POSTOPERATIVE ANALGESIA AFTER LOWER LIMB DISTRACTION OSTEOSTENYSIS

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Introduction: Distraction osteogenesis is known to cause severe pain with patients, making postoperative analgesia crucial. We report the transition process of the postoperative analgesia in children after lower limb distraction osteogenesis over a seven-year period. The objective of this study was to evaluate the effectiveness, complications, and side effects of six different methods.

Methods: The local Research Ethics Board reviewed this case report and gave permission to publish in accordance with all national regulations. As all patient data is collected anonymously and retrospectively, national regulations do not require written patient consent.

Sixty-two children underwent lower limb distraction osteogenesis between December 2007 and December 2014. In 2007, we performed epidural analgesia with ropivacaine (group E). A majority of patients reported severe pain, leading us in 2010 to use fentanyl with ropivacaine via epidural (group EF). In 2011, we began using peripheral nerve blocks and performed continuous sciatic nerve blocks with 0.2% ropivacaine. Some patients had only continuous sciatic nerve blocks (group S), while others had a combination of continuous sciatic nerve blocks and fentanyl infusions (group SF). In 2013, we began combining sciatic nerve blocks with continuous femoral blocks with 0.1% ropivacaine (group B). Some patients only received continuous fentanyl infusions (group F) because of contraindications to regional anesthesia, or due to patient or family request.

In groups E, S, and B, we calculated how many of the patients received intravenous fentanyl infusions as rescue analgesia because of a failure of initial pain management with regional anesthesia. In all groups, we calculated how many of the patients had severe pain (face scale score 4 or 5), postoperative nausea and vomiting (PONV), or whether they had had sensory or motor blockades.

Results: Results are shown in the table. Group B had the fewest pain management failures. Severe pain was lowest in group EF. Groups E, S, and B (without fentanyl) had lower rates of PONV. Intravenous fentanyl infusion combined with regional anesthesia decreased the rate of severe pain, but increased PONV. For peripheral nerve blocks, there were no sensory or motor blockades with the use of 0.1% ropivacaine.

Discussion: In group S, 75% of patients reported severe pain, indicating that only continuous sciatic nerve blocks were insufficient. Therefore, we later combined continuous femoral nerve blocks with sciatic nerve blocks. However, it is crucial to not exceed the maximum dose of local anesthetic, especially with lower weight children. Group B had the best analgesia in terms of effectiveness and having the fewest side effects.
effects. Nevertheless, over 44% of all patients in this study had severe pain, indicating that none of the methods were yet sufficient. We concluded that we must have a backup plan in such cases. Limitations of this study included that the n-values were too low for each group (preventing a statistical analysis), we had no specific protocol for administration of acetaminophen or NSAIDs, and the technical skills of anesthesiologists were unstable during early uses of peripheral nerve blocks.

References:

1 J Bone Joint Surg Br. 2011 93: 1562-1567
**84571 - A CASE OF MALIGNANT HYPERTENSION DURING KASAI PORTOENTEROSTOMY**

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**Introduction:** Biliary atresia is a progressive, obliterative cholangiopathy of the intra- and extra-hepatic biliary tree presenting in infancy. Left untreated, this condition is universally fatal. The Kasai procedure is the primary treatment for biliary atresia (1). This palliative operation involves hepatic portoenterosotomy, followed by Roux-en-Y jejunal loop formation and anastomosis to the hepatic hilum, re-establishing bile flow. We report a case of a 3-month-old infant male undergoing the Kasai procedure who experienced iatrogenic epinephrine overdose secondary to epinephrine soaked surgical packing. The subsequent malignant hypertension resulted in pulmonary edema, mesenteric ischemia and lactic acidosis which required aggressive treatment with multiple pharmacologic agents. This case highlights the importance of closed-loop communication in the operating room.

**Methods:** Using PubMed, a literature search was performed to identify any existing guidelines on the use of topical epinephrine in Kasai portoenterostomy. Parental consent was obtained for this case report.

