Novel treatment (new drug/intervention; established drug/procedure in new situation)

Use of a coronary sinus guiding sheath for placement of right ventricular lead in abnormal venous anatomy: a report of 2 cases

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Summary

Techniques of implanting pacing leads in the right ventricle (RV) have evolved over time and involve the use of preshaped stylets. However, in the presence of venous abnormalities, it could be very challenging to do the same. We describe two cases with complex superior vena caval (SVC) anatomy which could be negotiated only with the use of a slidable coronary sinus guiding sheath and successful placement of pacing lead in the right ventricle.

BACKGROUND

The standard technique for a permanent pacemaker lead implantation includes creation of a subcutaneous pocket, obtaining a venous access and advancing the lead through venous circulation via the superior vena cava (SVC) and right atrium (RA), into the right ventricle (RV). Venous obstruction creates a scenario wherein the guide wire can possibly be negotiated; however, the flexible, non-steerable leads fail to traverse the obstruction. Balloon dilatation of the obstruction may occasionally help in advancing the lead across, into the ventricle. Use of a long introducer sheath over the guide wire is a simple and effective method for introducing the lead into the RV, thus increasing procedural success and reducing fluoroscopy time.

CASE PRESENTATION AND INVESTIGATIONS

Case 1: A 66-year-old man was admitted with recurrent syncopal episodes since 1 week. ECG showed complete heart block (CHB) with a slow ventricular rate (HR 30/min). Transthoracic echocardiogram revealed aortic

valve sclerosis with normal biventricular systolic function. Renal function test and serum electrolytes were normal. Degenerative CHB was diagnosed and a temporary pacemaker was inserted via the femoral route into the RV apex. A left subcutaneous pocket was made and extrathoracic axillary venous puncture done. A peel-away 7 Fr introducer sheath was inserted. The initial attempt of introducing a 7Fr active fixation lead failed. A venogram carried out via sheath injection revealed a Type 3 complete obstruction of SVC (figure 1, left, white arrow) with a large accessory hemiazygous vein (black arrow).¹ A 0.035" J-wire could be negotiated through the obstruction into the RV (figure 1, right). A 5×40 mm balloon was dilated across the obstruction (figure 2, left, black arrow). The subsequent attempt to reintroduce the lead failed. A 50 cm 9 Fr coronary sinus guiding sheath (Attain Command 6250-MP) was advanced into the RV over the 0.035" wire (figure 2, right, white arrow). A 58 cm 7 Fr screw-in pacing lead (Capsurefix Novus 4076-58 cm, steroid eluting, bipolar) was passed through the introducer

Figure 1 Contrast venogram carried out via sheath showing a complete obstruction of innominate vein-superior vena cava junction (left, white arrow) with a large accessory hemiazygous vein. A 0.035" guide wire was negotiated through the obstruction into the right ventricle (right).

Figure 2 Image on the left shows a balloon dilated across the obstruction (black arrow). White arrow shows the long guiding sheath in the right atrium-superior vena cava (SVC) junction with the pacing lead advanced into the right ventricle.

sheath and advanced successfully to the RV apex. A stable position was obtained. The guiding sheath was later removed by carefully slitting it.

Case 2: A 79-year-old man with a history of presyncope over the last 1 month was evaluated and diagnosed to have sick sinus syndrome. A left subcutaneous pocket was made and a 7 Fr introducer sheath was advanced into the left subclavian vein. An attempt to negotiate a 7 Fr pacing lead through the sheath failed. Contrast injection into the sheath revealed contrast staining in the SVC, giving rise to suspicion of dissection (figure 3, left, white arrow). With some difficulty, a 0.035" J-wire could be advanced into the inferior vena cava (figure 3, right). A 4×40 mm balloon was dilated across the obstruction (figure 4, left, black arrow). A 50 cm 9 Fr coronary sinus guiding sheath (Medtronic Attain Command 6250-MP; Medtronic Inc., Minneapolis, USA) was advanced into the RV over the 0.035" wire (figure 4, right, white arrow). A 58 cm 7 Fr screw-in pacing lead (Medtronic Capsurefix Novus 4076-58 cm, steroid eluting, bipolar; Medtronic Inc.,

Minneapolis, USA) was passed through the introducer sheath and advanced to the RV septum and a stable position was obtained. The guiding sheath was slit in the usual manner.

DISCUSSION

Pacing leads, by virtue of their design, are sensitive and fragile. Obstacles to lead placement can be very frustrating, even to an experienced operator. The current technique involves use of prestyled stylets which stiffen the lead in order to advance them into the atrium or ventricle. However, the presence of a venous obstruction or dilated right-sided chambers with severe tricuspid regurgitation makes negotiating the leads successfully into the RV to attain a stable position quite challenging. The standard introducer sheaths have sufficient length to provide access to the subclavian vein and on occasion, to the SVC. Long guiding sheaths are typically used for coronary sinus (CS) cannulation and for delivering a CS lead. Their utility in

Figure 3 Contrast venogram shows staining of the superior vena cava (SVC) suggestive of dissection on the left. A guide wire was successfully negotiated through the dissection into the inferior venacava (right).

Figure 4 Image on the left shows a balloon dilated across the dissection (black arrow). White arrow shows the long guiding sheath in the right ventricle (RV) with the pacing lead advanced into the RV septum.

facilitating the implantation of RV pacing leads in selected patients needs to be appreciated.

The CS guiding sheaths, by virtue of their length, shape and stability, provide a superior method of lead delivery as they can negotiate through virtually any obstacle in the venous system, once delivered over a guide wire. Complication rates of pacemaker implantation were found to be high in centres performing less than 12 implants per year.² Weinstock *et al*,³ in a study using a long RV sheath advanced over a balloon flotation catheter, describe the ease and safety of introducing pacing leads with decreased fluoroscopy times. They compared the standard introducer sheath with the long RV sheath and reported significant advantages of the latter. They noted that the pacing leads could be placed more quickly, operating room time and fluoroscopy time were reduced and, more importantly, negotiating venous tortuosity and difficult-to-cross-tricuspid valve could be tackled easily.

Centres performing pacemaker implantation, especially low-volume centres, are at a disadvantage of not having long sheaths dedicated for RV lead implantation. However, a CS-guiding sheath would serve the same purpose as a long RV sheath in effectively delivering the lead into the right ventricle.⁴ In conclusion, long guiding sheaths need to be considered as an effective and safe lead placement strategy in the context of complex venous anatomy and an abnormal tricuspid valve.

Learning points

- Venous abnormalities and dilated right-sided chambers are associated with difficulty/failure in negotiating pacing leads into the right ventricle.
- Use of a long guiding sheath helps in successful placement of leads with an increase in safety and shorter duration of the procedure.

Competing interests None.

Patient consent Obtained.

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