M.P. ANAESTHESIOLOGY

• October 2018 • Volume 5 • Issue 2

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EDITORIAL

ERAS IN BIRTHING PRACTICE-NEED OF THE HOUR

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Health care services all over India are facing brutal burdens of overheads coupled with escalating demands of patients and scarcity of resources. Hence the concept of ERAS has widely picked up. Considering the load on maternity units and rising rates of class III and IV C-sections, there is a need for considering implementation of ERAS in obstetrics as well.[1] A multi-specialty team approach requiring complete involvement of the anesthesiologist perinatally, is needed for the same.

ERAS protocols would cover the entire peri-operatve course. The goal revolves around adequate tissue perfusion, inhibition of surgical stress response and prevention of foetal acidosis.[2] The old time rule of rigorous pre-operative starvation has been long replaced by allowance of moderate intake of high carbohydrate and low residue clear liquids till almost two hours prior to surgery in all but complicated labours. Sports drinks providing <30 KCals/100 ml and clear carbonated drinks are encouraged to avoid dehydration and ketosis. Anti-emetics and antibiotics still form the main pre-medicants before c- section.

Neuraxial anesthesia and analgesia continue as gold standards of care in obstetrics, even for complicated labours. Pre-loading has been partly replaced with “Co-loading” plus early vasopressors, among which phenylephrine is now most acceptable drug, in patients undergoing a C-section. Goal directed fluid therapy with non invasive assessment of fluid status is helpful in most obstetric high risk patients. The current ACOG recommendations advise 'delayed cord clamping for 30-60 seconds after birth in most deliveries.[3] Skin to skin contact upon delivery and early breast feeding improve the chances and duration of breast feeding.

Maternal hypothermia is the most neglected care parameter in our setting. Even in the most straight forward sections, there is a drop of nearly 1.4 °C per hour and may take as long as 4-8 hrs to return. Prevention of hypothermia must form a mandatory protocol. Thromboprohylaxis with graduated compression devices must be continued in all cases up to full ambulation. Scheduled analgesics provide much better comfort and early mobilization than proreta analgesics. Regular oral analgesics with regional blocks or neuraxial opioids gives satisfactory VAS scores. It also aids in early mobilization, and resumption of oral intake. Early resumption of oral liquids upto 1 hour post op, is the accepted standard in most developed countries. [4]

Here, as developed countries are moving towards ''Natural to gentle'' concept in operative deliveries, India still has its own caveats. Lack of dedicated birthing units, lack of human as well as capital resources in these units, poor cultural acceptability of patients and late arrival to hospital contribute to poor pre-operative counseling and preparation. Moreover, lack of literacy and education is a major stumbling block to widespread adoption

of ERAS in Indian obstetrics.

For successful implementation of ERAS in obstetrics with an optimal maternal and neonatal outcome, careful patient selection,early planning and prenatal education with regular follow up is crucial. Standardization of protocols for perinatal periods may help improve compliance for patients hailing from remote areas. There is a vast variation in protocols of different countries with few cohesive evidences.[7] Even an intense search into Cochrane, Mega trials, PubMed or EMBASE, doesn't yield any level of evidence on policy or protocol for ERAS in obstetrics.[5] The ERAS society has recently developed a set of guidelines for scheduled and unscheduled caesarean deliveries.[6] The author hereby encourages teaching hospitals of the country to conduct multicentre clinical trials based on ERAS in obstetric practice, and formulate an Indian protocol.

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ENHANCED RECOVERY AFTER SURGERY (ERAS)

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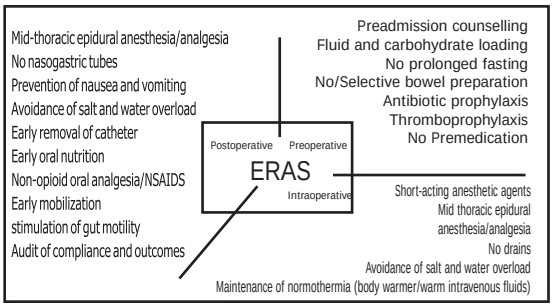
Abstract

Enhanced recovery after surgery (ERAS) protocols are multimodal patient care pathways beginning from the preoperative period till the end of the postoperative period, which aim to reduce perioperative surgical stress and improve patient outcome after major abdominal and pelvic surgeries. The essential components of the protocol are preoperative counselling, optimizing nutritional status, a standard anaesthesia technique which aims at rapid patient recovery, goal directed fluid therapy, and a good analgesia regimen, followed by early mobilization.

Introduction

A protocolized approach to patient care decreases the complication rate and enhances recovery. Enhanced recovery after surgery (ERAS) protocols or "fast-track" surgery programme is an amalgam of multimodal patient care pathways applied to care of surgical patient in the perioperative period. The aim of ERAS protocols is to reduce the surgical stress and improve the patient's metabolic milieu, so as to expedite the patient to his preoperative functional status. The aim of ERAS is to reduce the surgical impact on the metabolic and endocrine response leading to early recovery. Implementation at an institute level needs the constitution of a multi-disciplinary team with representatives from all specialities involved in patient care. ERAS-guidelines were initially developed by Henrik Kehlet in the 1990's for improving patient outcome after colorectal surgery, but currently these guidelines have been extended and developed for biliary- pancreatic surgery, gastric resection, radical cystectomy, pelvic surgery, onco-gynaecology surgery and oesophagectomy. The key components of ERAS protocols can be divided into the preoperative, intraoperative and postoperative period.

Table 1. ERAS Protocol



The key principles of the ERAS protocol include:

- Preoperative counselling
- Preoperative nutrition
- Avoidance of preoperative fasting and carbohydrate loading upto 2 hours
- Preoperative standardised anaesthetic regime and analgesic regime (epidural and non opioid analgesia)
- Early mobilization

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Preoperative Components

1.Preadmission information, education and counselling

Patients should be counselled in the preoperative period regarding the surgical and anaesthetic procedure both verbally as well as in written form. Preoperative information and education has been shown to improve patient satisfaction, allay anxiety and improve pain and other outcomes.

2. Preoperative Optimisation

Preoperative physical rehabilitation may be beneficial to patients in terms of improving postoperative recovery. Abstinence of smoking or alcohol for atleast1 month decreases the incidence of pulmonary and wound complications and improves organ function.

3. Avoidance of Mechanical Bowel Preparation

Mechanical bowel preparation (MBP) is not routinely indicated as it causes dehydration, dyselectrolytemia and prolonged ileus after colonic surgery causes liquefaction of faecal matter resulting in spillage of bowel contents resulting in infection associated with risk of anastomotic leak.

4. Preoperative Fasting and Nutrition

Short period of fasting after ingestion of clear liquids is safe and more acceptable to patients. The traditional practice of fasting from midnight prior to surgery aggravates metabolic stress resulting in hyperglycaemia and insulin resistance. The current guidelines allow clear liquids until 2 hours before surgery and solid intake until 6 hours before surgery. Providing carbohydrate loading prior to surgery decreases preoperative thirst, hunger and patient anxiety resulting in decreased insulin resistance and reduced protein catabolism.

Although the effectiveness of preoperative carbohydrate loading has been shown to result in adverse effects such as hyperglycaemia and delayed gastric emptying.

5. Pre-anaesthetic Medication

Preoperative education should be preferred over the use of sedative / anxiolytic medications as they can cause impairment of postoperative cognitive function resulting in decreased early mobility and ability to eat and drink. If required, short acting sedative premedication should be administered.

6. Thromboembolism Prophylaxis

Mechanical thromboprophylaxis using compression stockings and intermittent pneumatic compression devices along with pharmacological prophylaxis with low molecular weight heparin (LMWH) or unfractionated heparin decrease the incidence of venous thromboembolism (VTE). Prophylaxis should be considered for upto 1 month after discharge in a patient with thromboembolic complications. Patients on hormone replacement therapy (HRT) and combined oral hormonal contraceptives are at high risk of VTE. HRT should be discontinued 4 weeks prior to surgery.

7. Antimicrobial Prophylaxis and Skin Preparation

Prophylaxis with intravenous antibiotics covering both aerobic and anaerobic bacteria should be administered 30-60 minutes before incision. Broad spectrum antibiotics such as cephalosporins are most commonly used. The dose may need to be repeated during prolonged surgeries (>4 hours). Patients who are allergic to penicillin/ cephalosporins, a combination of clindamycin and gentamicin or a quinolone can be used. In patients with multiresistant staphylococcus aureus (MRSA), prophylaxis with glycopepside antibiotic (vancomycin Teicoplanin should be considered) is shown to be reduced.

