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Balloon assisted technique for closure of large atrial septal defects

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Abstract

Amplatzer device closure of large atrial septal defects is challenging. A large device tends to malalign with the plane of the interatrial septum or prolapses through the defect. We describe a balloon assisted technique which has been successfully used in over 300 cases without a single technical failure.

MeSH: Heart Defects, Embolization, Therapeutic, Heart, Congenital, Instrumentation, Catheterization/Instrumentation, Heart Septal Defects, Atrial/Pathology/Therapy

There is no universal definition of a large atrial septal defect (ASD). However, ASDs requiring devices more than 25 mm are generally regarded as being large. Closure of large ASDs is technically challenging. Of the currently available devices, the Amplatzer septal occluder (ASO) is the only device capable of closing large defects. For closure of small or moderate sized ASDs, there is a standard procedure of device deployment. This includes delivering the left atrial (LA) disk just outside the left superior pulmonary vein (LSPV) and then pulling the entire sheath-device assembly towards the interatrial septum (IAS) under the transesophageal echo (TEE) guidance. Once the LA disk is in close proximity and in proper alignment to the interatrial septum (IAS), the waist and the right atrial (RA) disk are released in rapid succession by stepping on the loading cable and pulling back the delivery sheath. Thereafter the position of the device is confirmed on the TEE and fluoroscopy and the device is released by unscrewing the cable using the plastic vise. A more detailed description has already been outlined in a previous paper.¹

In patients with large ASDs, this routine technique of device delivery usually does not work. The LA disk refuses to align itself with the plane of the IAS and tends to herniate across the defect into the RA. Small LA size, deficient rims, floppy inferior rim and abnormal LA curvature, either in isolation or in combination, result in inappropriate deployment of the device.

The balloon assisted technique helps in the device delivery in patients with large ASDs in a predictable fashion. The technique involves using a sizing balloon (Equalizer from Meditech Inc) to help the LA disk to align itself with the IAS without slipping through the defect. The technique consists of the following steps:

- Right and left femoral veins are accessed using 7F hemaquits. 100 i.u/kg of heparin is injected.
- JR 3.5 coronary catheter is used from the left femoral vein and deployed into the LSPV after crossing the ASD.
- 0.035" Amplatzer superstiff exchange guide wire (Boston Scientific) is passed through this catheter and positioned in the LSPV.
- Over this wire, an Equaliser (sizing) balloon is passed percutaneously and stationed in the RA. Equaliser is available in 4 sizes viz. 20, 27, 33 and 40 mm. The balloon size is selected depending on the size of the ASD. The balloon size has to be larger than the size of the device chosen for closure e.g. if using a 28 mm device to close a defect, a 33 mm balloon is used.
- The delivery system is passed from the right femoral vein and stationed in the right or the left superior pulmonary vein. In our experience, there are no criteria to predict which device delivery is going to be successful. It is strictly by trial and error. We usually prefer to deliver the device first from the RSPV and if we fail then go on to doing the same procedure from the LSPV.
- Once the delivery sheath is positioned deep into the RSPV, the device is pushed up to the tip of the sheath.

- At this juncture, the sizing balloon is inflated in the RA and is pushed over the guidewire, by your assistant, against the IAS. This is confirmed on TEE.
- Thereafter, the LA disk is delivered by pulling the sheath back just outside the opening of the RSPV. It is important not to allow the sheath and the LA disk to fall leftwards into the LA cavity. The balloon prevents the disk from falling across the defect into the RA. When the delivery is done from the RSPV, the balloon tends to support the LA disk from below.
- With the balloon, still inflated, the waist and the RA disk are delivered. At this juncture, since the balloon is inflated, the two disks remain widely separated and the device actually does not appear to have been deployed well, and in the shape of a dumbbell. At this stage, it is worth looking at the LA disk on TEE. If it is found to be coplanar with the lie of the IAS, the balloon is gradually deflated. Once the balloon is completely deflated, the device will flatten out and conform itself to its usual shape. The LA disk flattens by itself while the RA disk needs to be flattened actively by pushing the loading cable.
- Once the device is well formed, its position is confirmed on TEE and fluoroscopy. If found satisfactory, the balloon is slowly withdrawn without pulling back the LA disk. In order to achieve this, it is always better to aspirate on the balloon so as to minimize its profile and pull back the balloon by rotating it counterclockwise rather than pulling it straight. The guide wire is removed subsequently.
- Once again the device position is confirmed and if satisfactory, the device is released

If the RSPV approach did not succeed i.e. LA disk refused to align itself with the IAS, the delivery sheath is positioned in the direction of the LSPV and the above steps are repeated. While delivering the device from the LSPV, the inflated balloon in the RA should support the LA disk from the top and not from the bottom as was the case when the LA disk was delivered from the RSPV.

In our experience, one of the two techniques will succeed in all the cases. This technique has following limitations:

- Requires extra hardware (Balloon and superstiff guidewire) and therefore extra cost.
- Requires an additional assistant to hold the balloon against the IAS while the main operator is delivering the device.
- The balloon has a high profile and a blunt tip and therefore at times it is difficult to push the balloon through the skin and subcutaneous tissue especially in children less than 15 kg. It is advisable to use a 11F dilator to make a track for the balloon to go through easily.

- As a corollary, hemostasis is occasionally challenging and time consuming.

