THE OUTCOME OF LABOUR WITH EPIDURAL ANALGESIA

A RETROSPECTIVE STUDY

By

DR. MAS ADI BIN AHMAD

DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF MEDICINE (OBSTETRICS AND GYNAECOLOGY)

UNIVERSITI SAINS MALAYSIA

MAY 2001

TABLE OF CONTENTS

CONTENTS **PAGE**

	CONTENTS	PAGE

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

SVD	:	Spontaneous Vertex Delivery
Non SVD	:	Non Spontaneous Vertex Delivery
CI	:	Confidence Interval
OR	:	Odds Ratio
P	:	P Value
SD	:	Standard Deviation

ACKNOWLEDGEMENTS

I would like to extend my thanks and deepest gratitude to Dr. Haji Abdul Rahman Abdullah, lecturer and consultant in Department of Obstetrics and Gynaecology, School of Medical Sciences, Universiti Sains Malaysia, for his assistance and guidance in preparation of this dissertation.

I am also grateful to Dr. Awang Nila Ismail, consultant and head of the Department of Obstetrics and Gynaecology for his keen interest in my work; and also all the lecturers in the department for their guidance and encouragement throughout my training.

I am particularly indebted to my wife, Dr. Nor Azian bt. Ahmad Zainuddin whose support, understanding and endless prayers have guided me through my career.

May 2001 Dr. Mas Adi bin Ahmad

INTRODUCTION TO KELANTAN AND ITS MATERNAL HEALTH CARE SERVICES

1. INTRODUCTION TO KELANTAN AND ITS MATERNAL HEALTH CARE SERVICES

Kelantan is one of the 13 states within Malaysia and is situated at the north-eastern corner of Peninsular Malaysia. Kelantan derives its name from the Malay word 'kilatan' which means lightning, thus translating the name to 'The Land of Light'. It covers a total area of 14,922 square kilometres and shares its borders with the states of Perak, Pahang and Terengganu as well as the neighbouring country Thailand. The state of Kelantan comprise ten districts; these are Kota Bharu, Bachok, Pasir Puteh, Tumpat, Pasir Mas, Machang, Kuala Krai, Tanah Merah, Jeli and Gua Musang. The town of Kota Bharu is the state capital and administrative centre. Ninety five percent of its population of 1.4 million are of Malay ethnicity while the others are Chinese, Indians, Thais and Orang Asli.

Kelantan is frequently referred to as a haven for enthusiasts of Malay tradition and culture. The state is popularly known for its traditional handcrafts especially batik printing, songket weaving, silverware and kite making. Malay folklore presented in the form of songs and dances, notably Mak Yong and Menora, and also shadow puppet theatres, the 'Wayang Kulit', has become synonymous with Kelantan.

Kelantan's history dates back over 1000 years ago as ancient Chinese scriptures documented the existence of a kingdom which maintained ties with China. With the rise of the Malacca Sultanate in the 15th century, Kelantan came under the Sultanate rule.

The fall of the Malacca Sultanate brought autonomy to this region, however, this government was constantly under threat by the neighbouring Thais.

At the turn of the century, Kelantan became a province of the Siamese Kingdom. However, in 1909, as a result of the Bangkok Treaty signed between the Thais and the British, Kelantan was brought under British rule. The Second World War saw Japanese occupation of this region for a brief period. Following independence in 1957, Kelantan became part of the Federation of Malaya and subsequently a member state of Malaysia in 1963.

Kelantan's economy is primarily based on agriculture. Rice, rubber and tobacco are among its main produce. This is also supplemented by fishery and livestock rearing. In recent years, the state government has placed more emphasis on industries and manufacturing, thus providing new employment avenues for its people.

Tourism is an important feature of Kelantan's economic activity. Kelantan's rich cultural heritage and pristine beaches have given the region a 'tourist-attraction' status. Added to these assets are the people's warmth and hospitality. Tourists and foreigners can be easily seen every day mingling with the locals at the bazzars and night markets in the state capital.

Maternal health care in Kelantan is part of the government health care services provided by the Malaysian Ministry of Health.

Kelantan has 9 Hospitals, of which two are located in the district of Kota Bharu while the other districts excluding Bachok and Jeli have one district Hospital each. Prior to 1998, obstetric operations are only performed at Hospital Kota Bharu and Hospital Universiti Sains Malaysia. Since 1998, following the upgrading of Hospital Kuala Krai, specialist services in Obstetrics and Gynaecology and Anaesthesiology are made available in this Hospital. This enables more obstetrics operations and other surgical procedures to be done here. Apart from Hospitals, maternal health care services in Kelantan are also supported by the 55 government health clinics (Klinik Kesihatan) and 230 government rural clinics (Klinik Desa).

INTRODUCTION TO THE SCHOOL OF MEDICAL SCIENCES, UNIVERSITI SAINS MALAYSIA AND HOSPITAL UNIVERSITI SAINS MALAYSIA

2. INTRODUCTION TO THE SCHOOL OF MEDICAL SCIENCES, UNIVERSITI SAINS MALAYSIA AND HOSPITAL UNIVERSITI SAINS MALAYSIA

The School of Medical Sciences, Universiti Sains Malaysia is the third medical faculty to be set up in Malaysia after the medical faculties of University of Malaya and Universiti Kebangsaan Malaysia. Developed in 1979, the School of Medical Sciences, Universiti Sains Malaysia aims to bring itself above the rest by implementing a new curriculum designed to produce medical practitioners who are well rounded scientifically and spiritually. Its inception was much awaited and greatly welcomed by the people of Kelantan and the other states of the east coast as it was the first medical faculty in this region.

