### POSTER DISPLAY 2

**Sunday June 23**
**09:45 – 14:00**
**Exhibition Hall C/D/X**

### EXPOSITION DES AFFICHES 2

**Dimanche 23 juin**
**9 h 45 à 14 h**
**Salle d’exposition C/D/X**

### 1577091 - INTRALIPID REVERSES VASODILATION AND HYPOTENSION DUE TO PROPOFOL IN AGING RATS

Presenter: Ferrante Gragasin, Anesthesiology and Pain Medicine, University of Alberta, Edmonton, AB
Co-authors: Stephane L Bourque, Sandra T Davidge

### 1648664 - PULMONARY HYPERTENSION AND ANESTHESIA RISK: WHERE ARE WE NOW?

Presenter: Dagmar Moulton, Hospital for Sick Children, Toronto Ontario, Toronto, ON
Co-author: Katherine Taylor

### 1650504 - STABLE IDIOVENTRICULAR TACHYCARDIA DURING CESAREAN DELIVERY

Presenter: Jaclyn DesRoches, Medicine, Dalhousie University, Halifax, NS
Co-authors: Dolores M McKeen, Ronald B George, Catherine Kells, Andrew Warren, Romesh Shukla

### 1650591 - VAGINAL DELIVERY IN PARTURIENT WITH ALAGILLE-WATSON SYNDROME

Presenter: Jaclyn DesRoches, Medicine, Dalhousie University, Halifax, NS
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### 1650606 - A CHALLENGING CASE- DEXMEDETOMIDINE FOR THE MANAGEMENT OF ACUTE POST-OPERATIVE PAIN.

Presenter: Reva Ramlogan, The Ottawa Hospital, Ottawa, ON
Co-authors: Naveen Eipe, John Penning

### 1650714 - INTRACRANIAL HYPOTENSION TREATED AFTER 3 YEARS WITH BLOOD PATCH

Presenter: Maria Calvo, Anaesthesia, McMaster University, Ancaster, ON

### 1650863 - PERSISTENT PARALYSIS AFTER SPINAL ANESTHESIA FOR CESAREAN DELIVERY

Presenter: Valerie Zaphiratos, Women's and Obstetric Anesthesia, IWK Health Centre, Halifax, NS
Co-authors: Bruce Macaulay, Dolores M McKeen

### 1651455 - SUCCESSFUL PERIOPERATIVE ANALGESIA OF ANTERIOR ILIAC CREST BONE HARVEST USING A CONTINUOUS TRANSVERSALIS ABDOMINIS PLANE BLOCK

Presenter: Timur Ozelsel, Anesthesiology and Pain Medicine, University of Alberta, Edmonton, AB
Co-authors: Ban Tsui, James Green

### 1651546 - COMPLETE ATRIOVENTRICULAR BLOCK AFTER_CRANIOTOMY: ROLE OF TEMPORARY PACEMAKER

Presenter: Andrea Petropolis, Department of Anesthesia and Perioperative Medicine, University of Manitoba, Winnipeg, MB
Co-authors: Tumul Chowdhury, Bill Y Ong

### 1651610 - ANTINOCICEPTIVE EFFECT OF DEXMEDETOMIDINE MODULATES SPLEEN CELL IMMUNITY IN MICE.

Presenter: Ho-Kyung Song, Anesthesiology, The Catholic University of Korea, Inchon St. Mary’s Hospital, Inchon, Korea, Republic of
Co-author: You Jin Kang

### 1652235 - CHRONIC TRIGEMINO-CARDIAC REFLEX IN A PATIENT WITH ORBITAL FLOOR FRACTURE: ROLE OF SURGERY AND FIRST DESCRIPTION

Presenter: Tumul Chowdhury, Anesthesiology and Perioperative Medicine, University of Manitoba, Winnipeg, MB
Co-authors: Nora Sandu, Bernhard Schaller, Ronald B Cappellani
1652240 - SEVERE BRADYCARDIA IN A PATIENT UNDERGOING RETROGASSERIAN GLYCEROL RHIZOLYSIS: IS IT VASOVAGAL OR TRIGEMINO-CARDIAC REFLEX
Presenter: Tumul Chowdhury, Anesthesiology and Perioperative Medicine, University of Manitoba, Winnipeg, MB
Co-authors: Bernhard Schaller, Ronald B Cappellani, Jayesh Daya

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Presenter: Shaylyn Montgomery, Department of Anesthesia, University of Calgary, Calgary, AB
Co-author: Kaylene Dutten

1652547 - COST INFORMATION AND ANESTHETIC RESOURCE UTILIZATION
Presenter: Donal Finegan, University of Calgary, Calgary, AB
Co-authors: Nathan Brown, Molly Shing

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Presenter: Eric You-Ten, Anesthesia, Mount Sinai Hospital, Toronto, ON
Co-authors: Sherif Boulis, Cynthia Maxwell, Eugene Yu, Naveed Siddiqui, Devdatta Desai

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Presenter: Peter MacDougall, Anesthesiology, Pain Management and Peri-operative Medicine, Dalhousie University, Halifax, NS
Co-authors: Paul Brousseau, Andrew D Milne

1652895 - PREVENTING IATROGENIC BRACHIAL PLEXUS INJURY DURING V.A.T.S.
Presenter: Ognjen Visnjevac, Anesthesiology, SUNY, University at Buffalo, Buffalo, NY, USA
Co-author: Daniel Hemmingson

1652939 - A SYSTEMATIC REVIEW OF EMERGENCIES IN PEDIATRIC ANESTHESIA
Presenter: Asadollah Mirghassemi, Anesthesiology, University of Ottawa, Ottawa, ON
Co-authors: Victor Neira, Jamila Mulla, Carol Bradbury, Lee-Anne Ufholz, Nick Barrowman, Dylan Bould

1652997 - MATERNAL ANESTHESIA FOR EXIT PROCEDURE: A SYSTEMATIC REVIEW OF THE LITERATURE
Presenter: Cristiana Miron, Anesthesia & Perioperative Medicine, Western University, London, ON
Co-authors: Kamal Kumar, Indu Singh, Aarti Agarwal

1653041 - ANESTHETIC MANAGEMENT OF BILATERAL JUGULAR VENOUS RESECTION.
Presenter: Melissa Chin, Anesthesia and Perioperative Medicine, Western University, London, ON
Co-authors: James Riddell, Afif Al-Areibi

1653598 - ULTRA-LOW DOSE KETAMINE INFUSION FOR LIMB ISCHEMIA- A CASE REPORT.
Presenter: Qutaiba A Tawfic, The Ottawa Hospital, Ottawa, ON
Co-authors: Naveen Eipe, John Penning

1653623 - PULMONARY HYPERTENSION AND INSTRUMENTED SCOLIOSIS IN PREGNANCY
Presenter: Valerie Zaphiratos, Women's and Obstetric Anesthesia, IWK Health Centre, Halifax, NS
Co-authors: Victoria Allen, Dolores M McKeen
 Intralipid Reverses Vasodilation and Hypotension Due to Propofol in Aging Rats

Ferrante S. Gragasin¹, Stephane L. Bourque², Sandra T. Davidge²

1. Anesthesiology and Pain Medicine, University of Alberta, Edmonton, AB, Canada
2. Obstetrics and Gynecology, University of Alberta, Edmonton, AB, Canada

Introduction: Intralipid has been used to reverse toxicity of many lipophilic drugs. The incidence of hypotension under general anesthesia is predicted by the use of the lipophilic drug propofol and advanced age. Based on our previous findings, here we hypothesize that, in aging rats, intralipid reverses propofol-induced vasodilation and hypotension.

