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CASE REPORT

Low-dose sequential combined spinal-epidural: an anaesthetic technique for caesarean section in patients with significant cardiac disease

E. L. Hamlyn, C. A. Douglass, F. Plaat, J. A. Crowhurst, G. M. Stocks

Department of Anaesthesia, Queen Charlotte's & Chelsea Hospital, London, UK

SUMMARY. In the United Kingdom, cardiac disease is the second most common cause of all maternal deaths. The best anaesthetic technique for caesarean section in these patients has yet to be established. We describe a low-dose combined spinal-epidural technique in four high-risk obstetric patients who presented to this unit. Invasive monitoring was used in each case, and drugs with significant cardiovascular effects were avoided or used with extreme caution. Multidisciplinary team involvement, including serial echocardiography in the antenatal period, is strongly recommended.

Keywords: Cardiac disease; Regional anaesthesia; Maternal mortality; Invasive monitoring; Echocardiography; Multidisciplinary team

INTRODUCTION

In the UK, the incidence of heart disease in pregnancy is approximately 1%.[1] The most recent Confidential Enquiry into Maternal Deaths (2004) reports that cardiac disease now causes more maternal deaths than thrombosis and thromboembolism, and is the second most common cause of maternal mortality after psychiatric disease.[2] All four patients in our series had significant cardiac disease, and all required operative delivery. In each case, a low-dose sequential combined spinal-epidural (CSE) technique was used. Table 1 provides a summary.

CASE 1: PULMONARY HYPERTENSION

A 20-year-old, para 0 + 1 presented at 7 weeks' gestation with a planned pregnancy, which she had decided to continue against medical advice. At the age of three years she was diagnosed with rhabdomyosarcoma of the left chest wall for which she was treated with a combination of surgery, chemotherapy and radiotherapy. As a result she had developed a marked thoracic scoliosis, pulmonary hypertension, severe tricuspid regurgitation and biventricular cardiac failure. Cardiac catheterisation at the age of 12 years revealed a pulmonary artery pressure of 65/33 mmHg, a mean pulmonary capillary wedge pressure of 18 mmHg and left ventricular end diastolic pressure of 25 mmHg, suggestive of left ventricular diastolic dysfunction with poor ventricular compliance. A previous chest radiograph showed chronic left pleural thickening; lung function tests revealed a FEV_1 and FVC 50% of expected values, with minimal bronchodilator response.

At 29 weeks' gestation she was referred to our unit for joint medical and obstetric care. Echocardiography confirmed the presence of poor left ventricular filling caused by interventricular septal flattening, a dilated right atrium and ventricle, and an estimated right ventricular pressure of 70 mmHg. She received enoxaparin 40 mg at night for thromboprophylaxis pre-delivery, but was taking no other medication.

As pregnancy progressed, she became increasingly dyspnoeic, and by 32 weeks a decision was made to deliver by caesarean section due to worsening maternal respiratory function. Invasive arterial and central venous pressure monitoring were established. Pulmonary artery catheterisation was considered. However, after discus-

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Correspondence to: Dr. G.M. Stocks, Department of Anaesthesia, Queen Charlotte's and Chelsea Hospital, Du Cane Road, London W12 0HS, UK. Tel.: +44 208 383 3991; fax: +44 208 383 5373; E-mail: GStocks@hhnt.org

Table 1. Summary of clinical cases

	Case 1 2° PH	Case 2 HOCM	Case 3 AS/LAD	Case 4 MS
Investigations	PAP 46 mmHg	Dilated atria	Valve area 0.7 cm^2	Valve area 0.9 cm^2
NYHA	III	III	III	II
Parity	0 + 1	0 + 0	1 + 0	1 + 0
Gestation (weeks)	32	29	38	34
Intrathecal bupivacaine (mg)	4	5	5	5
+ fentanyl (μg)	25	25	25	20
Epidural bupivacaine (mg)	50 (+150 μg fentanyl)	50	17.5 (+5 mL N. saline)	30 (+5 mL N. saline)
Block height to cold	T4	T4	T2	T4
Systolic/diastolic pressure (mmHg)	110–120/65–80	90–135/55–75	105–150/50–75	125–140/40–65
CVP (cmH_2O)	15–20	18–26	3–7	6–9
Blood loss (mL)	300	300	500	650
Oxytocin			10 units/6 h	2 units

