Anaesthesia Practice

The obstetrical anaesthesia assessment clinic: a review of six years experience

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We reviewed the out-patient consultation notes of 136 pregnant women seen at the Ottawa Civic Hospital from 1985 to 1991 to evaluate the efficiacy of an Obstetric Anaesthesia Assessment Clinic (OAC). In addition, their anaesthetic records from labour and delivery were reviewed. For each patient the reason for referral was recorded according to the involved organ system. The anaesthetic management at delivery was compared with the proposed anaesthetic plan by the OAC consultant (obstetric anaesthetist). The majority of women 84 (62%) had complaints related to the musculo-skeletal system. In addition, 18 patients were referred because of previous anaesthetic problems, ten with a history of cardiac disease, and eight with neurological disease. Lumbar epidural analgesia (LEA) was a safe and effective choice for parturients with low back pain, history of lumbar fractures or single level discectomies without lumbar fusion. Parturients with posterior instrumentation experienced an increased incidence of inadequate pain relief from LEA. Individualized anaesthetic management plans were executed for parturients with spina bifida occulta, neurological, cardiac, and haematological disease as well as for women with a history of adverse drug reactions and previous problems with regional or general anaesthesia. It is concluded that the OAC has provided a valuable service to obstetricians and anaesthetists for the anaesthetic management of pregnant women with coexisting disease. The OAC gave an opportunity for patient education regarding anaesthetic options for labour and delivery. The attending anaesthetist was provided with a risk assessment and anaesthetic management plan which was adhered to with only two exceptions. Finally, the obstetrician was given consistent advice regarding anaesthesia management that may affect obstetrical decisions.

A l'hôpital civique d'Ottawa de 1985 à 1991, nous avons révisé les observations de 136 parturientes recueillies en clinique externe dans le but d'examiner l'efficacité de la clinique d'évaluation anesthésique obstétricale (CAO). Les dossiers du travail et de l'accouchement de ces patientes ont aussi été revus. Pour chacune des patientes la raison de la consultation a été classée selon le système mis en cause. La conduite anesthésique obstétricale a été comparée au plan projeté par le consultant de la CAO. Quatre-vingt quatre patientes (62%) avaient des symptômes se rapportant au système musculosquelettique. De plus 18 patientes ont été référées en raison de problèmes anesthésiques antérieurs dont dix avec des antécédents cardiaques et huit avec des antécédents neurologiques. L'anesthésie lombaire épidurale (ALE) a été un choix sécuritaire et efficace pour les lombalgies, les antécédents de fractures vertébrales lombaires et les discoïdectomies à niveau unique sans fusion. Celles qui avaient subi des interventions vertébrales ont été celles qui ont le moins profité du soulagement produit par l'ALE. Un plan anesthésique a été adapté sur mesure aux parturientes qui présentaient un spina bifida occulta, une maladie cardiaque, neurologique ou hématologique ainsi que des antécédents de réactions médicamenteuses indésirables à l'anesthésie régionale ou générale. Nous concluons que la CAO rend de grands services aux obstétriciens et anesthésistes pour la conduite anesthésique de parturientes présentant des pathologies associées. La CAO permet l'éducation de la parturiente en regard des options qu'on peut offrir pour le travail et l'accouchement. L'anesthésiste en charge profite de l'évaluation du risque et d'un plan de conduite auquel il a toujours adhéré à deux exceptions près. Finalement, l'obstétricien a profité de conseils utiles sur le conduite anesthésique susceptibles d'affecter la prise de décision obstétricale.

Key words
ANAESTHESIA: obstetrical;
ANAESTHESIA: complications;
ANAESTHETIC TECHNIQUES: epidural.

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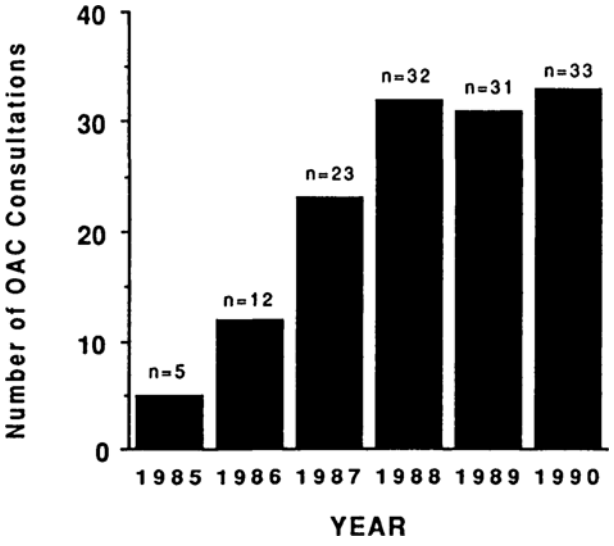

FIGURE 1 Number of OAC consultations per year since 1985.

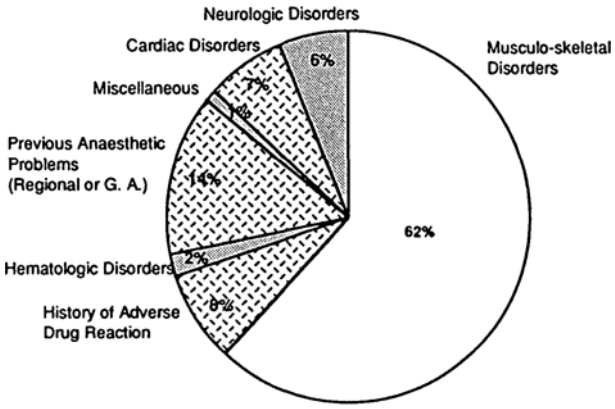

FIGURE 2 Distribution (%) of patients according to reason for OAC referral.

