Posterior fossa surgery in the sitting position in a pregnant patient with cerebellopontine angle meningioma

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The frequency of non-obstetric surgery during pregnancy is low, approximately 2 per 1000 cases.1 The main reasons for such interventions are emergency intra-abdominal disorders (such as acute cholecystitis, acute appendicitis or adnexal masses), trauma or problems related to the pregnancy itself.

During pregnancy, central nervous system disorders seldom require immediate surgical attention, and cases that do are usually vascular in nature, such as subarachnoid haemorrhage (SAH) related to congenital saccular aneurysm or cerebral arteriovenous malformation. Less frequently, the problem is a cerebral or spinal tumour.

The incidence of SAH is estimated as 1 per 10 000 to 1 per 2500 pregnancies,2 while the concurrence of primary brain tumours and pregnancy is even rarer. A recent study of 126 413 consecutive pregnancies (from 1983 to 1995) reported only seven women with associated brain tumours, only one of whom was operated on before giving birth.3 Meningioma associated with pregnancy is rarer still: to date only 40 cases have been reported in the English literature.3

Case report

We present the case of a 30-yr-old pregnant woman who underwent surgery in the complete sitting position for a cerebellopontine angle meningioma. When admitted to our institute she was in the second trimester of her first pregnancy. According to the last menstrual period and earlier ultrasound examination, gestational age was 23 weeks. Her past medical, gynaecological and neurological history was unremarkable. Her pregnancy had been uncomplicated until the third month, except for some emotional lability, which included feeling depressed and unjustified crying. Beginning at approximately 14 weeks’ gestation, the patient began complaining of sporadic vertigo, which in the subsequent weeks was followed by an unsteady gait and later by mild unilateral ataxia of the left upper and lower extremities, with slight dysarthria.

Magnetic resonance imaging (MRI) revealed a large extra-axial mass of the left cerebellopontine angle, with pronounced compression and displacement of the pons and medulla, consistent with a petro-clival meningioma (Fig. 1).

The patient’s physical condition and that of the fetus were good, and all laboratory values were within normal limits. The Department of Neuroanaesthesia was consulted and it was suggested, in agreement with the gynaecologist, that cerebral surgery be postponed until after Caesarean section, programmed for the 35th week, after fetal lung development was complete. However, over the following
few days and notwithstanding administration of dexamethasone, the patient’s condition deteriorated and she began having problems with deglutition (while other protective reflexes remained intact). Therefore, it was decided to proceed with surgery to remove the intracranial mass. At the time of surgery the patient was in the 25th week of gestation.

The patient (height 160 cm, weight 51 kg) received diazepam 6 mg and ranitidine 150 mg orally, with atropine 0.5 mg i.m. before operation. Following our usual protocol, preoperative ceftizoxime and low-molecular-weight heparin (enoxaparin) were also given for antimicrobial and venous thromboembolism prophylaxis, respectively. Before induction, a wedge was placed under the right hip to displace the uterus to the left and increase vena caval blood flow. After preoxygenation, anaesthesia was induced with fentanyl 0.15 mg and thiopental 300 mg, with vecuronium 5 mg to facilitate nasotracheal intubation. Anaesthesia was maintained with low-dose isoflurane (0.5%) and 50% nitrous oxide in oxygen, with continuous infusion of fentanyl 0.15–0.25 mg h⁻¹. In addition to standard monitoring (ECG, pulse oximetry, oxygen analyser, end-tidal carbon dioxide concentration, urine output), invasive arterial pressure, central venous catheter, precordial Doppler ultrasonography (with the probe positioned over the fifth intercostal space, just to the right of the sternum) and brainstem auditory evoked potentials were used. A nasogastric tube was also placed. Fetal heart rate for prompt detection of fetal hypoxia was monitored using a fetal Doppler fixed to the mother’s abdominal wall; monitoring was continued throughout operation and periodically during the first 12 h after operation.

After judicious (i.e. with constant observation of central venous pressure, heart rate and arterial pressure) administration of saline and hetastarch to stabilize arterial pressure, the patient was raised slowly to the complete sitting position without provoking haemodynamic instability. The operating table was tilted slightly to the left.

A Mayfield frame was used, clamped to the side rails of the back section of the operating table so as to render the head and trunk immobile with respect to each other. A left paramedian suboccipital craniectomy was performed. The mass was resected and only a thin portion strongly adherent to the brainstem was left. Pathology confirmed the diagnosis of meningioma.

Heart rate and arterial pressure remained stable during operation; mean arterial pressure throughout the operation was 90 (range 86–94) mm Hg. Arterial blood gases were assessed periodically with mean values as follows: pH 7.38–7.45, $P_{\text{a}CO_2}$ 4.7–5.1 kPa, $P_{\text{a}O_2}$ 32.1–35.3 kPa. Haemoglobin, packed cell volume and plasma electrolyte concentrations remained within normal limits throughout the operation.

During craniectomy, an episode of air embolism was diagnosed by a change in Doppler frequency and a reduction in end-tidal carbon dioxide values (from 4.1 to 3.3 kPa). The surgeon was advised and nitrous oxide was discontinued. The usual sequence of manoeuvres (compression of the jugular veins, irrigation of the operating field with saline to submerge the area of air entry, waxing of bone edges) allowed us to identify the bone edge as the air entry point and rapidly resolve the problem. During this episode, circulatory variables and pulse oximetry remained stable.

