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Case Report

Retrieval of Embolized Atrial Septal Defect Device from Left Atrium Using Innovative Techniques

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ABSTRACT

We report a technically difficult retrieval of embolized Atrial Septal Defect device from left atrium. Device was captured after multiple attempts using different types of snares and was brought to inferior vena cava without delivery sheath. As we were unable to slenderize the device into short sheath, it was finally retrieved using an unconventional and innovative technique. We emphasize the importance of safe improvised methods during challenging catheterization procedures resulting in successful outcomes.

Keywords: Atrial septal defect, Embolization, Trans-catheter.

How to Cite This Article: *Mehmood A, Imtiaz S, Akhtar K, Sadiq N. Retrieval of Embolized Atrial Septal Defect Device from Left Atrium using Innovative Techniques. Pak Armed Forces Med J 2022; 72(Suppl-3): S651-653. DOI: https://doi.org/10.51253/pafmj.v72iSUPPL-3.9584*

INTRODUCTION

Percutaneous atrial septal defect (ASD) device closure for ASDs with suitable anatomic characteristics has largely replaced surgery in many centres,[1] as it is associated with excellent outcomes. The overall rate of complications following ASD device closure was found to be 6.6% in a systematic review and meta-analysis, with major complications rate of 1.9%.[2] Device embolization or malposition needing further transcatheter therapy or surgery occurred in 1.6%. Although rare, but this can ultimately prove to be a fatal complication.[3]

Herein, we report on successful transcatheter retrieval of ASD device which was embolized into left atrium (LA). We used various newer techniques in this procedure. Use of very unconventional, promising and safe techniques by means of multiple snares, catheters and sheaths made this procedure an innovative one.

CASE REPORT

17 years old male presented with a large secundum atrial septal defect. Transesophageal echocardiography revealed a 34x28x30mm secundum ASD with adequate rims so device closure of the defect was planned. Through 14 F delivery sheath, 38 mm ASD Cocoon Device was deployed under transthoracic echocardiography and fluoroscopy guidance. Echocardiography was done few hours after implantation which showed device embolization probably due to mal-aligned atrial septum. Device was found in left atrium just above mitral valve (Figure-1).

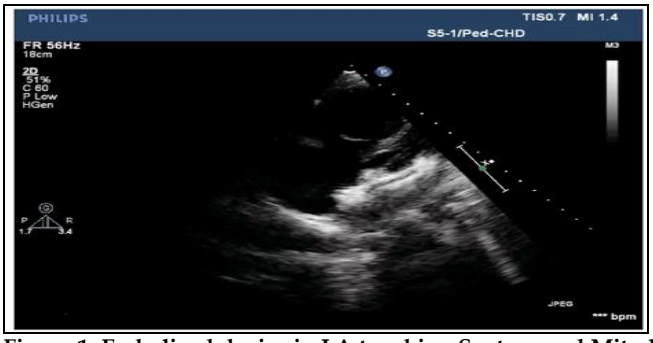

Figure-1: Embolized device in LA touching Septum and Mitral Valve

On examination, patient was hemodynamically stable with a pulse rate of 92/min, B.P 105/75 mmHg, SO_2 98% in air and normal sinus rhythm. He was immediately shifted to cath lab for percutaneous retrieval of embolized device. Under local anesthesia, both femoral veins were accessed with 6 Fr sheath. Device was found to be at LA impinging on mitral valve. Multiple attempts were made to capture the device with snare loaded in 6 Fr JR catheter within the 14 Fr long delivery sheath but failed. 6 Fr JR catheter with Ensnare was introduced separately without delivery sheath via other femoral vein access. After repeated attempts, device was captured with the snare but unfortunately snare was not introduced through the mullin delivery sheath. Snare with the captured device was tried to brought into the sheath but the maneuver involved the risk of losing the device. Device was carefully slided to right atrium (RA). Then it was tried to be brought into the inferior vena cava (IVC) without

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sheath with the help of different snares (Ensnare, Maslanka, Gooseneck, Endomyocardial biopsy catheter & delivery cable of Occlutech device) and by gently pulling the device up to femoral vein by snaringit again (Figure-2).

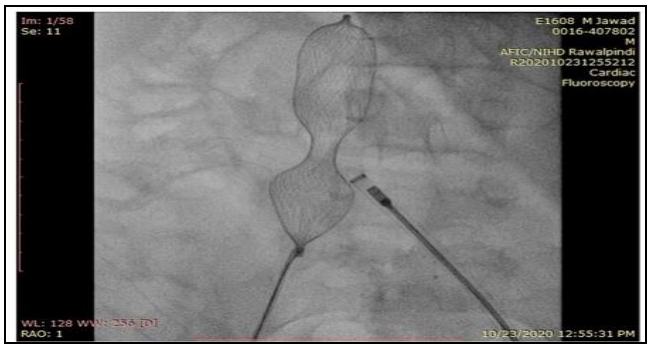

Figure-2: Device held with Snare taken down to IVC but multiple attempts could not take device into Mullen Sheath

At this point, we faced another challenge when device could not be drawn out through 12 Fr short sheath and 14 Fr short sheath was not available. Once device was close to skin, venesection was done a little above the device position. Proximal knob of device was held with the help of artery forceps (Figure-3). Before pulling the device, loose silk sutures were applied in figure of eight two above the device and one below the device. The sutures were tightened to secure the hemostasis while gently pulling the device out of skin. It was finally retrieved in a bloodless field.

