endothelialization of the device. Nguyen et al. [16] described one case of very late endocarditis after twelve years of an ASD closure. The surgical findings showed incomplete endothelialization of approximately one quarter of the Amplatzer Septal Occluder, and vegetations on both sides of the device. The authors commented that although in preliminary animal studies of transcatheter ASD closure investigators have reported complete endothelialization within weeks after implantation and a 100% closure rate at 3 months, in humans investigators have observed varying degrees of endothelialization with or without late sequelae. For this setting, investigators have been analyzing surface modifications and coatings on NiTi alloys at the molecular level to enhance device healing and endothelialization [17, 18].

Conclusions

Transcatheter ASD closure is a common and widespread procedure. However, very late complications may occur. Despite very rare, late thrombosis can be a potentially catastrophic event. Candidates for device implantation should be carefully screened for potential thrombotic and allergic conditions prior to choosing the ideal therapy. Close follow-up shall be mandatory in these patients.

Conflict of Interest

The authors have no conflict of interest relevant to this publication.

Comment on this Article or Ask a Question

References

1. Costa RN, Ribeiro MS, Pereira FL, Pedra SRF, Jatene MB, Jatene IB, et al. Percutaneous versus surgical closure of atrial septal defects in children and adolescents. Arq Bras Cardiol. 2013;100:347-354. DOI: 10.5935/abc.20130059
2. Butera G, Carminati M, Chessa M, Youssef R, Drago M, Giamberti A, et al. Percutaneous versus surgical closure of secundum atrial defect: comparison of early results and complications. Am Heart J. 2006;151:228-234. DOI: 10.1016/j.ahj.2005.02.051
3. King TD, Mills NL. Secundum atrial septal defects: non-operative closure during cardiac catheterization. JAMA. 1976;235:2506-2509. DOI: 10.1001/jama.1976.03260490024013
4. Sharafuddin MJA, Gu X, Titus JL, Urness

M, Cervera-Ceballos JJ, Amplatz K. Transvenous closure of secundum atrial septal defects: preliminary results with a new self-expanding nitinol prosthesis in a swine model. Circulation. 1997;95:2162-2168. DOI: 10.1161/01.CIR.95.8.2162
5. Du ZD, Hijazi ZM, Kleinman CS, Silverman NH, Larntz K. Comparison between transcatheter and surgical closure of secundum atrial septal defect in children and adults: results of a multicenter nonrandomized trial. J Am Coll Cardiol. 2002;37:1707-1712.
6. Chessa M, Carminati M, Butera G, Bini RM, Drago M, Rosti L, et al. Early and late complications associated with transcatheter occlusion of secundum atrial septal defect. J Am Coll Cardiol. 2002;39:1061-1065. DOI: 10.1016/S0735-1097(02)01711-4
7. Lee WC, Fang CY, Huang CF, Lin YJ, Wu CJ, Fang HY. Predictors of Atrial Septal Defect Occluder Dislodgement. Int Heart J. 2015;56:428-431. DOI: 10.1536/ihj.15-065
8. Yamamoto T, Kanazawa H, Tanosaki S, Goto S, Kimura M, Tsuruta H, et al. A Novel Mechanism of Atrioventricular Block Following Transcatheter Closure of an Atrial Septal Defect. JACC Cardiovasc Interv. 2016;9:2067-2069. DOI: 10.1016/j.jcin.2016.07.028
9. Geoffrey B, Crawford GB, Brindis RG, Krucoff MW, Mansalis BP, Carroll JD. Percutaneous atrial septal occluder devices and cardiac erosion: a review of the literature. Catheter Cardiovasc Interv. 2012;80:157-167. DOI: 10.1002/ccd.24347
10. Dickison, P, Harris V, Smith SD. Nickel hypersensitivity following closure of atrial septal defect: A case report and review of the literature. Australas J Dermatol. 2018;59:220-222. DOI: 10.1111/ajd.12787
11. Cooke JC, Gelman JS, Menahem S, Harper RW. Thrombus on ASD closure device: a call for caution. Heart, Lung and Circulation. 2000;9:30-31. DOI: 10.1046/j.1444-2892.2000.009001030.x
12. 2016 ACC/AHA Guideline Focused Update on Duration of Dual Antiplatelet Therapy in Patients With Coronary Artery Disease. Circulation. 2016;134:e123-e155. DOI: 10.1161/CIR.0000000000000453
13. Pedra CAC, Pedra SF, Costa RN, Ribeiro MS, Nascimento W, Campanh LOS, et al. Mid-Term Outcomes after Percutaneous Closure of the Secundum Atrial Septal Defect with the Figulla-Occlutech Device. J Interven Cardiol. 2015;9999:1-8.
14. Anmar R, Hegazy R. Transcatheter Closure of Secundum ASD Using Occlutech Figulla-N Device in Symptomatic Children Younger Than 2 Years of Age. J Invasive Cardiol. 2013;25:76-79
15. Krumsdorf U, Ostermayer S, Billinger K, Trepels T, Zadan E, Horvath K, et al. Incidence and Clinical Course of Thrombus Formation on Atrial Septal Defect and Patient Foramen Ovale Closure Devices in 1,000 Consecutive Patients. J Am Coll Cardiol. 2004;43:302-309. DOI: 10.1016/j.jacc.2003.10.030
16. Nguyen AK, Palafox BA, Starr JP, Gates RN, Berdjis F. Endocarditis and Incomplete Endothelialization 12 years After Amplatzer Septal Occluder Deployment. Tex Heart Inst J. 2016;43:227-231. DOI: 10.14503/THIJ-14-4949
17. Yang D, Lu X, Hong Y, Xi T, Zhang D. The molecular mechanism for effects of TiN coating on NiTi alloy on endothelial cell function. Biomaterials. 2014;35:6195-6205. DOI: 10.1016/j.biomaterials.2014.04.069
18. Shen W, Cai K, Yang Z, Yan Y, Yang W, Liu P. Improved endothelialization of NiTi alloy by VEGF functionalized nanocoating. Colloids Surf B Biointerfaces. 2012;94:347-353. DOI: 10.1016/j.colsurfb.2012.02.009

Cite this article as: Teixeirense PT, de Toledo JFB, Gubolino LA, Bragalha AA, Pereira CA. Very Late Thrombosis of an Atrial Septal Defect Occluder Device Causing a Massive Splenic Infarction. Structural Heart Disease. 2019;5(6):263-267. DOI: https://doi.org/10.12945/j.jshd.2019.005.19