Cardiology in the Young

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Prolonged QT and Torsades de Pointes in a child with late-onset post-operative complete heart block

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Brief Report

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Abstract

A young child presented with syncope attacks. Late-onset post-operative complete atrioventricular block and Torsades de Pointes were diagnosed. She was treated with surgical epicardial pacemaker implantation. This report is the description of Torsades de Pointes due to late-onset post-operative complete atrioventricular block followed by R on T phenomenon in a child.

Bradycardia, complete, or advanced atrioventricular block are among the factors responsible for the occurrence of Torsades de Pointes.[1] In this case report, we present a young child with syncope attacks who had Torsades de Pointes because of late-onset postoperative complete atrioventricular block.

Case presentation

A 5-year-old girl with Down syndrome was admitted from another hospital with an episode of syncope. The patient's vital signs were within normal limits, except for marked bradycardia. When she was 6 months old, she had been operated for a ventricular septal defect. She went to post-operative follow-ups regularly and there were no problems. She had no a family history of CHD or cardiac conduction disease. Her parents had normal electrocardiograms and normal QT intervals. She was not taking any QT prolonging medications. The patient was referred to our centre for further treatment.

Her laboratory findings were normal complete blood count, normal liver and kidney functions, and normal serum electrolyte levels. Her initial electrocardiogram showed a complete atrioventricular block at a rate of 60 beats per minutes (bpm) (Fig 1a). The echocardiogram revealed enlarged left atrium and left ventricle. Near normal left ventricular systolic function was detected with an ejection fraction of 50%.

The patient was taken to the ICU, and her heart ryhythm was monitored and Holter recording was started. In the intensive care follow-up, the patient had an attack of syncope. Due to bradycardia (heart rate 30 bpm), cardiopulmonary resuscitation lasting 2 minutes was performed. While isoproteronol infusion was initiated immediately, the patient was urgently taken to the catheterisation room and a temporary pacemaker was implanted. R on T phenomenon and short-term Torsades de Pointes oscillation were observed in the Holter recordings of the patient at the time of the syncope. Also, she had a prolonged QT interval (850 ms) (Fig 1b).

An epicardial, dual-chamber pacemaker, and two leads placed in the right atrium and left ventricle apex were surgically implanted because of late-onset post-operative complete atrioventricular block (Fig 2a). She did not have attack of syncope or ventricular arrhytmia. QT interval returned to normal at 2-month follow-up (Fig 2b).

Discussion

The incidence of complete heart block after open-heart surgery is between 1 and 3%.[2] Especially patients with Down syndrome undergoing ventricular septal defect repair had a higher rate of heart block requiring permanent pacemaker implantation.[3,4] Usually, heart block occurs immediately after surgery or in the early post-operative period. Rarely, it may occur months or years after surgery.[5–7] In this case, complete atrioventricular block developed 4 years after surgical ventricular septal defect repair. In the literature, patients who were in sinus rhythm after the surgical procedure and had a pacemaker inserted years later were described but the incidence of postoperative late-onset atrioventricular block has not been clearly determined.[8,9]

It is possible to manage in a timely manner by closely monitoring if the heart block develops in the early post-operative period. However, patients who develop heart block in the late post-operative period may be asymptomatic or present with non-specific findings such as fatigue. At