Hospital Universiti Sains Malaysia (HUSM) is the teaching Hospital for the university's School of Medical Sciences. This Hospital is located adjacent to the medical school in Kubang Kerian which is 6.4 kilometres from the town centre of Kota Bharu. Hospital Universiti Sains Malaysia was built in 1976 under the Third Malaysian Plan and was officially opened in 1984. It has a capacity of 675 beds and is equipped with facilities such as blood bank, radiology, pathology, biochemistry, microbiology as well as intensive care unit and operation theatre complex. This is to cater for the wide range of specialties present in this Hospital, from internal medicine to neurosurgery. HUSM is the referral centre for the state of Kelantan and the other states of the east coast.

THE DEPARMENT OF OBSTETRICS AND GYNAECOLOGY, UNIVERSITI SAINS MALAYSIA

3. DEPARTMENT OF OBSTETRICS AND GYNAECOLOGY, HOSPITAL UNIVERSITI SAINS MALAYSIA

The Department of Obstetric and gynaecology, Hospital Universiti Sains Malaysia provides specialist services in obstetrics and gynaecology on inpatient and outpatient basis. This department also serves as the O & G referral centre for other district hospitals and health clinics in Kelantan. The department is staffed by eleven lecturer consultants and twenty Master candidates and service medical officers.

Among the main objectives of this department is to provide postgraduate training in obstetrics and gynaecology. The programme for Master of Medicine in Obstetrics and Gynaecology was commenced in 1991. The first batch of candidates in this programme qualified in 1995. The department also conducts general obstetrics and gynaecology training for house officers and undergraduate medical students. Apart from training, the department conducts medical research and produce scientific literature in the field of obstetrics and gynaecology.

There are two gynaecology wards with a combined capacity of 62 beds, two antenatal wards with a total capacity of 40 beds, a forty-bedded postnatal ward and a labour ward complex with 10 delivery suites. The labour ward complex is equipped with an operation theatre for caesarean section and other obstetrical operations.

The Obstetrics and Gynaecology Clinic provides antenatal services via the antenatal Booking Clinic, General Antenatal Clinic and Combined Clinic. Besides the Antenatal, Postnatal and General Gynaecology Clinic, the department also conducts specialised clinics for menopause, infertility, oncology and trophoblastic diseases.

ABSTRACT OF DISSERTATION

4.1 BAHASA MALAYSIA VERSION

ABSTRAK

HASIL BERSALIN DENGAN PEMBIUSAN EPIDURAL

SUATU KAJIAN RETROSPEKTIF

Objektif

Objektif kajian ini adalah untuk menentukan hubungan di antara pembiusan epidural dengan kelahiran cara SVD (kelahiran verteks spontan) atau bukan SVD; untuk menentukan kesan pembiusan epidural ke atas jangkamasa bersalin peringkat pertama dan kedua; dan untuk menilai pengaruh gravidity, augmentasi oksitosin, parut terdahulu serta berat kelahiran fetus ke atas kesan-kesan dan hubungan-hubungan tersebut.

Kaedah

Suatu kajian retrospektif telah dijalankan di Jabatan Obstetrik dan Ginekologi, Universiti Sains Malaysia, dengan menggunakan data kelahiran sepanjang tempoh 16 bulan dari Februari 1999 hingga Mei 2000. Ia merangkumi pesakit yang bersalin tanpa pembiusan epidural yang dipilih secara rawak dalam tempoh 8 bulan yang pertama serta semua pesakit yang bersalin dengan pembiusan epidural dalam tempoh 8 bulan berikutnya.

Kriteria kemasukan adalah kandungan tunggal dengan presentasi kefalik manakala kriteria pengecualian adalah kandungan kembar, bersalin presipitat (precipitate labour) serta pesakit yang mempunyai indikasi untuk pembedahan caesarean elektif.

Data bersalin serta data kelahiran diperolehi dari nota kes pesakit dan dianalisa untuk hubungan dan signifikan menggunakan Ujian 'Chi Square' atau Ujian-T. Signifikan statistik diambil sebagai nilai P kurang dari 0.05.

Keputusan

Tujuh puluh lima pesakit dengan pembiusan epidural serta 96 pesakit tanpa pembiusan epidural telah dianalisa di dalam kajian ini.

Pembiusan epidural mempunyai kaitan yang signifikan dengan peningkatan kelahiran cara bukan SVD. Nisbah kebarangkalian (Odds Ratio) untuk pesakit dengan pembiusan epidural bersalin cara bukan SVD adalah 4.05 berbanding dengan pesakit tanpa pembiusan epidural. Graviditi pesakit, augmentasi oksitosin, parut terdahulu serta berat fetus tidak mengubah kaitan ini tetapi signifikan hanya didapati pada pesakit yang tiada parut terdahulu serta pesakit dengan berat fetus bersamaan atau kurang daripada 3200 gram.

Pembiusan epidural mempunyai kaitan dengan jangkamasa bersalin peringkat pertama yang lebih panjang berbanding dengan pesakit tanpa pembiusan epidural (P = 0.003). Kaitan ini hanya diubah oleh augmentasi oksitosin dan kehadiran parut terdahulu. Signifikan kaitan hanya ditunjukkan oleh pesakit dengan berat fetus bersamaan atau kurang dari 3200 gram serta pesakit tanpa parut terdahulu.

Pembiusan epidural mempunyai kaitan dengan jangkamasa bersalin peringkat kedua yang lebih panjang berbanding dengan pesakit tanpa pembiusan epidural. Kaitan ini tidak diubah oleh graviditi pesakit, augmentasi oksitosin, kehadiran parut terdahulu atau berat fetus. Walaubagaimanapun, signifikan hanya didapati dalam multigravida, augmentasi oksitosin, pesakit tanpa parut terdahulu dan fetus yang lebih besar atau lebih kecil (berat fetus bersamaan atau kurang daripada 3200 gram atau besar daripada 3200 gram).

Kesimpulan

Pembiusan epidural meningkatkan risiko kelahiran cara bukan SVD dan meningkatkan jangkamasa bersalin peringkat pertama dan kedua.