Methods: This study was approved by the Animal Policy and Welfare Committee at our institution. Sprague-Dawley rats aged 3 months (Young) and 13-15 months (Aged) were used. In isolated resistance mesenteric arteries (100-200 μm diameter), we determined the ability of intralipid (0.002%-0.2%) to reverse vasodilation due to propofol (100 μM) or to methacholine (MCh; 3 μM) following preconstriction ex vivo. In vivo, rats were mechanically ventilated, blood pressure was monitored by aortic cannulation, and drugs were delivered intravenously. Propofol was given to induce sustained hypotension, and an equivalent volume of intralipid was given four times successively. Intralipid was also given after hypotension was induced by isoflurane or hydralazine.

Results: Intralipid reversed propofol-induced, but not MCh-induced, vasodilation ex vivo. Compared to dimethyl sulfoxide (DMSO) and cremophor (substances known to solubilize propofol), the reversal of vasodilation was greatest in the intralipid group (area under curve [AUC] 32 and 97 vs. 191, respectively; p<0.05). Intralipid alone did not cause vasoconstriction and did not potentiate phenylephrine-induced vasoconstriction. Moreover, reversal of propofol-induced vasodilation was significantly greater in aged compared to young rats (AUC 181 vs. 94; p<0.05). In aging rats in vivo, intralipid reversed propofol-induced hypotension greater than isoflurane- or hydralazine-induced hypotension (AUC 338 vs. 97 or -76, respectively; p<0.05). An equivalent volume of normal saline did not restore blood pressure. The magnitude of restoration of blood pressure was greater in males compared to females (mean reversal 184% vs. 93%; p<0.05). In males, intralipid administered alone increased mean arterial pressure (MAP) by 13 mmHg; however, the magnitude of increased blood pressure due to intralipid was significantly greater in rats given propofol (mean MAP increase 86 mmHg; p<0.05). Finally, pre-treatment with intralipid prevented hypotension at the 5-minute mark post-propofol injection compared to if no intralipid was given (~21% vs 42% MAP decrease; p<0.05).

Discussion: In summary, intralipid reversed both propofol-induced vasodilation ex vivo and hypotension in vivo in aging rats. Interestingly, the magnitude of blood pressure increase was greater in aged males compared to females. In aging males, the magnitude of increased blood pressure was significantly greater when propofol was given beforehand compared to when no propofol was given. Pre-treatment with intralipid prevented the propofol-induced hypotension. Hypotension due to other agents (isoflurane and hydralazine) was not readily reversed by intralipid in comparison to propofol. This suggests that intralipid has a selective interaction with propofol to restore blood pressure.

1648664 - PULMONARY HYPERTENSION AND ANESTHESIA RISK: WHERE ARE WE NOW?

Dagmar Moulton¹, Katherine Taylor¹

1. Hospital for Sick Children, Toronto Ontario, Toronto, ON, Canada

Introduction: Children with Pulmonary hypertension (PH), particularly suprasystemic PH, are at increased risk of mortality secondary to acute pulmonary hypertensive crisis or right ventricular ischemia (1). Introduction of phosphodiesterase inhibitors (e.g. sildenafil), endothelin antagonists (e.g. bosentan), and prostacyclins have improved the life-expectancy (2)- have they improved anesthesia morbidity and mortality?

Methods: We reviewed the medical records of children with PH who underwent anesthesia or sedation for noncardiopulmonary bypass procedures from 2010-2012. Clinically important symptoms, physical signs and results of investigations present before anesthesia were recorded. The incidence and type of complications that occurred intra-operatively and death (up to 7 days post-operatively) were also collected.

Results: Currently we have reviewed 74 procedures in 40 patients. Suprasystemic PH was present in 7/40 (17.5%). The etiology of PH was congenital cardiac disorders (20, 50%), chronic respiratory disease (8, 20%), idiopathic PH (7, 17.5%), venous PH (4, 10%), and porto-pulmonary hypertension (1, 2.5%). PH specific therapy was present in 18/40 (45%) including 8 (20%) on sildenafil, 5 (12.5%) on milrinone, 2 (5%) on bosentan, 2 (5%) on prostacyclin and 1 (2.5%) on inhaled nitric oxide. There were no deaths within 7 days post-operatively and 5/74 (6.7%) major complications (see Table 1), 3 in patients on DMDs. All major complications occurred during catheterization procedures (13.5% of catheterizations), 3 were episodes of hypotension during anesthesia, there was 1 (1.3%) pulmonary hypertensive crisis and 1 (1.3%) cardiac arrest. Minor complications occurred in 7/74 procedures (9.4%).

Discussion: Cardiac catheterization remains the highest risk procedure for adverse events in PHT patients undergoing non-cardiac surgery. While the percentage of intra-operative complications has not significantly changed there does appear to be a reduction in the peri-operative mortality associated with anesthesia. By June 2013 we will have data for 100 patients.

2. Barst RJ, McGoone MD; Elliott CG; Foreman AJ; Miller DP; Ivy DD. Survival in Childhood Pulmonary Arterial Hypertension. Circ 2012;125:113-122

Table 1. Summary of Major Complications and the presence of Disease Modifying Drugs

<table>
<thead>
<tr>
<th>Patient Demographics</th>
<th>DMDs</th>
<th>Etiology PH</th>
<th>Severity of PH</th>
<th>Procedure</th>
<th>Complication</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-m-old female 6kg</td>
<td>Sildenafil</td>
<td>iPHTN</td>
<td>Systemic mPAP=62</td>
<td>Cardiac catheterization PH study Duration: 165min</td>
<td>PH crisis</td>
</tr>
<tr>
<td>3-d-old male 3kg</td>
<td>Milrinone, PGI2</td>
<td>Pulmonary venous</td>
<td>Subsystemic mPAP=40</td>
<td>Cardiac catheterization Duration: 245 min</td>
<td>Ventilation Difficulty, Cardiac arrest</td>
</tr>
<tr>
<td>1.6-yr-old male 10 kg</td>
<td>Sildenafil</td>
<td>Respiratory - CLD</td>
<td>Subsystemic mPAP=10</td>
<td>Cardiac catheterization and PH study Duration: 255min</td>
<td>Hypotension</td>
</tr>
<tr>
<td>1-yr-old male 5kg</td>
<td>Nil</td>
<td>Pulmonary venous</td>
<td>Subsystemic mPAP=22</td>
<td>Cardiac catheterization Duration: 155 min</td>
<td>Alveolar collapse, Hypotension</td>
</tr>
<tr>
<td>5-m-old male 5kg</td>
<td>Nil</td>
<td>Cardiac - ASD</td>
<td>Suprasystemic mPAP=72</td>
<td>Embolization of Vein of Galen Duration: 240 min</td>
<td>Hypotension</td>
</tr>
</tbody>
</table>

