Case Report

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Application of Snare Traction Technique in Implantation of Leadless Pacemaker in Patients with Giant "Spherical" Right Ventricle: A Case Report

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ABSTRACT

Background: Leadless pacemakers have the advantages of less trauma, high safety and fewer complications, especially for elderly patients, more underlying diseases, and patients with higher risk of pacemaker bag infection.

Case Presentation: We report here the case of 88-year-old patients with valvulopathy, leadless pacemaker delivery systems are difficult to attach to the right ventricular septum and apex because of the large "spherical" right ventricle. Using the Snare traction technique, it can be successfully attached to the right ventricle and the pacemaker system can be stably placed at the apex of the RV.

Conclusion: This special trap and traction technique may be helpful for the safe and effective implantation of leadless pacemaker in patients with severely dilated right ventricle.

Keywords: Valvulopathy; Giant Right Ventricle; Leadless Pacemaker; Traction Technique

Introduction

Compared with traditionalpacemakers, Leadless pacemaker have the advantages of less trauma, Higher safety and fewer complications, especially in patients with advanced age, more underlying diseases and high risk of pacemaker bag infection. However, implantation is more difficult and may even fail in some patients with valvulopathy, especially in patients with severe dilation of the right heart structure. Here, we describe a case in which theleadlessdelivery system could not be effectively attached due to the dilated right ventricle. Finally, The Micra delivery system was successfully attached to the right ventricular apex by using the Snare traction technique, the leadless pacemaker was successfully implanted.

Case Report

A 88-year-old male patient complained of syncope twice. She had a history of valvulopathy. The patient had given up valve replacement because of her grade. 12-lead electrocardiogram showed atrial fibrillation with prolonged pause for more than 6 seconds. Chest X-ray showed severe enlargement of the whole heart, with a cardiothoracic ratio of 90%. Transthoracic echocardiography showed that the whole heart was enlarged. Severe tricuspid regurgitation, moderate mitral regurgitation and broadened right ventricular outflow tract. The patient refused to implant the traditional pacemaker. After obtaining the informed consent of the patient and his family, we decided to implant the leadless pacemaker (Micra, Medtronic made in USA). The leadless pacemaker system was inserted through the right femoral vein

and successfully reached the right ventricle. Cephalography showed that the right ventricle was large and "spherical", and the delivery cup could not reach the septum, suggesting that the trabecula of the right ventricle was rare. The anterior delivery system can easily deliver the delivery cup to the area where the septum meets the anterior wall (Figure 1). Radiography shows that it is very close to the outermost edge of the heart, considering that the risk of cardiac perforation in this area is extremely high, so we give up looking for the right ventricular septum. Adjust the delivery catheter to enter the right ventricular apex, but repeatedly pressurize and try to stick to the right ventricular apex. it can be seen that the pressure is all acting on the top of the tricuspid valve, and the pressure cannot be transferred to the head of the delivery cup in order to be effectively close to the myocardium. Radiography shows that there is a long distance between the head of Micra and the myocardium, and the phenomenon of the head swinging under high pressure can be observed (Figure 2), finally, the release fails.

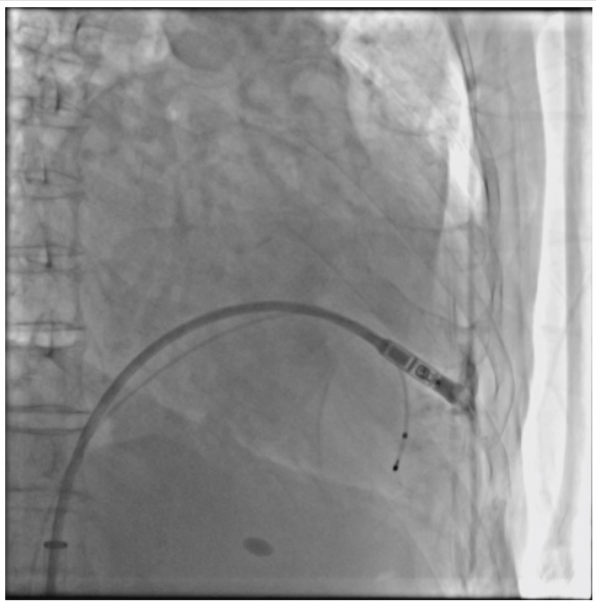

Figure 1: The anterior delivery system can easily deliver the delivery cup to the area where the septum meets the anterior wall, Radiography shows that it is very close to the outermost edge of the heart.

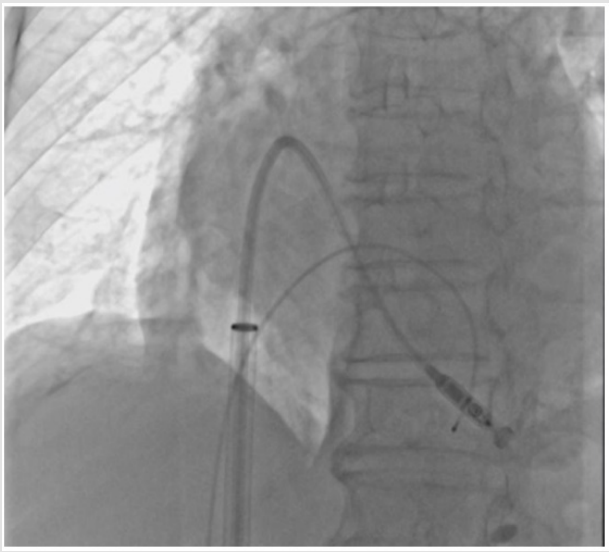

Figure 2: Radiography shows that there is a long distance between the head of Micra and the myocardium, and the phenomenon of the head swinging under high pressure can be observed.