Hanya augmentasi oksitosin dan parut terdahulu mengubah kaitan di antara pembiusan epidural dengan jangkamasa bersalin peringkat pertama yang lebih panjang, manakala faktor-faktor lain tidak mengubah kaitan yang terdahulu.

Tiada suatu faktor pun dari yang dinilai, iaitu graviditi pesakit, augmentasi oksitosin, parut terdahulu atau berat fetus, yang mengubah hubungan positif di antara pembiusan epidural dan jangkamasa bersalin peringkat kedua yang lebih panjang.

4.2 ENGLISH VERSION

ABSTRACT

THE OUTCOME OF LABOUR WITH EPIDURAL ANALGESIA

A RETROSPECTIVE STUDY

Objectives

The objectives of this study are to determine the association between epidural analgesia and the mode of delivery by SVD and non SVD ; to determine the effect of epidural analgesia on the duration of the first and second stages of labour; and to evaluate the influence of gravidity, oxytocin augmentation, previous scar and foetal birth weight on the above effects and associations.

Methods

A retrospective study was carried out in the Department of Obstetrics and Gynaecology, Universiti Sains Malaysia, utilizing data of deliveries over a 16 month period from February 1999 until May 2000. This comprises randomly selected patients delivering without epidural analgesia within the first 8 months and all patients delivering with epidural analgesia in the other 8 months of the study period. Inclusion criteria are singleton pregnancy with cephalic presentation while exclusion criteria are

multiple pregnancy, precipitate labour and patients with indications for elective caesarean section.

Labour and delivery data were obtained from patients' case notes and analyzed for associations and significance with Chi Square Test or T-Test. Statistical significance was taken as P value of less than 0.05.

Results

Seventy five patients with epidural analgesia and 96 patients without epidural analgesia have been analyzed in this study. Epidural analgesia was associated with a significant (p = 0.001) increase in non SVD. The Odds Ratio for a patient with epidural analgesia delivering by non SVD was 4.05 as compared to a patient without epidural analgesia. Patients' gravidity, oxytocin augmentation, presence of previous scar and foetal birth weight did not alter this association but significance was only demonstrated in non previous scar and patients with fetal weight of 3200 gm or less.

Epidural analgesia was associated with longer mean duration of the first stage of labour compared to non epidural patients (p = 0.003). This association was only altered by oxytocin augmentation and presence of previous scar. Significance in the associations were only demonstrated in patients with fetal weight of 3200 gm or less and patients without previous scar.

Epidural analgesia was associated with a longer mean duration of the second stage ($p = 0.001$). This association was not altered by the patients' gravidity, oxytocin augmentation, presence of previous scar or the fetal birth weight. However, significance was only demonstrated in multigravida, oxytocin-augmented patients, non previous scar patients and both larger and smaller foetus (3200 gm or less and more than 3200 gm).

Conclusion

Epidural analgesia significantly increased the risk of non SVD and increased the mean duration of the first and second stages of labour. Only oxytocin augmentation and presence of previous scar altered the association between epidural analgesia and a longer mean duration of first stage of labour, while the other factors did not.

None of the evaluated factors, that is patients' gravidity, oxytocin augmentation, previous scar and foetal birth weight altered the positive risk association between epidural analgesia and non SVD; or the association between epidural analgesia and a longer mean duration of the second stage.

INTRODUCTION TO THE PHYSIOLOGY OF LABOUR AND LABOUR ANALGESIA

5. INTRODUCTION TO THE PHYSIOLOGY OF LABOUR AND LABOUR ANALGESIA

The administration of local anaesthetics and opioids via an epidural catheter for labour analgesia has been increasing over the past 20 years. The widespread use of epidural analgesia for intrapartum pain relief has come under scrutiny following studies indicating that epidural analgesia adversely affect the progress of labour and the caesarean delivery rate (Thorp et al. 1993, Morton et al. 1994). The multiple factors that contribute to these outcomes require understanding of the physiology of labour and the anaesthetic technique used.

5.1 Physiology Of Labour

Two different but interrelated physiological processes constitute labour. These are cervical ripening and increase in myometrial excitement. The uterus changes from a dormant capacitance vessel to an active contractile organ capable of effecting childbirth. This change is not abrupt but rather a gradual one over several weeks before delivery, which is known as prelabour. The frequency and intensity of uterine contractions become greater with the increase in uterine sensitivity to oxytocin and the development of intermyometrial cell gap junctions. The cervix loses its firm consistency and become a readily dilatable structure.

The cervix contain a large proportion of collagen fibres and very small amount of smooth muscle. Collagen provides the cervix its mechanical strength while proteoglycan with glycosaminoglycan complexes form its ground substance and also binds the collagen fibril. As glycosaminoglycans are hydrophillic, changes in the proteoglycan/glycosaminoglycan composition increases the cervical tissue hydration and destabilizes collagen fibrils, thus promoting cervical ripening. The change in the proteoglycan/glycosaminoglycan composition is stimulated by prostaglandins, especially PGE_2 which is increased at term. Estradiol induce prostaglandin synthesis where there has been previous exposure to progesterone. Progesterone exert an inhibitory effect on cervical ripening physiologically as the administration of antiprogestins has been shown to stimulate the ripening process.

The uterus is a highly muscular organ which is made up of smooth muscle bundles in a collagen-based connective tissue matrix. Uterine muscle contraction is effected by the flux of intracellular calcium and its interaction with calmodulin which in turn stimulates actin and myosin filaments. Although the myometrium is not densely innervated, it is capable of effecting coordinated uterine contractions due to the presence of intercellular connections called gap junctions. These allow metabolic and electrophysiological communication between the cells.

Prostaglandins E_2 and $F_2\alpha$ which are produced in the chorion, amnion and decidua play an important role in the period preceding labour. Prostaglandin E_2 ripens the cervix while prostaglandin $F_2\alpha$ stimulates and maintains uterine contractility.