The surgical procedure was completed in 11 h without complication, and recovery in intensive care was uneventful. Before tracheal extubation, the patient’s protective reflexes were checked. Coughing was present and strong; swallowing
had not deteriorated. The patient was transferred to the surgical ward on the first postoperative day. Over the following days the only problem she complained of was transitory hiccup. Subsequent obstetric and ultrasound checks were normal.

The meningioma was positive for progesterone receptors and negative for oestrogen receptors.

The patient was discharged on the 12th day after return of all neurological function. Caesarean section was performed under general anaesthesia during the 35th gestational week and the child was a healthy boy of 2070 g.

**Discussion**

Most anaesthetists and surgeons are reluctant to operate on pregnant women because of the risk of inducing premature birth or miscarriage, or otherwise damaging the fetus. However, when faced with the clinical indication for urgent or emergency surgery, pregnancy should not affect the decision to proceed. Furthermore, despite the understandable concern, premature labour does not seem to be a frequent outcome of surgery during pregnancy and fetal mortality and morbidity are minimal when surgery is unavoidable. However, the data refer mainly to abdominal surgery (often laparotomy), and recent reports on neurosurgery for brain tumours (particularly at the subtentorial site) in pregnancy are scarce, in view of the rarity of the association.

Although elective surgery in pregnancy is deferred until after delivery, certain conditions can mandate immediate surgery. As described here, a brain tumour can become an emergency, in which case delay in treatment could jeopardize the life of the woman and the fetus. Our case was also distinguished by the unusual site of the lesion (posterior fossa) and operating position (sitting), presence of brainstem compression and long duration of the operation.

There are few reports in the literature regarding positioning of pregnant patients for surgery, except for delivery itself. Respiratory function during late pregnancy is known to be more favourable in the semi-sitting position than in the supine or lateral positions, and in any position other than the full left lateral decubitus position, precautions must be taken to ensure that the gravid uterus is not impinging on the inferior vena cava, aorta or iliac vessels.

We decided to operate with the patient in the sitting position as the prone position is contraindicated by the presence of the fetus, and although good for surgical access, the right lateral decubitus position can result in aortocaval compression. Furthermore, our neurosurgeon’s experience is that the sitting position provides better access to the lesion in addition to optimum operating conditions, including a cleaner operating field. Almost all posterior fossa operations are performed at our institute with the patient in the sitting position, with the corollary that the operating team is fully experienced in this particular surgical approach. Before surgery, an echocardiogram is obtained to assess the integrity of the interatrial septum. We stress the need for attentive monitoring to deal with venous air embolism, as this potentially grave complication occurs in up to 45% of patients operated on in the sitting position. Monitoring must include Doppler ultrasonography, which is considered the basic device for detecting venous air embolism and is the most sensitive commonly available device for detecting air in the right atrium, in addition to end-tidal carbon dioxide concentration.

Rapid sequence i.v. induction using succinylcholine has been advocated for general anaesthesia in women more than 20 weeks’ pregnant so as to reduce the increased risk of aspiration. We preferred not to use succinylcholine mainly for fear of increasing intracranial pressure, and also because this was an elective operation and the patient had fasted for 8 h. She was given ranitidine before operation and there was no prior indication that intubation might be difficult. On balance, it seemed that the least risk for our two patients was to proceed with careful induction that ensured haemodynamic stability and good oxygenation.

Mean arterial pressure decreases early in pregnancy and it was important for us to maintain an adequate arterial pressure to avoid uterine hypoperfusion and fetal hypoxia; lowered uterine perfusion can also lead to premature uterine contractions. After the 16th week of gestation, continuous monitoring of fetal heart rate may be useful for early detection of fetal hypoxia in the perioperative period.

We used the nasotracheal route for intubation as it is our practice at our institute when an extensive period of postoperative artificial ventilation is anticipated (as is the case for posterior fossa surgery). In our experience, nasotracheal intubation allows more secure tube fixation when the patient is in the sitting position. We did not consider preoperative tracheostomy. Unless there are particular problems this is not normal practice at our centre.

Management of intracranial tumours in pregnancy must be individualized. The patient’s physical condition, gestational age, site, size and type of tumour, and neurological signs (particularly the presence of intracranial hypertension), in addition to the patient’s wishes must be considered in the decision-making process. If possible, surgery should be deferred until the end of pregnancy, but continued use of corticosteroids, particularly during the third trimester, may result in fetal adrenal suppression and neonatal hypoadrenalism. The presence of progesterone receptors has been shown to correlate with worsening symptoms of meningioma and it has been suggested that an increase in tumour size during pregnancy and the presence of oedema around the tumour could be hormone-related.

In summary, this case demonstrates that anaesthesia and neurosurgery for posterior fossa lesions can be performed uneventfully during the second trimester of pregnancy. If the team is experienced, surgery in the sitting position is a valid option. Continuous and attentive monitoring of both the mother and her child (the second patient) is vital. It is also important to prevent arterial hypotension which may
lead to substantial reduction in uteroplacental perfusion, and to maintain normal $P_{aO_2}$, $P_{aCO_2}$ and pH, to avoid fetal hypoxia and acidosis.\textsuperscript{6,7}

References

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