Chiari Network or Catheter-Associated Thrombus? A Rare Complication of Transseptal Access

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INTRODUCTION

A Chiari network is an embryonic remnant of the valve of the sinus venosus and is a mobile, fenestrated reticular anatomic variant found in the right atrium in about 1.3% to 4.0% of the population. Hans Chiari first described this entity in 1897. Although usually of no clinical significance, the Chiari network has been associated with embolic phenomena and endocarditis and in rare cases has been reported to lead to catheter entrapment. It is typically a benign bystander during procedures involving manipulation of catheters in the right atrium or transseptal puncture, and to our knowledge only one case has been reported of a Chiari network prolapsing into the left atrium during a percutaneous procedure in an adult patient. Besides the obvious embolic risk, this finding can be particularly concerning and confusing to operators, as the mobile network in the left atrium may be confused with thrombus. In this report we present a case of a Chiari network herniating transeptally during a percutaneous left atrial appendage occlusion procedure, initially mimicking the appearance of catheter-adherent thrombus.

CASE PRESENTATION

An 82-year-old man with a history of hypertension, chronic obstructive pulmonary disease, and permanent atrial fibrillation was deemed intolerant to anticoagulation because of a severe gastrointestinal bleed requiring multiple transfusions. He subsequently presented to our institution for percutaneous left atrial appendage occlusion.

Upon removal of the catheter, the left atrium was inspected on TEE imaging, and no mobile echogenic focus in the left atrium was observed (Figure 5). Furthermore, the heaped-up tissue at the transseptal insertion point of the delivery sheath (Figure 2, Video 2). Further examination of the right atrial aspect of the transseptal puncture revealed what appeared to be heaped-up tissue at the transseptal insertion point of the delivery sheath (Figure 3, Video 3). After much debate, it was ultimately believed that the mobile mass may represent a Chiari network originating from the right atrium and traversing the interatrial septum with the delivery sheath.

Although seemingly unlikely, it appeared that the Chiari network had herniated into the left atrium while the interatrial septum was being traversed by the delivery system, presumably dragged by the delivery sheath or a preceding procedural sheath (Figure 4, Videos 4 and 5).

There was lengthy discussion about how to proceed, including aborting the procedure, removing the sheath and repeating the transseptal puncture, and closing the iatrogenic atrial septal defect with an atrial septal defect occluder to ensure that the mobile mass was trapped against the septum and not potentially free to embolize. Ultimately, it was believed that the mobile mass was stable and that the procedure could continue, with the understanding that eventual removal of the delivery sheath might in fact drag the Chiari network back to the right atrium and remedied the problem. The left atrial appendage closure device was successfully deployed. The access system was then removed. Upon removal of the catheter, the left atrium was inspected on TEE imaging, and no mobile echogenic focus in the left atrium was observed (Figure 5). Furthermore, the heaped-up tissue at the right atrial aspect of the transseptal puncture site was gone, and a newly free-flowing Chiari network could be seen in the right atrium (Figure 6, Video 6). Together these findings supported our impression that the echogenic mass was indeed a Chiari network that was retrieved back to the right atrium after retraction of the catheter.
The patient had no postprocedural complications, recovered well, and had an unremarkable discharge. In outpatient follow-up, he was noted on TEE imaging to have a well-seated left atrial appendage closure device with no significant peridevice leaks and a Chiari network in the right atrium.

**DISCUSSION**

We present the case of an uncommon, initially confusing, but ultimately harmless procedural complication involving a Chiari network herniating into the left atrium during a transseptal puncture. This highly unusual finding generated much discussion during the case but ultimately affected neither the technical aspect nor the clinical outcome of the procedure.

Transseptal puncture during a procedure increases the risk for complications given the left-sided access inherent in traversing the interatrial septum. Embolic phenomena including stroke have previously been reported, and as such operators must maintain a high level of vigilance for concerning left-sided findings. In our case, the initial concern was for catheter-associated thrombus, but the procedural imaging was crucial in ultimately elucidating the diagnosis. Additionally, this finding raised uncertainty regarding the decision to proceed with device implantation or retract the catheter knowing that an embolic event was possible.

To our knowledge, there has been only one prior case report of a Chiari network herniating into the left atrium during a percutaneous procedure. In that report, the authors described a similar occurrence during a percutaneous edge-to-edge mitral repair procedure. A Chiari network was noted in the left atrium after being trapped by the guide and stiff wire and dragged into the left atrium. Similar to our case, the Chiari network initially could not be differentiated from thrombus. The procedure was aborted, and both the guide
and Chiari network returned to the right atrium on retraction of the equipment. One additional case with some similarities, although in a neonate, which involved a foramen ovale closure, was found in the literature. In this case, imaging showed a Chiari network moving in and out of the right ventricle. Before the foramen ovale closure, the mobile remnant passed into the left atrium and became stuck. The differential for the remnant before it was identified included thrombus, tumor, vegetation, and ruptured chordae. As percutaneous procedures involving transseptal puncture become increasingly common, cases such as these are likely to recur, making awareness important.

In addition to raising awareness given the paucity of prior reports, our case highlights two important lessons for percutaneous procedures involving transseptal puncture. First, this case reiterates the importance of comprehensive TEE evaluation before beginning the case to detect potential anatomic variants and potential obstacles to an otherwise straightforward procedure. Second, and perhaps more important, this is the second case describing the management of this finding. Simply retracting the catheter appears to be a safe and effective strategy for the management of iatrogenic left atrial herniation of a Chiari network.

**CONCLUSION**

This report represents a unique and rare case in which a Chiari network was identified as having herniated into the left atrium. In an era of increasing percutaneous interventions requiring transseptal puncture, this case raises awareness of an ultimately benign complication associated with a Chiari network. The case also provides some direction on how to proceed during transseptal interventions should a Chiari network be encountered again in the left atrium.
SUPPLEMENTARY DATA

Supplementary data related to this article can be found at https://doi.org/10.1016/j.case.2019.10.005.

REFERENCES

1. Helwig FC. The frequency of anomalous reticula in the right atrium of the human heart “Chiari network”: report of eight cases. Am J Pathol 1932;8:73-80.
2. Chiari H. Ueber Netzbildungen im rechten Vorhof des Herzens. Beitr Pathol Anat 1897;22:1-10.
3. Schneider B, Hofmann T, Justen MH, Meinertz T. Chiari’s network: normal anatomic variant or risk factor for arterial embolic events? J Am Coll Cardiol 1995;26:203.
4. El-Khoury H, Putman D, Rutkowski M. Unusual case of prominent Chiari network trapped in the left atrium. J Am Soc Echocardiogr 1998;11:71-3.
5. Mousavi N, Bhagirath K, Arijarajah V, Fang T, Ahmadie R, Lytwyn M, et al. Chiari network endocarditis: not just an innocent bystander. Echocardiography 2008;25:642-5.
6. Goldschlager A, Goldschlager N, Brewster H, Kaplan J. Catheter entrapment in a Chiari network involving an atrial septal defect. Chest 1972;62:345-6.
7. Yeo KK, Chiam PTL, Tan J, Ding ZP. Chiari network complicating a Mitra-Clip procedure. In: Feldman T, Franzen O, Low R, Rogers J, Yeo KK, editors. Atlas of Percutaneous Edge-to-Edge Mitral Valve Repair. London: Springer; 2013:377-80.
8. B-Lundqvist C, Olsson SB, Varnauskas E. Transseptal left heart catheterization: a review of 278 studies. Clin Cardiol 1986;9:21-6.

Figure 6 TEE imaging of the right atrium showing echocogenicity free flowing.