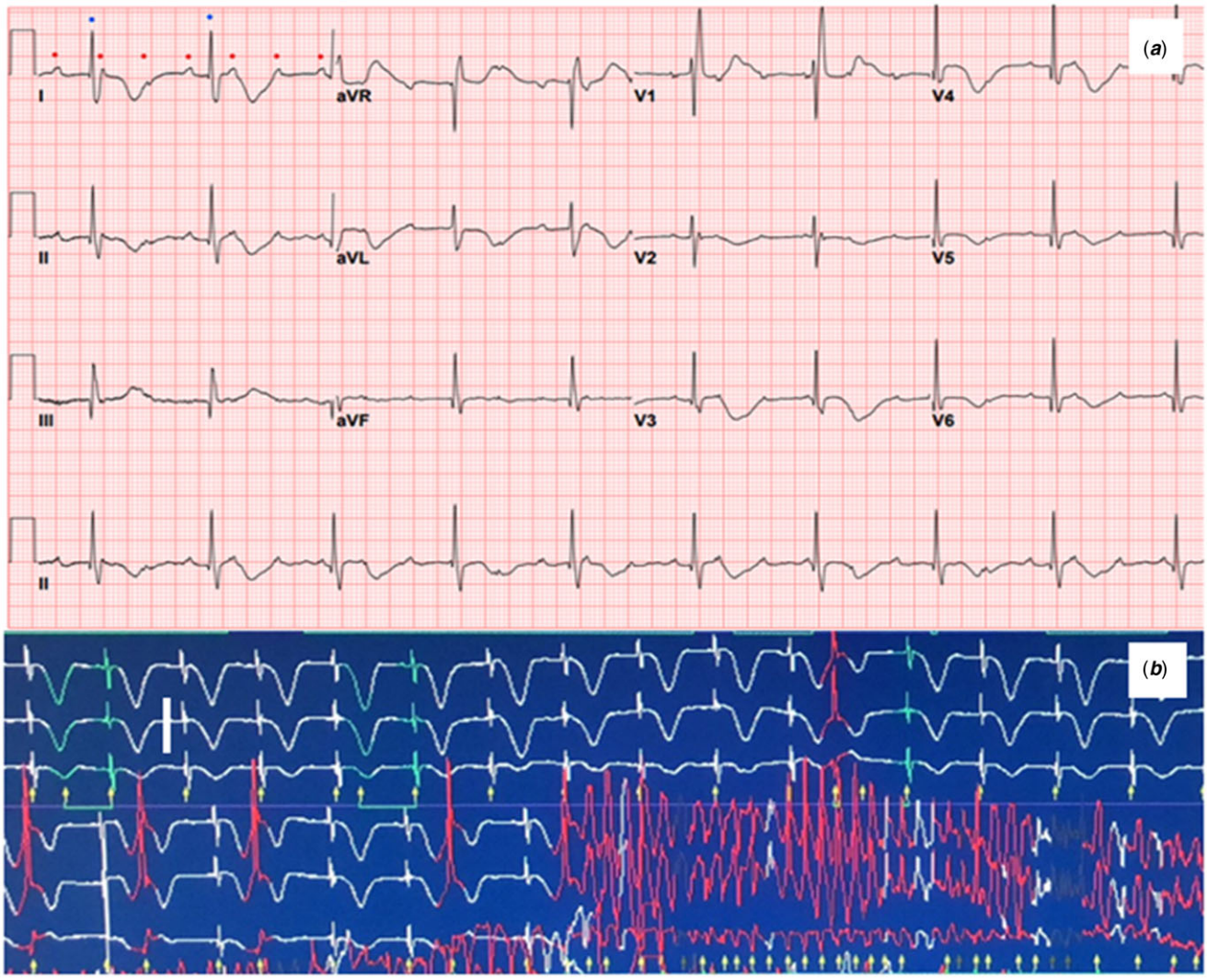

Figure 1. (***a***) Complete atrioventricular block is seen (ventricular rate: 60 bpm) at the 12 lead electrocardiogram (red dots indicate atrial activity and blue dots indicate ventricular activity). (***b***) Holter recording of complete atrioventricular block patient. Torsades de pointes is appearing with prolonged QT interval and R on T phenomenon.

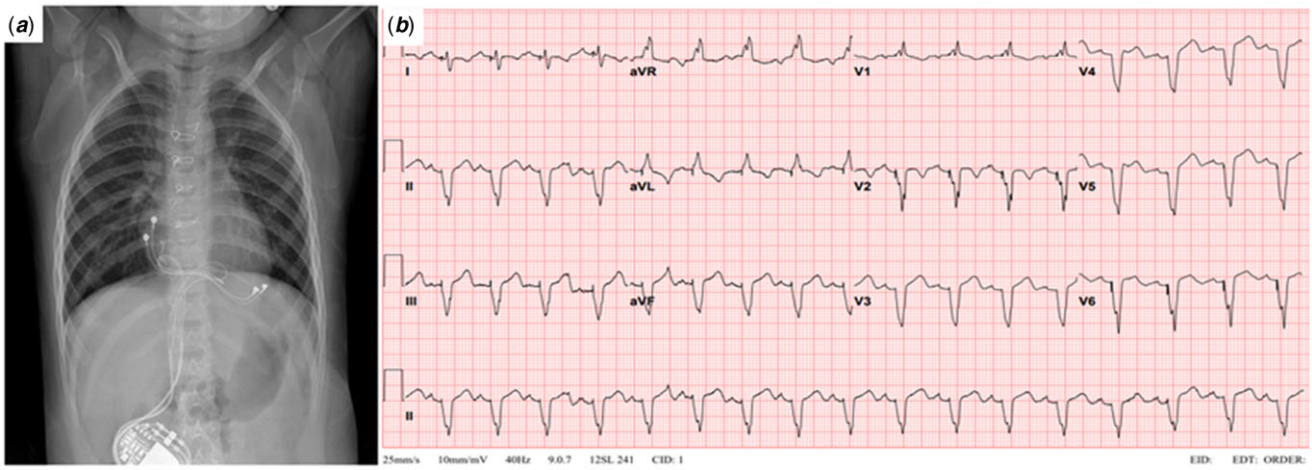

Figure 2. (***a***) Chest X-ray shows an epicardial, dual-chamber pacemaker, and two leads placed in the right atrium and left ventricle apex. (***b***) Normal QT interval after permanent pacemaker at the 12 lead electrocardiogram.

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worse, they may present with heart failure, syncope, and sudden death. For this reason, telemetry control is very important in the post-operative follow-ups of patients who have had congenital heart surgery, even if they are discharged from hospital in sinus rhythm.

