Antenatal and Intrapartum Management of a Patient with a Pre-existing Myocardial Infarction and Gestational Diabetes Mellitus - Case Report

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Abstract
Pre-existing cardiac disease in pregnancy poses a significant risk to both the mother and the foetus. Given the trend towards increased maternal age and increased incidence of cardiac risk factors including diabetes, hypertension and obesity; management of cardiac co-morbidities in pregnancy is becoming important to characterise. Here we outline a case covering the antenatal and intrapartum management of a patient with a pre-existing Myocardial Infarct (MI) and stent in pregnancy with Gestational Diabetes Mellitus (GDM). In the absence of unequivocal guidelines concerning antenatal management of pre-existing MI in pregnancy, we approached management using a multidisciplinary approach with involvement of cardiology, obstetrics, paediatrics, endocrinology and anaesthetics, with allied health services.

Background
Pre-existing cardiac disease becomes pertinent considering the underlying strain placed on the heart in a normal pregnancy. Pregnancy is associated with eccentric cardiac hypertrophy, 30-50% increased circulating blood volume and a drop in systemic vascular resistance [1]. Such changes persist for 2-3 weeks post-partum, but may last up to 12 weeks [2].

Specifically, in relation to Myocardial Infarctions (MI) in pregnancy there are 3 main causes: coronary dissection, coronary vasospasm and a coronary thrombus. Increased myocardial oxygen demand in pregnancy with corresponding myocardial ischemia that can worsen as the pregnancy progresses, increasing the risk of MI. This is compounded by haemodilution causing a relative anaemia. Venous compression during labour with increased oxygen demand increases the risk of dissection. Coronary spasms are thought to be due to increased contractility in response to hormonal stimulation including catecholamines and the risk of thrombi is likely due to the baseline hypercoagulable state of pregnancy [3].

Overall, maternal cardiovascular disease is associated with increased risk of intrauterine growth restriction, prematurity and foetal demise [4]. However, the obstetric outcomes vary depending on the type and degree of disease [5]. Antenatal management of women with a past MI and additional risk factors is not extensively documented in the literature [6]. As such no clear guidelines for management have been adopted. Pre-pregnancy cardiac evaluation, beta blocker use and preference for caesarean section have been suggested as considerations but have not been validated independently [5].

A study by Burchil et al. in 2015 has demonstrated that woman with pre-existing MI with atherosclerotic changes are at a significant risk for morbidity and mortality during pregnancy and at significant risk of adverse neonatal outcomes [7]. The authors estimated that 10% of woman with a pre-existing MI will go on to develop another significant cardiac event (MI, cardiac arrest or heart failure) in the postpartum period.

Pregnancy itself is associated with progressive insulin insensitivity, thought to be mediated by the interplay of placental hormones and other pregnancy related factors that have yet to be fully elucidated [8]. Gestational Diabetes Mellitus (GDM) is a form of diabetes that complicates approximately 4-6% of pregnancies in Australia. The incidence of GDM is steadily increasing, likely due to the prevalence of obesity in woman of childbearing age. Risk factors are obesity, weight gain above recommended levels, prediabetes prior to pregnancy and past-history of diabetes [9]. The importance of identifying and managing GDM lies in its association with adverse pregnancy
outcomes including but not limited to hypertensive disease of pregnancy (eclampsia and pre-eclampsia), macrosomia, shoulder dystocia, neonatal hypoglycaemia and increased risk of stillbirth. Furthermore, GDM increases the risk of the mother going on to develop type 2 diabetes mellitus post-partum [10]. Management options vary depending on severity and can range from dietary changes, to pharmacological therapy.

Case Presentation

Patient profile

The patient was a 37-year-old G3P1T1 to the antenatal clinic from her General Practitioner (GP) at K9+5. The reason for the early referral was due to various preconception risk factors, namely the past MI; obesity and dyslipidaemia.

Past medical history was significant for an episode of acute coronary syndrome requiring a left anterior descending artery stent in 2014. Cardiology follow up up 4/52 post MI showed patency in the stent with moderate stenosis in the distal right coronary artery. Patient was a past smoker with a 1.5 pack year history, which she ceased prior to becoming pregnant. The patient was previously taking clopidogrel 75 mg, atorvastatin 40 mg (Lipitor), fenofibrate 145 mg (Lipidil), perindopril 2.5 mg (Coverysyl) and bisoprolol (1.25 mg). The patient was advised to cease atorvastatin and perindopril prior to conceiving. She was further advised to switch clopidogrel for aspirin with the rationale being more literature available on the use of aspirin in pregnancy compared to clopidogrel [11].

The patient was deemed to be high-risk based on the cardiovascular co-morbidities; 4 weekly cardiology consults were recommended to occur concurrently with biweekly antenatal reviews. Further cardiology consults were unremarkable.

Workup

Routine antenatal screening tests were performed as per Royal Australian and New Zealand College of Obstetrician and Gynaecologists (RANZCOG) guidelines [12]. In addition, foetal growth scans were ordered every 8 weeks.

