Cardiac strangulation: An atypical complication from epicardial pacemaker leads in a newborn

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ABSTRACT

We report a rare and serious complication of cardiac strangulation arising from the implantation of epicardial pacing leads in a newborn. Patient's follow-up 9-month postsurgery revealed compression under the pulmonary valve annulus by a pacemaker lead, causing progressive stenosis of the right ventricular outflow tract. The epicardial leads were replaced to relieve compression, and stenosis of the right ventricular outflow tract was rectified. Pacemaker implantation in newborns is not without challenges; epicardial leads should be carefully positioned to avoid any compression of cardiac structures.

Keywords: Cardiac strangulation, epicardial leads, newborn, pacemaker

INTRODUCTION

Implantation of a pacemaker remains the only treatment for congenital complete atrioventricular block (CAVB) in neonates and is immediately required in the presence of a low ventricular rate.[1] It may result in many complications that have been described in the literature field.[2,3] In this case report, we describe a cardiac strangulation following epicardial pacing leads.

CASE REPORT

CAVB was diagnosed in the fetus at 28 weeks' gestation. At 32 weeks gestation, the baby was delivered by cesarean section following the onset of spontaneous preterm labor. At birth, congenital CAVB was confirmed, with a heart rate below 45 beats/min. A pacing system was implanted at 14 days of age and 2000-g body mass. Through a median sternotomy, a bipolar ventricular lead (CapSure Epi, Medtronic, Minneapolis, Minnesota, USA) was implanted on the apex of the left (distal electrode) and right (proximal electrode) ventricles. A uninopolar atrial lead was simultaneously implanted (CapSure Epi, Medtronic). The leads were fixed to the surface of the epicardium using a prolene suture, and its loops were placed on the anterior surface of the pericardium. A dual chamber pacemaker generator (Advisa DR, Medtronic) was placed in an abdominal pocket behind the left rectus abdominal muscle. The pacemaker was adjusted to DDD (dual chamber) mode. No acute complications were identified, and the patient was discharged home 4 weeks after birth.

Nine months after pacemaker implantation, the child remained asymptomatic, but his follow-up identified a progressive systolic cardiac murmur and stenosis of the right ventricular outflow tract [Figure 1a]. The initial hypothesis was of a pulmonary valve stenosis. However, a cardiac computed tomography (CT) scan confirmed compression just under the pulmonary valve annulus by a pacemaker lead [Figure 2].

A redo sternotomy was made, and we found both ventricular and atrial leads were encircling the pulmonary artery under the valve and were adherent to the pulmonary wall by heavy fibrotic tissue. No sequels of

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DOI: 10.4103/apc.APC_175_17

How to cite this article: Tahhan N, Ba PS, Hadeed K, Dulac Y, Cuttone F, Leobon B. Cardiac strangulation: An atypical complication from epicardial pacemaker leads in a newborn. Ann Pediatr Card 2018;11:191-3.

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hematoma were found. We were hesitating in opening the right ventricular outflow tract to evaluate the pulmonary valve, but the resecting of the heavy fibrotic tissue was enough to relieve pulmonary valve compression, without opening the right ventricular outflow tract. All epicardial leads have been removed, and a new leads can be implanted to avoid cardiac strangulation by placing the leads loop in the diaphragmatic surface [Figure 3b]. Assessment of pulmonary valve function through intraoperative transesophageal echocardiography showed a positive outcome [Figure 4]. After releasing compression, the pulmonary valve was competent, with a decrease in peak systolic velocity at the right ventricular outflow tract from 3.89 m/s to 1.5 m/s [Figure 1b]. The patient was discharged 5 days after surgery, with no complications. After 1 year of follow-up, the child is asymptomatic with no pulmonary regurgitation or stenosis.

DISCUSSION

The epicardial approach is still preferred for the implantation of pacemakers in newborn patients.[4,5]

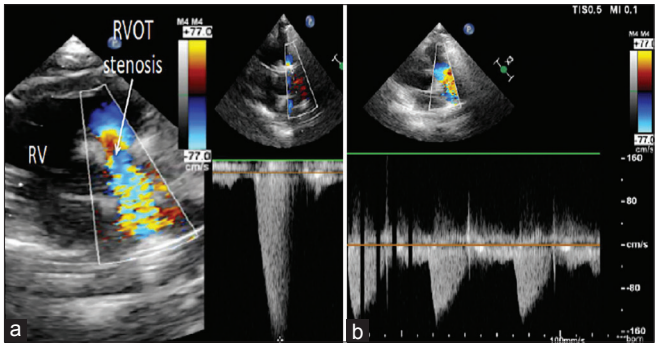

Figure 1: (a) Transthoracic echocardiogram short-axis view before surgery, showing stenosis of the RV outflow tract, with a peak systolic velocity of 3.89 m/s. (b) Transthoracic echocardiogram after surgery, showing a peak systolic velocity of 1.5 m/s. RVOT: Right ventricular outflow tract, RV: Right ventricle

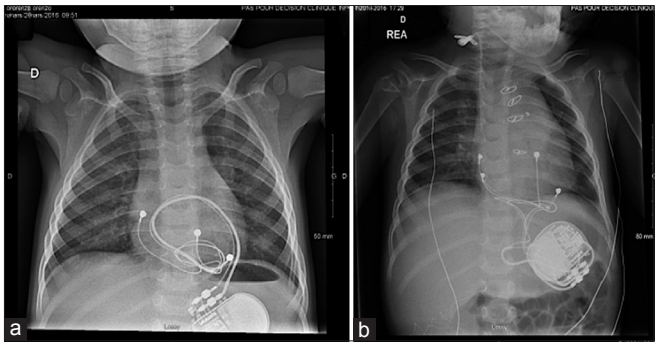

Figure 3: (a) Preoperative posteroanterior chest radiograph showing a looping by the atrial and ventricular leads, evoking a cardiac strangulation. (b) Posteroanterior chest radiograph postlead replacement, showing patient clear of any possible cardiac strangulation with the leads well situated on the diaphragmatic surface of the pericardium

The studies have shown that pacemaker implantation in pediatric patients is in itself associated with significant morbidity.