Anaesthetists are often required to provide safe and effective analgesia to parturients with co-existing disease during labour and delivery. Assessment of the parturient by an anaesthetist before labour and delivery offers many possible advantages to the parturient, anaesthetist and obstetrician. It also provides an opportunity for women to enquire about various options for pain relief during labour, thus reducing anxiety about anaesthetic techniques for analgesia or Caesarean section. The OAC consultant is able to obtain a detailed history and physical examination, and identify and manage risk factors that adversely affect outcomes. The OAC consultant may require further laboratory testing, and/or consultations with other specialist physicians. He/she is then better informed to recommend a strategy for anaesthetic management during labour and delivery.

We reviewed our six-year (1985–1991) experience with the Obstetric Anaesthesia Assessment Out-patient Clinic at the Ottawa Civic Hospital to determine its effect on anaesthetic management of labour and delivery.

Methods

The records of all consultations to the Obstetric Anaesthesia Assessment out-patient Clinic from 1985 until 1991 were reviewed. The findings of the anaesthetic and obstetric history and physical examination and the results of laboratory and radiological investigations were noted. In addition, the recommendations of the OAC anaesthesia consultant regarding anaesthetic technique and choice of anaesthetic agents for labour or Caesarean delivery were reviewed.

The anaesthetic technique used during labour and delivery was obtained by examining the anaesthetic records of all parturients. The following information was recorded: type of delivery, peri-partum obstetrical complications, and anaesthetic technique chosen by attending or resident anaesthetist. We also recorded the technical complications associated with epidural analgesia. The effect of epidural analgesia for labour or delivery was rated as excellent, fair, or poor, according to written comments by the anaesthetist and labour nurse. Finally, we determined whether the anaesthetist followed the recommendations by the OAC consultant regarding anaesthetic care during labour and delivery.

Results

A total of 136 outpatients were seen in consultation in the Obstetric Anaesthesia Outpatient Assessment Clinic during the six-year period of 1985–1991. Although 15 (11%) were seen by other anaesthetists, the majority of the pregnant women were assessed by one of the two obstetric anaesthetists at the Ottawa Civic Hospital. All referrals to the OAC were from consultant obstetricians or family physicians at the Ottawa Civic Hospital. There was a gradual increase in the number of yearly referrals since the start of the service in 1985 (Figure 1). The distribution of patients according to reason for referral by organ system is shown in Figure 2.

Musculo-skeletal system

Intermittent or chronic low back pain (LBP) was the primary reason for referral in 35 women (Table I); 26% of these women experienced worsening of LBP during pregnancy. The quality of epidural analgesia was excellent in 93% of parturients with chronic LBP and the epidural catheter was inserted without difficulty in all but

TABLE I Musculo-skeletal disorders

1 Low back pain	($n = 35$)
2 History of surgery for lumbar disc disease	($n = 5$)
3 History of fractured lumbar vertebrae	($n = 10$)
4 Scoliosis and/or kyphosis–no instrumentation	($n = 9$)
5 Scoliosis and Harrington instrumentation	($n = 19$)
6 Spina bifida occulta	($n = 6$)

three. In two, the anaesthetist failed to identify the epidural space at one level, but subsequently inserted the catheter successfully at the neighbouring lumbar interspace. On another occasion, the epidural catheter was inserted into an epidural vein. Six (17%) of the women with LBP had abnormal physical findings; three patients had point tenderness at one or both sacro-iliac (SI) joints, and three experienced pain radiating into the leg (Table II). One patient (#3, Table II) had severe back pain with radiation to the right knee and walked with a pronounced limp. She was advised that parenteral opioids with nitrous oxide supplementation would be preferable to LEA for labour, whereas the remaining women with abnormal physical findings had LEA for labour and delivery.

Five patients were referred because of a history of back surgery due to lumbar disc disease (Table III). All five parturients had excellent LEA for Caesarean section or labour. Only one of ten patients with a history of fractured lumbar vertebrae had undergone surgery to stabilize the spine. All of these parturients had excellent LEA for labour or Caesarean section.

Nine patients presented with mild or moderate scoliosis, due, in the majority to idiopathic scoliosis. One patient had a history of childhood poliomyelitis and suffered from secondary scoliosis and a severely atrophied left leg. Another patient in this group had Scheuermann's disease (adolescent scoliosis secondary to vascular necrosis of vertebral bodies). The epidural catheter was inserted at the first attempt in all parturients with scoliosis without posterior instrumentation and the quality of analagesia was excellent.

Four of 11 patients with Harrington instrumentation had incomplete or unilateral sensory block despite epidural catheter insertion on the first attempt. One patient had no discernible block following epidural catheter insertion at either L_{3-4} or at L_{4-5}. However, this patient had a subarachnoid block without technical difficulty and excellent anaesthesia for elective Caesarean section. The Harrington rods or distraction hooks extended caudally to the L_3 vertebra in all patients with poor epidural analgesia or no block. The parturients who experienced excellent analgesia for labour or Caesarean section had caudal distraction hooks placed on lumbar vertebrae #1 or #2, except in one parturient where the rods extended to the third lumbar vertebra.

Lumbo-sacral *x*-rays revealed the exact location of the spinal defect in four of six patients referred with spina bifida occulta (Table IV). The OAC anaesthetist was then able to recommend lumbar interspaces cephalad to the spina bifida occulta for LEA. One patient had never had lumbo-sacral *x*-rays, but on physical examination a patch of discoloured skin and aberrant hair growth suggested the location of the spina bifida at L_5 or S_1. Epidural catheter insertion was uncomplicated in all these patients, and excellent epidural analgesia was obtained on every occasion. The remaining patient who did not have *x*-ray films available received parenteral opioids for pain relief during labour.

Neurological system

Eight women were referred to the OAC with a history of neurological disease (Table V). Patient #2 with multiple sclerosis (MS) received epidural anaesthesia without complications for labour and delivery, and her symptoms did not worsen during her post-partum hospital stay. Two parturients with arterio-venous malformation (AVM) were strongly recommended to have epidural anaesthesia for elective Caesarean section. Both women had epidural anaesthesia for Caesarean delivery, and there were no hypertensive episodes during the perioperative period. These parturients also received epidural meperidine PCA infusion for effective pain control for two days after the operation. None of the six patients with neurological disease who received LEA for labour or Caesarean section experienced progression of their neurological symptoms after delivery.

