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CASE REPORT

The anesthetist as cardiologist: a case of heart block identified in the peripartum period

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ABSTRACT
We describe a case of undiagnosed heart block which was detected during the postpartum surgical repair of a vaginal tear, and the subsequent investigations that confirmed diagnosis of atrio-ventricular heart block.

Keywords: Arrhythmia; Atrio-ventricular heart block; Peripartum

Case report

A 31-year-old woman had a vaginal delivery of her second child following an induction of labour. She sustained a third-degree tear requiring repair in the operating theatre. At anesthetic pre-assessment she was graded American Society of Anesthesiologists (ASA) physical status 2 due to mild asthma managed with salbutamol only. She described a history of occasional unprovoked syncopal episodes occurring since childhood. Following transfer to the operating theatre her baseline observations were unremarkable, with blood pressure 118/82 mmHg, heart rate 100 beats per min (bpm) and oxyhemoglobin saturation of 96% on room air. Anesthesia was provided by uncomplicated spinal anesthesia using 2.2 mL hyperbaric bupivacaine 0.5% and 300 μg diamorphine. A prophylactic vasopressor infusion of phenylephrine (total intra-operative dose 95 μg) maintained systolic blood pressure >100 mmHg. She also received an intravenous infusion of compound sodium lactate solution and an antibiotic (Co-Amoxiclav). Spinal anesthesia was effective and she had no pain. During the procedure the electrocardiogram (ECG) was monitored continuously. It was noted to show frequent dropped QRS-complexes that occurred simultaneously with her reporting symptoms of chest pressure. The chest pressure subsided following the procedure when she was able to sit up again. There was no association with periods of maximum surgical stimulation and her blood pressure remained stable. Postoperatively, she was admitted to our obstetric close observation unit. A 12-lead ECG was immediately attached to record a continuous rhythm strip for approximately two minutes. The cardiac rhythm was identified as atrio-ventricular (AV) heart block (Fig. 1), and this was confirmed by the on-call cardiologist who identified first-degree AV block and runs of Wenkebach phenomenon.

Serum troponin values were normal both immediately post-procedure and eight hours later (<2.5 ng/L). The hemoglobin concentration decreased from 138 g/L pre-delivery to 110 g/L post-delivery after an estimated blood loss of 450 mL; no blood products were required. Mild hypomagnesemia (0.68 mmol/L, normal range 0.7–1.0 mmol/L) was corrected, but all other electrolytes were normal. The following morning a trans-thoracic echocardiogram was carried out and was reported as normal, with a left ventricular ejection fraction of approximately 60%. Intermittently, there continued to

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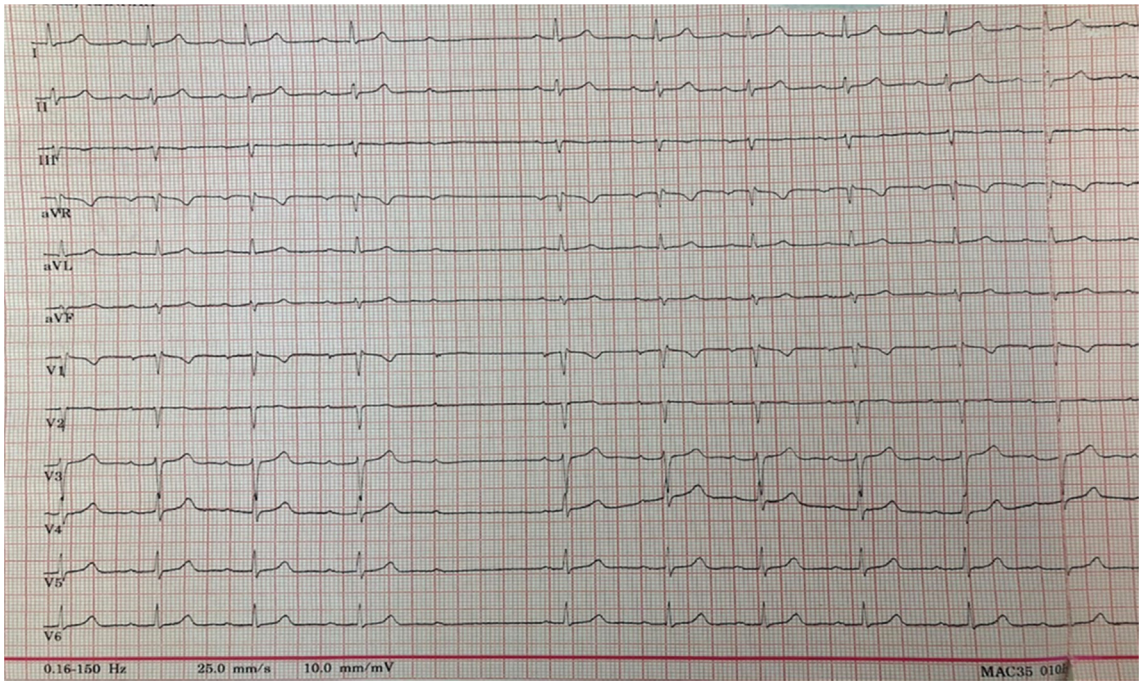