Hair clipping, as compared to hair removal and skin cleaning with chlorhexidine alcohol decreases the incidence of SSI.

Intraoperative Components

1. Standard Anaesthesia Protocol

Anaesthesia drugs and techniques

allowing rapid recovery should be preferred. Induction should be done using short- acting drugs like propofol, in combination with short acting opioids such as fentanyl or remifentanil. Muscle relaxation should be titrated using neuromuscular monitoring. Maintenance of anaesthesia should be done using short acting inhalation agents such as sevoflurane or desflurane. Total intravenous anaesthesia (TIVA) with propofol can also be used as it has the added advantage of reduced incidence of PONV. In elderly patients, the use of bispectral index (BIS) monitoring to titrate anaesthesia depth can enhance recovery from anaesthesia.

Adequate attention to airway management and ventilation is essential to reduce the incidence of postoperative pulmonary complications such as chest infection and lung injury. The use of appropriate sized cuffed endotracheal tube along with cuff-pressure monitoring reduces the risk of intraoperative micro-aspiration. Recent evidence suggests that use of protective lung ventilation strategy i.e. VT 5–7ml/kg with PEEP 4-6 cmH_2O improves postoperative pulmonary outcome.

Use of regional blocks along with general anaesthesia (GA) not only attenuates the stress response but also decreases intraoperative and postoperative systemic opioid consumption, thereby prompting rapid awakening. Intraoperative glucose monitoring is important as hyperglycaemia increases the incidence of postoperative complications.

2. Fluid Management and Haem-odynamic Monitoring

Fluid therapy needs to be balanced to avoid both hypovolemia and hypervolemia. Hypovolemia results in hypo perfusion of vital organs resulting in end-organ damage, hypervolemia on the other hand causes bowel oedema and increased interstitial lung water. If hypotension persists after ensuring normovolemia, vasopressors should be used.

Intraoperative fluid shifts can be minimised by avoiding bowel preparation, allowing oral intake of clear fluids up to 2 hours before surgery, minimal bowel handling and avoiding blood loss.

Currently, the fixed volume approach to intraoperative fluid management is being replaced by directing fluid therapy to maintain specific haemodynamic targets mainly the stroke volume optimization (SVO) and is called the goal directed fluid therapy (GDFT). The main aim of GDFT is to maintain a balance between global tissue oxygen delivery and consumption.

GDFT is guided using the minimally invasive cardiac output monitors. In patients undergoing major surgery, the use of oesophageal doppler (OD) device, targeted fluid therapy based on changes in stroke volume (SV) has demonstrated a lower incidence of acute kidney injury, decreased rate of infection, faster return of bowel function and possible improved survival after surgery.

Other minimally invasive cardiac output monitors which use arterial waveform analysis (e.g. LiDCO, Edwards Vigileo) are also commonly used. These functional haemodynamic monitors measure various dynamic variables such as stroke volume variation (SVV) and pulse pressure variation(PPV), in addition to SV, to guide fluid therapy.

Advanced haemodynamic monitoring has been found to be useful in high risk patients with multiple co-morbidities, when expected blood loss > 7 ml/kg and in prolonged surgeries.

Central venous pressure is now considered a poor predictor of fluid responsiveness.

Balanced crystalloid solutions are superior to 0.9% saline for fluid maintenance, as excess of 0.9% normal saline can result in renal oedema, impaired renal cortical perfusion and an overall increase in postoperative complications.

Postoperative enteral feeding should be encouraged as early as possible, while use of intravenous fluids should be minimised.

3. Preventing Hypothermia

Hypothermia (core body temp < 36°C) should be actively prevented by using forced-air warming blankets, heated mattresses under the patients and warming of intravenous fluids.

Avoiding hypothermia prevents various complications such as intraoperative bleeding, acidosis, shivering, myocardial ischaemia and postoperative wound infection. Intraoperative normothermia should be maintained.

4. Avoidance of Postoperative Drains and Nasogastric Tube

Routine use of nasogastric tube is discouraged and it should be removed prior to end of anaesthesia. Nasogastric tube increases GE reflux and also prolongs the period of ileus resulting in abdominal distension and basal hypoventilation. A combination of these factors has been shown to increase the incidence of fever, atelectasis and pneumonia and can hinder mobilisation.

5. PONV

PONV is one of the most distressing postoperative symptoms and leads to delayed hospital discharge. General measures used to avoid PONV are : avoidance of inhalation agents, use of propofol TIVA, regional blocks, minimising preoperative fasting and preoperative use of carbohydrate containing fluids. Antiemetic prophylaxis should be done using multimodal drug regimen, as the effect is more when >2 antiemetics are used in combination. The commonly used drugs are: cholinergic, dopaminergic (D_2), serotonergic (5-HT_3) and histaminergic (H_1).

6. Surgical technique

In comparison to open surgical technique, laparoscopic or minimally invasive surgery improves patient outcome. Laparoscopy is associated with decreased inflammatory response, immunosuppression, perioperative stress and length of hospital stay. It promotes early patient mobilisation and decreased analgesic requirement.

Postoperative Components

1. Postoperative Analgesia

Postoperative analgesia is managed used a multimodal approach with minimal use of systemic opioids. For patients undergoing open abdominal surgery, Thoracic epidural analgesia (TEA) is considered to be the gold standard for providing postoperative analgesia. It inhibits neuroendocrine and metabolic stress response, improves pulmonary function results in early gut mobility and faster ambulation. Commonly used drug combination for TEA is low concentration local anaesthetic (LA) along with short acting opioids so as to minimize risk of undesirable motor and sympathetic blockade.

LA can also be administered peripherally by using techniques such as transversus abdominis plane (TAP) block, rectus sheath block and wound catheter.

TAP block has been used both in open and laparoscopic surgeries with a reduction in pain score and opioid requirement.

The duration of analgesia with TAP block can be prolonged by placing a catheter in the fascial plane between the internal oblique and transversus abdominis and giving intermittent boluses or continuous infusion of LA through it.

Rectus sheath blocks can be given by surgeon under direct vision or by ultrasound guidance and have been used for midline incisions in gynaecologic and urologic surgeries.

Placement of wound catheter where in multihole catheters are placed in the preperitoneal space at the time of closure of surgical incision. The catheter is used for administration of LA by either bolus or continuous infusion.

The analgesia provided by central and peripheral nerve blocks can be supplemented with NSAIDs, paracetamol and tramadol.

2. Urinary Drainage

Early removal of urinary catheter has been

shown to decrease urinary tract infection rate. In patients receiving thoracic epidural analgesia (TEA), the catheter can be removed, regardless of usage and duration of TEA. For patients requiring prolonged duration (> 4 days) of urinary catheterisation, suprapubic catheterisation is superior to transuretheral catheterisation.

3. Prevention of Ileus

Postoperative ileus delays hospital discharge. It can be prevented by use of TEA, avoiding fluid overload and nasogastric decompression. There is no role of prokinetic drugs in preventing ileus. Drugs shown to be effective in enhancing gut function are: oral magnesium, bisacodyl and alvimopan (μ-opioid receptor antagonist).Perioperative use of chewing gum has also shown to be quite effective in preventing ileus.

4. Postoperative Nutrition

A low muscle mass has been shown to have a negative impact on recovery after major surgery. Early enteral feeding should be encouraged in the postoperative period as it decreases the risk of infection. The patients should consume atleast 1200-1500 kcal/day. To achieve preoperative nutrition goals, oral nutrition supplement can be used for short term. Immunonutrition with arginine, glutamine and omega-3 fatty acids has been found to be beneficial.

5. Glucose Control

Hyperglycaemia and insulin resistance increase the rate of complications and morbidity after major abdominal surgery. Postoperative normoglycemia can be maintained by using TEA, preoperative carbohydrate loading, early postoperative enteral nutrition, maintenance of fluid balance, and early mobilisation.

6. Early Mobilisation

A structured mobilization plan should be in place, patient should be seen by physiotherapist. Although early mobilisation may not have any direct benefits, it may prevent chest infection, insulin resistance, improve muscle strength and decrease the incidence of DVT.

7. Audit

Clinical outcomes including readmission rates and compliance to various ERAS strategies should be regularly audited. Reeadmission rates should not exceed 10%.

Conclusion

Development of ERAS pathways have highlighted the importance of perioperative care.

Ability to achieve a reduced hospital stay, patient satisfaction and reduced rates of complications have demonstrated a new powerful tool.

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PROPHYLACTIC ONDANSETRON FOR POSTOPERATIVE NAUSEA AND VOMITING: TIME OF ADMINISTRATION MATTERS

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ABSTRACT

Background and objective: Despite the availability of plethora of drugs, Ondansetron remains as one of the most time tested antiemetic. Its best time of administration, preoperative or at the end of surgery largely remains unstudied. This study was planned to determine the efficacy of Ondansetron in controlling PONV when given as prophylaxis 20 minutes pre operatively or 20 minutes before the extubation.

Methods: This was a prospective study comprising of 60 female patients undergoing laparoscopic and open surgeries under General Anesthesia. Thirty patients received Inj. Ondansetron 8 mg, 20 minutes prior to induction while the other 30 females received it 20 minutes prior to extubation. All postoperative cases were assessed for episodes of PONV as well as pain using VAS score hourly after shifting the patient to recovery for first 6 hours and every 6 hourly thereafter for 24 hours. Incidence of nausea, vomiting and number of patients needing rescue antiemetic were compared using Pearson Chi Square test, One-way ANOVA and Tukey Pair wise test. A p-Value of <0.05 was considered significant.

Results: In the first 6 hours Ondansetron given preoperatively was significantly better than Ondansetron given at the end of surgery. However, no difference was observed in both the groups after 6 hours. VAS score was also significantly higher in the patients who received Ondansetron before induction during the first 6 hours. It was comparable in both the groups at 12, 18 and 24 hours postoperatively. Greater number of patients required rescue antiemetic treatment when Ondansetron was given just before extubation.

Conclusion: Ondansetron is more effective in controlling PONV when given just before induction. Not only the dose but timing of administration is crucial for successful treatment of PONV.

Introduction

Pain and Emesis are the most distressing symptoms following anesthesia and surgery in a patient. PONV is a common presentation with unpleasant complications following anesthesia and surgery, such as - wound dehiscence, bleeding, aspiration of gastric contents, delayed hospital discharge. Commonly used antiemetic drugs include Anticholinergics (Scopolamine, Atropine), Steroids (Dexamethasone), Dopamine antagonists (Promethazine, Prochlorperazine and Metoclopramide), 5HT3 receptor antagonists (Ondansetron, Granisetron, Dolasetron) and

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Antihistaminic drugs (Diphenhydramine, Hydroxyzine)[1-3]. No single agent has been found to be totally effective against Post Operative Nausea and Vomiting (PONV). Not only the drug itself but the time of its administration remains crucial for successful treatment.

Ondansetron is a highly selective 5-hydroxytryptaminse receptors (5-HT_3) receptor antagonist, which prevents nausea and vomiting by blocking 5-HT_3 receptors located in the chemoreceptor trigger zone (CTZ) in the area postrema of the brain and possibly on vagal afferents in the upper gastrointestinal tract. Ondansetron also causes an increase in the rate of gastric emptying. Numerous studies have been done with Ondansetron regarding its dose and antiemetic action. In most of them, it is administered prior to induction of anesthesia [4-10]. Few studies done to determine the time of administration validated that Ondansetron before extubation is more efficacious [11-13]. Time of administration has not adequately emphasized, especially in Indian population. Hence this study was planned to evaluate the efficacy of Ondansetron in controlling PONV in relation to time of administration.

Methods

This prospective study was conducted in a tertiary care setup for duration of three months. After approval from institutional ethics committee, 60 females of physical status ASA-I - III, posted for elective surgery under General Anaesthesia, both laparoscopic as well as open, were recruited. Females between the age group 20-60 years were included in the study. All male patients and those females refusing to give consent, belonging to ASA grade IV, known hypersensitivity or contra-indications to study drugs, posted for emergency surgery, age greater than 60 years and less than 20 yrs with a history of motion sickness, gastroesophageal reflux disease and nausea, vomiting or retching in 24 hours before anaesthesia or receiving anti-emetic drugs or drugs with anti-emetic property during 24 hours before anaesthesia were excluded. Recruited patients were randomly divided into 2 groups of 30 each by block permutation technique.

Induction was done with Inj. Glycopyrrolate 0.2mg, Inj. Midazolam 1 mg, Inj. Fentanyl 1.5- 2µg/kg and Inj. Propofol 2 to 2.5 mg/kg. Tracheal intubation was facilitated by Inj Atracurium 0.4mg/kg or Succinylcholine 1.5mg/Kg. Maintainence of anesthesia was done with N_2O/Air + O_2 + Isoflurane /sevoflurane and Inj. Atracurium. At the end of surgery extubation was done after adequate reversal and duration of anesthesia noted. Patients belonging to Group OI received Inj. Ondansetron 8 mg 20 minutes prior to induction while the patients in Group OE received Inj. Ondansetron 8 mg approximately 20 minutes prior to extubation.

Since pain is considered as one of the most important factor in etiology of PONV, it was also graded using VAS scale. It was explained to the patients preoperatively. The episodes of vomiting and nausea and VAS score for pain were recorded hourly for first 6 hours and every 6 hourly thereafter for 24 hours. Drugs known for causing PONV like opioids, when given was recorded. Severity of PONV was graded using PONV scale: Grade 0- No vomiting, Grade 1- Only nausea, Grade 2- Retching, Grade 3- Vomiting, Grade 4- severe vomiting (> 4 episodes). Rescue antiemetics were given when grading was 3.

Incidence of nausea, vomiting and number of patients needing rescue antiemetic were measured as percentage. VAS was compared with ''Student T test for two sample mean''. A p-Value' of <0.05 was considered significant.

Result

The demographic profile and parameters studied intraoperatively and postoperatively

Table-1 Demographics and preoperative parameters recorded for the two Groups

	Group OI (Ondansetran given before induction)	Group O (Ondansetran given before extubation)
Number of patients (n)	30	30
Age (Years)	36.8±12.96	38.7±12.21
Laparoscopic surgeries	8 (13.3%)	7 (23.3%)
Open surgeries	22 (73.3%)	23 (76.7%)
Duration of surgery (minutes)	120.67 ± 47.17	139.17 ± 56.20
Total Fentanyl used (µg)	85.50 ± 21.19	94.14 ± 12.96
Rescue antiemetics required in first 6 hours (n)	9	15
Rescue antiemetics required in next 18		

have been represented in Table-1. Both the groups were comparable in terms of age and type of surgeries done. Most of the patients underwent open surgeries in both the groups which included Laminectomy, head, neck and abdominal surgeries. Most of the laparoscopic surgeries performed were gynecology related. Duration of surgery was also comparable in both groups. Incidence of nausea and vomiting was found to be higher in patients receiving Ondansetron just before extubation in the first 6 hours. No difference was seen thereafter at 12hours, 18 hours and 24 hours postoperatively. Incidence of nausea was 50% when Ondansetron was given before extubation as compared to 36.7% when given before induction during the first 6 hours.

Table- 2 Comparison of VAS score (Mean ± SD) at various intervals between the two groups

Time after extubation (Hours)	Group OI	Group OE	p- value
1	2.1± 0.712	1.03± 0.85	<0.001*
6	2.13± 0.776	1.27± 1.202	0.002*
12	2.67± 1.061	2.6± 0.969	0.8
18	2.7± 1.236	2.67± 1.269	0.918
24	2.37± 1.098	2.27± 0.98	0.7111
*(p-value< 0.05, statistically significant)			

Table 2 shows the VAS score for pain recorded at 1 hour, 6 hours and 6 hour interval thereafter. VAS score was significantly higher in patients receiving Ondansetron before induction as compared to those receiving before extubation.

Discussion

The present study was done to establish the best time of administration of Ondansetron for PONV control. We found that Ondansetron when given just before induction provides better results as compared to that given as prophylaxis before extubation during the first 6 hours before surgery. No difference was found after 6 hours, between the two groups. The results of our study are contrary to the similar previous studies.

Female gender, non smoking status, history of PONV and motion sickness are consistently the strong factors associated with PONV[3]. This study was done only in female patients who were non smokers. Patients with history of PONV or motion sickness were excluded as efficacy of Ondansetron is questionable in such cases[14]. Volatile anesthetics, nitrous oxide and opioids increase the risk of PONV[3]. Ondansetron is effective against PONV due to general anesthetics as well[15]. Standard anesthesia technique with

sevoflurane or isoflurane was used in our study.

The package insert of ondansetran recommends that it should be administered before induction of anesthesia when used for prophylaxis against PONV (Emset package insert; Cipla limited, Indore, Madhya Pradesh). This recommendation is based on the hypothesis that blockade of receptors in the CTZ before the arrival of emetic stimuli associated with anesthesia and surgery provides greater antiemetic efficacy. Ondansetron has a relatively short elimination half-life of 2.8 + 0.6 hours [16], it seems logical that it might be more effective when administered after surgery, thereby producing a more sustained antiemetic effect in the postoperative period.

Very few studies have been conducted till date regarding time of administration of Ondansetron .Tang et al did their study in outpatient laparoscopic procedures[11]. Sun et al selected patients undergoing Otolaryngologic surgeries[12]. Both these studies unanimously conclude that Ondansetron should be given prior to extubation and not before induction for better control of immediate PONV .Our study included females undergoing both laparoscopic as well as open major surgeries. We found that Ondansetron 8mg is more effective when given prior to induction in such cases. This difference observed might be due to more tissue trauma and prolonged and deeper anesthesia required in such cases. Hence Ondansetron should be given prior to any provoking stimuli along with Dexamethasone in high risk open cases.

Cruz NI et al have concluded that for long duration ambulatory plastic surgery of more than 2 hours duration Ondansetron 30 minutes before extubation along with Dexamethasone is a better choice for late onset PONV[13]. However in major open surgery involving more tissue handling for longer duration, action should be taken before the application of surgical stimulus as proven by our study especially for immediate onset PONV. Even though VAS for pain was significantly higher in this group of patients, PONV was better controlled (Table-2).

The main limitation of our study was the lesser number of patients included. Larger studies are required to establish the best time of administration of Ondansetron especially in high risk patients undergoing major open surgeries.

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COMBINED SPINAL EPIDURAL ANAESTHESIA A ROUTE LESS EXPLORED

● Dr. Javed Khan[1] Dr. Dhairal Mehta[2]

ABSTRACT:

Combined Spinal Epidural (CSE), is a neuraxial blockade in which both spinal and epidural anaesthesia are administered simultaneously. It comprises of combining the benefits of both spinal and epidural anaesthesia and decreasing the side effects. It was suggested for urologic surgery, but indications for its use have expanded in recent years.CSE has a role in patients with significant comorbidities who are at high risk for general anaesthesia. Although at first sight the CSE technique appears to be more complicated than either epidural or spinal block,drug administration via intrathecal route and placement of the epidural catheter are both facilitated by the newer modifications in the combined spinal-epidural technique.

KEYWORDS- Combined spinalepidural,spinal anaesthesia,epidural anaesthesia.

INTRODUCTON:

CSE commands a unique place in recent times. The spinal component provides a rapid onset in the block,whereas the titratable dose and long lasting analgesia can be provided by the epidural catheter.

History: In1937, Soresiwas the first to use the “episubdural” technique by injecting a dose of local anaesthetic epidurally and followed by needle insertion in dural cavity to inject the spinal dose. Later Curelaru introduced an epidural catheter through a Tuohy needle and then performed a traditional dural puncture in lumbar space distally.Over time a variety of spinal, epidural and specialised combined spinal-epidural needles have been devised and a number of techniques described to simplify this procedure..

Classification:

CSE can be classified according to the number of interspaces used for performing the procedure:

1. Single interspace CSE technique or Single segment technique (SST) -when both the epidural and the spinal procedures are performed in the same interspace.

The reduced number of skin puncture decreases the incidences of patient discomfort, infection and hematoma formation.

2. Double interspace CSE technique or Double segment techniques (DST) - when both the procedures are performed in different spaces.

It is cheaper as it does not require specialised CSE needle which are expensive. There is only a theoretical possibility of damaging the epidural catheter with the spinal needle if the catheter is threaded before subarachnoid block

These can be further classified according to the technique of needle used as:

i)Needle through needle technique

ii)Needle beside needle technique

Both can be done using either the median or paramedian approach.

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Each of these can be used with or without spinal and epidural catheters.

Needle through needle technique:

1. Single Aperture Epidural needle: It consists of a conventional epidural needle to locate the epidural space. A spinal needle is then introduced through the epidural needle to exit it through the aperture and proceed to puncture the dural wall to enter the subarachnoid space.
2. Additional Aperture CSE needle (Huber and Hanaoka Needles):Its an epidural needle with an additional aperture ('back eye') situated at the distal end.

Needle-Beside-Needle technique:

1. Double-Lumen Needles: comprise of an epidural needle and spinal needle which are introduced through barrels or separate lumen which may or may not consist of a spinal needle guide attached alongside the epidural needle.

2. Separate Needle- The epidural needle is first placed in the epidural space by the usual technique followed by the introduction of the spinal needle beside the epidural needle for performing the subarachnoid puncture.

MEDIAN VS PARAMEDIAN APPROACH TO CSE:

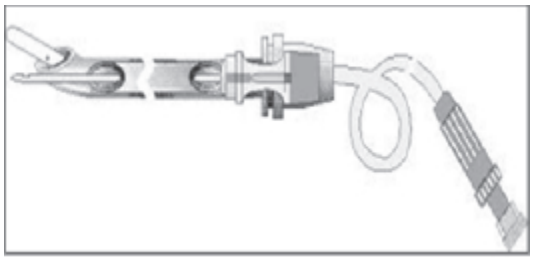
With the midline approach, the epidural-dural distance is reduced improving the success of spinal component.

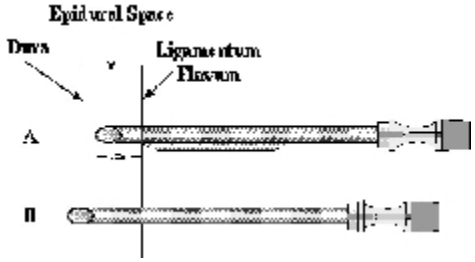
Paramedian approach may prove to be advantageous for epidural placement for the following reasons: decreased unintentional dural puncture, decreased probability of postdural puncture headache as there is oblique approach to dural fibers and increased probability of cephalad catheter placement.

TYPES OF NEEDLES:

1. ELDOR NEEDLE-

A. The spinal conduit of this needle serves as a break at the ligamentum flavum for an inadvertent insertion into the subarachnoid space.

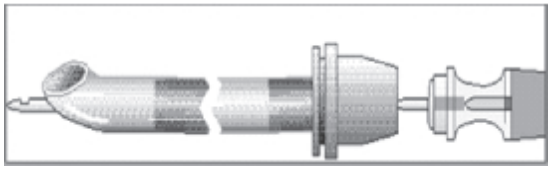




B. The usual epidural needle has no such break,hence possibility of its inadvertent subarachnoid insertion is higher.

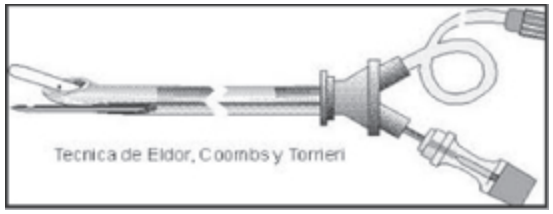
2)HUBER NEEDLE:

A hypodermic needle having an auxiliary outlet being in transverse alignment with the channel outlet.It has a very small hole behind the epidural needle tip(back eye). The back-eye helps in positioning the dural puncture away from the epidural catheter



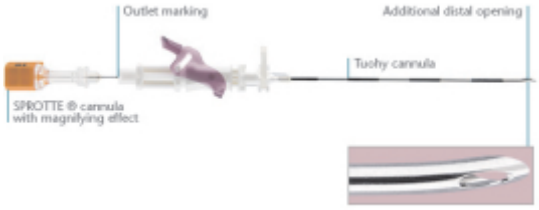
3)COOMBS CSE NEEDLE:

The Coombs epidural –spinal needle, a newer multi-lumen device that has two channels, with the spinal channel being underneath the epidural channel.