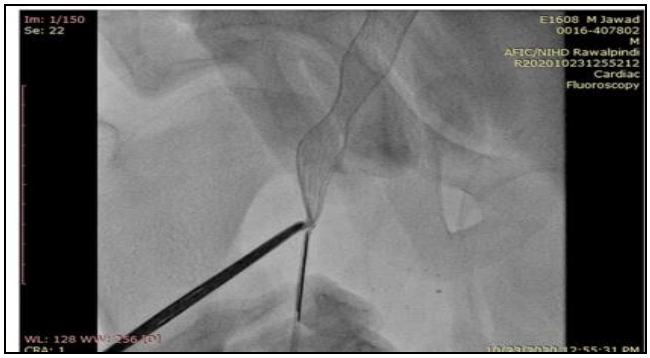

Figure-3: While holding and gently pulling the device a cut was made over the proximal knob of device and on exposure the knob is held with Artery Forceps and locked

The procedure run-time last 260 mins while the fluoroscopy run time last 130 mins. The patient remained stable hemodynamically throughout the procedure and no arrhythmia and desaturation were observed. Post procedure recovery was smooth too. He was discharged the next day and referred to cardiac surgeon for ASD patch closure.

DISCUSSION

Percutaneous closure of ASD is a popular choice as an alternative to surgical repair for majority of patients because of reduced rate of early complications and length of hospital stay.[4] Embolization of device is the most common periprocedure or early post procedure complication. Other complications include atrial arrythmias, atrioventricular blocks, pericardial effusion, cardiac perforation due to erosion by device, femoral venous or arterial injury, blood transfusion,[5,6] and sudden death.[7]

Several factors have been described leading to device embolization including incorrect estimated size, a very large defect, flimsy rims unable to carry the device, extremely mobile interatrial septum, septal rupture or the technical problems/bad image quality just before device release.

Detailed preprocedural assessment of anatomy, size, rims of the defect and careful positioning/deployment of device across the defect under clear imaging can prevent embolization. The use of Transesophageal or Intracardiac Echocardiography (ICE) facilitates the transcatheter deployment of ASD closure devices to a great extent. In addition to its role in preprocedural assessment, TEE can be used not only to guide the procedure in real time but also to minimize fluoroscopy time.[8] Once embolized, device can migrate to main pulmonary artery, left atrium, left ventricle, ascending aorta, arch of aorta or descending aorta.[9] Various features of device like the type, size, site of embolization and position determine the retrieval technique and success.[10] Multiple prerequisites for technically sound, safe and successful device retrieval are the prompt availability of the appropriate delivery sheaths, variety of snares, balloons, wires, bioptomes, biplane fluoroscopy and above all patience of both operator & patient. Our procedure took about 5 hours.

In present case, large defect size and malaligned atrial septal defect could be the reason for device embolization. We missed the use of TEE during the initial deployment of device, which could have assisted in proper positioning or the decision of retrieval before releasing the device provided the positioning was not found satisfactory in the first place. Secondly, non availaibility of certain equipment where on one hand made retrieval procedure a little complicated and prolonged, on the other hand it led to use of some new and innovative techniques of device retrieval by the operator without compromising the safety of procedure.

The device was successfully retrieved using different snares and catheters. Blood loss was avoided using artery forceps and less commonly used hemostatic techniques.

CONCLUSION

Accurate preprocedure assessment and thorough estimation of margins, position, stability, and residual flow judgment on color with good imaging during deployment can prevent device embolization. Transcatheter device retrieval is safe if all the required equipment and expertise is available. Moreover, innovative techniques during difficult procedures work wonders if conventional methods don't help.

ACKNOWLEDGEMENT

I am deeply grateful to my supervisor for his guidance, patience and support who provided insight and expertise that greatly assisted my research project. I also want to share my gratitude for COMDT Exec Dir AFIC/NIHD and HOD R&D for their support and contribution in completion of the research paper.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

AM : Proof reading, Intellectual contribution, approval of the final version to be published

SI : Manuscript writing, drafting, editing and approval of the final version to be published

KA: Proof reading, Intellectual contribution, approval of the final version to be published

NS: Drafting the manuscript, proof reading, critical review and approval of the final version to be published

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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