It is possible to predict that some patients may develop heart block. Postoperatively transient complete atrioventricular block, long PR according to pre-operative telemetry, and different P and QRS morphology are among the stimulating factors.[8,10] The possible post-operative risk factors are unknown in our patient. Down Syndrome and perimembranous ventricular septal defect were predictable risks for the patient in the preoperative period. There are similar cases in the literature.[11,12]

Our case is also an excellent example of Torsades de pointes-related syncope in complete atrioventricular block. Bradyarrhythmia is an expected finding in patients with complete atrioventricular block. However, it is rare for bradyarrhythmias to be associated with QT interval prolongation and Torsades de pointes.[13] Kurita et al.[14] hypothesises that patients with complete atrioventricular block have a bradycardia-sensitive repolarisation abnormality, and therefore may develop Torsades de pointes. In our case, the heart rate was under 60 bpm and Torsades de pointes started by an ectopic ventricular complex interrupting the T wave before isoproteronol infusion.

Conclusions

The definitive treatment of late-onset post-operative atrioventricular block is permanent pacemaker implantation. It should be kept in mind that the conduction system should be carefully monitored in the long-term follow-up of patients who have had congenital heart surgery.

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Conflicts of interest. None.

Ethical standards. The authors assert that this work complies with the ethical standards of the relevant national guidelines on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. This case was approved by the patient's family.

References

1. Moroe K, Saku K, Tashiro N, Hiroki T, Arakawa K. "Torsades de pointes" and atrioventricular block. Clin Cardiol 1988; 11: 9–13. DOI 10.1002/clc.4960110111.
2. Gross GJ, Chiu CC, Hamilton RM, Kirsh JA, Stephenson EA. Natural history of postoperative heart block in congenital heart disease: implications for pacing intervention. Heart Rhythm 2006; 3: 601–604. DOI 10.1016/j.hrthm.2006.01.023.
3. Fudge JC Jr, Li S, Jaggers J, et al. Congenital heart surgery outcomes in down syndrome: analysis of a national clinical database. Pediatrics 2010; 126: 315–322. DOI 10.1542/peds.2009-3245.
4. Tucker EM, Pyles LA, Bass JL, Moller JH. Permanent pacemaker for atrioventricular conduction block after operative repair of perimembranous ventricular septal defect. J Am Coll Cardiol 2007; 50: 1196–1200. DOI 10.1016/j.jacc.2007.06.014.
5. Bonatti V, Agnetti A, Squarcia U. Early and late postoperative complete heart block in pediatric patients submitted to open-heart surgery for congenital heart disease. Pediatr Med Chir 1998; 20: 181–186.
6. Andersen HØ., de Leval MR, Tsang VT, Elliott MJ, Anderson RH, Cook AC. Is complete heart block after surgical closure of ventricular septum defects still an issue? Ann Thorac Surg 2006; 82: 948–956. DOI 10.1016/j.athoracsur.2006.04.030.
7. Ayyildiz P, Kasar T, Ozturk E, et al. Evaluation of permanent or transient complete heart block after open heart surgery for congenital heart disease. Pacing Clin Electrophysiol 2016; 39: 160–165. DOI 10.1111/pace.12778.
8. Lin A, Mahle WT, Frias PA, et al. Early and delayed atrioventricular conduction block after routine surgery for congenital heart disease. J Thorac Cardiovasc Surg 2010; 140: 158–160. DOI 10.1016/j.jtcvs.2009.12.050.
9. Liberman L, Pass RH, Hordof AJ, Spotnitz HM. Late onset of heart block after open heart surgery for congenital heart disease. Pediatr Cardiol 2008; 29: 56–59. DOI 10.1007/s00246-007-9034-x.
10. Villain E, Ouarda F, Beyler C, Sidi D, Abid F. Facteurs prédictifs de bloc auriculo-ventriculaire complet tardif après traitement chirurgical des cardiopathies congénitales [Predictive factors for late complete atrio-ventricular block after surgical treatment for congenital cardiopathy]. Arch Mal Coeur Vaiss 2003; 96: 495–498.
11. Nasser BA, Mesned AR, Mohamad T, Kabbani MS. Late-presenting complete heart block after pediatric cardiac surgery. J Saudi Heart Assoc 2016; 28: 59–62. DOI 10.1016/j.jsha.2015.06.004.
12. Altaweel H, Kabbani MS, Hijazi O, Hammadah HM, Al Ghamdi S. Late presenting complete heart block after surgical repair of ventricular septal defect. Egypt Heart J 2018; 70: 455–459. DOI 10.1016/j.ehj.2018.10.006.
13. Subbiah RN, Gollob MH, Gula LJ, et al. Torsades de pointes during complete atrioventricular block: genetic factors and electrocardiogram correlates. Can J Cardiol 2010; 26: 208–212. DOI 10.1016/s0828-282x(10)70369-x.
14. Kurita T, Ohe T, Marui N, et al. Bradycardia-induced abnormal QT prolongation in patients with complete atrioventricular block with torsades de pointes. Am J Cardiol 1992; 69: 628–633. DOI 10.1016/0002-9149(92)90154-q.

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