PH = Pulmonary Hypertension; iPHTN = idiopathic pulmonary hypertension; ASD = atrial septal defect; CLD = chronic lung disease; DMDs = disease modifying drugs; mPAP = mean pulmonary arterial pressure; PGI2 = Prostacyclin
1650504 - STABLE IDIOVENTRICULAR TACHYCARDIA DURING CESAREAN DELIVERY

Jaclyn DesRoches², Dolores M. McKeen¹, Ronald B. George¹, Catherine Kells⁴, Andrew Warren³, Romesh Shukla¹

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3. Pediatric Cardiology, IWK Health Centre, Halifax, NS, Canada
4. Medicine, Division of Cardiology, Capital District Health Authority, Halifax, NS, Canada

Purpose: Hypertrophic cardiomyopathy (HCM) is a genetic disorder affecting the myocardium. Pregnancy is generally tolerated if parturients have good functional status prior to conception. We describe the management of a parturient at 32 weeks twin gestation with HCM (septal thickness 31mm; midcavity gradient 150mmHg; RVSP 56mmHg) who developed a stable idioventricular tachycardia (VT) necessitating urgent cesarean delivery (CD).

Clinical Features: Informed consent for publication was obtained. A 26-year-old female with HCM was admitted at 31 weeks gestation for monitoring and anticipated need of early delivery for discordant fetal growth. Medications on admission: atenolol 100mg OD and FeSO4. On the 6th day of admission she reported feeling weak and short of breath. On exam she was alert and pale, SPO2 100%, BP of 64/50 and pulse 100. With immediate volume resuscitation SBP improved to 106 mmHg. ECG revealed a slow (100-110) idioventricular tachycardia. The multidisciplinary team, with cardiology, decided an urgent CD was necessary because of her potential for further cardiac rhythm decompensation.

With informed consent she went to the OR. Arterial line monitoring and a pre-induction TTE (LVOT 98mmHg; RVSP 52mmHg) were performed. Anesthetic management, fluid administration and phenylephrine infusion were guided by TTE monitoring. Using an 18g Touhy, an L3/4 epidural was placed and 22mls of 2% lidocaine (with epinephrine and bicarbonate) was incrementally administered. She also received 50 mcg of fentanyl, 5mls of 0.5% ropivicaine and 2.5mg epidural morphine. Phenylephrine infusion was titrated by TTE and to maintain SBP 90-130 mmHg. Except for a brief period where she reverted to normal sinus rhythm (NSR) the patient remained in stable idioventricular rhythm during her operative course. During skin closure she converted to NSR 60bpm and SBP improved 140mmHg. Approximately 1500ml normal saline was infused. She was transferred to the PACU in NSR where an amiodarone infusion was initiated, and a post-operative TTE (LVOT gradient 85mmHg; RVSP 54mmHg) was performed. After recovery from neuraxial anesthesia, she was transferred to a cardiac care unit. She remained in NSR for the remainder of hospitalization. An automated implantable cardioverter defibrillator was inserted and she was discharged home on post-op day 5 with no further complications.

Conclusion: This case is remarkable for several reasons; (a) stable idioventricular tachycardia during urgent CD; (b) pre, intra and postoperative TTE to monitor cardiac function in response to anesthesia and (c) successful use of regional anesthesia in a potential unstable parturient with HCM. This adds to literature regarding successful use of epidural analgesia in patients with HCM and use of TTE to better inform real time anesthetic management.
1650591 - VAGINAL DELIVERY IN PARTURIENT WITH ALAGILLE-WATSON SYNDROME

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3. Obstetrics and Gynecology, IWK Health Centre, Halifax, NS, Canada

Purpose: Alagille-Watson Syndrome (AGS) is an often fatal genetic disorder with complex multi-organ co-morbidities including the liver, heart, vasculature, eyes and vertebrae. Prognosis is poor with 30% of patients requiring liver transplant (1). This case presents a parturient with AGS. This case is remarkable because liver disease often disrupts normal production of estrogen and therefore pregnancy in patients with AGS is considered a rare event.

Clinical Features: Patient consent to publish was obtained. A 28-year old G1P0 with AGS was seen at 26 weeks by anesthesia as part of multidisciplinary delivery planning. Despite multi-organ co-morbidities (supravalvular pulmonary stenosis (PS) patch repair, atrial septal defect (ASD) closure, biliary atresia, chronic renal failure (CRF) and asthma) she was lost to routine medical follow up. This patient was followed at 16 weeks gestation by maternal fetal medicine and cardiology. This pregnancy was complicated by chronic cholestasis, chronic anemia (Hb 99), and thrombocytopenia (123x10⁹). Subspecialty assessments had not been completed since childhood. Investigations were requested to ascertain current disease impact on obstetric and anesthetic management. Transthoracic echocardiogram: no residual ASD shunt, mild PS gradient of 36mmHg and RVSP 26 mmHg. Pulmonary function testing: moderate airflow obstruction FEV1 1.46L/min FVC 3.06L. MRI brain/spine: no vascular abnormalities, T5 butterfly vertebral body was identified. Despite remote history of GI bleed, Hepatology did not clinically suspect portal hypertension (PHTN) (stable elevated liver function tests, normal coagulation). A remote CT scan had documented multiple splenic hemangiomas. CT scan to further assess PHTN and spleen was ordered but not completed. Based on patients pre-existing liver, cardiac disease, splenic hemangiomas, and unclear PHTN status, a plan was in place for vaginal delivery (VD) with early epidural and avoidance of expulsive efforts with assisted second stage labour.

She was admitted at 36 weeks gestation for hypertension (170/78) and worsening CRF (creatinine 150). Medications: salbutamol, fluticasone, calcium and FeSO⁴. Despite treatment with labetolol, BP remained elevated and platelets decreased. Patient was asymptomatic, but induction of labour was indicated due to deteriorating clinical status. Cervidil and oxytocin were initiated. At 3cm dilation, uneventful L3/4 epidural was initiated with 20mg of 0.1% ropivicaine and 2mcg/ml fentanyl at 6ml/h for labour analgesia. Kielland forceps assisted VD was utilized. She had an uncomplicated postpartum course and was discharged home on postpartum day 3.

Conclusion: This case demonstrates successful multidisciplinary management of a pregnant patient with AGS multi-system co-morbidities using epidural anesthesia and assisted second stage VD. The multi-system effects of AGS requires complex anesthetic decision making for successful management of care. There is limited literature available with respect to anesthetic management of adults, in particular parturients with AGS and thus this case provides guidance for practitioners in their decision making.