2° PH = secondary pulmonary hypertension and biventricular cardiac failure; HOCM = hypertrophic obstructive cardiomyopathy; AS/LA = Aortic stenosis and stenosis of left anterior descending coronary artery; MS = Mitral stenosis; PAP = mean pulmonary artery pressure; NYHA = New York Heart Association functional grading.

sion with cardiac colleagues, it was felt that her previous extensive left-sided thoracic surgery would make placement of the catheter, and interpretation of values, extremely difficult.

Using a needle-through-needle technique, combined spinal-epidural (CSE) anaesthesia was performed at the L3/4 intervertebral space with the patient sitting upright. A 27-gauge Whitacre spinal needle was passed through a 16-gauge Tuohy needle. After an initial intrathecal dose of hyperbaric bupivacaine 4 mg (0.8 mL of 0.5%) and fentanyl 25 μg, the patient was placed in the left lateral position and given oxygen via a Hudson facemask. Epidural boluses of 3 mL then 2 mL of plain 0.5% bupivacaine were given 15 and 30 min after the intrathecal injection. This was supplemented by fentanyl 100 μg, also given via the epidural catheter. After 35 min there was a bilateral sensory level to cold, using ethyl chloride spray, at T4. At this point, the patient was turned into the wedged supine position. Shortly after surgery had started, 60 min after the intrathecal injection, a further 5 mL of plain 0.5% bupivacaine with fentanyl 50 μg was given epidurally.

Cardiovascular parameters remained stable during the development of the block and during surgery. Blood pressure ranged from 110/65 to 120/80 mmHg with central venous pressures (CVP) between 15–20 cmH_2O. Estimated blood loss was 300 mL. She received a total of 1000 mL of Hartmann's solution, given as a slow intravenous infusion throughout the surgery. A healthy baby boy was delivered. The uterus contracted well so oxytocin was withheld. Immediately postoperatively the patient was transferred to the intensive care unit where she received epidural diamorphine 2.5 mg for analgesia. She was nursed supine, with head up tilt until sympathetic tone returned. She received 5000 units of subcutaneous heparin every 12 h until the second postoperative day, when she was fully anticoagulated with an intravenous heparin infusion, and started on oral warfarin. The epidural catheter was removed on the first postoperative day, 10 h after the initial heparin injection. She remained haemodynamically stable and was subsequently transferred to the post-natal ward. She is currently being considered for a heart-lung transplant.

CASE 2: HYPERTROPHIC OBSTRUCTIVE CARDIOMYOPATHY

A 34-year-old para 0 + 0, with known hypertrophic obstructive cardiomyopathy (HOCM) and paroxysmal atrial fibrillation, presented at 22 weeks' gestation with an acute episode of pulmonary oedema. She had had a dual chamber pacemaker inserted nine years previously, and was under regular review by local cardiologists. She was admitted to our coronary care unit where she continued to suffer intermittent episodes of pulmonary oedema, which initially responded to a combination of diuretics, anti-arrhythmics and β blockade. Echocardiography revealed a hypertrophied left ventricle with good function, but dilated atria. Her cardiologist considered that there was clinical evidence of intermittent left ventricular outflow obstruction, although this could not be demonstrated on echocardiography.

At 29 weeks a decision was made to deliver by urgent caesarean section for intrauterine growth restriction with absent umbilical artery end diastolic flow. Using invasive monitoring and the same technique as described in case one, a CSE was performed using an intrathecal dose of hyperbaric bupivacaine 5 mg, (1 mL of 0.5%) with fentanyl 25 μg. This was followed by 4, 3, and then 3 mL slow boluses of epidural 0.5% bupivacaine, given 10, 20 and 35 min after the spinal. A bilateral upper sensory level of T4 to cold and T6 to touch was achieved. Surgery did not begin for another 40 min due to non-clinical reasons and a further