Cardiovascular system

Ten patients were referred to the OAC with a history of cardiac disease. The timing and mode of delivery was a joint decision between the perinatologist, cardiologist and the OAC consultant. Three of these women gave a history of childhood rheumatic fever (Table VI). Patient #4 had a history of mitral valve replacement (tissue) eight years before her pregnancy. She had experienced slight shortness of breath and occasional palpitations from the fifth month of pregnancy. She was taking acetylsalicylic acid and dipyrridamole which was discontinued ten days prior to term. She received LEA for labour and delivery without any change in her clinical condition. Three patients had undergone cardiac surgery to correct congenital anomalies. None experienced cardiac symptoms; however, one patient had a permanent neurological deficit in her lower limbs as well as poor bowel and bladder control due to intraoperative rupture of the aorta during closure of a patent ductus arteriosus at 25 yr. Normal cardiac function was confirmed by echocardiogram in all these patients. Two women gave histories of congenital heart

TABLE II LBP and lower extremity neurological deficit

Patient #	*Clinical features*	*Diagnosis*	*Anaesthesia*	*Complications*	*Quality of analgesia*
1	L_{4-5} disc herniation. Sensory deficit on calf and between 1st and 2nd toe. Decreased power to knee flexion	LBP sciatica	LEA L_{3-4}	None	Excellent
2	LBP radiating to right leg. Sensory deficit L_5 dermatome. Lasegue sign at 70°	LBP sciatica	LEA L_{2-3}	None	Excellent
3	LBP radiating to right buttocks/thigh/knee. Sensory deficit. Lasegue's sign bilaterally at 60°	LBP sciatica. ?Large central herniation	Parenteral opioids	None	–

TABLE III History of lumbar disc surgery

Patient #	*Clinical features*	*Anaesthesia*	*Complications*	*Quality of anaesthesia*
1	L_{4-5} and L_5-S_1 discectomy. Asymptomatic. T_{12}-S_2 midline scar	LEA L_{3-4} for CS	Unable to identify epidural space L_{2-3}, easy catheter insertion at L_{3-4}	Excellent
2	L_{4-5} discectomy. Retroperitoneal approach, left flank scar	LEA L_{3-4}	None	Excellent
3	L_{4-5} discectomy. Asymptomatic. Midline scar L_4-S_1	LEA L_{3-4}	None	Excellent
4	L_{4-5} discectomy. Asymptomatic. Midline scar L_3-L_5	LEA L_{3-4}	None	Excellent
5	L_{4-5} discectomy. L_5 laminectomy. No bone grafting.	LEA L_{3-4}	None	Excellent

TABLE IV Spina bifida occulta

Patient #	*Clinical features*	*X-ray*	*OAC recommendation*	*Outcome*
1	None	Spina bifida S_1	LEA at L_{2-3} or L_{3-4}	Excellent LEA at L_{2-3}
2	LBP	Lumbar scoliosis, spina bifida S_1	LEA at L_{2-3} or L_{3-4}	Excellent LEA at L_{2-3}
3	Dimple at L_5-S_1. Discoloured skin, aberrant hair growth	None	LEA at L_{1-2} or L_{2-3}	Excellent LEA at L_{2-3}
4	None	Spina bifida S_1	LEA at L_{2-3} or L_{3-4}	Excellent LEA at L_{2-3}
5	LBP. No sensory deficit. Absent right ankle jerk	Spina bifida L_5. Spondylisthesis 40% L_5 on S_1	LEA at L_{2-3} or L_{3-4}	Excellent LEA at L_{3-4}
6	None	Done at a different hospital	*X*-rays of lumbo-sacral spine requested	*X*-ray report not available. Received parenteral opioids

TABLE V Neurological disorders

Patient #	*OAC assessment/ diagnosis*	*Anaesthesia*	*Complications*	*Quality of LEA*
1	Cerebral palsy. Tremor of shoulder girdles, arms and face	No labour analgesia. GA for retained placenta.	None. Easy tracheal intubation	-
2	Multiple sclerosis. Dizziness, slurred speech, blurred vision, ataxia and loss of fine motor control. Decreased power in all limbs	LEA for labour	None	Excellent
3	Stroke at 3 yr. Nonprogressive hemiparesis	LEA for CS	None	Excellent
4	Subarachnoid haemorrhage 4 mo after delivery of infant 2 yr ago. Basilar AVM. Unsuitable location for surgical treatment	LEA for CS	None	Excellent
5	History of incomplete clipping of AVM. Hemiparesis with wasting and hyperflexia	LEA for CS	None	Excellent
6	Meningioma of lateral ventricle	Did not request LEA	-	-
7	Congenital absence of anterior horn cells. Hemiparesis	LEA for CS	None	Excellent
8	Progressive inherited neuromuscular disease. Mild muscle weakness. EMG: chronic denervation/renervation abnormalities	Did not request LEA	-	-

TABLE VI Cardiovascular disorders

Patient #	*Diagnosis*	*Anaesthetic outcome at delivery*
1	Rheumatic mitral stenosis	LEA for labour
2	Rheumatic mitral stenosis - valve area 1.6 cm^2	LEA for labour
3	Rheumatic mitral stenosis - valve area 1.1 cm^2	LEA for CS. Swan Ganz monitoring. Intraoperative CHF, improved with LEA and *iv* furosemide
4	Mitral valve replacement-tissue	LEA for labour
5	ASD repair, ligation of PDA and pulmonary valvotomy	LEA for labour
6	Ligation of PDA. Postoperative neurological deficit	LEA for labour. No charge in neurological status
7	Rubella syndrome with systolic heart murmur	LEA for labour
8	Mitral valve prolapse. History of supraventricular tachycardia (SVT)	LEA for labour. No peri-partum SVT
9	Tetralogy of Fallot with definite repair	LEA for labour
10	History of myocardial infarction	LEA for labour. No myocardial ischaemia

murmurs; one from maternal rubella infection and the other from mitral valve prolapse (MVP).