**Results (n/a)**

**Discussion:** Currently, there are no guidelines or established protocols to aid surgeons and anesthesiologists in choosing an appropriate dose for topical epinephrine administration. Systematic reviews, case reports and randomized controlled trials in the otolaryngologic and burn literature have suggested that topical use of undiluted, 1:1000 epinephrine is safe in nasal surgery, tonsillectomy and burn surgery (2,3). Interpretation of results is made difficult by large variability in volume and concentration of epinephrine applied. Case reports cite adverse effects including tachyarrhythmias, myocardial ischemia and infarction, hypertensive crises, pulmonary edema, cardiogenic shock and death when topical epinephrine is used in endoscopic nasal and reconstructive burn surgery (2,3,4,5). Our review of the literature found no reports of regular use of topical epinephrine in Kasai portoenterostomy.

Surgical and anesthesiology teams should practice clear, closed-loop communication during the application of epinephrine. Preoperative briefings have been shown to
increase patient safety by improving team communication (6). Studies in patient safety have focused on operating room culture, suggesting that while teams operate in the same physical space, a strong hierarchical environment persists. In our case, the operating room nurses supplied 1:1000, undiluted epinephrine to the surgeon, who administered the drug via surgical packing to the liver bed, while the anesthetist remained unaware that the drug was being used in the surgical field. Malignant hypertension with pulmonary edema, mesenteric ischemia and lactic acidosis ensued. Many factors contributed to this communication breakdown, including a long, complex operation, fatigue, a large surgical team, and reluctance to challenge team members.

Our case highlights the importance of performing a comprehensive surgical safety checklist with all team members present and maintaining clear communication intraoperatively. Due to this adverse event, our department is looking into developing an institutional guideline regarding the use of topical vasoconstrictors.

References:

2) J Burn Care and Rehab. 2003; 24(5): 297-305.
A 13-year-old 44 kg girl with adolescent idiopathic scoliosis was scheduled for posterior fusion of the thoracic spine from level T6 to T12. Her curvature was 48 degrees. As per standard institutional and investigational review board policy, permission was received from the patient and her family to publish this report. Past medical history was significant for migraine and trigeminal autonomic cephalagia, for which she took carbamazepine. She had no other past surgical history, and her physical exam and laboratory results were otherwise unremarkable.

After midazolam premedication, standard monitoring and administration of oxygen, she underwent induction and intubation with fentanyl, propofol, and rocuronium. Due to somatosensory evoked potential and motor evoked potential monitoring, anesthesia was maintained with 0.5MAC of isoflurane and infusions of propofol and fentanyl. She also received tranexamic acid. The patient was turned prone and supported on rolls placed longitudinally on a standard Jackson table frame. At incision, her arterial blood pressure was 99/60, heart rate 72, oxygen saturation 100%, and esophageal temperature 35.7.

Approximately 1.5 hours after surgical incision, there was a sudden loss pulse oximetry, of arterial line pressure, a flat EKG trace and decrease in end-tidal CO₂ from 36 to 18. There was no pulse palpated, and within seconds the neurophysiologist reported loss of EEG trace. Asystole was diagnosed. The causes included hypovolemia from compression of the inferior vena cava and cardiac tamponade-like pathophysiology from compression of the heart. The surgeons were immediately asked to stop all surgical manipulation, and they indicated that they had been applying downward pressure on the spine when placing spinal instrumentation. With cessation of surgical pressure on the thorax, there was spontaneous return of arterial blood pressure, pulses, EKG and pulse oximetry trace, and the neurophysiologic monitoring returned to baseline. ABG and blood tests were within normal limits. Surgery recommenced, and the patient was stable throughout the remainder of procedure except for a brief episode of bradycardia and hypotension with surgical pressure that immediately resolved once the surgical team was asked to apply less mechanical force. The total estimated blood loss during the procedure was 595 mL.

After tracheal extubation, the patient was following commands and her motor function
was intact. Postoperative EKG was unremarkable. Cardiology consult confirmed a normal cardiovascular exam. The postoperative course was uneventful. She was discharged on hospital day 10 with postoperative radiographs showing significant improvement of scoliosis.