Prostaglandin $F_2\alpha$ production is also increased by the administration of prostaglandin E2. The rise in prostaglandin $F_2\alpha$ is also contributed by the transfer of prostaglandin E_2 from the amnion to the myometrium and its conversion by the decidual enzyme 9 – ketoreductase to prostaglandin $F_2\alpha$.

Oxytocin induces myometrial contractions and also increases the frequency and intensity of the contractions. Oxytocin increases intracellular calcium by influx through specific calcium channels and by releasing intracellular calcium stores. Although plasma oxytocin level does not show any change, there is an increase in the number of myometrial oxytocin receptors as pregnancy progress to term, leading to increased uterine sensitivity to oxytocin. Myometrial sensitivity to oxytocin is also enhanced by prostaglandins. Estrogen produce stimulatory effect on uterine contractilily by lowering the resting membrane potential of myometrial cells, increasing gap junction formation, stimulating prostaglandin production and increasing oxytocin receptors.

The control of parturition is dependent on the balance between uterine stimulants prostaglandins and estrogen; and uterine relaxant progesterone. The relaxant predominate during pregnancy while the stimulants will predominate in parturition. Although a fall in progesterone level at the time of labour has not been demonstrated in humans, it is postulated that changes in progesterone receptor or receptor occupancy may still occur and hence initiate labour. The control of parturition is influenced by the maturation of the foetal hypothalamo-pituitary-adrenal axis. Corticotrophin-releasing factor (CRF) and adrenocorticotrophin (ACTH), both of which can be produced by the placenta, will stimulate foetal adrenals to synthesize cortisol and dehyroepiandrosterone

sulphate (DHEAS). Aromatase enzyme present in the placenta converts DHEAS to estradiol thus shifting the balance of control of labour towards uterine stimulants.

The softened cervical tissue undergoes effacement before dilatation of the cervix takes place although some cervical dilatation may occur in the multipara before full effacement of the cervix. The increasing rhythmic contractions of the myometrium pulls the softened cervical tissue and causes it to be taken up around the foetal presenting part and the membranes surrounding the forewater, bringing the cervical tissue in close proximity to the source of prostaglandin E_2.

The first stage of labour sees the progressive dilatation of the cervix. Cervical dilatation initially starts gradually in the latent phase and subsequently increase to a rate of at least 1 centimetre per hour after 3 centimetres dilatation onwards. This indicates the active phase of the first stage of labour. As the cervical dilatation nears 10 centimetres the rate of dilatation slows down slightly due to the edges of cervix almost passing the sides of the foetal presenting part, that is its largest diameter. These changes give a sigmoid curve appearance to the graphical charting of the cervical dilatation, and was first described by Friedman in 1954. These observations form the early understanding of the science of partography as is known today.

Cervical dilatation is the observation in labour that is easiest to understand and demonstrate the least interobserver variability.

However, it is not necessarily the best indicator of the overall progress of labour as a patient with cephalopelvic disproportion may still exhibit continuing cervical dilatation. Other clinical observations particularly the descent of the foetal head per abdomen, the station of the presenting part which is the level of the presenting part in relation to the maternal ischial spines, the foetal position, the degree of caput and moulding, and the uterine contractions facilitate assessment of the overall progress of labour.

Abnormal progress of labour may be seen as a prolonged latent phase of labour, or primary dysfunctional labour and secondary arrest of labour in the active phase. The terms 'power', 'passage' and 'passenger' constitute the possible causes of poor progress of labour, with a considerable influence by the patient's 'participation'.

Inadequate or incoordinate uterine contractions may be corrected by augmentation with intravenous oxytocin infusion. First synthesized in the 1960s oxytocin was found to be effective for augmentation of labour of spontaneous onset. Oxytocin can be given in doses of 1 milliunit per minute and doubled half hourly to a maximum of 32 milliunit per minute. It is necessary to exercise caution when administering oxytocin infusion especially in the grandmultipara and the patient with previous caesarean section. In these patients the dose of oxytocin should not exceed 16 miliunits per minute.

Poor progress of labour could be due to malposition of the foetal head. Higher incidence of occipito-posterior position has been associated with inefficient uterine contractions, anthropoid pelvis, anterior placenta and epidural analgesia. Malposition of the foetal head may be corrected with oxytocin infusion. However, an occipito-posterior

position may be persistent if the vertex remain deflexed as it enters the pelvis, as indicated by the location of the anterior fontanelle relatively low in the pelvis. Other clinical signs of persistent occipito-posterior position are a protracted active phase, persistent anterior cervical lip and foetal lie with back down.

5.2 The Second Stage Of Labour

The second stage of labour starts at full dilatation of the cervix and can be divided into the pelvic phase and the expulsive phase, also known as the perineal phase. Other signs suggesting a fully dilated cervix are patient's sensation of bearing down, perineal distension, blood-stained discharge, anal dilatation and early decelerations in the foetal heart rate due to foetal head compression.

As opposed to previous views, the second stage of labour should not have rigid time limit in a situation where the maternal and foetal condition remain satisfactory. However, an arbitrary limit of one hour may be taken for multigravidae who are not on epidural analgesia (Paterson 1992). The duration of the second stage is influenced by multiple factors. These are gravidity, size of foetus, foetal position and resistance of perineal soft tissues. The contention that epidural analgesia prolongs the second stage is mainly based on the fact that epidural causes pelvic floor muscle relaxation and interrupts Ferguson's reflex.

Bearing down efforts are undertaken in the expulsive phase of the second stage. Bearing down efforts may be directed or spontaneous. Directed pushing involves a Valsalva manouvre where the patient takes in a deep breath of air at the beginning of each contraction and bears down against a closed glottis. Spontaneous pushing is exercised in multiple short pushes of about 5 seconds each throughout a contraction with breaths of air released and then taken in between the pushes. The bearing down efforts cause further descent of the foetal head and distends the perineum. Spontaneous pushing encourages an even distribution of pressure by the presenting part and a more gradual distension of the perineum, thus reducing the risk of perineal lacerations.

5.3 Analgesia In Labour

In general, pain functions as a signal that tissue or organs are being or about to be damaged. Pain is closely associated with the labour process, indicating that the event of childbirth is about to take place. The immense intensity of pain in labour compelled its use as a comparison of severity of pain in other situations. Although there is sound physiological and humanitarian basis for providing pain relief in labour, the method of analgesia should not deprive the patient of the emotional rewards of the experience of childbirth. Indeed, most women want to retain consciousness and sensation to appreciate this experience and maintain a feeling of control over the delivery process. Some patients even consider labour pain an integral part of the experience of labour (Robinson et al. 1980). The subjective nature of pain assessment, the individual variation of pain threshold and the different perceptions of importance of pain during childbirth further adds complexity to the management of pain in labour.

Pain in labour is perceived as abdominal contraction pain, lower back contraction pain, continuous low back pain and perineal pain. Both visceral and somatic components contribute to pain in parturition.

Visceral pain is caused by stretching or distension of the lower uterine segment and the cervix with each strong uterine contraction. From the nociceptors in the uterus and cervix, visceral stimuli are transmitted via sensory fibres in the sympathetic nerves which pass through the uterine, cervical, hypogastric and aortic plexuses before entering the spinal cord with the T_{10} to L_1 nerve roots. These fibres synapse in, and make connections with other ascending and descending fibres in the dorsal horn, particularly in lamina V.

The onset of perineal pain in the late first stage of labour signals the increasing foetal descent and the approach of complete cervical dilatation. Stretching and compression of pelvic and perineal structures intensifies the pain. The somatic pain impulses increasingly originate from pain-sensitive areas in the perineum and travel via the pudendal nerve which communicates with the anterior primary divisions of the second, third and fourth sacral nerves. Somatic pain may also travel via the ilioinguinal nerve, genito femoral nerve and posterior femoral cutaneous nerve.

The commonly used analgesia in labour are inhalational, systemic opioid and regional anaesthesia. Other less common methods of pain relief are transcutaneous electrical nerve stimulation (TENS), acupuncture and hypnosis, however their success has been very limited.

Introduced into obstetrics use since mid nineteenth century, inhalational analgesia has gained much acceptance due to its relative ease of administration. Entonox, which is a 50:50 mixture of nitrous oxide and oxygen is the inhalational analgesic agent used in obstetrics at present. Halogenated ethers such as methoxyflurane and enflurane have no advantage over nitrous oxide. The pungent odour of these ethers is their main drawback. Entonox inhalational analgesia is relatively cheap and easy to administer. However, its analgesic property is limited. Although this method confers patients some control over their pain relief, some degree of coordination on the patients' part is required to ensure maximal analgesia at the peak of each uterine contraction. Patients may also hyperventilate in the attempt to inhale these gases. This could lead to hypocapnia with resultant dizziness, nausea and tetany, Some patients find the dizziness and nausea intolerable.

Systemic opioid analgesics have been widely used since the 1950s. Pethidine is preferable to morphine in labouring women because of its more rapid onset of action and higher lipid solubility. The usual intramuscular dose of pethidine is 50 mg to 100 mg and the intravenous dose is 25 mg to 50 mg. The peak analgesic effect occurs 40 to 50 minutes after intravenous administration. The duration of action is 3 to 4 hours. Generally, opioids have the disadvantage of having side effects such as nausea, vomiting and hypotension. It has strong sedative effect but limited analgesic property. Pethidine used for labour analgesia may cause maternal respiratory depression and reduced foetal heart rate variability on cardiotocograph. Pethidine can also produce dose-dependent neonatal depression (Hodgkinson et al. 1978) as evidenced by prolonged time to sustained respiration, decreased Apgar scores (Shnider et al. 1964) and abnormal results from neurobehavioral examinations (Hodgkins et al. 1982,

Kuhnert et al. 1985). Foetal exposure to pethidine is highest 2 to 3 hours after administration of the drug to the mother. The effects on foetal respiratory effort can be expected to manifest if delivery occurs from one hour to four hours after administration of intramuscular pethidine. Because of this, labour ward personnel often show reluctance in administering pethidine injections in the late first stage of labour.

As with other opioids, pethidine is known to delay gastric emptying in labouring patients. As pregnancy itself prolong gastric emptying time; the increased delay in gastric emptying and the emetic side effects caused by pethidine place the parturient at a significant risk of lung aspiration (Mendelson's Syndrome) if general anaesthesia is required for an emergency caesarean section.

Morphine produces its peak analgesic effect 1 to 2 hours after intramuscular administration and 20 minutes after intravenous administration. Its duration of action is 4 to 6 hours. In equianalgesic doses, morphine produces more respiratory depression of the newborn than does pethidine. Because of the delayed onset and prolonged duration of action of morphine in the mother and the greater sensitivity of the foetal respiratory centre to morphine, this drug has been replaced by pethidine and fentanyl in obstetric analgesia.

Fentanyl is given in doses of 50 to 100 mcg intramuscularly or 25 to 50 mcg intravenously in labour. Its duration of analgesia is 30 to 60 minutes with the peak analgesic effect occuring within 3 to 5 minutes. Pain relief with mild sedation were apparent after administration of 50 mcg or 100 mcg of fentanyl intramuscularly. This in utero exposure of the foetus to fentanyl did not produce adverse effects on neonatal

examination (Rayburn et al. 1989). Fentanyl is also a useful adjuvant for either regional or general anaesthesia for caesarean delivery.

Nalbuphine and butorphanol are two synthetic analgesics used in obstetrics. Although larger doses of morphine produce more respiratory depression, larger doses of nalbuphine or butorphanol do not. However, larger doses of nalbuphine or butorphanol may cause maternal dizziness and somnolence and adverse neonatal neurobehavioral effects (Wilson et al. 1986). Studies performed on these drugs in obstetrics have not shown significant advantages over other opioids (Frank et al. 1987, Wilson et al. 1986, Quilligan et al. 1980, Maduska et al. 1978, Hodgkinson et al. 1979).

Patient-controlled analgesia (PCA) with intravenous pethidine was developed in the attempt to improve opioids analgesia in obsterics practice. Self administration of boluses of intravenous pethidine 0.25 mg/kg at 10 minutes interval have been practised. Comparison with intermittent intramuscular pethidine injections has given variable results in terms of total opioid dose requirement and patients' satisfaction.

Regional analgesia by epidural blockade is another method for pain relief that is rapidly increasing in use today.

5.4 Epidural Analgesia

Regional analgesic techniques are the most effective means of providing analgesia for labour and vaginal delivery. Lumbar epidural analgesia is the most

common regional block performed for this purpose. The block is placed once the patient is in established labour. If augmentation with oxytocin is anticipated, the epidural block can be placed earlier. Continuous epidural analgesia enables the administration of analgesia for the duration of labour, with the dose adjusted for desired effect. Low doses of local anaesthetics or opioids are often sufficient during the first stage of labour to provide an effective T_{10} to L_1 segmental block.

In contrast to systemic opioids, epidural analgesia provides pain relief without sedative effects. Therefore it maintains patients' alertness thus maximizing patients' participation during delivery and allows immediate bonding between the patient and her newborn baby post delivery. Regional anaesthesia avoids the likelihood of neonatal respiratory depression and maternal aspiration pneumonitis. Apart from effective pain relief, other benefits of epidural blockade include reduction of maternal catecholamines release and a means of providing surgical anaesthesia should a caesarean section be needed. Adding a single large bolus of up to 20 ml of bupivacaine 0.5% to a pre-existing analgesic block rapidly converts it to a surgical regional anaesthesia.

In centres where labour epidural service is well established, all parturients are offered epidural blocks except those who have contraindications. Epidural block is preferable in almost any medical or obstetrical condition as the patients would benefit from avoidance of the stress of painful labour. It also prevents from compounding the risk of a general anaesthesia.

The benefits of epidural analgesia are notable in certain medical and obstetrical conditions. Hypertensive diseases in pregnancy is a common indication for labour

epidural analgesia. Epidural blockade facilitates intrapartum blood pressure control as it avoids the sympathoadrenal overactivity that is characteristic of pre eclampsia (Abboud et al. 1982). It prevents the surge of catecholamines usually associated with endotracheal intubation for general anaesthesia in an emergency caesarean section. Furthermore, difficult intubation due to laryngeal oedema in pre eclampsia patients is also avoided. Patients, however, must not have coagulopathy prior to the insertion of the epidural catheter.

In parturients with cardiac disease, the avoidance of the strain on cardiac function is achieved through effective analgesia via an epidural block. However, epidural blockade is contraindicated in patients with fixed cardiac output states, for example an aortic stenosis with low ejection fraction.

In patients with premature labour and intrauterine growth restriction (IUGR) where the foetal reserves are already limited, epidural analgesia reduces the stress of labour and also avoids transplacental transfer of opioids to the foetus. This ensures that the respiratory effort of the newborn is not jeopardized by the analgesia given.

Breech presentation and twin pregnancies are advisable to have epidural analgesia as these deliveries often require additional manouvres which are more easily done with effective pain relief.

Epidural analgesia is not contraindicated in parturients with a history of previous caesarean section as the epidural predominantly blocks the uterine contraction pain which is transmitted via A delta fibres rather than pathological pain from a surgical

scar which is transmitted via C fibres (Carlsson et al. 1980). Epidural analgesia is therefore advantageous in a trial of scar.

Absolute contraindications to epidural analgesia are few. Epidural is contraindicated if there is patient's refusal of this procedure. Sepsis in the lumbosacral region and maternal coagulopathy are also absolute contraindications because abscess or haematoma formation can result in spinal cord compression. With the exception of low dose heparin, the use of anticoagulants is also an absolute contraindication for epidural block. Patients on heparin and those who have increased risk of developing coagulopathy, for example in severe pre eclampsia or abruptio placenta should have a normal coagulation profile confirmed prior to the procedure. Relative contraindications are spinal deformities, progressive neurological disease and cardiac lesions with fixed cardiac output and low ejection fraction.

Although complications of epidural analgesia are potentially life threatening, the incidence of these complications are low. Inadvertent subarachnoid block (total spinal) from misplacement of an epidural catheter and injection of a large dose of local anaesthetic into the cerebrospinal fluid could result in cardiorespiratory collapse. Patient would sense a rapidly rising numbness and dyspnea and subsequently develop loss of consciousness and apnoea.

A dural puncture occurs when the epidural needle is accidentally advanced through the dura mater into the cerebrospinal fluid. Leakage of CSF through the epidural needle results in low CSF pressure and causes headache in the post delivery period in 70% of dural taps.

Intravascular placement of the epidural catheter is recognized by continuous aspiration of blood through the epidural needle. If intravascular placement of epidural catheter is undetected, the injection of local anaesthetic may cause light-headedness and tingling sensation in the lips and fingers and even convulsions and dysrrhytmias.

A sympathetic block may cause significant hypotension due to expansion of the vascular compartment. This may be avoided by preloading the patient intravenously with 500 to 1000 ml of Hartman's solution. Severe hypotension may cause low cardiac output and foetal acidosis, and may necessitate use of vasopressor drugs, for example ephedrine for its correction.

REVIEW OF LITERATURE

6. REVIEW OF LITERATURE

6.1 Pain Relief

Comparison of analgesic property between intramuscular pethidine injection and epidural analgesia has been made in many studies concerning pain relief in labour. Although intramuscular opioids are more commonly administered in labour, its analgesic property is very limited. The lack of analgesic effect of opioids in active phase of labour was demonstrated by Olofsson et al. (1998). Pethidine was found to provide some relief of the lumbar back pain but not the intermittent visceral abdominal pain. Parturients on pethidine show high pain scores regardless of whether pain assessment was done intrapartum (Olofsson et al. 1998) or retrospectively in the post partum period (Robinson et al. 1980). Apart from the high pain scores, pethidine also produced a strong sedative effect. Olofsson et al. (1998) therefore concluded that systemic opioids administration for labour analgesia is inappropriate. Comparing epidural analgesia with intramuscular pethidine, Robinson et al. (1980) found lower pain scores with epidural analgesia in all stages of labour. Likewise, epidural analgesia provides superior pain relief when compared to intravenous Pethidine (Ramin et al. 1995). However, when epidural analgesia was witheld in the second stage of labour to retain the bearing down reflex, the pain scores in the second stage did not differ from those of the pethidine group (Philipsen et al. 1989). Witholding Bupivacaine epidural infusion in the late first stage and second stage, and substituting it with saline also produced higher pain scoring and less perineal anaesthesia compared to continuous epidural infusion throughout second stage (Chestnut et al. 1987 a).

The same tendencies were seen with lignocaine epidural infusion, although the difference in perineal anaesthesia was not statistically significant (Chestnut et al. 1987 b).

Besides lower pain scores, Robinson et al. (1980) also reported that patients on epidural analgesia scored significantly lower for sedation and nausea.

6.2 Progress of Labour

The effects of epidural analgesia on the progress of labour is another major concern for clinicians. Epidural analgesia has been reported to prolong the duration of first and second stages of labour when compared to narcotic analgesia (Thorp et al. 1993). Epidural analgesia was also associated with a slower rate of cervical dilatation and an increased requirement for oxytocin augmentation.

Other studies have investigated the effects of epidural analgesia on the second stage of labour. An increased duration of the second stage of labour regardless of the patient's gravidity was found by Johnson et al. (1995). Similarly, in a study of primigravid women, the duration of second stage was longer with epidural analgesia, compared with patients who had their epidural infusion witheld in the late first stage (cervical dilatation 8 cm or more) and second stage of labour (Chestnut et al. 1987 a).

In an institution where there was an abrupt increase in the availability of elective epidural service as compared to prior occasional epidurals on selected cases, the increase in the use of epidurals was associated with an earlier need for oxytocin augmentation in the first stage of labour and a higher incidence of second stage longer than 2 hours, but no significant increase in the incidence of second stage longer than 3 hours (Lyon et al. 1997).

Quoting the interruption of Ferguson's reflex as a possible cause for reduced uterine activity with epidural analgesia, Saunders et al. (1989) intervened the second stage of labour in epidural patients without prior oxytocin stimulation by starting an oxytocin infusion at full dilatation of cervix. This intervention reduced the mean duration of the second stage, compared to epidural patients who are not given oxytocin at full dilatation of cervix.

Contradicting these reports, Bofill et al. (1977) found no significant difference in the duration of the first and second stages of labour between parenteral opioids and epidural block in primigravid women. Even when analysed separately for augmented and unaugmented labours, the rate of cervical dilatation with epidural block was unchanged (Studd et al. 1980).

Philips et al. (1983) also opposed the view that epidural analgesia prolongs the second stage of labour. In a study of similar design to Chestnut et al. (1987 a), Philips et al. (1983) did not find any significant difference in the duration of the second stage when epidural analgesia was maintained or allowed to wear off at full dilatation of cervix. Philips et al. (1983) advocated the delay of pushing in the second stage until the

foetal head is below the ischial spines. The authors claimed that this had prevented the prolongation of second stage of labour with epidural analgesia.

Delayed pushing in the second stage with epidural block was also studied by Maresh et al. (1993) who found that although there was an increase in the mean total duration of second stage and the mean waiting time before pushing, the actual pushing time did not change significantly. The delayed pushing, however, resulted in more spontaneous deliveries and less forceps deliveries without increasing the incidence of adverse foetal outcomes.

6.3 Mode Of Delivery

Numerous studies have described the relationship between epidural analgesia and caesarean and instrumental delivery rates. Since many institutions at present use intermittent intramuscular pethidine combined with inhalational analgesia in the majority of labouring patients, many clinicians take particular interest in its comparison with epidural block. Robinson et al. (1980) reported that an increased rate of forceps delivery was seen with epidural analgesia compared to pethidine with inhalational analgesia.

Comparison between hospitals with different rates of epidural analgesia revealed positive correlation between epidural analgesia and instrumental delivery rates (Hemminki et al. 1996). In individual based analyses, the increase in caesarean and

instrumental delivery rates in patient with epidural block was greater in multigravid than primigravid women.

When elective epidural service was made widely available in an institution, an increase was noted in the caesarean section for the indication of arrest of descent or arrest of dilatation among epidural patients before and after the ready availability of the epidural. However, the caesarean section rates were similar for the overall population from both periods (Lyon et al. 1997).

Ramin et al. (1995) reported that caesarean sections for dystocia were increased with Bupivacaine epidural analgesia compared to intravenous Pethidine although the quality of analgesia is better. Having limited the indications of forceps delivery to inadequate descent and inadequate pushing, Ramin et al. found that the rate of low forceps was increased although outlet forceps rate were similar.

A twentyfold increase in the rate of rotational forceps with epidural block has been reported by Studd et al. (1980). When analyses were made separately for augmented and unaugmented labours, Studd et al. (1980) found that without epidural blockade the percentage of spontaneous deliveries was higher in the normal than augmented dysfunctional labours. This difference was not seen in patients with epidural analgesia. Epidural analgesia also reduced the incidence of spontaneous delivery overall.