The remaining patient (#10) in this group had a myocardial infarction (MI) at 29 yr, one year before becoming pregnant. She was using a birth control pill at the time and was also a smoker, a habit which she continued during her pregnancy. She did not have angina pectoris, and her only medication was acetylsalicylic acid. The OAC consultant recommended LEA for all ten cardiac patients. This was carried out at delivery without problems.

History of complications associated with anaesthesia
A heterogenous group of 18 patients were referred to the OAC with complaints relating to previous anaesthesia for labour or Caesarean section.

Six parturients complained of inadequate epidural analgesia or anaesthesia for labour or Caesarean section. Physical examination was normal in all these women. These parturients subsequently had effective LEA following easy identification of the epidural space and catheter insertion. Two parturients gave a history of severe postpartum headache following Caesarean section. A review of their hospital records revealed that they previously had spinal anaesthesia using a #22 gauge spinal needle. One patient was treated successfully with epidural blood patch. Both women were administered uneventful epidural anaesthesia for Caesarean delivery. Another woman had been told by an anaesthetist that she could not have regional anaesthesia for Caesarean section because of active genital herpes infection. The patient did not have an outbreak at the time of her repeat Caesarean section and had epidural anaesthesia without neurological sequelae. One woman complained of severe shivering during and up to three hours after Caesarean section with epidural anaesthesia. The OAC anaesthetist suggested the use of warm *iv* fluids and epidural injection of opioid as an adjuvant to the local anaesthesic for epidural anaesthesia. However, despite the use of warm *iv* crystalloid solution she again developed severe intraoperative shivering. The intensity of shivering was modified somewhat by an epidural injection of meperidine 60 mg after delivery of the baby. Acute anxiety, a strange taste in the mouth, drowsiness and palpitations were the complaints by two women who had epidural analgesia for labour. Their hospital charts revealed that 60 mg lidocaine and 15 μg epinephrine had been injected into an epidural vein resulting in transient maternal tachycardia.

One patient experienced claustrophobia and a panic attack during her last Caesarean section with epidural anaesthesia, necessitating the induction of general anaesthesia. A review of the anaesthetic record showed that the sensory block had not been excessively high (T_4). She received a continuous infusion of bupivacaine 0.125% with 2 μg of fentanyl/ml which provided good labour analgesia while enabling her to move her legs freely. Unfortunately her labour failed to progress and it was decided to proceed to Caesarean section. The attending anaesthetist attempted to extend the block using carbonated 2% lidocaine with epinephrine 1:200 000, but the patient again panicked during skin preparation despite verbal reassurances from the attending staff. General anaesthesia was induced when the patient became very restless and upset.

Another woman in this group had received *iv* oxytocin during the first stage of labour after having had LEA before the oxytocin infusion. She experienced uterine hypertonus following oxytocin augmentation which resulted in temporary fetal distress. She alleged that LEA had slowed labour to the extent that the oxytocin infusion was necessary. Therefore, she would not consent to LEA in the future, and wanted information about the use of Transcutaneous Electrical Nerve Stimulation (TENS) for labour analgesia.

History of adverse drug reaction
Seven patients gave a history of adverse reaction to the injection of a local anaesthetic, most commonly during dental surgery. A history of fainting and slow heart rate associated with injection of local anaesthetic was presumed to be due to vasovagal syncope rather than an allergic reaction. Two women gave a history of pruritic facial swelling following injection of local anaesthetic. However, after consultation with the allergist and dentist the OAC anaesthetist was able to recommend a safe local anaesthetic for epidural anaesthesia. One woman gave a history of positive reaction during skin testing to both ester and amide local anaesthetics. As the allergist was unwilling to repeat the skin testing procedure while the patient was pregnant, she was advised to have parenteral opiods and nitrous oxide for pain relief during labour.

Two of the remaining patients gave a history of susceptibility to malignant hyperthermia (MH). One had had a intraoperative fulminant MH crisis in the past, requiring cardio-pulmonary resuscitation. Both were recommended to have LEA during early first stage of labour in order to decrease the stress response associated with labour pain, and careful monitoring of heart rate and body temperature. They had effective LEA with lidocaine and bupivacaine for labour and delivery without developing signs or symptoms of MH.

Although another patient had a family history of plasmacholinesterase deficiency, blood testing done during her OAC visit showed normal enzymatic activity and plasmacholinesterase concentration.

Haematological disorders
Two parturients in this category had inherited coagulation disorders. One patient had hereditary haemorrhagic telangiectasia (Rendu-Osler-Weber disease) and presented with telangiectasiae on her face, lips and chest wall. She was advised not to have LEA for labour due to possible spinal cord involvement with telangiectasiae, which could result in spinal hematoma formation and neurological compromise. She received nitrous oxide analgesia during labour and a pudendal nerve block. The baby had multiple skin lesions at birth.

The other parturient had von Willebrand's disease which had been diagnosed following extensive bleeding during dental extractions several years prior to this pregnancy. At the time of her OAC visit her bleeding time and partial thromboplastin time (PTT) were normal. Her coagulation values remained normal at the time of elective Caesarean section and she therefore had epidural anaesthesia without any sequelae.

One patient was receiving subcutaneous heparin therapy due to deep venous thrombosis and pulmonary embolism that occurred during the second trimester of pregnancy. She was receiving 17,000 units daily at the time of the OAC consultation, and some mild unilateral calf tenderness was noted. It was recommended that she should continue anti-coagulant therapy until the onset of uterine contractions. Her last dose of heparin was given several hours before hospital admission, and although the PTT was normal when she was in labour, she decided not to have LEA for labour and delivery.