A CHALLENGING CASE - DEXMEDETOMIDINE FOR THE MANAGEMENT OF ACUTE POST-OPERATIVE PAIN

Reva Ramlogan¹, Naveen Eipe¹, John Penning¹

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Purpose: Dexmedetomidine is a centrally acting alpha 2 adrenergic agonist approved by the FDA for sedation in ICU patients for 24 hours and for procedural sedation. There is evidence supporting its use in reducing opioid consumption (1, 2), as an adjunct in regional anesthesia (3) and preventing emergence delirium (4). We report the use of dexmedetomidine for the management of acute post-operative pain.

Clinical Features: A 35-year-old male presented with a compound crush injury to his right leg after an all-terrain-vehicle accident. He was admitted to the monitored trauma unit and remained hemodynamically stable off circulatory or ventilator support. The extensive limb injury was complicated by wound infection, sepsis and rhabdomyolysis. He required subsequent multiple operations for debridement of devitalized tissue and eventual amputation of the limb. His pain was initially managed by the Acute Pain Service (APS) with hydromorphone (HM) intravenous (IV) patient controlled analgesia (IVPCA) pump and oral multimodal analgesia protocol of acetaminophen, celecoxib, tramadol and pregabalin. Over the next 10 days (and through 5 surgeries), his pain scores and opioid requirements had increased considerably. Despite maximal multimodal analgesic use and increased PCA settings, his daily opioid requirements reached an oral morphine equivalent of 1000mg. His PCA had been changed to a hydromorphone-ketamine combination. By the 13th day, he had suffered recurrent pain crises with acute neuropathic symptoms - excruciating, burning and shooting pain. Despite maximal use of his PCA, his pain was reported as uncontrolled and was associated with extreme distress and agitation. The APS initiated a lidocaine infusion, but this was not well tolerated. In the Trauma Unit under continuous monitoring, the APS gave him a 1mcg/kg bolus of dexmedetomidine. This was well tolerated and he reported a reduction in his pain. An infusion of dexmedetomidine was initiated (0.2 mcg/kg/hr) and the patient remained stable and comfortable. This continued intermittently for 3 days and his pain scores and opioid requirements reduced gradually. The dexmedetomidine infusion was discontinued and he was weaned off his PCA. He remained on oral multimodal analgesia till his discharge to the rehabilitation institution.

Conclusion: This patient’s pain management reports our first experience with dexmedetomidine infusions for the management of severe post-operative acute pain. This has not been previously reported. Further investigation is needed to explore this opioid sparing, anti-nociceptive role of dexmedetomidine in patients with severe injuries, acute hyperalgesia and difficult to treat acute pain.

1650714 - INTRACRANIAL HYPOTENSION TREATED AFTER 3 YEARS WITH BLOOD PATCH

Maria E. Calvo

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Purpose: Inclusion of Intracranial hypotension (IH) in the differential diagnosis of Headaches. Radiographic findings and physical examination aid on determination of the level of injury. Epidural blood patch (EBP) more effective at level of injury and still useful even in longstanding pathology.

Clinical Features: Patient consent was obtained. Female 42 y presents postural headaches after a fall, remain undiagnosed for 3 years, worsening of headaches required MRI-Gadolinium enhance, presenting signs of Intracranial hypotension, no CSF leak identified with spine MRI. Physical exam of spine determined tenderness, trophic changes, piloerection with palpable temperature change at level of T12-L1, indicating possible level of injury. Fluoroscopically guided Blood patch (2) injection at L1-L2 was done, volume injected until pressure sensation a total of 21cc was used. Intracranial hypotension presents with dural nerve root sleeve tear and because of its position at the anterior spinal canal, the volume of blood should be enough to surround the spinal canal, 20ml or more has been reported to be successful. Complete resolution of headache was achieved. MRI reports improve intracranial hypotension.

Conclusion: Intracranial hypotension remains under diagnosed, clinical and radiographical manifestations are varied with diagnosis based on clinical suspicion and Cranial MRI and myelograph. The physical exam of the back may bring clues to determine the level of the leak, when radiographic imaging is not conclusive. EBP has been more successful when used at the level of lesion effort must be made to locate the source of the CSF leak. Evidence of rapid increase on CSF pressure after EBP has been determined and through continuity the intracranial pressure improves reducing the traction on pain sensitive structures. There is no specific time frame where the Epidural blood patch stops being useful for this pathology, therefore it should be attempted if conservative treatment has failed. There is no consensus on the volume needed, therefore injection should be stop at any volume where the patient experiences pressure or discomfort.

1650863 - PERSISTENT PARALYSIS AFTER SPINAL ANESTHESIA FOR CESAREAN DELIVERY

Valerie Zaphiratos¹, Bruce Macaulay¹, Dolores M. McKeen¹

1. Women's and Obstetric Anesthesia, IWK Health Centre, Halifax, NS, Canada

**Purpose:** Anterior spinal cord ischemia has rarely been reported as a cause of permanent neurologic complications after neuraxial anesthesia in obstetric patients (1,2). We describe a parturient that developed anterior spinal cord ischemia after spinal anesthesia (SA) for cesarean delivery (CD).

**Clinical Features:** Written informed consent for publication was obtained. We present the case of a 32-year-old G4P2A1 parturient of Ethiopian origin, who presented at 41 (2/7) weeks for primary elective CD for breech presentation. This current pregnancy was uncomplicated and she had no significant medical history. Preoperative BP was 98/70 mmHg and haemoglobin (Hb) 108.

Uncomplicated SA was performed at L3-4 with clear CSF on the first pass. Bupivacaine 12 mg (0.75% hyperbaric), fentanyl 20 mcg, and preservative-free morphine 150 mcg were administered. Phenylephrine was then infused at 50 mcg/min. Block height was T4 at 5 min. Intraoperative course was uneventful except for symptomatic bradycardia (37-40 bpm) and hypotension (SBP 85mmHg) 15 min post SA, treated by decreasing the phenylephrine infusion, intravenous ephedrine 10 mg and atropine 0.6 mg. Blood loss was estimated at 750 ml and the lowest intraoperative SBP recorded (Innovian® Anesthesia, Draeger Medical) was 85 mmHg.

Post anesthesia care unit vitals initially were BP 107/65, HR 82 and SpO2 97%. Over the next 3 hours, 3 episodes of mild hypotension (SBP 85-90) were treated with fluid boluses. Clinical assessments revealed no excessive bleeding and postoperative Hb was 82. Seven hours after SA, the patient had dense persistent motor block, despite pain from her surgical incision. At nine hours a diffusion-weighted unenhanced MRI of the lumbosacral region was normal, finding no spinal cord compression or cord lesion. Fifteen hours after SA, Neurology found leg strength 0/5 bilaterally, decreased sensation to T6, no sensation to void, intact bowel function, vibration sense and proprioception. The deficits were consistent with a lesion above T6, impacting the anterior spinal cord while sparing the posterior tracts.

Two more unenhanced spinal cord MRI studies within 48 hours failed to identify the pathology. Six days postpartum, the sensory and motor deficits persisted. Daily neurologic improvement was observed over postpartum days 7-14. Normal echocardiogram ruled out patent foramen ovale and a negative sickle cell screen ruled out vaso-occlusive crisis. At one year, persistent neurologic deficits included mild left hip flexor weakness, persistent T10-12 dyesthesia and neuropathic pain in her left leg.