Fig. 1 Section of the ECG recorded immediately post-procedure, which is similar to the rhythms observed during the operative procedure

be runs of Wenkebach phenomenon observed on cardiac monitoring, and a repeat 12-lead ECG showed first-degree AV block between these episodes. However, there was no further significant chest discomfort, syncope or hemodynamic instability. The woman remained in hospital for four days' postpartum because her baby required on-going pediatric assessment.

After her discharge from hospital, a 24-h ambulatory ECG recording was conducted at 17 days postpartum. This provided approximately 19 h of continuous data. Minimum and maximum heart rates were 45 bpm and 149 bpm respectively, with a mean heart rate of 73 bpm. There were episodes of first-degree and second-degree (Wenkebach) AV block, and rare occasions of second-degree Mobitz II 2:1 AV block (examples in Fig. 2). A total of 2372 dropped QRS-complexes were recorded, mostly in the context of Wenkebach. There was no evidence of third degree (complete) AV block and no tacharrhythmias. There were only two isolated ventricular ectopic beats and two isolated supraventricular ectopic beats. No symptoms were annotated during the recording. The woman was advised to have 24-h ambulatory (Holter) monitoring surveillance every 6–12 months, and that a pacemaker might be required should she become symptomatic.

Discussion

Peripartum cardiac disease represents a significant challenge in obstetric anesthetic practice, and remains a cause for concern in the latest UK report of maternal mortality and morbidity.[1] The maternal mortality rate from cardiac disease persists at 2.1 per 100 000 maternities.[1] In the UK, between 2015–17, 82 women died from cardiac complications during pregnancy, delivery and up to 42 days postpartum. As such, cardiac disease is the most common cause of both indirect maternal death and maternal death overall. Sudden arrhythmic death in an otherwise normal heart accounted for a significant proportion (18%) of these cardiac deaths. More benign arrhythmias can also occur, but their incidence is relatively unknown. If they present incidentally, without symptoms, hemodynamic compromise or underlying cardiac pathology, they may rarely be detected and possibly be dismissed as a temporary rhythm disturbance or as unimportant. Diagnosis of AV block in pregnancy is particularly rare, with only a few case studies published.[2–6]

Atrio-ventricular block represents impaired electrical conduction between the atria and ventricles and is categorised anatomically in relation to the AV node and/or by severity.[7] First-degree AV block is relatively benign in most patients (PR prolongation >0.2 s with AV conduction intact), whereas third-degree block reflects complete AV dissociation. Between these extremes, second-degree block is subcategorised as Wenkebach (or Mobitz I) and Mobitz II. Wenkebach is progressive prolongation of the PR-interval leading to transient loss of AV conduction (dropped QRS-complexes), with this pattern often repeated. Mobitz II involves dropped QRS-complexes in the context of fixed PR-intervals with