During pacemaker implantation using epicardial leads for a newborn or child, a loop of lead is usually created to allow for growth. Cardiac strangulation is often due to the placement of the loop on the anterior surface of the pericardium [Figure 3a]. The epicardial leads adhere to the heart in a circumferential manner and over time constrict the encompassed structures. As the patient grows, the lead tightens around the heart,[3] which may lead to coronary stenosis, valvular insufficiency, or ventricular dysfunction, with the potential of cardiac arrest and death.[6] During the implantation of the pacing system, careful positioning of the epicardial leads can prevent cardiac strangulation.[2,3] The surgeon could place the loop of the leads on the diaphragmatic surface of the pericardium or in the abdominal pocket with the pacemaker device. Often, the treatment involves removing of pacemaker leads and resection of fibrotic tissue to relieve the compressed cardiac structure. Another New leads can then be implanted in a good manner.[6]

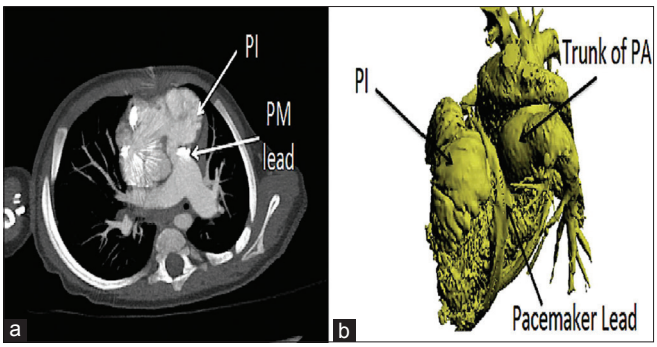

Figure 2: Cardiac computed tomography scan (a) and its three-dimensional model (b): Generated using Materialise Mimics (version 18.0 × 64 bit), showing infundibular dilatation and compression under the pulmonary valve by pacemaker leads. PA: Pulmonary artery, PI: Pulmonary infundibulum, PM: Pacemaker

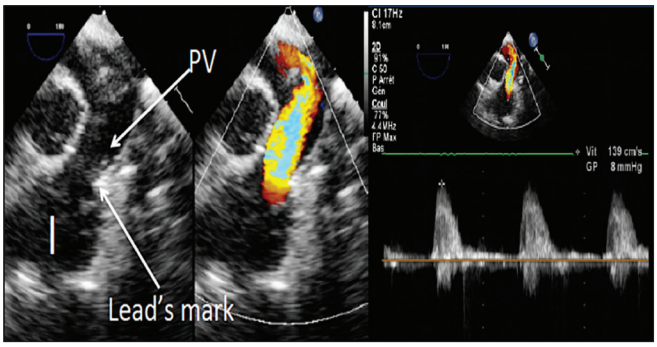

Figure 4: Intraoperative transesophageal echocardiogram short-axis view: the infundibular stenosis has disappeared after replacement of the epicardial leads. PV: Pulmonary valve

CONCLUSION

Cardiac strangulation is a unusual complication of permanent epicardial pacing. It would be suspected when new symptoms not related to the underlining disease occur. Preoperative cardiac CT scan can confirm the diagnosis. Intraoperative transesophageal echocardiography can be used to verify the pulmonary outflow tract after removing of pacemaker leads to avoid any unnecessary surgical procedures on the pulmonary valve or trunk.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the legal guardian has given his consent for images and other clinical information to be reported in the journal. The guardian understands that names and initials will not be published and due efforts will be made to conceal patient identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Donofrio MT, Gullquist SD, Mehta ID, Moskowitz WB. Congenital complete heart block: Fetal management protocol, review of the literature, and report of the smallest successful pacemaker implantation. J Perinatol 2004;24:112-7.
2. Carreras EM, Duncan WJ, Djurdjev O, Campbell AI. Cardiac strangulation following epicardial pacemaker implantation: A rare pediatric complication. J Thorac Cardiovasc Surg 2015;149:522-7.
3. Takeuchi D, Tomizawa Y. Cardiac strangulation from epicardial pacemaker leads: Diagnosis, treatment, and prevention. Gen Thorac Cardiovasc Surg 2015;63:22-9.
4. Cutler NG, Karpawich PP, Cavitt D, Hakimi M, Walters HL. Steroid-eluting epicardial pacing electrodes: Six year experience of pacing thresholds in a growing pediatric population. Pacing Clin Electrophysiol 1997;20:2943-8.
5. Johns JA, Fish FA, Burger JD, Hammon JW Jr. Steroid-eluting epicardial pacing leads in pediatric patients: Encouraging early results. J Am Coll Cardiol 1992;20:395-401.
6. Alhuzaimi A, Roy N, Duncan WJ. Cardiac strangulation from epicardial pacemaker: Early recognition and prevention. Cardiol Young 2011;21:471-3.