**Discussion:** To our knowledge, this is the first report since the 1970 paper by Dykes, *Sudden Cessation of Cardiac Output during Spinal Fusion*, where similar phenomena of hypotensive episodes were associated with surgical pressure on the upper thoracic vertebrae. Anesthesiologists and surgeons should be aware of the potential for mechanical compression of the thorax causing sudden decrease in cardiac output during this procedure.

**References:**

COMPLEX TESSIER FACIAL CLEFTS PRESENTING FOR CRANIOFACIAL SURGERY.

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Introduction: Complex Tessier Facial Clefts are rare craniofacial anomalies, which encompass a wide array of facial and cranial vault defects ranging from palatal and midface clefts to large skull defects requiring extensive reconstructive surgery. A multidisciplinary team approach (with anesthesia, plastic surgery, neurosurgery and other medical specialties) is crucial for preoperative planning. Surgery consists of osteotomies, cranial bone remodeling with grafting and fixation. Anesthesia challenges include airway issues such as difficult mask ventilation, difficult intubation and a shared airway. Prolonged operative time in infants < 10kg is usual. Utilizing multimodal blood conservation strategies is important, as massive blood loss is an issue. We present 2 such challenging cases. As per standard institutional and investigational review board policy, permission was received from the patient's families to publish this report.

Patient A: 19 month old 9 kg female, with a large midline Tessier facial cleft involving nose, palate and forehead, with developmental delay, and hypothyroidism. Surgical plan included facial bipartition, orbital and frontal bone reconstruction, and palatal repair. Preoperative Hct was 33 with normal coagulation profile and fibrinogen 286. Inhaled induction was challenging as the defect caused a poor mask fit. The patient's airway was secured with a video-assisted scope and the endotracheal tube was wired to the mandible. Surgical duration was 11 hours. EBL was 375 mL. Total fluids administered were crystalloid 540mL, 5% albumin 375mL and PRBC 293mL. Dopamine infusion and tranexamic acid were utilized. She was extubated with nasal trumpet placed by surgery. Postoperative Hct was 27, coagulation test borderline normal and Fibrinogen 124. ICU course was significant for mild upper airway obstruction.

Patient B: 5 month old 6 kg male, with large midline Tessier facial cleft and frontonasal encephalocele. Surgical plan included craniectomy for removal of encephalocele, bilateral orbital osteotomies, cleft lip and palate repair, and reconstruction of anterior cranial fossa. Preoperative Hct was 30, coagulation tests normal and fibrinogen 120. A
slow inhalation induction maintaining spontaneous ventilation was performed with two-hand technique of mask ventilation using an upside-down mask to give room for encephalocele. Direct laryngoscopy and intubation were successful. Surgical duration was 10 hours. EBL was 250 mL. Total fluids administered were crystalloid 725mL, 5% albumin 250mL and PRBC 306mL. Tranexamic acid was utilized. Postoperative Hct was 36, coagulation tests mildly elevated and fibrinogen 150. He was successfully extubated. ICU course was complicated by Diabetes Insipidus.

**Discussion:** Perioperative management of Tessier facial clefts involves a complex multidisciplinary approach. Issues include challenges with airway management including difficult mask fit, intubation and ventilation. Careful hemostasis, fluid and blood management techniques should be utilized to avoid hemodilution, metabolic acidosis and facilitate early and successful extubation.
**85993 - REDUCTION IN CODE BLUE ACTIVATIONS IN THE POST ANESTHESIA CARE UNIT**

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**Introduction:** The purpose of this study is to determine if a code blue system that records only time and date of activations can be used to provide useful information for retrospective data collection that can then be used for quality improvement.

**Methods:** This study adheres to local Research Board Ethics regulations. The code blue management system (CBMS) was interrogated for the dates of January 1, 2007 to June 30th, 2014 in the Post Anesthetic Care Unit (PACU) at a children’s hospital. The time, date, location and length of activation were reported for each activation. This list was cross-referenced with an electronic report of all patients admitted to the PACU during the same time frame. If a patient was present at the time of activation, the patient’s health record was reviewed to confirm the event. If a code activation occurred when there were no patients present in PACU, the activation was deemed to be a test, which is consistent with weekly testing of the code blue system.