4)EPISPIN LOCK NEEDLE:

It is designed to guide the smooth passage of the spinal needle through the Tuhoy to its backhole exit point. The clamping feature on the needle when closed,locks the spinal needle in place firmly once the desired position is achieved. It also has a magnifying hub for quick identification of flash back onset of CSF.



ADVANTAGES OF CSE:

It combines the benefits of both spinal and epidural anaesthesia as:

Spinal:	Epidural:
i)fast onset	i) high flexibility
ii)high success rate	ii) prolonged anaesthesia
iii)good relaxation	iii)post operative analgesia
iv) low toxicity	

The advantage of combined spinal and epidural anaesthesia is in its ability to combine the rapidity, density, and reliability of the subarachnoid block with the flexibility of continuous epidural block to titrate a desired sensory level, control the duration of anaesthesia,vary intensity of the block and provide post operative analgesia.

It also provides greater hemodynamic stability for high-risk patients by using a lower initial dose of drug for spinal anaesthesia and for subsequent gradual extension of the block as and when necessary via epidural.

CONTRAINDICATIONS:

-Patient refusal

- Severe Hypovolemia

-Coagulopathy or other bleeding diathesis

-Infection at procedure site

-Severe aortic stenosis, mitral stenosis

-Current neurologic pathology, demyelinating lesions

CONCLUSION:

CSE is a combination of spinal and epidural anaesthesia on the same patient.

The use of modified epidural needles with a back hole for combined spinal-epidural technique significantly reduces paresthesia associated with the insertion of the spinal needle and is associated with more frequent successful spinal needle placement on the first attempt.[1] Moreover the two CSE techniques do not differ in terms of the procedure time and patient's preference[2] The technique of separate needle CSE had less hypotension, lower spinal failure rate and took no longer than needle-through needle technique [3,4]. Also the choice of either paramedian or median approach for CSE does not affect the success rate of the subarachnoid puncture, thought to raise the success rate of subarachnoid puncture by paramedian approach a longer protruded spinal needle is recommended[5]. On comparing CSE with epidural analgesia in labour it was seen that CSE provides faster onset of effective pain relief along with a higher incidence of maternal satisfaction as per a recent Cochrane study. In recent studies it has also been seen that CSE anaesthesia could be considered as an effective anaesthetic technique for elective major upper abdominal surgery in awake or sedated neonates and infants and can be preferred by an anaesthesiologist as an alternate to general anaesthesia in high-risk neonates and infants.[6] Also CSE anaesthesia had fewer adverse respiratory and cardiovascular events[7] .Compared to spinal or epidural anaesthesia alone, CSE anaesthesia was preferred, providing rapid onset, reliable spinal block and high quality intraoperative and postoperative analgesia in elderly patients[8,9]. It is currently popular and it is used in a wide variety of clinical settings. It seems to be particularly useful in

ambulatory surgery, because it facilitates early patient ambulation and discharge to home.[10]

In addition, CSE has a role in patients with significant comorbidities and high risk for general anaesthesia who need to undergo surgery [11,12]

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MANAGEMENT OF DIFFICULT AIRWAY IN INFANT WITH HIGH DORSAL MYELOMENINGOCELE WITH ARNOLD CHIARI MALFORMATION

● Dr Shaila Kamat [1], Dr. Nimisha Parkari [2],

ABSTRACT

The anaesthetic implication in myelomeningocele is positioning of the patient for induction of general anaesthesia without applying direct pressure to exposed neural placode[1], especially in large defects with cervico-dorsal herniation.

We present a 9 month old with a high dorsal MMC 8X10cm in size. The challenge with our case was the difficulty securing airway in supine position along with limited neck extension. Soft rolls or doughnut shaped gel support[2] to achieve intubation in supine position could not be used as it would result in flexion of the neck and hinder airway management. Owing to the precarious airway we employed inhalational induction. Lateral position was employed to sedate, preoxygenate and to induce the infant with Sevoflurane. Once at an adequate depth of anaesthesia, the infant was slid off the table such that the lower back and buttocks rested on the OT table. One assistant supported the infant's back off the table just below the myelomeningocele, while a second assistant supported the head and neck. The operator performed laryngoscopy and intubated the infant while a third assistant externally manipulated the larynx. Muscle relaxant was administered after confirming tube placement and the infant was replaced on the table in lateral position. Subsequently the child was placed prone for the surgery. Intraoperatively the child stayed haemodynamically stable. At the end of surgery the child was extubated once fully awake, active and moving all four limbs[3].

Thus we present induction of general anaesthesia in supine position, in a difficult airway without compression of the MMC.

Abbreviation:

MMC- Myelomeningocele

Keywords:

Myelomeningocele, Difficult Airway, Arnold- Chiari Malformation

INTRODUCTION:

Myelomeningocele (MMC), is described as the most common congenital malformation of the central nervous system, and the most complex treatable congenital anomaly compatible with life[4]. MMC occurs in 0.4-1 per 1000 live birth with variable incidence based on environmental and genetic factors [4,5,6].

It is a congenital spinal anomaly which results from failure of neural tube to fuse in foetus which may occur anywhere along the neural axis. There is herniation which

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comprises of neural elements and CSF.

Associated congenital conditions include hydrocephalus, club foot, dislocation of hip, exstrophy of bladder, intestinal malformations, renal anomalies, cardiac malformations and tracheo- oesophageal fistula [8].

Most infants with hydrocephalus are usually associated with Arnold- Chiari type II [9] malformation (downward displacement of the cerebellum into the brain stem and cervical canal with medullary kinking). This may cause cervical cord compression, during extension for intubation leading to brain stem compression. Also, application of direct pressure to the exposed neural placode must be avoided in order to prevent rupture [6]. The open neural tube is continuous with the surface of the skin hence inadvertent rupture of MMC puts them at a greater risk for bacterial meningitis due to the spinal defect.

It is noteworthy that most patients show a diminished response to hypoxia, and may be more susceptible to post-operative apnoeic episodes[7] which warrants stringent monitoring.

CASE REPORT:

An infant of nine months of age, male, weighing 6.5 kg presented with a congenital upper back swelling which was progressively increasing in size.

The mother was a booked case at a tertiary care hospital and serial USG scans during antenatal visits at 5th and 7th month did not reveal any evidence of meningomyelocele. Baby was delivered at 37 weeks by lower segment caesarean section in view of cephalo-pelvic disproportion, cried at birth, birth weight being 2.4 kg; APGAR score was 8 at 1st minute.

The above mentioned swelling was present at birth; measuring 1.5 X 2 cm. Baby moved all 4 limbs and other systemic examination did not reveal any other congenital abnormalities at birth.

Follow up with paediatrician was not done by the parents, until at 9 months following birth when progressive augmentation in the size of the cyst was noted. There was no history of seizure or increase in size of head.

On Examination the child was afebrile. Heart rate- 115/minute, regular, respiratory rate- 34/minute, with blood pressure of 80/50 mmHg. SpO2 99% with room air. RS: normal vesicular breath sounds heard in all lung fields. CVS: S1S2 heard, no murmur. CNS : conscious, active, moving all 4 limbs, (no neurological deficit, no motor ,sensory, bowel or bladder deficit).

Spine examination revealed a cystic midline swelling over upper back in the inter-scapular region, 8x10 cm in size, soft in consistency, with intact but stretched overlying skin. No cranial deformity was noted, head circumference was 44cm.

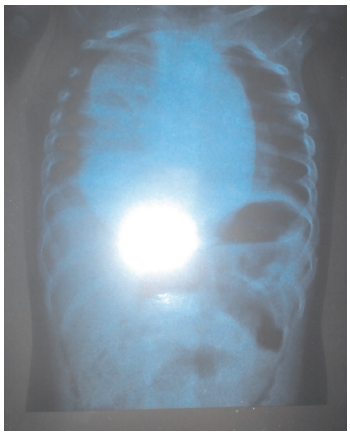
Airway examination revealed restriction of neck extension.

INVESTIGATIONS:

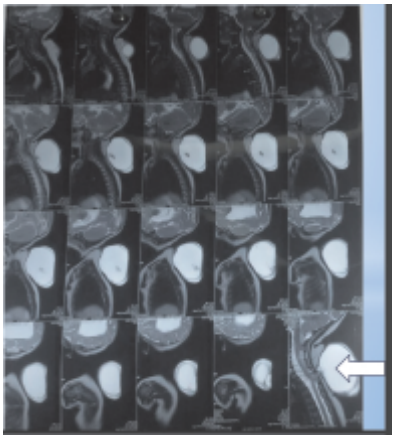
Hb=10.4gm%, PCV=32.6%, TC=10540 cells/mm^3, platelets 1.9 lacs/mm^3 , coagulation profile normal, renal function test and serum electrolytes within normal limits.

Chest X-ray showed a well defined opacity seen obscuring the right lung and heart

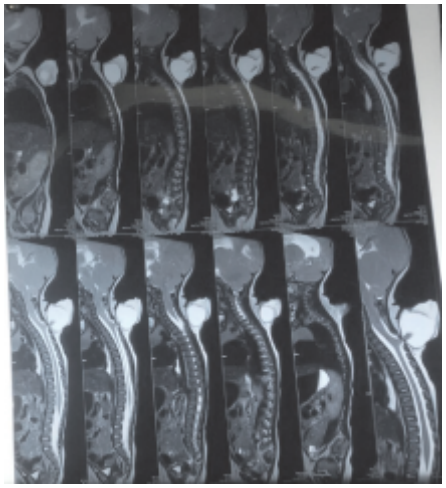
shadow. 2D ECHO was done to rule out any associated congenital heart disease and was normal.



On MRI Brain there was peg like herniation of cerebellar tonsils into the spinal canal below the foramen magnum for an approximate length of 1.9 cms. A small shallow posterior fossa with low lying transverse sinuses was noted, suggestive of Arnold Chiari Malformation type II with moderate degree of hydrocephalus.



MRI spine showed High dorsal Myelomeningocele with an extent of C4- D5 level (spinous) with defect seen in the posterior spinal elements at the level of D1 to



D2 vertebrae with herniation of the meningeal sac, CSF and neural elements into the subcutaneous plane resulting in a soft tissue mass.

Operative procedure planned was High Dorsal Myelomeningocele repair in prone position.

ANESTHETIC MANAGEMENT:

Child was kept Nil by mouth for 6 hours preceding surgery, during which period IV cannula- 24 G was secured on the foot and maintenance IV fluid (Ringer lactate) was started at the rate of 4ml/kg/hour. Plan was to administer general anaesthesia.

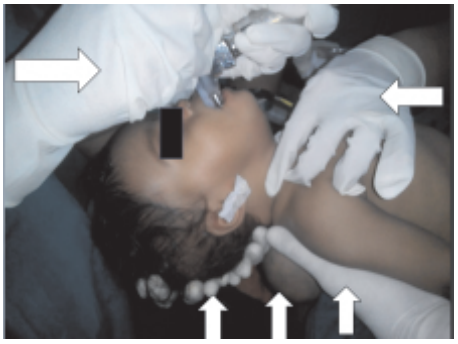
Premedication was administered to allay separation anxiety, namely IV Atropine 0.12 mg and IV Midazolam 0.3mg . On being brought inside operation theatre, monitors were connected including pulse oximeter, ECG, non invasive blood pressure, precordial stethoscope, end tidal CO_2 and temperature probe.

Preoxygenation with 100% was done for 5 minutes in lateral position in order to avoid compression to the mass. Sedation was provided with IV Fentanyl 12µg. Owing to the precarious airway we employed inhalational

induction with increamental Sevoflurane (2-6%). LMA ProSeal™ no. 1.5 was kept standby due to anticipated difficulty.

Once at an adequate depth of anaesthesia and on confirming mask ventilation, the infant was slid off the table such that the lower back and buttocks rested on the OT table.

One assistant supported the infant's back off the table just below the myelomeningocele, while a second assistant supported and stabilized the head and neck.



The operator performed laryngoscopy and intubated the infant with uncuffed oral endotracheal tube no. 4, while a third assistant externally manipulated the larynx.

Muscle relaxant IV Atracurium 3mg was administered after confirming tube placement and the infant was replaced on the table in lateral position. After confirmation of bilateral equal air entry by 5 point auscultation and ETCO2 tracing, the tube was fixed in situ.

Subsequently the child was placed prone for the surgery. Adequate padding of all pressure points was done. Rolls were placed under the chest and pelvis so that abdomen was free. Eyes padding was placed. Bilateral air entry was checked again after re-positioning.

Anaesthesia was maintained on O2+N2O (50%: 50%) + Sevoflurane(1-1.5%) ,injection Atracurium (1mg + 1mg) and Injection Fentanyl (6 µg + 6 µg) intravenously. Child was transfused 100ml of ringer lactate solution during the course of surgery.

The surgical excision took a total period of 1hr and 30mins. Intra-operative course was uneventful and the child remained haemodynamically stable.

At the end of surgery the child was replaced in lateral position for extubation. Once spontaneous respiratory efforts and normothermia was ensured reversal was administered i.e., IV Neostigmine 0.3mg + IV Atropine 0.12mg. Thorough oral suctioning

was done, and the infant was extubated once fully awake, active and moving all four limbs. Monitoring in PACU was undertaken for 1 hour before shifting the child to paediatric ward. The case was managed successfully without any complications.

DISCUSSION:

Goals during the above case were to attain optimum positioning of the patient for intubation, while considering first attempt of intubation as best attempt. Application of direct pressure to exposed neural placode was to be avoided[2].

In addition, as standard protocol dictates, prevention of hypothermia was a primary concern as large surface area of the mass is exposed and autonomic control below the level of defect is predicted to be abnormal[10]. Appropriate fluid administration, replacement of estimated blood loss was considered to be equally essential.

Cardiovascular complications included bradycardia, hypotension and tachycardia were monitored. Brainstem compression and coning causes most of the cardiac complications including cardiac arrest when MMC is associated with Arnold Chiari malformation [11].

Challenges faced in our case were the site of the mass, i.e. high dorsal that limited neck extension and inability to place baby supine. Due to the above two factors it resulted in a precarious airway.

Possible methods of securing airway in these cases include intubation in supine position with doughnut placement under the neural placode, intubation in lateral position, and the method described by us which allows intubation in supine position without compression of the mass.

Supine placement for intubation was not employed as laying the infant flat and extension of the neck would compress the MMC and the contained neural elements, which was to be avoided at all costs.

Placing of a doughnut or soft rolls was not a feasible option. In order to encircle the MMC adequately, a large enough doughnut would be needed, the rim of which would rest on the neck of the infant, resulting in flexion of the neck thus adding difficulty with mask ventilation and laryngoscopy.

Intubation in lateral position is usually associated with higher incidence of failure. Deteriorated laryngoscopic view is achieved in left lateral position. Operator must be trained in intubation in lateral position especially while attempting it in a paediatric candidate.

Thus the method used by us is best suited for cases of cervical or high thoracic meningomyelocele.

CONCLUSION:

Positioning during induction of a case of myelomeningocele, especially involving cervico-thoracic spine can pose as a challenge when, one has to prevent compression of the mass, and at the same time manage to successfully conduct laryngoscopy and intubation in paediatric age group, which itself herald difficulty in airway management due to anatomical factors. Besides avoidance of excessive extension during laryngoscopy in Arnold- Chiari type II malformation to prevent cervical cord and herniated brain stem compression.

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A NESTED CASE CONTROL STUDY OF INTENSIVE CARE UNIT RE-ADMISSIONS, RISK FACTORS AND OUTCOMES AMONG THE READMITTED PATIENTS IN INTENSIVE CARE UNIT

● Dr. Shaila S. Kamat[1] Dr. Rohini Bhat Pai[2], Dr. Gayatri S. Kamat[3]

Abstract

Aim: To determine the incidence of Intensive Care Unit re-admission, risk factors and outcomes among the readmitted patients.

Materials and method: A nested case control study was conducted over a period of 2 years. 1612 patients were shifted out of ICU after fulfilling our protocol for transferring out patients which included 1186 surgical patients and 426 medical patients. Amongst these transfer outs, there were 48 re-admissions, which were studied to assess the risk factors for readmission. Out of the transferred out patients who did not get re-admitted, 200 patients were selected as controls.

Results: Incidence of readmission was 2%. Of these, 37.5 % of the patients were readmitted within 48 hours of transfer-out from ICU. Majority of the readmissions occurred in the age group of 21-40 years. 56% of readmitted patients were males. Among readmitted patients, mean APACHE II score at first admission was higher (18.91 +/- 7.6 versus 10.8 +/-5, p=0.0001) and mean GCS at first admission was lower (11.17 +/- 4.5 versus 12.88 +/-3.3 p=0.0001). 42.43% patients who were readmitted had undergone abdominal surgeries, 35.41% of the patients had been shifted out with tracheostomy during primary admission.50% of the readmitted patients expired in ICU.

Conclusion: Males are at higher risk of readmission. Higher APACHE II scores at admission and low GCS at admission is a risk factor for readmission. Presence of tracheostomy at shift out is a risk factor for readmission.

INTRODUCTION

Health services are facing great challenges due to high health care budgets and inadequate resources. Intensivists are under pressure to reduce health care costs which leads to shortening the length of stay of patients and premature discharges.

Once discharged from ICU, patients may experience adverse outcomes leading to re-admission to ICU or in extreme circumstances death. The above may be due to further deterioration of the health condition which may be related to the same disease process or appearance of a new disease process.

To alleviate this problem, some hospitals are provided with High Dependency Units. Critical Care outreach service teams deployed in the wards have an important role in critical care.[1]

Society of Critical Care Medicine's Quality Indicators Committee ranked ICU readmission within 48 hours as the top indicator for judging ICU quality, and is considered to reflect premature discharge behaviour.[2]

Our aim was to evaluate the incidence, the risk factors for readmission and outcomes among re-admitted patients in ICU.

Materials and Methods

The study was conducted in our Medical College, Intensive care Unit, over a period of

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two years from 1st June 2014 to 1st June 2016.

Surgical ICU consists of post-operative patients from general surgery, orthopaedics, gynaecological and obstetric surgeries, otorhinolaryngological surgeries, plastic surgery, Urology and Neurosurgery. It also included trauma cases who were operated or conserved due to the non-emergency nature of the injury and/ or because the patient was not stable.

Medical patients include patients admitted from General medicine, Nephrology, Neurology and pulmonary Medicine.

We carried out Nested Case Control study in which all patients who were re-admitted at least once in ICU within 10 days of transfer-out from ICU were included in the analysis. We included patients being readmitted due to deterioration of previous disease condition as well as due to appearance of new disease process.

Patients less than 16 years of age, patients who were re-admitted after re-explorations, except neurosurgical patients who were re-explored due to decreasing GCS, patients re-admitted after second stage of an elective surgery, patients re-admitted after 10 days were excluded from the study.

To identify risk factors for re-admission to ICU, we categorised patients admitted to ICU into 2 groups:

CASES: Patients transferred out of ICU and re-admitted to ICU.

We had 48 cases in a period of two years.

Whenever patients were re-admitted in ICU, the parameters to be studied were noted from their case papers as recorded at the time of first admission.

CONTROLS: Patients transferred out of ICU, not re-admitted to ICU and survived.

Out of 1564 patients transferred out of ICU and not re-admitted, in a period of two years, 200 patients were selected by simple random sampling.

During this 2 year period there were 1636 surgical admissions out of which 1186 patients were transferred out of ICU and 450 expired in ICU. There were 952 admissions in medical ICU, out of which 426 were transferred out and 526 expired in ICU.

Hence there was higher probability of selecting surgical patients as controls than medical patients. Also there was higher probability of selecting emergency surgical patients than elective surgical patients as controls.

The factors studied were age, sex (Males or Females), severity of illness(APACHE II score was calculated within 24 hours of admission to determine severity of illness.), GCS prior to surgery or as informed by ventilator support call prior to shifting patient to ICU, type of surgery, tracheostomy at shift out, number of days in ICU, associated co-morbid conditions.

RESULTS AND OBSERVATION

The study was conducted in the Intensive Care Unit of our Medical College, which is 21 bedded and admits surgical, medical as well as trauma patients.

The study was conducted from 1st June 2014 to 1st June 2016.

During this 2 year period there were 1636 surgical admissions out of which 1186 patients were transferred out of ICU and 450 expired in ICU. There were 952 admissions in medical ICU, out of which 426 were transferred out and 526 expired in ICU.

In this 2 year period we had 48 readmissions in our ICU. These 48 readmissions matched our criteria of readmission.

The incidence of readmission in our ICU was 2%.

Mean age among readmitted patients was (47 ± 19 years patients in re-admission group versus 45.7±17 years in non-readmission group p=0.065, hence insignificant).Majority of the patients re-admitted were in the age group of 21-40 years. (Figure 1).56% of the patients re-admitted were males (n=27), 44%

females (n=21).

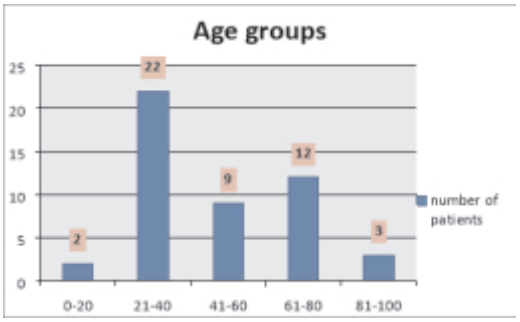

Figure 1:Distribution according to Age among readmitted

The variables that were significant are the mean APACHE II score among readmitted patients (19±7.6 versus10.8±5, p=0.0001,p value significant). The mean GCS score among readmitted in case versus control group was (11.17±4.5 versus 12.8±3.3 p=0.0001) and the difference between the groups was statistically significant.Out of the 48 patients re-admitted 35.4 % (n=17) patients had tracheostomy at shift out during the first admission whereas 15% of the patients in non-readmitted group had tracheostomy at shift out. Pearson chi square value was 11.776. The probability of patient shifted out of ICU with tracheostomy and being readmitted is found to be statistically significant at 95% confidence level. (Table 1)

Tracheostomy present	Yes	No	Decannulated
Readmitted	17	29	2
Non-readmitted	30	166	4

Table 1:Distribution as per the presence of tracheostomy at shift out

Among the readmitted patients, 79.17% (n=38) patients were post-operative cases or trauma cases. 20.83 %(n=10) patients were medical cases. (Figure 2). Out of the 38 post-operative and trauma cases 58.3 % (n=28) cases had undergone emergency surgery, 31.25 % (n=15) patients had trauma and were either conserved or operated and 10.42 % (n=5) were elective surgical patients. (Figure 3).Among the surgical patients, 42.43%of the patients had undergone abdominal surgeries, 30.3 % of the patients had undergone craniotomies and 15.15% had undergone orthopaedic surgeries. (Figure 4).

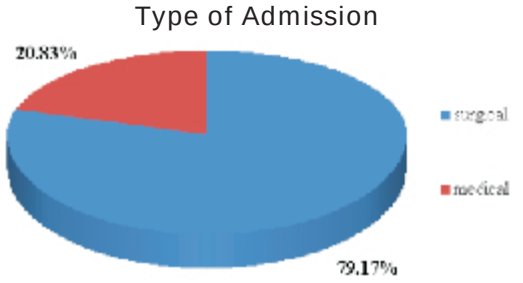

Figure 2:Distribution as per type of admission

Figure 3: Distribution according to Nature of surgery

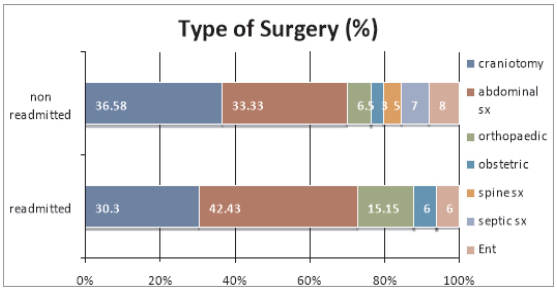

Figure 4:Distribution as per the type of surgery

The mean length of stay in ICU among readmitted patients was 6.65 days with standard deviation of 11.4 days and among non readmitted patients was 4.91 days with

standard deviation of 0.03 days (p=0.530).p>0.05,hence insignificant.

58.33 %(n=29) patients re-admitted did not have any comorbid conditions, 41.67 %(n=19) patients had cardiovascular, renal, respiratory comorbidities. (Table 2).

	Yes	No
Readmitted	19	29
Non-readmitted	54	146

Table 2:Presence of Co- morbidities

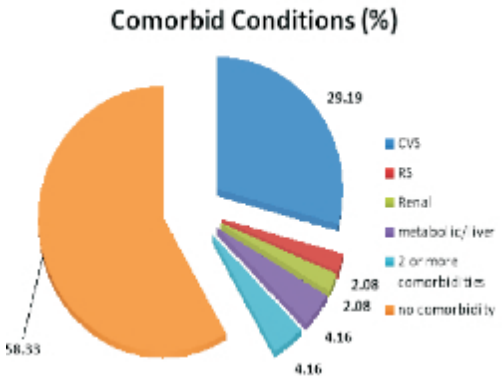

Figure 5 Distribution according to pre-existing co-morbid health condition

68.75% of the patients were re-admitted following respiratory distress in the ward. Among these, 10.41% of the patients were readmitted with respiratory distress probably due to tracheostomy tube block, 10.41% patients re-admitted with respiratory distress with decreasing GCS, 6.25%patients re-admitted with respiratory distress and shock probably due to sepsis and 4.18% patients were re-admitted following cardiac arrest in the ward.37.5% of the patients were re-admitted within 48 hours of shift out from ICU. The mean number of days within which re-admission occurred was 3.4 days with a standard deviation of 2.1 days. 50% of the re-admitted patients died in the ICU. (Figure 6)

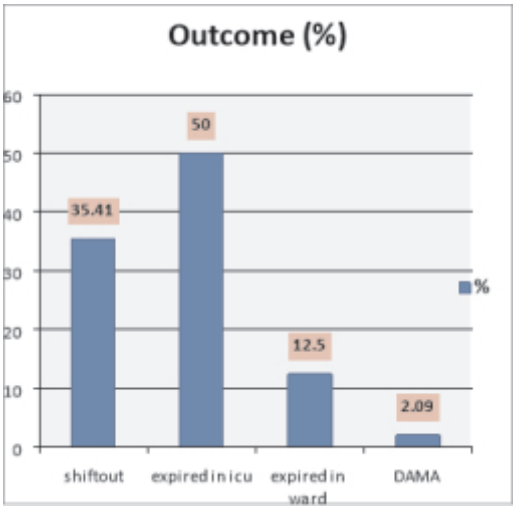

Figure 6:Distribution of outcome among readmitted

Discussion

According to our study, readmission rate was 2%. ICU readmission rates in US vary from 5-13%[3]. ICU readmission rates in our ICU was similar to that of Kareliusons et al [4] (2%) while it is lower than Amin et al[5] (8.7%). Differences in ICU readmissions is due to differences in case mix, duration of study and exclusion criteria.

We observed that the mean age among the readmitted was 47.35 and 45.72 among non-readmitted (p=0.065, p value insignificant). Majority of the patients were in the age group of 21-40 years. Amin et al[5] reported mean age of 55 years among readmitted.

In our study, we observed that 56% of readmitted patients were males and 44% females, (p=0.0001, p value significant).Hence we conclude that males are at higher risk of readmission than females. Kareliusson et al[4] reported 57% males and 43% females being readmitted .We observed greater number of trauma cases in males compared to females and their susceptibility to trauma associated complications.

The mean APACHE II score among readmitted patients was 19±7.6 while in non-readmitted patients it was 10.8±5, (p=0.0001, p value significant). Timmers et al[6] too in their study observed that the initial APACHE II score was significantly higher among readmitted patients than non-readmitted. Lee et al[7] concluded that APACHE II score at discharge was a better predictor of mortality and readmission to ICU as compared to APACHE II score at admission.

GCS score among the readmitted group of patients at their initial admission was 11.17 ±4.5,while among the non readmitted group it was significantly higher 12.88 ±3.3, (p=0.0001, p value significant).

Surgical patients constituted 79.17% of the readmissions. This included post-operative patients as well as trauma patients who were not operated while the rest 20.83% was consisted of medical patients, p=0.068 , p value insignificant. Kareliusson et al4 reported 70% surgical, 26%medical and 4% oncological patients being readmitted.

58.33% patients in the surgical readmission group had undergone emergency surgery during the initial admission, 10.42% patients had undergone elective surgery at their initial admission and 31.25% were admitted following major trauma during their initial admission and were conserved. However p=0.099, p value insignificant.

Potter et al[8] reported 26% elective surgical readmissions and 74% emergency surgical readmissions in their set-up.

42.43% patients had undergone abdominal surgeries mainly laparotomies (perforated bowel, intestinal obstruction). 30.3% patients had undergone craniotomy, majority of them following head injuries, aneurysmal repair and intracranial bleeds. 15.15% patients had undergone orthopaedic surgeries following polytrauma.

Acute respiratory failure occurs in 10-25% of post-operative abdominal surgery patients. Atelectasis and pneumonia are the most common underlying mechanisms responsible for hypoxemia. Need for mechanical ventilation is usually observed within few hours of surgery to 5 days.'[9]

Respiratory insufficiency seen among the abdominal surgery cases can also be attributed to inadequate analgesia provided to these patients in the ward. This leads to inadequate respiratory efforts.

According to S.Ghosh and colleagues[10] neurological patients who had lower Glasgow Coma Scale (GCS) on admission, had longer ICU stay and longer number of days on ventilator and hence more VAP rates.

Amin et al[5] reported 51% patients with surgery for GI neoplasm and 13% patients with surgery for respiratory neoplasm being readmitted.

Of the 48 patients readmitted to our ICU, 17(35.4%) patients readmitted had tracheostomy at shift out. 30(15%) patients in the control group (never readmitted to ICU) were shifted out with tracheostomy, p = 0.003, p value significant. Sodhi et al[11] reported 24.39% of the patients readmitted were with a tracheostomy.

This can be best explained with reference to neurosurgical patients where the tracheostomy care is not very efficient due to workload, leading to tube blocks. Ward staff are also not well trained with tracheostomy care which ultimately leads to nosocomial infections and hence contribute to readmission among these patients.

The mean length of stay in ICU among readmitted patients was 6.65 days with standard deviation of 11.4 and non readmitted patients was 4.9 with standard deviation of 10.03,with a p=0.530 which is insignificant.

58.33 % of the readmitted patients did not have any comorbid health condition, wherein 41.67% of patients had

comorbidities. p=0.76 and hence insignificant. On the contrary, Timmers et al[6] , in their study observed that co-morbidities were significantly higher among readmitted patients.

In our ICU, of those re-admitted, 37.5% of the re-admissions occurred within 48 hours. The mean number of days between discharge and readmission was 3.4 + / - 2.1 days.

Lee et al[7] observed that 26% of the readmissions occurred within 48 hours while Brown et al[12] had 2% of the readmissions occurring within 48 hours , median of 3 days

68.75 % of the patients were readmitted with respiratory distress, 10.41% of the patients were readmitted with respiratory distress and drop in the GCS, 6.25% of the patients were readmitted with respiratory distress and hypotension, 4.18% of the patients were readmitted following cardiac arrest, 10.41% were readmitted with respiratory distress probably due to tracheostomy tube block. Timmers et al6 reported 48% of the patients being readmitted with respiratory compromise, while 16%were readmitted following cardiac compromise.

35.41% of the patients readmitted, survived and were finally discharged from the wards. 50% of the patients died in ICU following readmission, 12.5%of the patients died after shifting out to the ward , and 2.09% of the patients were discharged against medical advice.

Readmission rate can decrease if the hospital has a High Dependency Unit (HDU) wherein patients discharged from the ICU can be cared for before being shifted to the ward. Also quality of care in the general ward such as care of tracheostomy tube, use of aseptic measures while handling patients, better analgesia in post-operative abdominal surgeries will go a long way in reducing the ICU readmission rate. Also the Critical Care outreach service teams deployed in the wards have an important role in critical care.

Conclusion

From our study we concluded that for the following variables statistical significance can be considered as predictive for readmission in ICU: male sex, APACHE II score 18 or more, GCS score of 11 and less than 11and presence of tracheostomy at shift out.

Whereas the following variables which were found to be statistically insignificant are not the risk factors for readmission in ICU in our set-up. They are: age, nature and type of surgery, number of days in ICU during primary admission and pre-existing co-morbidities.

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