

JOURNAL REVIEWS

Anesthesiology	Dr Mike Girgis
Anaesthesia	Dr Peter J. Shirley
Anaesthesia and Intensive Care	Dr Damaris Kähler
Anesthesia and Analgesia	Dr Yue Dong
Canadian Journal of Anesthesia	Dr Aneeta Sinha
British Journal of Anaesthesia	Dr Paul Sice

Relative Analgesic Potencies of Levobupivacaine and Ropivacaine for Epidural Analgesia in Labour.

Polley LS, Columb MO, Naughton NN, Wagner DS, Van de Ven CJM and Goralski KH, *Anesthesiology* 2003;99:1354-8

In this study the relative analgesic potencies of epidural levobupivacaine and ropivacaine were assessed by determining their respective minimum local analgesic concentrations (MLAC). 105 parturients requesting epidural analgesia with ASA status I or II, singleton pregnancies greater than 36 weeks duration, vertex presentation and in active labour with cervical dilatation of 3-7cm at time of catheter placement were enrolled. The participants were allocated to receive either levobupivacaine or ropivacaine in a randomised double-blind prospective study. The concentration of local anaesthetic received was determined by the response of the previous patient in that group using an up-down sequential allocation technique. The first patient in each group received 20ml 0.10% wt/vol of the corresponding local anaesthetic and the dose was either increased or decreased by 0.01% wt/vol with each subsequent patient. Maternal and fetal haemodynamic data were recorded at 5 minute intervals. Pain was assessed at 10 minute intervals for the first 30 minutes using a 100mm visual analogue pain scale (VAPS). Sensory level and motor blockade were also assessed. A VAPS of 10mm or less was defined as effective and resulted in a 0.01% wt/vol decrement for the next patient. A VAPS of more than 10mm which responded to rescue with a 12ml bolus of 0.25% wt/vol of the same local anaesthetic, was defined as ineffective and resulted in a 0.01% wt/vol increment in drug concentration for the next patient. If the patient was not responsive to rescue local anaesthetic, the result was defined as a reject and the next patient received the same concentration.

In total 35 women were excluded for either not responding to rescue local anaesthetic, protocol violation, entering the second stage of labour before completion of the study, intravascular epidural catheter placement, patient withdrawing and fetal heart rate deceleration secondary to cord prolapse. This left 35 patients in each group, the demographic and obstetric characteristics of both groups being similar. There was no significant difference in maternal or fetal haemodynamics between the two groups. The MLAC was calculated using the Dixon and Massey formula and was 0.087% wt/vol (95% CI, 0.081-0.094%) for levobupivacaine and 0.089% wt/vol (95% CI, 0.075%-0.103%) for ropivacaine. The potency ratio was 0.98 (95% CI, 0.80-1.20) indicating that levobupivacaine and ropivacaine have similar potencies. There was no difference in time to onset of block, block duration, spread of block, or motor block between the two groups.

New aspects of ventilation in acute lung injury. Malarrkan N, Snook NJ, Lumb AB, *Anaesthesia* 2003;58:647-667.

This review starts by stating the definitions of Acute Lung Injury (ALI) and pointing out that ARDS (Adult Respiratory Distress Syndrome) is a severe form of ALI, with a greater impairment of gas exchange. Of those patients treated in intensive care units with ARDS, only about half survive, with old age and sepsis associated with poor outcomes. However, the mortality from ALI is slowly decreasing and only a minority of patients actually die as a direct result of their injured lungs; most succumbing to underlying pathology or multi-organ failure.

The initial treatment strategy, prior to tracheal intubation, should be to give supplementary oxygen, treat the underlying cause, optimise fluid management and consider non-invasive ventilation if available.

The authors suggest a primary ventilation strategy, based on the best current evidence and published guidelines. In particular 'protective' ventilation with tidal volumes of 6 - 8ml/kg and stepwise increments of positive end expiratory pressure (PEEP) to maximise benefit and limit cardiovascular side-effects (usually 10-15cmH₂O). The lowest fractional inspired oxygen (FiO₂) should be used to achieve a PaO₂ ≥ 8 kPa, and respiratory rate adjusted to achieve PaCO₂ ≤ 8 kPa. The plateau airway pressure should be kept < 35cmH₂O by adjusting the respiratory rate and possibly accepting a slightly lower PaO₂ or higher PaCO₂.

If this primary strategy fails, then secondary strategies are suggested. These include inverse-ratio ventilation, high-frequency ventilation, prone positioning, inhaled nitric oxide and partial liquid ventilation. Of these, prone positioning and inverse-ratio ventilation are achievable with limited resources.

The review concludes with the idea that in the near future a 'one size fits all' approach, with one artificial ventilation technique for all patients, will be abandoned as subgroups of ARDS and ALI are recognised.

Delivery times for caesarean section at Queen Elizabeth Central Hospital, Blantyre, Malawi; is a 30-minute 'informed to start of delivery time' achievable. O'Regan M. *Anaesthesia* 2003;58:756-759.

The author introduces this paper by emphasising the limited health facilities in their hospital and the demands placed on it by poverty related illness. Their aim was to see how closely they achieved the 30-minute time line from informing the anaesthetist to the start of an operative delivery, as recommended by the Association of Anaesthetists of Great Britain and Ireland (AAGBI) and

Obstetric Anaesthetists Association (OAA). A questionnaire study was undertaken. The time from informing the anaesthetist until 'knife to skin' (I - KTS time) was divided into component times and reasons for any delays noted at each stage. The classification of urgency of the requirement to do the caesarean section was also noted and divided into four grades.

78 questionnaires were completed in a 3-week period in April 2002. 65 (83%) spinal anaesthetics were performed, 9 (12%) general anaesthetics and 4 (5%) generals following failed spinal. The anaesthetic was administered by a student in 47 (60%) cases, a clinical officer in 25 (32%) cases and a physician anaesthetist in 6 (8%) cases.

A 30 minute I - KTS was achieved in 69% of grade-1 (immediate threat to the life of the mother or fetus) and 27% of grade-2 (fetal or maternal compromise but not immediately life threatening). The authors do accept that these figures may be better than expected due to increased effort during the audit period, nevertheless they are impressive.

In 18% of grade-1 and 2 cases the I-KTS interval was over an hour. The anaesthetist was unavailable for more than 15 minutes in one grade-1 and seven grade-2 cases. In five of these, the anaesthetist was busy with another patient.

A median time of 12 minutes was recorded for actually anaesthetising the patient. No attempt was made to analyse delays in terms of anaesthetic technique, the unit policy being in line with the Seventh Annual Confidential Enquiry into Stillbirths and Deaths (CESDI) to recommend not repeatedly attempting spinal anaesthesia in the absence of significant risk factors for general anaesthesia.

Anaesthesia and Isolated Systolic Hypertension - Pathophysiology and Anaesthesia Risk. Wongprasartsuk P, Sear JW. *Anaesthesia and Intensive Care* 2003;31:619-628

Hypertension is regarded as an additional risk factor in anaesthesia. Attitudes towards the management of the hypertensive patient perioperatively have changed with time and continuation of antihypertensive therapy is now recommended.

Traditionally, therapy was focussed on controlling the diastolic rather than the systolic blood pressure. Recent clinical studies have led to a new emphasis on isolated systolic hypertension i.e. systolic pressures of >160mmHg with diastolic pressures of <90mmHg. It has been shown that a large difference between systolic and diastolic blood pressure is a greater risk factor for stroke or other cardiovascular events than isolated diastolic hypertension or elevation of both the systolic and diastolic pressures. This seems also to be true for the development of chronic renal disease secondary to hypertension.

The aggressive reduction of elevated systolic blood pressure to values <140 mmHg reduces the risk of stroke, coronary heart disease and other cardiovascular events dramatically (23-44% for stroke, 21-26% for CHD and 25-32% for other cardiovascular events). This seems to be especially true for patients aged 65 years and older.

Association between hypertensive disease and perioperative cardiovascular events is established and recommendations do exist concerning the lowering of diastolic blood pressure to values below 100 - 110 mmHg prior to elective surgery. However, there are as yet no recommendations on the management of isolated systolic hypertension. There is a great need for further studies using isolated systolic hypertension and increased pulse pressure as markers for perioperative risk.

Allergies to local anaesthetics - the real truth. Finucane BT *Canadian Journal of Anaesthesia* 2003; 9:869-874

Many of us face the situation of a patient claiming that they are 'allergic to local anaesthetics'. The author of this article discusses some important issues regarding this situation.

Allergic reactions to local anaesthetic (LA) agents are rare and are much less common with amide than with ester compounds. *Allergists believe that less than 1% of reported allergic reactions to LAs are immune mediated - amide linked immune reactions constituting a minute fraction.*

Allergy is only one of the causes of adverse events when performing local anaesthetic procedures. Epinephrine is frequently added to solutions and injection can result in a cardiovascular response of which the patient becomes aware. Inadvertent intravascular injection of LAs can result in systemic toxic reactions. These, along with vasovagal reactions and 'panic attacks', account for the vast majority of adverse reactions. Latex allergies should also be considered. Patients often emerge from these events interpreting 'a reaction to the LA' as an allergy.

Any patient suspected of true immuno- allergy to LAs should be referred for testing. A thorough history and review of records is important. Skin tests are performed using a control, a known histamine releaser and the LA. Small quantities of these substances are injected intradermally and the responses compared. Positive reactors are subjected to gradually increasing concentrations of the LA until full strength is reached. Intradermal testing is a useful primary screening test but results are often equivocal. *In vitro* testing of LA can be performed and is recommended in patients with a history of anaphylaxis. Cell cultures of lymphocytes are exposed to the suspected allergen. Proliferation of lymphocytes suggests allergy and a leucocyte histamine response adds weight to results.

The term allergy is used too casually. Both education and a strategy are required to ensure patients experiencing adverse events are appropriately investigated and given correct explanations. This would prevent patients being incorrectly labelled as 'local anaesthetic allergic', thereby losing the benefits of regional anaesthesia.

Age-related iso-MAC charts for isoflurane, sevoflurane and desflurane in man. Nickalls RWD and Mapleson WW. **British Journal of Anaesthesia** 2003;91:170-4

This study describes the development and use of age-related iso-MAC charts for isoflurane, sevoflurane and desflurane to assist the estimation of appropriate end-tidal concentrations for patients of different ages. Mapleson described the decrease in MAC for different volatile agents with age and calculated age-related MAC as a function of MAC at 40 yrs

$$\text{MAC}_{\text{age}} = \text{MAC}_{40}^{-10 \cdot 0.00269(\text{age} - 40)}$$

It was assumed that the clinical effects of nitrous oxide (N₂O) and inhalational agents are additive. The fractional end-tidal concentration (FE_T) = k (MAC_{age}, where k represents a multiple of MAC and by combining the above equations they produced graphs of end-expired anaesthetic concentrations for different ages to give multiples of MAC ranging from 0.6 - 1.6 in the presence of 0%, 50% and 67% N₂O.

The graphs can be used to estimate the total age-related MAC value given the end-tidal anaesthetic and N₂O concentrations or guide the clinician as to the end-tidal concentration appropriate for the patient's age to provide a desired MAC.

They also allow a consistent MAC to be maintained when changing the fractional inspired N₂O concentration. When changing from 67% N₂O to 0% in the elderly a 3-fold increase in end-tidal anaesthetic concentration will be required to maintain a similar MAC. The authors claim that colleagues found the charts helpful and easy to use.

There is a wide variation in MAC at extremes of age. An end-tidal concentration of isoflurane of 0.7 at 1 year and 0.2 at 80 will provide an estimated MAC of 1.0 in 67% N₂O. This difference in the required concentration of volatile agent is exaggerated by the age variation in MAC for N₂O, (133% at 1 and 81% at 80). Anaesthetic monitors do not make age-related MAC calculations and elderly patients may receive higher concentrations of anaesthetic agents than necessary.

MAC refers to a population of patients and care must be taken when extrapolating it to individuals. However, *it is probably the*

best estimation of brain anaesthetic concentration, once equilibrium with alveolar concentration has been reached, and therefore depth of anaesthesia currently available. Taken into context with the pharmacological elements of a balanced anaesthetic, the degree of surgical stimulation and patients' physiological parameters during anaesthesia these charts provide a useful guide to depth of anaesthesia, especially at extremes of age.

New light on intravascular volume replacement regimens: what did we learn from the past three years? Boldt J. **Anesthesia & Analgesia** 2003;97:1595-604

Hypovolaemia is common in surgical, trauma, and intensive care unit (ICU) patients. Adequate intravascular volume replacement therapy may help to improve organ function and reduce patient morbidity or even mortality. There is still no widely accepted golden standard of adequate volume replacement strategy. The author undertook a key word MEDLINE search and reviewed 40 clinical studies published between 2000-2002.

The crystalloid / colloid debate continues. Crystalloids may have a negative influence on coagulation (hypercoagulability) and metabolic state (hyperchloremic acidosis) following large volume infusions and appear to have no beneficial effects on the microcirculation and organ perfusion.

Dextrans are not the first choice for volume replacement and gelatin was used in several recent studies without showing any severe negative effects.

Hydroxyethyl starch (HES) is the plasma substitute that has been studied most often but concerns remain about the effects of HES on renal function, coagulation and organ perfusion.

Because the studies did not have the same outcome endpoints it is hard to compare different treatments and the author doesn't give direct suggestions as to which agent is best. Colloids may have a better outcome compared to crystalloids. Different colloids have different therapeutic profiles but due to the lack of standard guidelines for choice of fluid and outcome measurement, it is very hard to draw a final conclusion based on this paper. Good prospective, double blinded studies on this topic are needed.

Age	1 MAC isoflurane		1 MAC sevoflurane		1 MAC N ₂ O
	100% O ₂	67% N ₂ O	100% O ₂	67% N ₂ O	
1	1.5	0.7	2.3	1.1	133
20	1.3	0.55	2.1	0.9	
40	1.15	0.4	1.8	0.65	104
60	1.05	0.3	1.6	0.45	
80	0.9	0.2	1.4	0.3	81