Miscellaneous

One patient was a Jehovah's Witness and wanted reassurance that the anaesthetist would not administer blood products. The other patient in this category wanted counselling regarding the various options for pain relief during labour, in particular TENS. She received TENS analgesia during early first stage of labour with poor effect. Therefore LEA was administered for labour and repair of an extensive perineal tear.

The anaesthetic techniques for labour and/or Caesarean delivery recommended by the OAC consultant were followed by attending and resident anaesthetists, with only two exceptions. On one occasion epidural anaesthesia for Caesarean section was attempted despite a history of acute anxiety and hysteria during previous Caesarean section, requiring induction of general anaesthesia. The OAC consultation had recommended genral anaesthesia for Caesarean section rather than regional anaesthesia. The other case where the OAC recommendation was not followed ocurred when the use of bupivicaine for LEA was not recommended. This was based on a weakly positive reaction to this agent during intradermal skin testing. However, bupivicaine was chosen for LEA labour analgesia, without evidence of adverse reaction associated with its use. A copy of the OAC report was on file in the labour and delivery unit and in the anaesthesia call room. Therefore, the on-call attending anaesthetist had immediate access to this information when the parturient was admitted to the labour and delivery unit.

Discussion

Approximately half of all pregnant women develop some degree of LBP during pregnancy.[1] The high incidence of LBP during pregnancy is believed to result from increased joint laxity, especially during the last trimester.[2] The women referred to the OAC were anxious to know whether LEA would worsen their LBP, and whether the pain relief would be as effective as for those without back complaints. Our results indicate that the quality of LEA is excellent in these patients; 93% of parturients had very good pain relief during labour and delivery. This result is comparable to a control population of parturients without LBP.[3] It is evident that a history of non-specific LBP is not a contraindication to LEA during labour; rather, parturients with LBP should expect excellent pain relief from LEA without an increased incidence of complications associated with this procedure. Earlier reports have described delayed onset of LEA and inadequate spread of local anaesthetic in patients with LBP and sciatica.[4,5] However, these patients had lumbar disc protrusions and well-defined segmental root defects that presumably obstructed the spread of local anaesthetic in the epidural space.

A previous study of non-pregnant patients with a history of spinal surgery showed that the failure rate with LEA was slightly higher than in a control group.[6] All five women referred to the OAC with a history of back surgery due to lumbar disc disease had simple, single level discectomies without lumbar fusion. The favourable outcome of LEA for labour in these patients who had less extensive surgical intervention indicates that few technical difficulties will be encountered, and good labour analgesia can be expected.

Most patients who have been treated conservatively for lumbar vertebral fractures have minor disability following rehabilitation.[7] Our data on parturients with a history of lumbar fractures indicate that this group of patients benefits from LEA for labour. All had excellent pain relief during labour and no problems associated with the procedure.

Although scoliosis has been associated with premature delivery, women with mild or moderate scoliosis can expect normal pregnancies and labour.[8,9] Cardiorespiratory complications are now exceedingly rare. LEA can be recommended for safe and effective pain relief during labour and delivery, since all parturients with moderate scoliosis, not requiring surgical correction, had effective analgesia without complications. Our results of LEA for labour or Caesarean section in parturients with posterior instrumentation are similar to earlier reports that concluded that this procedure is associated with increased difficulty in identifying the epidural space and poor analgesia.[10,11] This is presumably due to scar formation of the skin, subcutaneous tissue and the epidural space. Spinal anaesthesia should be considered for Caesarean

section in patients with posterior instrumentation, since predictable surgical anaesthesia will result following subarachnoid injection of local anaesthetic.

If epidural puncture is attempted at the level of a spina bifida occulta, dural puncture is inevitable.[12] In our series of six patients with spina bifida occulta we were able to obtain *x*-ray reports in four patients. This enabled us to determine the exact location of the defect and suggest appropriate alternative lumbar interspaces for epidural catheter insertion in these four patients (Table IV). Unfortunately, we did not receive the *x*-ray reports before labour on one occasion, and the woman had an *iv* PCA opioid infusion for pain relief during labour. Low-dose prenatal irradiation may increase the risk of childhood cancer, hence radiological examination of the lumbosacral spine is inadvisable during pregnancy.[13]

It appears that LEA can be safely used in patients with chronic neurological disease, without exacerbation of neurological signs or symptoms.[14] Pregnancy is generally associated with stability or improvement of the clinical status of parturients with MS, although the six-month post-partum period may be associated with an exacerbation of the disease.[15] It is therefore not surprising that a case report has described exacerbation of symptoms of MS following LEA.[16] However, there is no evidence that LEA *per se* will result in a relapse of the disease. The procedure can be performed safely after having informed the parturient of the risks and benefits of LEA. The growth rate of meningeal tumours may increase during pregnancy. This may be related to hormonal factors since both progesterone and oestrogen receptors have been found in meningiomas.[17] Epidural bolus injections can temporarily increase intracranial pressure. Hilt *et al.*[18] suggest that LEA is contraindicated in patients with intracranial space occupying lesions. However, we agree with Wildsmith[19] that epidural analgesia may be performed in selected cases using very slow epidural injection rates if the patient is asymptomatic without evidence of increased intracranial pressure.

Arterio-venous malformations usually present in the primigravid patient, whereas aneurysmal rupture occurs more frequently in the multiparous parturient.[20] Lumbar epidural analgesia is a good choice for labour and delivery to prevent cardiovascular stress associated with painful uterine contractions. The use of outlet forceps without maternal Valsalva manoeuvers is also recommended in these patients. However, many obstetricians recommend elective Caesarean section at 38 wk gestation in untreated or imperfectly treated patients.[21] Our two parturients with AVM received LEA for Caesarean section without complications, and subsequently had effective postoperative analgesia using epidural PCA meperidine.

Maternal mortality from heart disease has declined over the last three decades. The reasons for this improvement in outcome include better diagnostic techniques, more agressive medical management and successful correction of many congenital heart conditions.[22] There has also been a change in the pattern of heart disease. In the 1950's, rheumatic heart disease accounted for approximately 80% of valvular cardiac disease, whereas in the latest series, congenital heart disease was three times more common than rheumatic heart disease.[23] Parturients with prosthetic valves require anti-thrombotic therapy during pregnancy to prevent systemic embolism, while those with tissue valves do not require anticoagulation.[24] Intravenous antibiotic administration is recommended in all patients with prosthetic valves for any obstetrical procedure to prevent infective endocarditis.[25] Our patient with tissue mitral valve replacement was receiving acetylsalicylic acid and dipyrridamole thoughout pregnancy, but these were stopped one week before full term. The bleeding time was normal at the onset of labour and she had uneventful LEA for labour and delivery.

The medical, obstetrical and anaesthetic management of the parturient with rheumatic heart disease should be the result of consultation between the subspecialties involved in the patient's care. The OAC recommendations for peri-partum management of the parturients with mitral stenosis included: (1) prevention of rapid ventricular rate which impairs ventricular filling and reduces cardiac output; (2) avoiding acute increases in central blood volume; (3) avoiding precipitous falls in peripheral vascular resistance which may result in hypotension and tachycardia; (4) administering antibiotic prophylaxis against infective endocarditis.[26]

Ischaemic heart disease is becoming more prevalent in pregnant women (incidence 1:10 000), possibly due to smoking and the older age of many parturients.[27] Successful pregnancy following MI has been reported.[28] The aim of anaesthetic management is to prevent pain and thereby to limit myocardial oxygen demand. In addition one should aim at optimizing coronary perfusion and oxygenation. The use of LEA during labour and delivery affects these goals, provided systemic hypotension does not occur. The patient that presented to the OAC with coronary artery disease received LEA and supplemental oxygen throughout labour and delivery without developing symptoms or signs of myocardial ischaemia.

Mitral valve prolapse is associated with mitral regurgitation and the auscultatory finding of a mid-systolic click and a late systolic murmur.[29] Some patients with MVP may have a decreasing intravascular volume and increased concentration of plasma natriuretic factor.[30] However, NYHA class I parturients do well during pregnancy and parturition, and no special precautions are necessary. Our patient became hypotensive and tachy-

cardic following Caesarean section under LEA. This was treated by rapid infusion of crystalloid solution. Intravenous antibiotic prophylaxis is not recommended for routine vaginal delivery in patients without evidence of mitral regurgitation, but is recommended for complicated delivery and intrauterine manipulation.

Incomplete anaesthesia may occur in 1–10% of patients with LEA depending on the patient population.[3] This may be due to: inability to identify the epidural space, complications related to the epidural catheter, abnormal anatomy of the epidural space or inadequate volume or concentration of local anaesthetic. Some anaesthetists had not informed the patient of the possibility of failure of the LEA technique, although all the patients who were referred to the OAC with a history of inadequate LEA had been informed of the possibility of a headache after delivery, and in some cases had been warned of a remote possibility of neurological compromise.

Shivering during Caesarean section may be associated with epidural injection of local anaesthetics at room temperature.[31] Epidural[32] or *iv*[33] administration of meperidine and warm *iv* crystalloid infusion[34] may ameliorate the symptoms. Our patient demonstrated severe shivering on two occasions, despite injection of epidural meperidine and infusion of warm *iv* fluids.

The incidence of PDPH following spinal anaesthesia is related to needle size.[35] Although one report has suggested that impaired epidural analgesia may occur after previous dural puncture and epidural blood patch,[36] this was not the experience in our patients.

Recrudescence of genital herpes infection without lesions extending to the lumbosacral region is not a contraindication to LEA for Caesarean section.[37] While primary herpes infection can be associated with viraemia, there is no evidence of neurological complications following recrudescence of genital herpes infection. Acute anxiety, panic attacks and claustrophobia may occur in susceptible women during Caesarean section with regional anaesthesia. This is distressing for the patient, and jeopardizes the operating conditions for the obstetrician. In our experience one should consider general anaesthesia for subsequent Caesarean section. Some parturients are concerned that LEA will diminish the frequency and intensity of uterine contractions. There is little evidence to support such a contention.[38] Therefore, it is unreasonable to incriminate LEA as the reason for a subsequent oxytocin-induced uterine hypertonus and temporary fetal compromise. The occurrence of complications or side effects of LEA for labour and Caesarean section underscores the importance of patient education during pregnancy, and early communication and explanation when complications do arise.

Allergic hypersensitivity reactions to local anaesthetics are rare, and account for only 1% of all adverse reactions associated with the administration of local anaesthetic agents.[39] Systemic reactions are more common and are due to: vaso-vagal episodes, inadvertent intravascular injection of local anaesthetic containing epinephrine, overdosage or reaction to an additive (methylparaben). Allergic reactions occur more frequently following the use of ester local anaesthetitics. However, allergy to lidocaine has been documented following dental,[39] subcutaneous[40] and pudendal nerve block.[41] Immune-mediated allergic reactions with a decrease in C_4 complement plasma concentration have also been reported following intradermal[42] and epidural[43] administration of bupivicaine. In most cases a careful history will give a good indication of the likely cause of the reaction. Skin testing during pregnancy has been described,[41], but we feel that this diagnostic test is contraindicated at this time due to the risk to mother and fetus should an anaphylactic reaction result from injection of local anaesthetic. All women with a history of adverse reaction to local anaesthetics should be encouraged to have intradermal skin testing before becoming pregnant. Reactions to metabisulphite have been well documented,[44] and patch testing with potassium metabisulphite will confirm the diagnosis of sulphite allergy.[45]

Trauma to the epidural venous plexus may occur during localization of the epidural space by the needle or during insertion of the epidural catheter. This may result in haematoma formation with resulting spinal cord compression and neurological deficit in patients receiving heparin. Epidural haematomata and complete paraplegia has been described following LEA in a patient who had received prophylactic heparin therapy (5000 U *sc* every 12 hr).[46] The safety of LEA in patients on low-dose heparin has not been determined. Because of the serious neurologic consequences resulting from epidural haematoma formation, we recommend that LEA not be performed unless the PTT is normal.