Therefore, using the net basket trap Snare system (EN SNARE, Merit Medical, Salt Lake City, Texas, USA), first, an assistant doctor inserted the trap catheter from the left femoral vein, the pacemaker delivery system was pulled to the orifice of the inferior vena cava, and snare successfully captured it in the right atrium(Figure 3), secondly, the pacemaker catheter was bent with the handle as it approached the tricuspid valve, the sheath was snared distal to the point where it bent. We pushed the pacemaker sheath system to the right ventricle, then pulled the head of the delivery system to the right ventricular apex and made it firmly attached to the right ventricular wall. Radiography showed that the head was well attached to the myocardium, (Figure 4). followed by the release of Micra in the X-ray right anterior italic position, and then we carried out a traction test to confirm the position of the three fangs. The pacemaker parameters were R-wave sensing amplitude 7.3mV, impedance 660 Ω and pacing threshold 0.9V/0.24ms. During the hospitalization, there were no complications such as cardiac tamponade, massive hemorrhage and displacement. After the operation, the patient was discharged from the hospital in good condition and did not show syncope again. Three months after discharge, the patient's condition and the parameters of the pacemaker were stable.

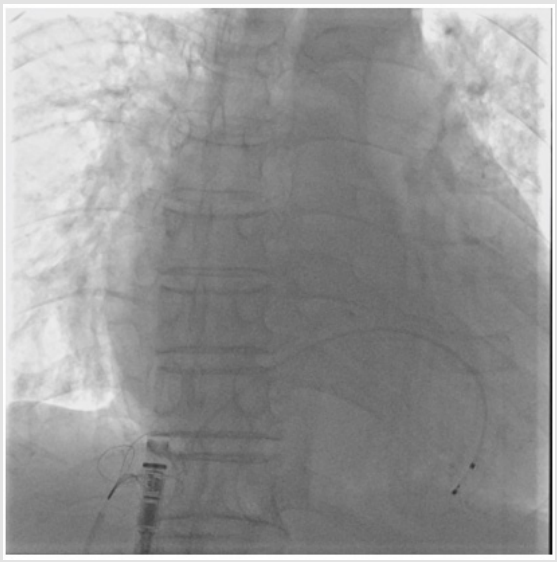

Figure 3: We used a net basket trap Snare. We believe that the trap using a net basket is easier to implement delivery system capture in the atrium.

Figure 4: Pulled the head of the delivery system to the right ventricular apex and made it firmly attached to the right ventricular wall. Radiography showed that the head was well attached to the myocardium.

Discussion

In this case, we reported the effectiveness of entrapment and traction techniques when implanting an unleaded pacemaker in a patient with a large right ventricle. Similar to traditional pacemaker implantation, leadless pacemaker implantation is expected to be difficult in patients with right ventricular dilatation and severe tricuspid regurgitation [1], mainly in two aspects: first, in severe tricuspid regurgitation, it is difficult for the pacemaker catheter to cross the tricuspid valve, second, it is difficult to attach the delivery catheter to the right ventricular septum or apex [2], in our case. The thrust exerted on the catheter is released to the top of the tricuspid valve rather than to the distal end of the catheter, so that during pressure, the delivery catheter shows greater tension at the tricuspid valve [3], but the distal end of the catheter wobbles. We found that in the case of right ventricular dilatation with severe tricuspid regurgitation, using the Snare trap traction technique to assist in the implantation of leadless pacemakers has several advantages. first, the snare can assist delivery catheters to cross the tricuspid valve into the right ventricle [4].

In addition, thrust can be applied to coaxial the distal end of the catheter so that it can achieve a good attachment effect, and repeated attempts to insert the catheter into the RV using conventional methods may lead to the risk of heart injury and complications. In our case, it is difficult to attach the Snare-assisted delivery catheter to the interventricular septum, and the reason may be that the patient's ventricle is too large and the trabeculae are rare [5]. In addition, this patient indicates that the right ventricular wall is thin [6], and if the high release is chosen, it is likely to be located in the area where the interventricular septum meets the anterior wall, where operation is likely to lead to cardiac perforation, so in the end we chose released at RV apex [7]. Hiramatsu et al reported a patient with severe right atrial dilatation who used Snare to assist Micra implantation to achieve efficient clinical results [8], while our patient had severe right ventricular dilatation with some similar difficulties. However, they used a single-loop trap, while we used a net basket trap Snare. We believe that the trap using a net basket is easier to implement delivery system capture in the atrium. Considering its ability to avoid the above risks, the special trap and traction technique reported in this case may promote the safe implantation of leadless pacemaker in severely dilated cardiac cavities, so that this technique can be effectively applied in clinic [9].

Conclusion

It is safe and effective to use the trap and traction technique when implanting leadless pacemaker in patients with large right ventricle.

Disclosure of Conflicts of Interest

The authors declare that they do not have conflicts of interest.

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