**Conclusion:** Possible etiologies of anterior spinal cord ischemia include severe hypotension, arteriosclerosis, or mechanical interference with aortic blood flow (emboli or vasospasm) (2). Three cases report spinal artery syndrome after neuraxial anesthesia in the obstetric population (3-5). Mild hypotension combined with a vasoconstricting agent and the hypercoagulable state of pregnancy may be contributory (3,6). Our case report highlights the importance of the clinical examination in determining the diagnosis when faced with a prolonged block after neuraxial anesthesia in the obstetric population.

**References:**
1651455 - SUCCESSFUL PERIOPERATIVE ANALGESIA OF ANTERIOR ILIAC CREST BONE HARVEST USING A CONTINUOUS TRANSVERSALIS ABDOMINIS PLANE BLOCK

Timur Ozelsel¹, Ban Tsui¹, James Green¹

1. Anesthesiology and Pain Medicine, University of Alberta, Edmonton, AB, Canada
Purpose: Perioperative bradycardia and/or complete atrioventricular (AV) block has been described in neurosurgical patients.\(^1\)\(^-\)\(^3\) We present a case of complete AV block in a neurosurgical patient with pre-existing right bundle branch block (RBBB) and 1\(^{\circ}\) AV block.

Clinical Features: Patient consent for case report was obtained. A 68-year-old male presented for emergent evacuation of an acute left temporal subdural hematoma. Past medical history was significant for hypertension, dyslipidemia, coronary artery bypass graft surgery, and transient ischemic attack treated with dual antiplatelet therapy. After an episode of dizziness and a fall, the patient developed a left temporal subdural hematoma with midline shift. The patient underwent craniotomy and hematoma evacuation under general anesthesia with propofol, remifentanil, rocuronium, and sevoflurane. Following skin closure, neuromuscular blockade was reversed with neostigmine and glycopyrrolate. Shortly thereafter, the patient’s cardiac rhythm progressed from a pre-existing RBBB with left-axis deviation and 1\(^{\circ}\) AV block to complete AV block with junctional escape at 35 bpm. Mean arterial pressure dropped from 90 to 60 mmHg. Despite additional doses of glycopyrrolate, the patient remained bradycardic and hypotensive. Arterial blood gas analysis revealed no abnormality. Epinephrine infusion and transcutaneous pacing were initiated, and blood pressure rapidly recovered. Transvenous pacemaker was placed and the patient was transported to the intensive care unit. The patient converted to sinus rhythm, but over the next 24 hours experienced two brief episodes of atrial flutter with complete AV block requiring pacing. Postoperative scan revealed no residual or fresh hematoma. EKG and transthoracic echocardiogram showed no significant abnormality. Permanent pacemaker was placed, and the patient was transferred to a rehabilitation facility on postoperative day twelve.

Conclusion: Bradycardia in neurosurgical patients is frequently associated with conditions of raised intracranial pressure (Cushing’s reflex).\(^2\) Bradycardia and asystole can also be caused by the trigeminal-cardiac reflex, vago-glossopharyngeal reflex, and brain stem or hypothalamic stimulation.\(^3\)\(^,\)\(^4\) Complete AV block one hour post-craniotomy has been reported and was considered neurogenic in origin, although high vagal tone and advanced age may have contributed.\(^1\) The risk of perioperative AV block for patients with RBBB and 1\(^{\circ}\) AV block is estimated to be less than 2\(\%\) in the absence of other cardiac symptoms.\(^2\) Prophylactic temporary pacemaker is not generally recommended.

In this report, neurosurgical stimulus coupled with pre-existing cardiac conduction abnormalities led to complete AV block. Although the incidence of complete AV block is low in neurosurgical patients with pre-existing RBBB and 1\(^{\circ}\) AV block, hemodynamic effects can be profound. Transcutaneous or transvenous pacemaker should be readily available.

ANTINOCICEPTIVE EFFECT OF DEXMEDETOMIDINE MODULATES SPLEEN CELL IMMUNITY IN MICE

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Introduction: Acute and chronic pain with concomitant tissue injury markedly activates immune reaction by the release of noradrenaline at sympathetic synapses. Dexmedetomidine, a potent α2 adrenergic agonist, reduces the central sympathetic outflow and show sedative, analgesic and sympatholytic effect by inhibiting norepinephrine output. To assess the possible influence of analgesic efficacy of dexmedetomidine on immunomodulation, we assessed NK tumoricidal cytotoxic activity and the ability of T lymphocytes proliferation from isolated spleen cells in C57BL mice after formalin test.

Methods: Volume of 10 mL/kg of dexmedetomidine (30 µg/kg) or physiological saline (10 mL/kg) was injected intraperitoneally before 30 min of formalin (20 µl of 2% formalin in 0.9% saline) or saline subcutaneous injection. After confirming analgesic efficacy of dexmedetomidine on formalin-induced pain, NK cell activity and splenocytes proliferation were measured from isolated splenocytes of each control naïve, saline- or dexmedetomidine -treated mice. NK cell activity against NK-sensitive YAC-1 lymphoma cells was evaluated by the percentages of specific lactate dehydrogenase (LDH) release. Various numbers of effector cells (NK cells) were added to the wells of a microtiter plate containing 2 × 10⁴ target YAC-1 cells in 100 µL, to achieve final effector-to-target cell ratios of 80:1, 40:1, and 20:1. The immunoreactivity of isolated splenocytes from each mouse was determined by the proliferative responses to PHA as a mitogen. BrdU incorporation in newly synthesized cellular DNA is measured by an ELISA to quantify cell proliferation.

Results: Intraperitoneal administration of dexmedetomidine in formalin test significantly decreased the time of licking and biting during the first and second phases (P <0.001). As a result of formalin induced pain, NK cell activity was significantly higher in saline-treated mice than in dexmedetomidine-treated mice. (P < 0.05). Specifically, at 80:1 ratio of NK cells to NK-sensitive YAC-1 lymphoma cells, the NK cell activity was assessed to 19.8±18.5% by cells from saline treated mice, 4.9±0.7% by cells from control naïve mice and 5.1±0.9% by cells from dexmedetomidine treated mice. (P < 0.05). The proliferative response of splenic lymphocytes by formalin injection was not altered by dexmedetomidine.

Discussion: Formalin induced pain increased immunological reactivity of splenic NK cells and splenic lymphocytes. The analgesic efficacy of dexmedetomidine on formalin induced pain modulates splenic immune reaction by suppressing NK cell activity, but the proliferative response of splenocytes did not show any changes by dexmedetomidine.

1652235 - CHRONIC TRIGEMINO-CARDIAC REFLEX IN A PATIENT WITH ORBITAL FLOOR FRACTURE: ROLE OF SURGERY AND FIRST DESCRIPTION

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Purpose: Isolated orbital floor fracture comprises around 10% of all the facial fractures. However, we have highlighted the mechanism of debilitating cardiovascular changes and role of surgery in this group of patients.