Hereditary haemorrhagic telangiectasia is a familial disease transmitted as an autosomal dominant trait of high penetrance. It is a systemic disease resulting in vascular malformations that may involve the spinal cord, and neurological compromise has been described in several patients as a result of haemorrhage and acute cord compression.[47] Waring *et al.*[48] described uneventful continuous LEA in a patient with hereditary haemorrhagic telangiectasia and rheumatic heart disease. We elected not to administer LEA to our parturient who had telangiectic chest wall lesions, but no other coexistent disease.

Von Willebrand's disease is an inherited coagulation disorder often characterized by a prolonged bleeding time and PTT due to quantitative and/or qualitative abnor-

malities of the components of the factor VIII complex.[49] Some patients with the most common and mild form of the disorder (Type I) can achieve normal levels of co-factors VIII:C and VWF:Ag during pregnancy and a correction of the bleeding time.[50] We feel there is no contraindication to LEA for labour or Caesarean delivery if the bleeding time and PTT are normal. The epidural catheter should be removed immediately after delivery because the VWF:Ag and VIII:C levels may decrease rapidly in the post-partum period.

Conclusion

The Obstetric Anaesthesia Assessment Clinic has proved to be beneficial and the advantages can be summarized as follows:

The parturient

There is a great need for ante-natal education regarding available options for pain relief for labour and delivery. A thorough knowledge of the advantages and disadvantages of various modes of pain relief results in a well-informed parturient, who is less anxious about the anaesthetic procedure itself and confident that she will not suffer severe pain and discomfort during labour or delivery. Although the parturients were referred to the OAC with a complaint related to a specific organ system, it was evident that many women were anxious to learn more about the various pain management options for labour and delivery.

The obstetrician

The OAC consultation report provided the obstetrician with information regarding obstetric anaesthesia management impacting on obstetric care. Since the majority of OAC consultations were seen by obstetric anaesthetists, there was also considerable uniformity in the suggestions made regarding obstetric anaesthesia management.

The anaesthetist

The OAC visit enables the obstetric anaesthetist to obtain a detailed history of the parturient's medical condition, which may be difficult to obtain in a labouring patient. Furthermore, clinical findings can be correlated with laboratory data obtained from previous hospital admissions and specialist consultations. As a result, recommendations regarding further necessary investigations were made before labour. The OAC consultant then suggested a plan for labour analgesia or anaesthesia for Caesarean section, in consultation with the parturient.

References

1 *Berg G, Hammar M, Möller-Nielsen J, Linden U, Thorblad J.* Low back pain during pregnancy. Obstet Gynecol 1988; 71: 71–5.

2 *Calguneri M, Bird HA, Wright V.* Changes in joint laxity occurring during pregnancy. Ann Rheum Dis 1982; 41: 126–8.

3 *Ducrow M.* The occurrence of unblocked segments during continuous lumbar epidural analgesia for pain relief in labour. Br J Anaesth 1971; 43: 1172–3.

4 *Benzon HT, Braunschweigh R, Molloy RE.* Delayed onset of epidural anesthesia in patients with back pain. Anesth Analg 1981; 60: 874–7.

5 *Schachner SM, Abram SE.* Use of two epidural catheters to provide analgesia of unblocked segments in a patient with lumbar disc disease. Anesthesiology 1982; 56: 150-1.

6 *Sharrock NE, Urquhart B, Mineo R.* Extradural anaesthesia in patients with previous lumbar spine surgery. Br J Anaesth 1990; 65: 237–9.

7 *Weinstein JN, Collalto P, Lehmann TR.* Thoracolumbar "burst" fractures treated conservatively: a long-term follow-up. Spine 1988; 13: 33–8.

8 *Lao TT, Yeung S, Leung BFH.* Kyphoscoliosis and pregnancy. J Obstet Gynaecol 1986; 7: 11–5.

9 *Visscher W, Lonstein JE, Hoffman DA, Mandel JS, Harris BSH III.* Reproductive outcomes in scoliosis patients. Spine 1988; 13: 1096–8.

10 *Crosby ET, Halpern SH.* Obstetrical epidural anaesthsia in patients with Harrington instrumentation. Can J Anaesth 1989; 36: 693–6.

11 *Daley MD, Rolbin SH, Hew E, Morningstar BA, Stewart JA.* Epidural anesthesia for obstetrics after spinal surgery. Reg Anesth 1990; 75: 280–4.

12 *McGrady EM, Davis AG.* Spina bifida occulta and epidural anaesthesia. Anaesthesia 1988; 43: 867–9.

13 *Harvey EB, Boice JD Jr, Honeyman M, Flannery JT.* Prenatal X-ray exposure and childhood cancer in twins. N Engl J Med 1985; 312: 541–5.

14 *Crawford JS, James FM III, Nolte H, Van Steenberge A, Shah JL.* Regional anaesthesia for patients with chronic neurological disorders and similar conditions. (correspondence). Anaesthesia 1981; 36: 821–2.

15 *Davis RK, Maslow AS.* Multiple sclerosis in pregnancy: a review. Obstet Gynecol Rev 1992; 47: 290–6.

16 *Warren TM, Datta S, Ostheimer GW.* Lumbar epidural anesthesia in a patient with multiple sclerosis. Anesth Analg 1982; 61: 1022–3.

17 *Roelvink NCA, Kamphorst W, van Alphen HAM, Rao BR.* Pregnancy-related primary brain and spinal tumors. Arch Neurol 1987; 44: 209–15.

18 *Hilt H, Gramm HJ, Link J.* Changes in intracranial pressure associated with extradural anaesthesia. Br J Anaesth 1986; 58: 676–80.

19 *Wildsmith JAW.* Extradural blockade and intracranial pressure (editorial). Br J Anaesth 1986; 58:579.

20 *Tuttleman RM, Gleicher N.* Central nervous system hemorrhage complicating pregnancy. Obstet Gynecol 1981; 58: 651–6.
21 *Wilkins RH.* Natural history of intracranial malformations: a review. Neurosurgery 1985; 16: 421–30.
22 *Sullivan JM, Ramanathan KB.* Management of medical problems in pregnancy – severe cardiac disease. N Engl J Med 1985; 313: 304–9.
23 *MacNab G, Macafee CAJ.* A changing pattern of heart disease associated with pregnancy. J Obstet Gynecol 1985; 5: 139–42.
24 *McColgin SW, Martin JN Jr, Morrison JC.* Pregnant women with prosthetic heart valves. Clin Obstet Gynecol 1989; 32: 78–88.
25 *Finch R.* Chemoprophylaxis of infective endocarditis. Scand J Infect Dis Suppl 1990; 70: 102–10.
26 *Brady K, Duff P.* Rheumatic heart disease in pregnancy. Clin Obstet Gynecol 1989; 32: 21–40.
27 *Nolan TE, Hankins GDV.* Myocardial infarction in pregnancy. Clin Obstet Gynaecol 1989; 32: 68–75.
28 *Chestnut DH, Zlatnik FJ, Pitkin RM, Varner MW.* Pregnancy in a patient with a history of myocardial infarction and coronary artery bypass grafting. Am J Obstet Gynecol 1986; 155: 372–3.
29 *Rayburn WF, Fontana ME.* Mitral valve prolapse and pregnancy. Am J Obstet Gynecol 1981; 141: 9–11.
30 *Boudoulas H, Sparks EA.* Mitral valve prolapse and the mitral valve prolapse syndrome. Curr Probl Cardiol 1991; 5: 315–75.
31 *Walmsley AJ, Giesecke AH, Lipton JM.* Contribution of extradural temperature to shivering during extradural anaesthesia. Br J Anaesth 1986; 58: 1130–4.
32 *Brownridge P.* Shivering related to epidural blockade with bupivicaine in labour, and the influence of epidural pethidine. Anaesth Intensive Care 1986; 14: 412–7.
33 *Casey WF, Smith CE, Katz JM, O'Loughlin K, Weeks SK.* Intravenous meperidine for control of shivering during Caesarean section under epidural anaesthesia. Can J Anaesth 1988; 35: 128–33.
34 *Workhoven MN.* Intravenous fluid temperature, shivering, and the parturient. Anesth Analg 1986; 65: 496–8.
35 *Kestin IG.* Spinal anaesthesia in obstetrics. Br J Anaesth 1991; 66: 596–607.
36 *Ong BY, Graham CR, Ringaert KRA, Cohen MM, Palahniuk RJ.* Impaired epidural analgesia after dural puncture with and without subsequent blood patch. Anesth Analg 1990; 70: 76–9.
37 *Crosby ET, Halpern SH, Rolbin SH.* Epidural anaesthesia for Caesarean section in patients with active recurrent genital herpes simplex infections: a retrospective review. Can J Anaesth 1989; 36: 701–4.
38 *DeVore JS, Eisler EA.* Effects of anesthesia on uterine activity and labour. *In:* Shnider S, Levinson G (Eds.). Anesthesia for Obstetrics. Williams & Wilkins, Baltimore MD, 1987.
39 *Reynolds F.* Adverse effects of local anaesthetics. Br J Anaesth 1987; 59: 78–95.
40 *Brown DT, Beamish D, Wildsmith JAW.* Allergic reaction to an amide local anaesthetic. Br J Anaesth 1981; 53: 435–7.
41 *Fisher McD. M, Pennington JC.* Allergy to local anaesthesia. Br J Anaesth 1982; 54: 893–4.
42 *Fisher McD. M, Graham R.* Adverse responses to local anaesthetics. Anaesth Intensive Care 1984; 12: 325–7.
43 *Erkkola R, Kanto J, Mäenpää J, Kero P, Hovi-Viander M, Viander M.* Allergic reaction to an amide local anaesthetic in segmental epidural analgesia. Acta Obstet Gynecol Scand 1988; 67: 181–4.
44 *Dooms-Goossens A, de Alam AG, Degreff H, Kochuyt A.* Local anesthetic intolerance due to metabisulphite. Contact Dermatitis 1989; 20: 124–6.
45 *Fisher AA.* Reactions to injectable local anesthetics Part IV: reactions to sulfites in local anaesthetics. Cutis 1989; 44: 283–4.
46 *Parnass SM, Rothenberg DM, Fischer RL, Ivankovich AD.* Spinal anaesthesia and mini-dose heparin (letter). JAMA 1990; 263: 1496.
47 *Roman G, Fisher M, Perl DP, Poser CM.* Neurological manifestations of hereditary hemorrhagic telangiectasia (Rendu-Osler-Weber disease): report of 2 cases and review of the literature. Ann Neurol 1987; 4: 130–44.
48 *Waring PH, Shaw DB, Brumfield CG.* Anesthetic management of a parturient with Osler-Rendu-Weber syndrome and rheumatic heart disease. Anesth Analg 1990; 71: 96–9.
49 *Cameron CB, Kobrinsky N.* Perioperative management of patients with Von Willebrand's disease. Can J Anaesth 1990; 37: 341–7.
50 *Conti M, Mari D, Conti E, Muggiasca ML, Mannucci PM.* Pregnancy in women with different types of Von Willebrand's disease. Obstet Gynecol 1986; 68: 282–5.