Cardiology in the Young

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Successful transesophageal pacing in a very-low-birth-weight-infant with atrioventricular block

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Brief Report

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Abstract

A baby with complete atrioventricular block was born with a birth weight of 1403 g. Isoproterenol was ineffective and emergency pacing was required. Since transcutaneous pacing was ineffective and transvenous pacing was untenable due to small body size, transesophageal pacing was performed for 3.5 hours until permanent pacemaker implantation. There were no complications. This is the first report of continuous transesophageal pacing in a very-low-birth-weight infant.

Transesophageal pacing is a method of temporary cardiac pacing.[1,2] It is primarily used for a short time as atrial pacing and recording, but can also be used for a short period of time as ventricular pacing in patients with atrioventricular block.[3–6] Prolonged pacing is associated with an increased risk of oesophageal burn.[6–9] Particularly in newborns, the tissue is vulnerable, and caution is advised with ongoing utilisation. There are only a few reports of continuous use in newborns,[5,6,10] and the lowest weight was 1838 g.[5] In this report, we describe a very-low-birth-weight (<1500 g) infant with atrioventricular block in whom continuous transesophageal pacing was safely performed for 3.5 hours.

Case report

A 47-year-old, gravida 2, para 0 patient presented with foetal pleural effusion at 28 weeks' gestation. At 30 weeks, there was worsening foetal pleural effusion and delayed transient bradycardia. Emergency caesarean section was performed the following day due to foetal bradycardia below 60 beats/minute. The baby was born in good condition with an Apgar score of 7 and 8 at 1 minute and 5 minutes each, at a birth weight of 1403 g. The initial electrocardiogram demonstrated sinus rhythm with complete atrioventricular block with a ventricular escape rate of 60 beats/minute.

Mean arterial pressure was 25 mmHg. He was intubated, and pleural effusion was drained. However, the observed increase in the heart rate and blood pressure was temporary and subsequently decreased.

Isoproterenol infusion (0.05–0.10 μg/kg/minute) was commenced with resolution of atrioventricular block resulting in an increased heart rate of 180 beats/minute. The mean arterial pressure also increased to 50 mmHg. Further investigation revealed that the serum of both the mother and infant contained anti Ro/SS-A antibodies. Permanent pacemaker implantation was intended to perform after waiting as long as possible to facilitate weight gain due to the patient's small body. However, the heart rate gradually decreased and by day 4 the heart rate was 70 beats/minute and the mean arterial pressure decreased to 40 mmHg. On day 5, the heart rate dropped to 50s beats/minute and the mean arterial pressure dropped to 30s mmHg. The isoproterenol was increased to 0.20 μg/kg/minute, but there was little improvement in the heart rate and blood pressure.

Given the haemodynamic instability, a permanent pacemaker implantation was indicated. Temporary pacing was attempted whilst awaiting surgery, but transcutaneous pacing was ineffective, and transvenous pacing was not feasible due to the small body size. An oesophageal lead was positioned (Fig 1a) to maximise the recorded ventricular waveform. Pacing was started at a rate of 100 beats/minute, with a pulse width of 10 ms and pulse current of 33 mA. There was intermittent loss of capture due to body motion, however the overall heart rate was maintained at 80–100 beats/minute with an increased blood pressure from 30s mmHg to 40–50 mmHg. The pacing output was set as low as possible to minimise the risk of oesophageal burn. Continuous pacing was performed for 3.5 hours until permanent pacemaker implantation (Fig 2) and a permanent pacemaker (SOLUS MICRO II SR; Pacesetter, Sylmar, CA, USA) was placed. After surgery, there were no oesophageal or gastric complications suggestive of oesophageal burns, although endoscopy was difficult to perform due to

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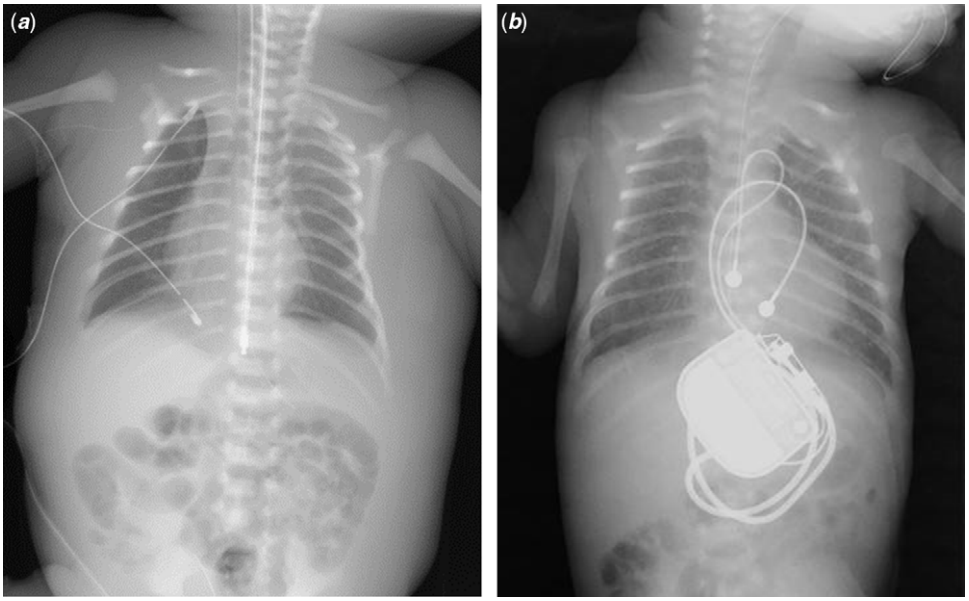

Figure 1. X-rays. (***a***) The esophageal lead is positioned (day 5). (***b***) A permanent pacemaker was implanted in the abdomen of a very-low-birth-weight infant. The subcutaneous edema improved (day 31).

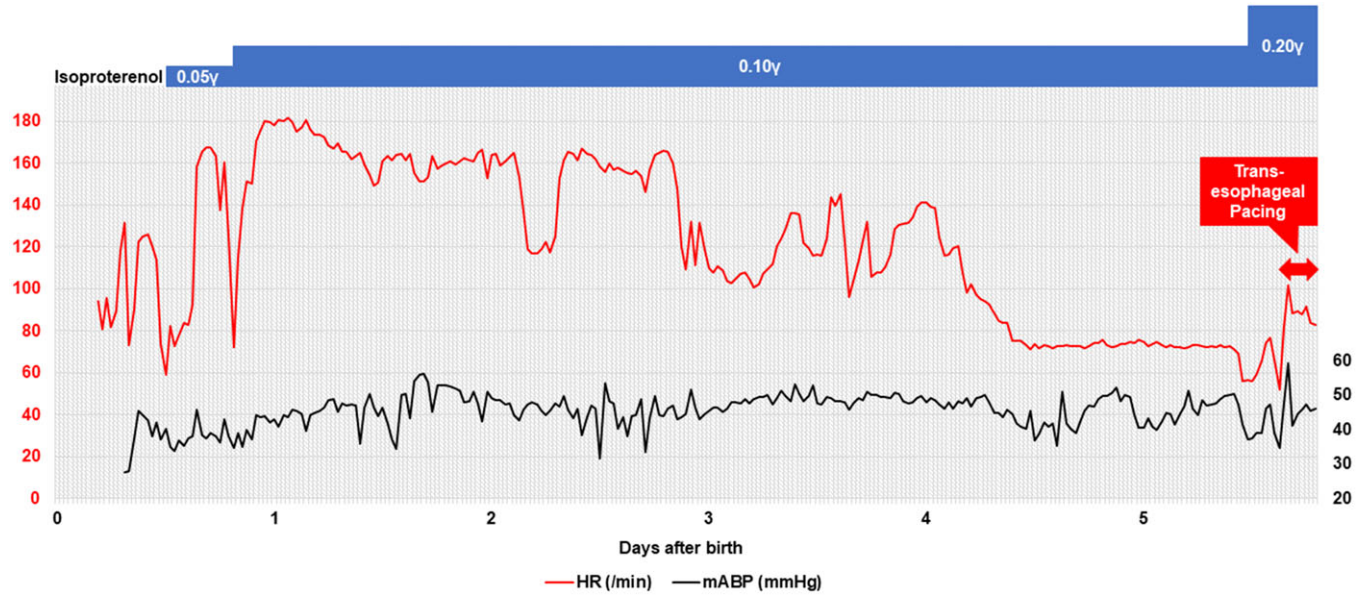

Figure 2. Time trends in heat rate (HR) and mean arterial pressure (MAP) from day 0 to day 5. On day 5, transesophageal pacing was continued for 3.5 hours until the permanent pacemaker was implanted.

the small body size. Subcutaneous oedema improved (Fig 1b) and the patient was discharged on day 117.

Discussion

We could safely perform transesophageal pacing for 3.5 hours in a very-low-birth-weight infant. This is the first report of continuous transesophageal pacing in a very-low-birth-weight infant. In previous reports, the smallest weight was 1838 g,[5] which was much heavier than our case.

Also, our case duration of 3.5 hours could be used in future as a base reference for continuous transesophageal pacing in very-low-birth-weight infants. Previous case reports have only described low-birth-weight infants[5,10] and these two case reports were large discrepancies in the pacing time. One is between short duration during surgery[5] and the other is 2 days.[10] The safe pacing duration is not established in low-birth-weight infants, to say nothing of very-low-birth-weight infants. Although a previous case series study existed only in dogs, which described experimentation in 55 dogs,[9] it showed that more than 4 hours of pacing time increases the risk of oesophageal burn. It would be reasonable to use continuous transesophageal pacing time for less than 4 hours in very-low-birth-weight infants while being cognizant of their fragile tissues.

The smaller the neonate is, it needs longer waiting period until the body size matches the pacemaker size. Since, we may more often come across a situation where emergency pacemaker implantation is unavoidable and a less invasive bridge therapy, such as transvenous, transcutaneous, or transesophageal pacing, is required. Although epicardial temporary pacing is possible, it is the most invasive of the three methods. Transvenous pacing is

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difficult to access in small neonates, and transcutaneous pacing may not be effective as in our case. In this situation, transesophageal pacing is the only option, and our study will be a useful reference for other providers.

This study has several limitations. First, this is a single case report. Safety of transesophageal pacing for 3.5 hours in very-low-birth-weight infants cannot be guaranteed. In addition, the limits of pacing time depend on current and pulse duration.[9] A larger cohort study is warranted to gather more data and increase confidence in the safe use of transesophageal pacing for 3.5 hours in very-low-birth-weight infants.

In conclusion, we reported the first case of transesophageal continuous pacing in a very-low-birth-weight infant. Continuous pacing duration was 3.5 hours.

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Conflicts of interest. None.

Ethical standards. The patient's parents provided informed consent for the publication of this case report.

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