Clinical Features: After obtaining written informed consent, we report a case of an otherwise healthy patient who suffered from trauma to the left eye and developed upper gaze diplopia. CT scan revealed a fracture of the left-sided orbital floor and minimal soft tissue entrapment. He was managed conservatively. One month later, the patient experienced several episodes of dizziness while looking up. Holter monitoring showed normal sinus rhythm with multiple premature ventricular complexes (PVC’s). Stress ECG, as well as echocardiography, also revealed no abnormality. The patient's pulse rate slowed during sleep and there were several episodes of interrupted sleep due to sudden fluctuations in heart rate and blood pressure. Five months later, patient was admitted to hospital to repair the left-sided fracture of the orbital floor. A few days after surgery, the patient's cardiovascular symptoms dramatically improved. Hemodynamic perturbations are commonly reported complications in patients with orbital floor as well as zygomatic fractures and mainly reported just after the trauma or in the perioperative period. The possible mechanism highlighted is generally accepted as oculocardiac reflex (OCR), a subgroup of a peripheral trigeminal cardiac reflex (TCR). ¹,² This patient also presented with hemodynamic changes which persisted for one month following the insult; a feature that is not yet described and may be related to OCR on a sub acute or chronic basis. ³ Occult swelling of muscle tissue might have progressively increased and incited OCR. Extra ocular muscle stretch during rapid eye movement (REM) coupled with high vagal tone during sleep might stimulate the OCR. ⁴,⁵ REM sleep also produced sympathetic over-activity which manifested as transient tachycardia and hypertension in this patient. ⁴ As the floor of orbit is supplied by a branch of trigeminal nerve, stimulation during jaw movement and could incite TCR and manifest as hypertension and bradycardia. Fixation of the orbital floor, as well as release of soft tissue improved the swelling and stabilized the orbital frame, and hence minimized the overall chances of stimulation of OCR.

Conclusion: In conclusion, this is the first reported case of a chronic TCR underlying the fact that the TCR is a substantial, if not the principal phenomenon of autonomous nervous system. If an otherwise healthy patient with orbital floor fracture presents with cardiovascular changes, OCR should be ruled out and surgical intervention should be taken into consideration.

SEVERE BRADYCARDIA IN A PATIENT UNDERGOING RETROGASSERIAN GLYCEROL RHIZOLYSIS: IS IT VASOVAGAL OR TRIGEMINO-CARDIAC REFLEX

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Purpose: Hemodynamic perturbations are commonly observed complications of ablative procedures for trigeminal neuralgia.¹ In the anesthetized patient, it would be challenging to differentiate the various causes pertaining to these cardiovascular changes if they occur in the predilatation phase of the procedure. After obtaining written informed consent, we have highlighted this issue.

Clinical Features: A middle aged, otherwise healthy patient was diagnosed with trigeminal neuralgia and was scheduled for retrogasserian glycerol rhizolysis under general anesthesia. Baseline heart rate and mean arterial blood pressure (MABP) were recorded as 58 bpm and 77 mmHg respectively. For the retrogasserian block, the surgeon proceeded with transovale placement of a spinal needle in the trigeminal cistern of Meckel's cave under fluoroscopic guidance. When the needle tip punctured the trigeminal cistern, egress of cerebrospinal fluid was noted at hub of the spinal needle. At this time an episode of sudden bradycardia (25 bpm) developed just prior to the contrast dye injection. The surgeon was immediately notified and asked to hold the injection. In view of persistence of bradycardia (more than 30 seconds), intravenous glycopyrrolate (0.4 mg) was given and the heart rate increased up to 84 bpm with an increase in MABP (77 to 96 mmHg). Thereafter, the surgeon performed the rest of the procedure (dye and glycerol injection) without any further changes in the hemodynamic parameters. Vasovagal reactions can be associated with any sharp noxious stimuli; however such reactions are usually observed during transovale passage of the needle during percutaneous ablative procedures.² The other possible differential diagnosis in this case might be stimulation of trigeminal cardiac reflex (TCR) which is usually triggered by the mechanical, chemical dilatation (due to dye/glycerol or balloon) and/or electrical stimulation (radiofrequency ablation).¹ In our case, bradycardia was noted some time after the needle placement in trigeminal cistern thus the possibility of a vasovagal reaction is highly unlikely. It is possible that sudden egress of CSF led to sudden traction of the dura and provoked TCR. The meningeal branch of the maxillary nerve (branch of trigeminal nerve) innervates the middle fossa dura, which in this patient, might elicit the TCR.³ This patient had low baseline heart rate. Preexisting high vagotonicity coupled with mild stimulation of trigeminal nerve during dural traction could lead to TCR resulting in to severe bradycardia.⁴

Conclusion: In conclusion, TCR can be provoked during the predilatation phase of trigeminal ablative procedure with catastrophic consequences and vigilant monitoring is warranted throughout the procedure in such cases. The behavior of TCR around the Ganglion Gasseri is different to other locations and sheds light on an ongoing definition of the TCR.

ASA PHYSICAL STATUS: CLEAR AS MUD THE USE OF ASA-PS IN PERIOPERATIVE LITERATURE

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Introduction: The American Society of Anesthesiologists physical status (ASA-PS) was introduced in 1941. It was designed as a grading system that applied to the patient’s preoperative physical state, which could then be correlated with other variables such as patient outcomes [1]. It was thought that it would be easy for anesthetists to limit themselves to only the patient’s physical conditions when using ASA-PS. However, numerous studies demonstrate inconsistencies when grading patients between anesthesiologists in both adult and pediatric populations [2-5]. These inconsistencies included taking into consideration factors like smoking and the type of surgery, which should not impact ASA-PS. This raises the question of how ASA-PS is used throughout anesthesia literature because if it is used to select patient populations or draw conclusions or correlations between ASA-PS and other perioperative variables this may not be valid.

Methods: The purpose of the study was to determine how ASA-PS classification is used in randomized clinical trial’s (RCT’s). Two Ovid searches of medline were performed. The first used the MeSH terms anesthesia, anesthesiology and anesthetic. The second used perioperative care and preoperative care. The search was limited to studies published between 2005-2009, human subjects, English language and RCT’s. 200 articles from each search that met inclusion criteria were reviewed as to the use of ASA-PS. Data was collected on if and how ASA-PS was used in the article. Articles were selected using a random number generator. The primary authors’ area of specialization was used as the specialty for the article. The results of the two groups were then combined by area of specialty.

Results: Of the 400 articles reviewed 185 had an anesthesiologist as the primary author with the remaining 215 studies being non-anesthesia. 142 of the 185 anesthesia articles used ASA-PS (77±5.9%) compared to 28 of the 215 non-anesthesia articles (13±4.7%, p<0.001). There was no significant difference between the two groups in the number of times ASA-PS was used in the introduction, results, conclusion, or discussion sections (p>0.05). Anesthesia articles used ASA-PS more often in the methods (89±4.3%) than the non-anesthesia articles (71±6.4%, p<0.02). Anesthesia articles also used ASA-PS more often for inclusion/exclusion criteria (95±3%) and data analysis (75±6.1%) as compared to non-anesthesia articles (65±6.7%) and (31±6.6%) respectively (p<0.001).