An early glucose tolerance test at K16 was performed and the patient was found to have GDM. The patient was managed by the dietician, diabetes educator and endocrinologist, with input from the treating obstetrician. Patient was commenced on metformin 500mg bds at K17, however glycaemic control was poor. Increasing the dose of metformin (1g bds) at K18 did not significantly improve glycaemic control, therefore insulin was added on at K20+1. The certified diabetes educator titrated the dose of insulin throughout the pregnancy, with consultations from the endocrinologist and obstetrician. Metformin was used in addition to insulin, because metformin was well tolerated by the patient, provided a moderate reduction in weight gain and reduced the necessity of higher doses of insulin.

Cardiology review recommended an echocardiogram be performed every trimester to monitor the cardiac status, including ejection fraction. The patient’s ejection fraction at K=32 was 54% (initially also 54% prior to falling pregnant). She was deemed suitable for an elective caesarean section at Level II Hospital with an echocardiogram performed at 36 weeks to guide the timing of the delivery. The patient being informed of the risks, elected for a caesarean section. The patient was consented for a Lower Uterine Segment Caesarean Section (LUJCS) with tubal ligation, planned to be performed at 38 weeks, as per American Congress of Obstetrics and Gynaecology (ACOG) guidelines [13]. The echocardiogram performed at 36 weeks, showed an ejection fraction of 54%. A foetal ultrasound performed at the same time showed polyhydramnios (amniotic fluid index = 27.2).

Management

The patient was given 2 doses of betamethasone 11.3mg at K35+4 and K=35+5. The Royal College of Obstetrician and Gynaecologist (RCOG) guidelines recommends administering antenatal corticosteroids for patients undergoing an elective caesarean section up to K38+6 [14].

Owing to the diagnosis of polyhydramnios at 36 weeks, the elective caesarean section and tubal ligation was performed at K37, instead of the planned K38. The indication for caesarean was because the patient elected for one in addition to a past MI, dyslipidaemia, GDM on insulin and polyhydramnios.

No concerns were noted with the procedure itself. Routine post-operative care consisted of Dalteparin 5000IU, analgesia, recommencing the clopidogrel 75 mg and continuing the Aspirin 100mg, full blood count to monitor blood loss, sequential compression device use until mobile and thromboembolic deterrent stockings until discharge.

Outcome

Neonatal examination was performed by a paediatrician with no concerns noted. Cardiology follow up 2 months post-operatively and subsequent exercise stress test showed no evidence of ischaemia or additional cardiac damage. Further management consisted of routine GP checks and 4/52 follow up for another glucose tolerance test which came back negative.

Discussion

In this report, we chart the antepartum management from initial presentation to post-delivery follow up in a woman who had a previous MI. The increasing incidence of obesity, dyslipidaemia and other cardiac risk factors, in addition to the trend for advanced maternal age makes it likely that clinicians will encounter a similar scenario in their scope clinical practice. Most literature on this topic is primarily concerned with management of an acute MI in pregnancy. Management of a patient with a previous MI requires aggressive risk factor modification to reduce the risk of another acute cardiac event, the development of heart failure or cardiac arrest during pregnancy.

In this case, pre-pregnancy assessment of myocardial function in the form of an echocardiogram, with subsequent echocardiograms each trimester being imperative to tracking maternal cardiac function. With cardiac input, routine ECGs, cardiac markers and coagulations screens were not performed as the patient did not have symptoms of an acute cardiac event and therefore did not warrant additional investigations. The patient’s ejection fraction was stable throughout pregnancy and cardiology follow up showed no deterioration post-delivery.

A multi-disciplinary approach allowed risk factors to be addressed independently and managed. Briefly how each specialty contributed. The obstetrics team directed management of the case, performed the caesarean section and were responsible for directing
antepartum and post-operative management of the patient. The paediatrics team was responsible for neonatal care before and after caesarean, no resuscitation was required. The cardiology team performed the stress echocardiogram prior to concepcion to assess cardiovascular status, was responsible for serial antenatal echocardiogram monitoring, management of dyslipidaemia, and management of anticoagulation, risk factor modification and post-partum monitoring of heart function. The endocrinologist was responsible for management of GDM and directing the dietitian and certified diabetes educator. The anaesthetics team assessed patient suitability for caesarean section.

This case report provides a scaffold for how patients presenting with a past myocardial infarction on the background of additional risk factors can be managed using a multidisciplinary approach.

Learning Points

- Pre-existing cardiac disease while uncommon, is an important consideration in antenatal care.
- Cardiac disease in pregnancy often presents with other co-morbidities.
- Many physiological changes in pregnancy (relative anaemia, hypercoagulable state, increased myocardial demand) are risk factors for MI, therefore close monitoring is required in a pregnant woman with a history of MI.
- Early detection and management of high risk patients minimises potential adverse outcomes.
- A multidisciplinary approach is imperative in managing patients with multiple co-morbidities.

Conclusion

In antenatal management of a patient with co-morbidities that have the potential for severe neonatal and maternal outcomes, it is imperative to involve other medical disciplines early on. Each specialty involved can identify and mitigate risk factors under the direction of the obstetric team to prevent adverse outcomes.

Ethics

The authors declare no conflict of interest. The patient in question provided verbal and written consent for the de-identified publication of this case.

References