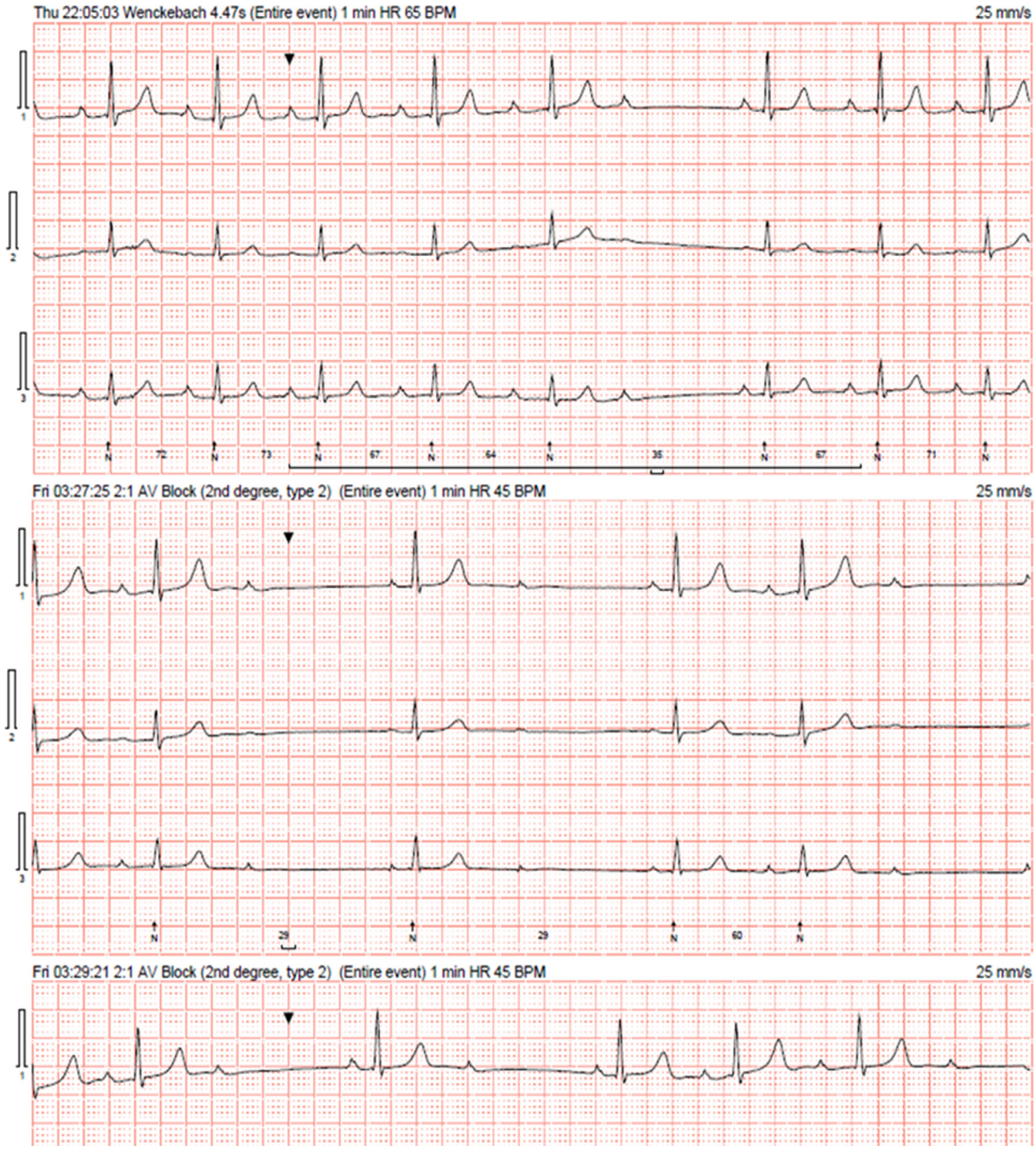

Fig. 2 Ambulatory ECG recorded 17 days post-discharge from hospital. Example of three of the events identified during the 19-h recording

varying ratios of atrial to ventricular beats, for example 2:1.

Atrio-ventricular block is intrinsically pathological (e.g. due to cardiac conduction system fibrosis or ischaemia) or 'extrinsic' (i.e. functional/physiological), for example reflecting high vagal tone.[8] Underlying cardiac pathology is more likely in older patients with higher degree or more persistent AV block.[8] In these cases untreated AV block can lead to syncope, heart failure or to bradycardia-triggered ventricular tachyarrhythmias that require an anti-bradycardia pacemaker to be implanted.[8] In patients with extrinsic causes of AV block it is very unlikely that pacemaker implantation would be required except in the rare case of a patient

with significant bradycardia-related symptoms.[8] Indeed, asymptomatic Wenkebach block has been found incidentally in 2.2% of 625 healthy individuals (mean age 42 years, standard deviation 11.9 years) undergoing 24-h ambulatory ECG monitoring.[9] It was particularly important for the woman in our case to have further cardiac investigation because of AV block in the context of long-term unexplained syncope.

One of the largest case series reported the outcome of AV block in 25 pregnancies.[3] Four women included in this cohort had presented with new-onset AV block, only one of whom had a prior history of cardiac disease (myocarditis). The AV block progressed in severity with the duration of pregnancy in all four women; two women required pacemaker insertion postpartum but the arrhythmia resolved without intervention in the other two women. Similar to our case, one woman had first-degree block with intermittent Wenkebach and Mobitz II block, associated with some dizziness, but cardiac pacing was not required as symptoms resolved following delivery. Indeed, a few case studies describe women who have had an uneventful pregnancy and delivery without a pacemaker even when in complete AV block,[4–6] although temporary pacing capability was recommended.[4,6] We suggest that more evidence is required to better understand the evolution of AV block during pregnancy and to confirm management recommendations.

Atrio-ventricular block is typically diagnosed on a single 12-lead ECG. However, asymptomatic pregnant women are unlikely to have an ECG routinely and therefore intermittent arrhythmias can be missed. During routine intra-operative monitoring in obstetric anesthesia, there is a unique opportunity to detect abnormal heart rhythms and to correlate them with symptoms. Stress, hemodynamic changes, uterine contractions, vagal stimulation[10] and drugs used during anesthesia, such as phenylephrine,[11] may result in transient benign bradyarrhythmias or unveil intermittent pathological arrhythmias that require further investigation. This includes a 12-lead ECG and consideration of continuous ECG monitoring with or without a later ambulatory (Holter) recording, as was performed for our case. In addition, a superficially implanted cardiac loop recorder may be considered for arrhythmias that present intermittently.

The need to be alert to common cardiac symptoms (breathlessness, palpitations, chest pain) and the need to investigate these symptoms appropriately (ECG, serum troponins, echocardiogram) so that a diagnosis is made has been highlighted in the Confidential Enquiry reports into maternal deaths.[1] In our patient, it is uncertain whether the history of syncope was related to intermittent episodes of AV block similar to those we recorded postpartum but this is a possibility. Syncope in pregnancy is a recognised phenomenon but is not always associated with arrhythmia. A recent Canadian study of 481 930 pregnancies reported a ~1% incidence of syncope, which was most likely associated with vasovagal events.[12] Those pregnancies associated with syncope had a higher rate of cardiac arrhythmia diagnosis in the year following delivery (0.8%) compared with those pregnancies without syncope (0.2%). Of 36 women who presented with syncope during pregnancy, followed by an arrhythmic event up to a year later, approximately half (47%) had a new-onset diagnosis of arrhythmia.[12]

Any persistent abnormal heart rhythm seen during intra-operative monitoring should be investigated. A recent study supported the potential usefulness of implanting intermittent loop recorders in pregnant women with a suspected arrhythmia to enable longer-term close monitoring and management.[13] This could improve our understanding of the longevity and evolution of any concerning arrhythmias detected during pregnancy. Women who show progression of their AV block may be identified early as requiring a permanent pacemaker. Other women may gain reassurance from knowing that their arrhythmia settles without the need for intervention.

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