In our experience of over 300 cases, this technique has never failed us in delivering the device appropriately. However, we have had 4 devices that became displaced after the delivery probably due to inability of the devices to hold on to the thin and floppy inferior rim.

Figure 1(A) Bicaval view on TEE showing a large secundum ASD. (B) Inflated balloon (Equalizer) in the right atrium is gently pushed against the interatrial septum by the assistant. (C) LA disk is partly delivered in the LA with the balloon inflated (D) The waist and the RA disk are delivered sequentially with the balloon still inflated. Note the “dumb-bell” shaped device (E) With the balloon, partially deflated, the device is “forming” itself (F) After complete deflation of the balloon, the device is seen to sit across the defect optimally

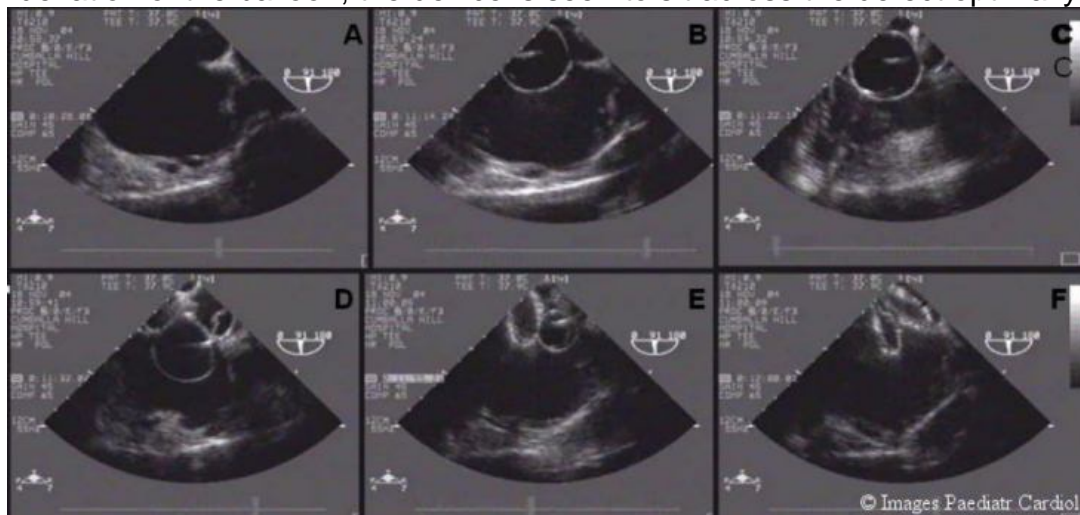
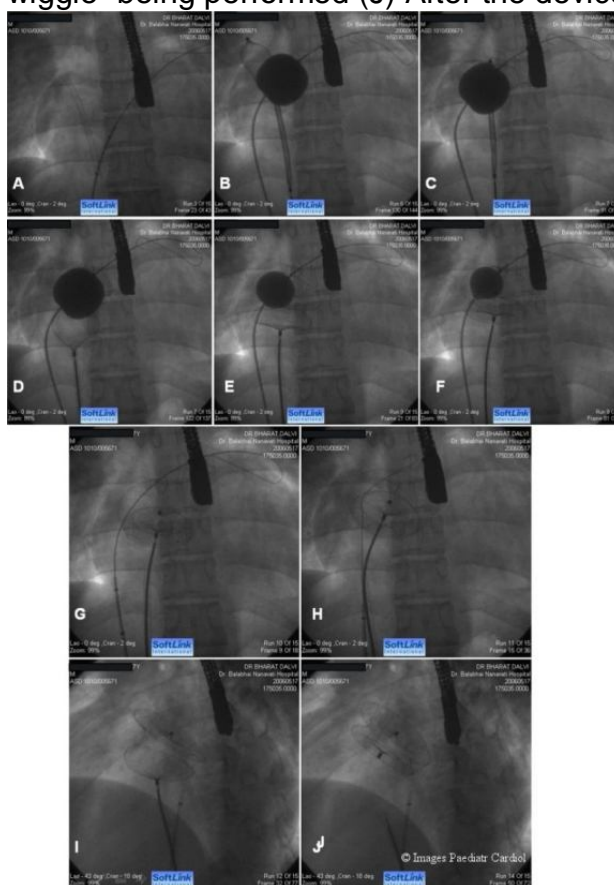


Figure 2 (A) Fluoroscopic image showing PA projection with a superstiff guidewire in the LSPV and the delivery sheath in the RSPV (B) Sizing balloon introduced over the superstiff guidewire is inflated in the RA. Note the partly delivered LA disk (C) The LA disk is completely delivered with inflated balloon in position (D) The waist and RA disk are deployed in succession with sizing balloon still inflated. Note the “dumb-bell” shaped device (E) With the balloon partly deflated, the device is “forming” itself (F) With the further deflation of the balloon, the device profile is getting normalized (G) With the balloon completely deflated, the device has become “flat”. The balloon is withdrawn into the IVC (H) The guide wire is in the process of being removed into the IVC as well (I) Fluoroscopic image in the LAO 30 Cranial 30 projection showing “Minnesota wiggle” being performed (J) After the device is released



References

1. Grech V, Felice H, Fenech A, DeGiovanni JV. Amplatzer ASO device closure of secundum atrial septal defects and patent foramen ovale. Images Paediatr Cardiol. 2003;15:42–66.

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