Discussion: Although ASA-PS has been used for over 70 years, the validity of this grading system has been questioned numerous times [2-5]. These results raise some interesting questions as to the use of ASA-PS in evidence-based medicine. Numerous studies have demonstrated ASA-PS is unreliable between users [2-5] and yet 77% of anesthesia RCT’s utilize it. Of those 89% use it in their methods, 95% for inclusion/exclusion criteria. This practice could potentially be introducing bias into RCT’s as the study population is being selected based on the researchers concept of ASA-PS instead of more rigorous criteria. Perhaps in an era of evidence-based medicine we should be moving towards more stringent criteria when selecting our patient populations.

References: 1. Anesthesiology 1941 2(3): 281-4
5. Paediatr. Anaesth. 2006 16(9): 928-31
Introduction: Anesthesia related intra-operative variable costs (drugs and supplies) are a recurrent target for cost saving measures (1). These costs are thought to represent around 3% of perioperative costs (2). It has been demonstrated that providing cost information to anesthesiologists can result in cost saving behaviour (3). The purpose of this study was to examine and provide feedback on intra-operative resource utilization by local anesthesiologist before and after providing cost information in the form of a price list.

Methods: This quality improvement (QI) project was conducted in compliance with local research ethics board regulations. All data was collected via a survey made available to anesthesiologists at a single hospital who were asked to complete one survey for each case documenting their use and waste of drugs and supplies intra-operatively. Phase I collected information on baseline practice and phase II collected the same information after the posting of a price list in each operating room adjacent to the anesthetic machine. Details of the anesthetic type (GA, regional, sedation) and procedure type along with inhalational agent type, duration, flow rate and concentration were requested. The groups in phase I and II were compared with respect to case mix, anesthetic type and anesthetic duration using a fisher exact and two tailed t test as appropriate. Changes in utilization were compared using a two tailed t test with p<0.05 indicating statistical significance.

Results: A total of 11 anesthesiologists participated in both phases of the study and they submitted data on 110 cases: 56 in phase I and 54 in phase II. The cases mix, duration and anesthetic type was not statistically different among the phase I and II groups. An additional 6 anesthesiologists (submitting 29 cases) participated in phase I but not phase II. When all data collected was analyzed there was a statistically significant reduction in the per case supply related costs ($45.38 vs. $25.23, p<0.01). Other costs including injectable drug costs and inhalational agent costs were not statistically different. When considering data only for those participating in both phases, there was a trend toward lower supply costs ($36.33 vs. $25.23 p=0.17) but it was not statistically significant. Total costs were similar ($72.90 vs. $68.90). Other costs were not statistically different with the exception of the cost of injectable drugs which was slightly higher in phase II ($14.02 vs. $17.87, p<0.05).

Discussion: This study on anesthetic variable cost demonstrated a trend towards lower supply/equipment related costs and a slight increase in injectable drug costs after the provision of cost information to anesthesiologist in the form of a price list. A weakness of this study was its design primarily as a QI project to document local practice which resulted in the inclusion of a broad range of different case types.

2. Anesthesiology 1995;83:1138-44
Introduction: Obesity, defined as a BMI > 30 kg/m², in the pregnant population has increased dramatically over the past decade (1). In a most recent UK national report of over 6400 general anesthesia in the pregnant population the incidence of failed intubation is estimated to be up to eight times that of the non-pregnant adult population with an increased risk of 7% for every 1 kg/m² gain in BMI (2). Failed intubation in the obese parturient can rapidly deteriorate into the most feared airway crisis of “cannot intubate-cannot ventilate”. When faced with this life-threatening airway crisis a cricothyrotomy is the only life-saving procedure. Success with this emergency procedure depends on the accurate and rapid identification of percutaneous anatomical landmarks. Clinical case series from the recent Fourth National Airway Project and cadaveric studies demonstrated that mis identification of the cricothyroid membrane (CTM) is among the most common errors for failed cricothyrotomies and serious airway injuries (3). Over the past years there is increasing evidence of ultrasonography (US) in airway management (4). Our HYPOTHESIS is that direct visualization with US-guidance is more accurate in identifying the CTM in obese parturients. To date, no study has determined the role of preoperative bedside US in the identification of the CTM in labouring obese parturients. The propose study is to determine the accuracy of conventional digital palpation to US-guidance identification of the CTM in the obese and non-obese labouring parturients.

Methods: This is an institutional REB-approved prospective single blinded study. Obese (n = 30) and non-obese (n = 30) parturients who are in labour and are not in distressed will be recruited and consented. With the parturients in the supine position, voluntary consented anesthesia staff, residents, or fellows will first identify the CTM using the conventional finger palpation method where the location of the CTM will be marked (first spot) on the skin. Following the finger palpation, a single operator who is an expert in airway ultrasound will then identify and marked the CTM (US-guided). The distance (in mm) of the first (finger palpation) compared to the second (US-guided) spot will be calculated to determine the accuracy of identifying the CTM.

Results: Our preliminary data showed a greater distance between finger palpation and US-guided identification of the CTM in the obese (n = 6, mean 11.7 mm, range 3 – 34 mm) than the non-obese (n = 9, mean 5.3 mm, range 0 – 30 mm) parturients. Finger palpation was as accurate (within < 2 mm) as US-guided in 6 out 9 non-obese parturients but none in the obese pregnant population.

Discussion: The early results suggest that conventional finger palpation of the CTM in obese labouring parturients is less accurate than in the non-obese counterparts and that preoperative bedside US may play an important pre-emptive strategy to increase the accuracy of identifying the CTM. To further collaborate the preliminary findings more patients are currently being recruited.

1652873 - PERI-OPERATIVE USE OF OPIOIDS IN PATIENTS HAVING CHEST SURGERY

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Introduction: Nearly every type of surgery is associated with a chronic pain state (1, 2). The relationship between the peri-operative period and long term opioid use is not understood. A large dataset was created by combining the Anesthesia Information Management System and the provincial prescription monitoring program database (3). This allows us to characterize the use of prescription opioids before and after surgery. We chose to study the peri-operative use of opioids for persons having cardiac and thoracic surgeries as these patients are less likely to be using opioids for the condition for which they are having surgery and therefore post-operative changes in opioid use are more likely to be related to surgery. This study outlines a review of the peri-operative opioid use of for all patients having cardiac and thoracic surgery over a 5 year period at a tertiary care centre.

Methods: REB approval was obtained. The study is a retrospective review of data obtained from the large dataset (3). Inclusion criteria were 1) One surgical procedure during the selected time period; 2) At least one opioid prescription within 6 months prior to or following the surgical procedure 3) Surgery requiring thoracotomy, VATS, sternotomy or minimally invasive cardiac surgery. Exclusion criteria were 1) Admission for surgery within six months of discharge from a previous surgery; 2) Absence of prescription for opioids; 3) Percutaneous cardiac or thoracic surgery. Pre-operative opioid use was classified as (i) Naive (no pre-op prescription), (ii) Acute (prescriptions for at least 75% of days for ≤ 3 months prior to surgery), (iii) Intermittent (prescriptions for < 75% of days for ≤ 3 months prior to surgery; (iv) Chronic (prescriptions for at least 75% of days for > 3 months prior to surgery. Post operative use was described as prescriptions for 75% of the time period described.