**Results:** The CBMS printed a report showing that the code blue button was pressed 939 times. 697 code activations were concluded to be tests. There were 201 code blue activations that were attributed to patients. 200 separate patients were found, with one patient having two separate events, 24 minutes apart. 18 activations were for simultaneous different button presses for the same event. There were 23 code blue activations where there was at least one patient in the PACU at the time of activation, but after all available charts were reviewed, no documented patient event could be found.

A control chart was created plotting the number of code activations per month versus month (figure 1). An upper control limit at 3 standard deviations from the mean is drawn at 6.72. The control chart indicates that there was between 0 and 7 code blue activations per month, with an average of 2.23 and a standard deviation of 1.48. There is one month (November 2013) above the upper control limit with 7 code blue activations.

**Discussion:** Looking at the control chart, the number of code blue activations per month is generally in control, with most of the variation due to common cause variation.
There is one month above the upper control limit, where special cause variation may be responsible.
This study is the first step of an overall quality improvement project with the goal to decrease code blue activations in the PACU. Now that it is known that we can determine which patients are having events in the PACU using the CBMS and successfully use retrospective data collection, each event can be further scrutinized to shed more light onto the common causes and special cause variation.
Introduction: Arterial catheters are routinely used during major surgeries and in critically ill patients for continuous hemodynamic monitoring and blood samplings. Rare but serious complications can occur, with higher incidence in neonates and infants\(^1\).

Specific recommendations for primary sites of insertion, alternative sites, insertion techniques and maintenance are lacking, as well as recommendations to manage failures/potential complications.

The aim of this survey was to describe the clinical and technical approach to arterial cannulation among pediatric anesthesiologists of Canada, United States, Great Britain and Italy.

Methods: After local ethics committee approval, a 26-items web questionnaire was designed according to guidelines previously published for websurvey\(^2\). Participants were asked to provide information regarding country of practice, academic position, years of experience, arterial cannulation preferences (preferred insertion sites, techniques, use of ultrasound), solutions used for maintenance and troubleshooting management. Three clinical neonatal scenarios were designed to address certain technical and decisional aspects. Interviewers were contacted by their society of affiliation (CPAS, SPA, APAGBI and SARNePi). Descriptive statistic has been used for preliminary analysis.

Results: Most respondents are staff (93%), 52% full-time pediatric anesthesiologists, 56% work in a pediatric university hospital and 58% have > 10 years of experience. The radial artery represents the overall primary site in 88%. Clinical scenarios, answers regarding use of ultrasound and troubleshooting management are reported in Fig. 1.

In summary, 78% of the interviewers use intravenous catheters for radial artery cannulation. For femoral cannulation, 33% of providers use 3 F catheters or bigger. Most of respondents (75%) do not have guidelines for cannulation and do not assess
collateral perfusion prior radial/ulnar cannulation, and prefer landmarks/palpation to 2D ultrasound (20%).

Overall reported complications rate is 24%. The most common complications were temporary occlusion (42%), hematoma (33%) or thrombosis/embolism (12%). In children < 10 kg, the keep Artery Opened (KAO) regimen was heparin 1Ui/ml in 42% and normal saline in 32% of the cases; 4% uses pressure bags.

Discussion: This preliminary analysis shows a relative uniformity of practice among experienced pediatric anesthesiologists, who declared having high success rate and low morbidity with traditional techniques. Radial is still the preferred site, despite axillary and brachial accesses have shown to carry similar risks. 2D ultrasound is mostly limited as a rescue technique, although data indicates high first attempt success rate and shorter cannulation time. Few responders use pressure bags, which carry risk of serious complications.

On note, 33% of responders cannulate the femoral artery with big size catheters, which correlate to risk of thrombotic complications.

Conclusion: Further analysis between countries and regions, as well as group of responders (years of practice/experience and position) may give more insight into arterial line placement management but will require completed data and is not yet possible.

References:
