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RESEARCH

Labour epidural analgesia audit in a tertiary state hospital in South Africa

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Background: Neuraxial analgesia is currently considered the most effective method of labour analgesia. While well studied in developed countries, it is uncertain whether the results, particularly regarding epidural analgesia complication rates, can be extrapolated to the context of the South African public hospital.
Method: A retrospective one-year audit reviewed available records for indications for-, complications of-, and patient satisfaction with labour epidural analgesia at Tygerberg Hospital, Western Cape.
Results: During the period audited, 157 (2.2%) of 7 005 parturients received labour epidural analgesia. One hundred and forty nine records were retrieved for analysis. Epidural analgesia was not provided on patient request. Rather, specific indications for epidural analgesia in 73.2% of these cases were preeclampsia, cardiovascular disease and morbid obesity. The incidence of complications was 32.3%, comprising hypotension (13.4%) and all other complications (18.9%). Most complications were minor and self-limiting (97.9%). One serious adverse event (cardiac arrest) due to accidental intravenous infusion of bupivacaine was recorded. Resuscitation with lipid emulsion was successful. Parturients reported being "happy" or "very happy" (50% and 36% respectively) with epidural analgesia.
Conclusions: At this tertiary referral hospital in the Western Cape, only 2.2% of parturients received labour epidural analgesia, possibly because of personnel time constraints. Indications comprised predominantly preeclampsia, cardiovascular disease and morbid obesity. The incidence of complications from labour epidural analgesia was in line with that observed in developed countries. Most patients were happy with their analgesia. This audit identifies an urgent need for improvement of the labour epidural service at this institution.

Keywords: analgesia, complications, epidural, labour indications

Introduction

A recent review advocated neuraxial analgesia, in particular continuous epidural analgesia employing low concentrations of local anaesthetic combined with a lipid-soluble opioid, as the most effective method of intrapartum analgesia associated with the least maternal or fetal sedation.[1,2] However, it is uncertain whether data regarding labour epidural analgesia from the developed world[1-4] can be extrapolated to countries with limited resources.

Patients in early to advanced labour with an indication for epidural analgesia are identified by the obstetrician, who then requests the services of the single anaesthesiologist (usually a registrar supported by an on call consultant) on call for labour ward. As per standard operating practice, written informed consent is obtained by the anaesthesiologist before epidural catheter placement.

The records are thus comprehensive and lend themselves to an audit of epidural analgesia. The aims of this retrospective audit were to establish the incidence of epidural analgesia in women in labour, the indications for this approach, associated complications and overall patient satisfaction over a one year period in a tertiary referral centre in the Western Cape.

Methods

Approval was obtained from the Stellenbosch University Health Research Ethics Committee (protocol number S12/11/287), and the manager of Medical Services and Research at Tygerberg Hospital, to audit the epidural labour analgesia records of a one year period from 1 January 2012 to 31 December 2012. Study variables included total number of women in labour, number of epidural analgesia procedures, patient demographics, indication, complications, epidural technique, experience of anaesthesiologist and patient satisfaction.

Where more than one indication for epidural analgesia existed, the "primary indication", as determined by the anaesthesiologist performing the epidural, was recorded for analysis.

For the audit, hypotension was defined as a greater than 20% decrease from a baseline systolic blood pressure taken before commencing epidural placement. Unintentional dural puncture was defined as cerebrospinal fluid observed or aspirated from the epidural needle or the epidural catheter. Patient confidentiality was maintained. De-identified data from the epidural records was entered into Microsoft Excel® (Microsoft Corporation, Redmont, USA) and analysed by The Centre for Statistical Consultation at Stellenbosch University using STATISTICA version 10: StatSoft Inc. [2012]).

Results (Tables 1, 2 and 3)

During the one-year period, 7005 parturients were managed for labour and delivery in our hospital. Caesarean sections, normal and assisted vaginal deliveries comprised 40.9, 51.0 and 8.1% of deliveries respectively. While the Department of Anaesthesiology register indicated that 157 (2.2%) of parturients received labour epidural analgesia, only 149 of the epidural analgesia records could be retrieved for analysis. The figure used as the denominator for indications and complications of this study, relied on the number of epidural records containing relevant data. These figures only indicate the number of epidurals that were performed for labour analgesia, and not the epidurals that were performed exclusively for Caesarean section. The number of labour epidurals "topped-up" for Caesarean section was not recorded.

There was an equal day-night distribution, 52.3% and 46.3% respectively, of epidural insertion. Second year anaesthesiology registrars performed most epidurals (35.6%), with a roughly even distribution between those in their first, third, and fourth years of study. The most frequently employed technique was a midline approach (98%) with loss of resistance to saline (70.5%). Follow up was performed within and after twenty-four hours of epidural placement in 47% and 16% of parturients respectively (with no time recorded in 36.9%). Of the 24 parturients that were followed up later than 24 hours, 17 were followed up within 48 hours of epidural placement, 6 within 72 hours, and one was followed up at 74 hours after epidural placement.

The most common primary indications for epidural analgesia were preeclampsia (36.2%), body mass index (BMI) exceeding 45 kg/m^2 (22.1%), and cardiac indications (14.8%). Details of the cardiac conditions included eight parturients with known previous rheumatic heart disease. Of these eight parturients, the lesions included aortic regurgitation (two patients, one each with mild and moderate severity), mitral regurgitation (two patients, one each with mild and severe disease), and one each with mitral stenosis (mitral valve area 1.4 cm^2), mixed mitral valve disease, and previous mitral valve replacement. One patient had both mixed aortic and mitral valve disease. The two patients with ischaemic heart disease were both in their thirties, with chronic hypertension and hypercholesterolaemia. One patient had stable angina, New York Heart Association (NYHA) class III, and also a BMI of 65 kg/m^2. The other was asymptomatic, following coronary artery bypass grafting four years earlier. A patient with sickle cell disease had secondary pulmonary hypertension (estimated pulmonary artery systolic pressure 53 mmHg on echocardiography), cor pulmonale, and NYHA II exercise tolerance. Another patient had idiopathic pulmonary haemosiderosis with estimated pulmonary artery systolic pressure 70 mmHg and NYHA IV function.

The most frequent complications were self-limiting and non-life-threatening e.g. post-epidural hypotension (13.4%), low back pain at the time of follow up (7.4%) and unintentional dural puncture (4%). No patient required epidural blood patch to treat post-dural puncture headache. One parturient reported residual paraesthesia, but she was followed up very shortly after the epidural infusion was discontinued. Review of her records revealed she was discharged from hospital with no paraesthesia. One serious incident involving systemic local anaesthetic toxicity occurred. About one hour after an uncomplicated normal vertex delivery, during which the mother received epidural labour analgesia, the patient

Table 1: Data obtained from the Tygerberg hospital labour analgesia records for the period 1 January 2012 to 31 December 2012.

Variable		*n*	%
Demographics	Total deliveries during study period	7005	
	Total Caesarean sections performed	3032	43.3
	Total epidurals performed for labour analgesia	157	2.2
	Epidural labour analgesia records retrieved	149	94.9
	Epidural labour analgesia records lost to follow up	8	5.1
Time to follow up (available data: *n* = 94)	Within 24 hours post epidural placement	70	47
	Later than 24 hours post epidural placement	24	16
Time when epidural analgesia performed (available data: *n* = 147)	Day shift*	78	52.3
	Night shift†	69	46.3
Primary Indications (available data: *n* = 149)	BMI > 45 kg/m^2‡	33	22.1
	Cardiac condition (see table II)	22	14.8
	Preeclampsia	54	36.2
	Augmentation of labour	11	7.4
	Primigravida (Obstetrician request)	21	14
	Other (see table II)	8	5.4
Year of study of Anaesthesia Registrar (available data: *n* = 149)	1	35	23.5
	2	53	35.6
	3	33	22.1
	4	27	18.1
	Medical officer	1	0.7
Epidural technique (available data: *n* = 149)	Midline approach	146	98
	Paramedian approach	3	2
Loss of resistance (available data: *n* = 147)	Saline	105	71.4
	Air	42	28.6
Mode of Delivery (available data: *n* = 149)	Caesarean section	61	40.9
	Normal vertex delivery	76	51
	Assisted instrumental vaginal delivery#	12	8.1
Patient satisfaction (available data: *n* = 114)	Not happy	16	14
	Happy	57	50
	Very happy	41	36

*Day shift: 07h00 to 17h00.
†Night shift: 17h00 to 07h00.
‡BMI>45: Body mass index greater than 45 kg/m^2.
#Assisted instrumental vaginal delivery: Ventouse or forceps delivery.

Table 2: Cardio-respiratory and other indications for epidural labour analgesia.

Cardiac disorders n = 22	Rheumatic heart valve disease (*n* = 8) (See text for details)	Mitral regurgitation	2
		Mixed valve disease	2
		Mitral stenosis	1
		Mitral valve replacement	1
		Aortic regurgitation	2
	Congenital cardiac defects (*n* = 4)	Atrial and ventricular septal defect repaired previously	1
		Coarctation of aorta repaired previously	1
		Patent ductus arteriosus (still patent)	1
		Atrial septal defect (still patent)	1
	Dilated cardiomyopathy	Peripartum	1
	Ischaemic heart disease		2
	Pulmonary hypertension		2
	Arrhythmias	Wolf-Parkinson-White syndrome	1
	Arteritis	Takayasu arteritis	1
	Hypertension	Chronic primary	2
		Acute pulmonary oedema secondary to preeclampsia and acute severe hypertension	1
Other n=8	Respiratory (*n* = 5)	Restrictive lung disease	1
		Destructive lung disease secondary to pulmonary tuberculosis	1
		Pneumonia	2
		Uncontrolled asthma	1
	Other (*n* = 3)	Symptomatic gestational hyperthyroidism	1
		Paraplegia	1
		Fetal anomaly	1

Table 3: Complications of labour epidural analgesia.

Complication	*n*	%
Unintentional dural puncture	6	4
Post-dural puncture headache	5	3.4
Nausea and vomiting	4	2.7
Back pain	11	7.4
Residual paraesthesia	1	0.7
Local anaesthetic toxicity	1	0.7
Hypotension	20	13.4

had a grand mal convulsion followed by cardiac arrest. The bupivacaine infusion had been disconnected from the epidural catheter after delivery, but was subsequently reattached to the intravenous line. Cardiopulmonary resuscitation and lipid emulsion therapy were successful and the patient was extubated 12 hours later, with no residual adverse sequelae.

Most patients reported being "happy" or "very happy" (50% and 36% respectively) with the epidural analgesia. The reason noted for patients being "not happy" (14%) with epidural analgesia was the presence of residual labour pain. In two of these instances, the anaesthesiologist administered the initial epidural bolus, but the continuous infusion was not commenced by the nursing staff.

Discussion

The low epidural rate of 2.2% of labouring parturients at Tygerberg Hospital represents a markedly different figure from data gathered from hospitals in the developed world. Approximately 23.4% of UK parturients are reported to receive epidural labour analgesia.[3,5,6] In the USA the incidence is higher, with labour epidural rates of 61% for large maternity hospitals,[7] and even 90% in one Chicago hospital.[1] The limited use of labour epidural analgesia, and predominantly for medical indications, represents the major difference between the South African public hospital and the USA/UK environments. The main reason for the low epidural rate is probably related to the limited time available; epidural catheters are often sited in the short time available between cases, the anaesthesiologist sometimes not having time to confirm adequate analgesia before attending to other duties. During the study period, the anaesthesiology registrar on call for obstetrics was responsible for anaesthesia for elective and emergency caesarean sections, all other emergency obstetric and gynaecological procedures, assisting in the obstetric high care unit, as well as the epidural analgesia service for labour. Because of the growing workload, the Department of Anaesthesiology has motivated for more staff and theatre lists, with the subsequent establishment of a separate elective caesarean section list, and gynaecological emergencies being managed on the general emergency list.

Amelioration of the neuroendocrine stress response, and attenuation of the effects of increased venous return that accompanies pain and uterine contractions,[1,8] rather than purely humanitarian considerations, of necessity comprised the major indications for labour epidural analgesia at Tygerberg Hospital. However, the American Society of Anesthesiologists (ASA) states that maternal request alone, without a necessity for clinical indications, represents sufficient justification for instituting analgesic strategies during labour.[9] Provided sufficient resources (anaesthesiologists and nursing staff) are available, the ASA has suggested that neuraxial catheter techniques should be offered for labour analgesia.[9] Labour epidural analgesia on

request, solely for analgesia, is currently not accessible at this tertiary facility.

The technique for identifying the epidural space was loss of resistance either to air or saline, as preferred by the anaesthesiologist. While several studies have shown better outcomes with loss of resistance to saline[10-12] (i.e. better analgesia and decreased morbidity), Segal et al found no significant difference in block success between loss of resistance to air and saline, when the technique used was at the anaesthesiologist's discretion.[13] This was the practice at our hospital.

The combination of infusing dilute local anaesthetic with a lipid soluble opioid (in our case bupivacaine 0.1% and fentanyl 2 µg/ml) allowed the use of lower doses of each agent, thus minimizing undesirable side effects. This technique was in keeping with contemporary neuraxial analgesia practice.[1] Although ropivacaine is increasingly used for this purpose because it is reputedly less cardiotoxic and causes less motor blockade, bupivacaine was cheaper and these advantages are less of an issue when using low concentrations of local anaesthestic infusions. Combined spinal epidural analgesia is used in some institutions to provide analgesia in early labour using lipophilic intrathecal opioids to avoid hypotension and motor blockade.[1] Such equipment was available in our hospital theatre complex, but the sets are expensive and consequently not freely available in the labour ward.

We identified complications in 32.3% of parturients receiving labour epidurals, comprising a 13.4% and 18.9% incidence of hypotension and "other" complications respectively. The majority of "other" complications (back pain, unintentional dural puncture, post- dural puncture headache, nausea and vomiting, and residual paraesthesia) were self-limiting and not life threatening (Table 3). This concurs with Agarwal and colleagues' review of neuraxial analgesia complications,[14] in which they observed that despite the common occurrence of postpartum lower back pain, serious complications were rare.[4] The 7.4% incidence of lower back pain reported during follow-up is much lower than the 56% incidence of lower back pain on the first postpartum day reported by Macarthur and colleagues.[15] A 3.4% incidence of post-dural puncture headache (PDPH) was observed, which is in a similar range to that reported by Loubert and colleagues (1%)[16] and Agarwal and colleagues (7%).[14] No blood patches were requested to treat PDPH, notwithstanding a much higher rate (up to 72%) of epidural blood patch after accidental dural puncture in other studies.[17] The reasons for these differences in back pain and need for blood patches may be related to the pre-existing medical conditions of these patients rendering them less ambulant, but this is not clear and offers an area for future research.

Large studies, such as the Third National UK Audit project of the Royal College of Anaesthetists[3] and a prospective French survey,[4] have all indicated that serious complications of labour epidural analgesia such as subdural hematoma, neuraxial infection, total spinal, permanent neurological damage and cardiac arrest are rare.[14] While this audit was inadequately powered to detect these serious complications, one potentially fatal, preventable complication, that of systemic local anaesthetic toxicity occurred. This emphasizes the importance of adequate training of the anaesthesiologist, and the need for the availability of lipid emulsion where local anaesthetics are administered. As addressed by Lanigan after the death of a patient following a similar incident, the advisability of luer-lock connections on epidural and local anesthetic infusions is questionable.[18,19] Possibly an increase in the number of epidurals performed, with both better nurse experience and education, would prevent such complications.

Previously, a visual analogue scale (VAS) was used at Tygerberg Hospital to assess parturient satisfaction with their epidural analgesia. However, before initiation of this study, the assessment was changed to the use of the terms "happy", "not happy" or "very happy", as patients had difficulty expressing themselves using the VAS. The majority (86%) of patients were "happy" or "very happy" with the epidural analgesia provided, the reasons for being "not happy" being mostly residual labour pain.

The high incidence of Caesarean sections (40.9%) reflected that Tygerberg Hospital is a tertiary referral center dealing with high risk patients, who are more likely to require a Caesarean section. It is not possible to comment on whether epidural analgesia influenced the mode of delivery, because the audit was retrospective. However, studies have shown that epidural analgesia does not increase the rate of Caesarean section, but may increase the incidence of instrumental vaginal deliveries.[20,21]

Limitations of this study include that it was a retrospective audit, with descriptive rather than prospective data. The information gathered was compromised by incomplete data, as 5.1% of epidural records were missing. The anaesthesiologists' labour ward workloads often resulted in incomplete data collection and delayed follow-up beyond the requisite 24 hour period, with one instance where follow up occurred 74 hours post epidural placement. The small numbers of parturients receiving labour epidural analgesia meant that our study was under-powered to detect rare complications.

Conclusions

At this tertiary referral South African hospital, only 2.2% of parturients received labour epidural analgesia, most likely because of time constraints on the limited available personnel. Indications for labour epidurals were predominantly preeclampsia, cardiovascular disease and morbid obesity, with no capacity for the provision of epidural analgesia on patient request. The incidence of complications from labour epidural analgesia was in keeping with that observed in developed countries. A follow-up audit would establish whether the alternative staff deployments introduced subsequently have resulted in a higher epidural rate. Previous work also suggests a requirement for patient education with respect to the process of labour and the benefits of epidural analgesia.[22]

It is a basic humanitarian tenet that "women in pain don't need an 'indication' for labour analgesia".[2] Sadly, this goal cannot currently be achieved in this State hospital. Similar audits in other South African hospitals are indicated, in order to establish the extent of this problem, and introduce interventions to improve analgesia in labour in State institutions.

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