Apart from the incidence of instrumental delivery, Hoult et al. (1977) also analysed the incidence of malposition at the end of second stage of labour with lumbar

epidural analgesia, and other factors which might affect the mode of delivery. The authors found that the incidence of malposition, which was defined as the number of spontaneous occipito-posterior deliveries and deliveries requiring instrumental rotation, increased significantly with epidural analgesia. Patient's gravidity had little significance over the increased incidence of malposition. However, a larger percentage of primigravid patients underwent instrumental delivery compared to multigravid patients. The increase in instrumental deliveries in primigravid women were also significantly higher in the epidural than non-epidural group. The incidence of instrumental deliveries with epidural analgesia was reported by Hoult et al. (1977) as 70% in primigravidae and 40% in multigravidae.

Philips et al. (1983) reported that witholding an epidural infusion in the second stage of labour produced a higher incidence of occipito-posterior or occipito-anterior positions at delivery and a higher forceps rate. However, these increases were not statistically significant. When compared with narcotic analgesia, epidural analgesia was found to increase the incidence of malposition by a factor of 4 (Thorp et al. 1993).

As apposed to Lyon et al. , no difference in the rate of primary caesarean sections was noted by Gribble et al. (1991) following the setting up of a 24 hour on demand epidural service. Impey et al. (1999) found that a fivefold rise in the rate of epidural analgesia usage in primigravid women was not associated with significant increase in the rate of caesarean and instrumental delivery. Comparing epidural analgesia with parenteral opioids, Bofill et al. (1997) claimed that there was no significant difference in the number of dystocia-related caesarean section when patients who had received cervical ripening or oxytocin induction were excluded, and early

detection and correction of desultory labour was ensured by strict adherence to a protocol for active management of labour.

Comparison between epidural and pethidine were also made in patients whose epidural blockade effects were allowed to wear off in the beginning of the second stage of labour (Philipsen et al. 1989). The purpose of this manouvre was to retain the bearing-down reflex in the second stage. This did not produce significant increase in the rate of caesarean or instrumental deliveries compared to intramuscular pethidine in labour (Philipsen et al. 1989).

Starting an oxytocin infusion at the beginning of second stage in epidural patients without prior oxytocin stimulation reduces the number of non-rotational forceps deliveries but does not reduce the rotational forceps deliveries associated with malposition (Saunders et al. 1989).

Philips et al. (1983) stated that in the comparison between continuing and stopping the epidural analgesia in the second stage of labour, the incidence of occipito-posterior and occipito-transverse positions and forceps delivery rates were higher without the epidural analgesia in the second stage although the increase in forceps delivery was not statistically significant. This is inconsistent with the hypothesis that epidural analgesia predispose to instrumental delivery.

Allowing sufficient time in the second stage before patients start pushing has been thought to increase the chance of spontaneous delivery. Philips et al. (1983) suggested commencement of pushing when the foetal head is below the ischial spines

while Maresh et al. (1983) instructed patients to push only when foetal head is visible on parting the labia or after 2 hours of second stage if foetal head is not visible. Maresh et al. found that the delayed pushing was associated with an increase in spontaneous deliveries and less rotational forceps although the difference was not statistically significant. Although the total duration of second stage is longer, the higher rate of spontaneous deliveries were not associated with a longer actual pushing time.

6.4 Other Complications

Other concerns in labour epidural analgesia include foetal outcome and other complication. In comparison between epidural analgesia and opioids in labour, Thorp et al. (1993) noted that although both the epidural and narcotic groups had similar proportion of patients with meconium-stained liquor, there was no difference in the proportion of low Apgar scores at one and five minutes. The umbilical cord arterial and venous blood gases values at birth were also equal in both methods of analgesia. Witholding or continuing the epidural analgesia in the second stage of labour did not result in any difference in the Apgar scores or umbilical cord acid-base values (Chestnut et al. 1987 a, Chestnut et al. 1987 b). Besides the Apgar scores at 1 and 5 minutes and the umbilical cord pH, the administration of oxytocin infusion in epidural patients at full dilatation of cervix did not alter the incidence of foetal distress in the second stage or neonatal morbidity (Saunders et al. 1989).

Although delaying maternal pushing in the second stage of labour in epidural patients prolonged the total duration of second stage, it did not increase the incidence of

low umbilical cord pH, abnormal foetal heart rate pattern or poor Apgar scores (Maresh et al. 1983). The lack of adverse effects of prolonged second stage on the foetus was supported by Cohen (1976). An increased duration of second stage did not adversely influence perinatal or neonatal mortality rates, and did not increase the incidence of low Apgar scores even after stratification according to mode of delivery.

Okojie and Cook (1999) reported that the largest number of complaints following labour epidural analgesia were for the problem of back pain. Back pain was found to be the commonest complaint in both the epidural and conventional analgesia in the immediate (up to 48 hours) and delayed (up to 6 weeks) post partum period. Macarthur et al. (1997) found a 12% overall frequency of back pain at one year post delivery. However, epidural and non-epidural patients showed no significant difference in the prevalence of the low back pain, the functional impairment or the pain scoring. Association between epidural analgesia and subsequent low back pain are poor. Low back pain after an epidural analgesia may be due to poor posture during delivery associated with muscular relaxation and immobility. Lack of abdominal muscle support, a changed center of gravity and repeated lifting tasks in the post partum period also play a role in the development of chronic back pain. In general, studies have not demonstrated a dose-response gradient between epidural analgesia and back pain.

Apart from back pain, headache also appeared to be a significant complaint in the immediate post partum period. Both back pain and headache occurred in a greater percentage of patients in the epidural than conventional analgesia group. Although dural taps occurred in 2.6 % of epidural patients, there was absence of life-threatening complications in this study.