Results: There were 5073 single admissions within the study window. 89.1% were opioid naïve, 8.2% were intermittent, 1.6% were chronic, and 0.7% were acute. Hydromorphone was the most commonly prescribed opioid. This was followed by acetaminophen/opioid combination products, morphine and oxycodone. Opioid use declined rapidly after 1 month. The percent of patients on opioids continued to steadily decline over 6 months. At 6 months 65% of chronic, 35% of acute, 10% of intermittent and less than 5% of naïve patients were prescribed opioids.

Discussion: Linkage of two large datasets allows elucidation of the relationship between prescribing opioids and chest surgery. Overall, the rate of opioid use declines significantly one month after surgery. Less than 10% of patients presenting for surgery were using opioids pre-operatively. Rates of pre-operative opioid use are higher in patients using opioids pre-operatively, suggesting that the opioid use is for conditions unrelated to surgery. Hydromorphone was the most commonly prescribed opioid. This may vary in other places.

PREVENTING IATROGENIC BRACHIAL PLEXUS INJURY DURING V.A.T.S.

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**Purpose:** Previous reports of iatrogenic brachial plexus injuries (IBPIs) during video-assisted thoracic surgery (VATS) discuss diagnosis, pathology, postoperative intervention, and/or outcomes of IBPIs. To our knowledge this is the first case report describing the active intraoperative prevention of an IBPI during a VATS procedure, and may lead to further study toward prevention of future IBPIs.

**Clinical Features:** Patient consent in accordance with institutional guidelines was obtained. An ASA-II 75 kg 65-year-old female presented for right-sided thoracoscopic excision of apical blebs following spontaneous pneumothorax. During dissection of seemingly simple fibrous apical tissue, the anesthesiologist noticed stimulation of the brachial plexus as evidenced by digital flexion concurrent with use of electrocautery. For 30 minutes, the anesthesiologist acted as a neuromonitor to guide the surgeon's dissection to avoid brachial plexus injury. Nerves were not identified among the mass of fibrous tissue during the dissection, but the brachial plexus was clearly visualized immediately superior to the apical pleura following excision of the fibrotic mass. During her postoperative stay in hospital, the patient had no evidence of IBPI or other neurological deficits.

Of note, brachial plexus stimulation occurred 10 minutes after the patient was observed to have four twitches using a train-of-four monitor. Had additional neuromuscular blockade been given, as is often done, no digital flexion would have been observed with stimulation by electrocautery and this patient would have been at great risk of IBPI.

IBPIs during thoracic surgery occur more commonly following open thoracotomy than during VATS (1). Most often, the mechanism of injury is related to patient positioning (2), but nerve damage from electrocautery, neurovascular compromise, and surgical manipulation have also been implicated (3-5).

This case also emphasizes the proximity of the brachial plexus to pleura, but this patient's anatomy is not unique. Peripheral nerve blocks (i.e. supraclavicular) performed under ultrasound guidance allow for direct visualization of pleura, often in very close proximity to nervous structures (6).

**Conclusion:** VATS procedures have gained widespread acceptance and popularity in recent years, but they are not without complications. IBPIs are most commonly caused by positioning, but have also resulted from intraoperative use of cautery. The proximity of the brachial plexus to pleura is emphasized and should spur vigilance from both anesthesiologists and surgeons alike, especially during apical dissection or manipulation.

With this case, aggressive use of neuromuscular blockade during thoracoscopy comes into question. Any patient movement while instruments are within the thorax near large vessels could be catastrophic. On the other hand, deep neuromuscular blockade in a case such as this one would have ablated a motor response to electrocautery and IBPI may not have been avoided. In this case, the choice was made to refrain from additional neuromuscular blockade in favour of deep anesthesia with a positive outcome and prevention of a disastrous iatrogenic injury during thorascopic surgery.

**References:**
3. World Neurosurg 2011 76:208-10
Introduction: Quantification of anesthesia emergencies is essential to plan curricula and guidelines. There is currently no systematic review of emergencies in pediatric anesthesiology. Our aim was to identify emergencies in terms of frequency and outcome.

Methods: We defined emergencies as an unexpected perioperative event which without intervention by the anesthesiologist within 30 minutes may lead to disability or death. A systematic search was performed using MEDLINE, EMBASE and CINAHL. Screening and data extraction were performed independently by two investigators and disagreements settled by consensus of third investigator, where necessary. Diagnoses were coded according to the specificity of the description. Quality assessment of studies done with strobe checklist.

Results: Of 2512 abstracts, 36 met all inclusion criteria. There was much variation in the specificity of diagnostic descriptions, e.g. specific diagnosis (51%), monitoring description (22%), poorly defined diagnosis (16%), organ system (6%), drug error (3%) and equipment failure (2%). Distribution of diagnostic codes by organ systems were 63%, 21%, 6%, 4% and 1% for respiratory, cardiovascular, multi-system, central nervous and hematology. Data on cardiac arrests were well defined. The incidence of emergencies with specific diagnosis is illustrated in figure1. There was much variation in quality of methods, in particular their poor definition of diagnostic criteria for emergencies within studies. Data was very heterogeneous and pooled estimates are probably not meaningfully generalizable. Majority of studies failed to define potential source of bias, explain how missing data were addressed and also indicate the number of participants with missing data for each variable of interest.

Discussion: The data on non-fatal emergencies is poorly defined with large variation in the specificity of diagnostic reporting even within studies. We suggest that it is vital for future studies in this area to be based on a standardized hierarchical system of diagnostic reporting with adequate description of population details to describe heterogeneity.

Figure 1. Incidence of emergencies with specific diagnosis
MATERNAL ANESTHESIA FOR EXIT PROCEDURE: A SYSTEMATIC REVIEW OF THE LITERATURE

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Introduction: The ex utero intrapartum treatment (EXIT) procedure allows airway establishment for fetuses with life threatening conditions while maintaining placental support. Maternal anesthesia is challenging. Anesthetic goals include uterine relaxation, maintenance of uteroplacental perfusion, and fetal anesthesia. General anesthesia (GA) is often advocated. Recently, there have been reports of the use of regional anesthesia (RA). The aim of this article is to review the literature and compare both techniques with respect to maternal and fetal outcomes.

Methods: Multiple electronic databases were searched using the terms “Ex-utero intrapartum treatment” and “Anesthesia/anaesthesia”. The search was limited to English language. Reference lists of retrieved articles were searched to identify other studies. This review included all reports that described anesthetic techniques as well as maternal and fetal outcomes.

Results: We found a total of 24 reports of 129 patients. Nineteen reports described the use of GA in 120 patients and five reports described RA in nine patients. The most common GA technique was balanced anesthesia with Desflurane. There were 3 reports of the use of total intravenous anesthesia (TIVA). In the RA group, combined spinal epidural (CSE) was used in 8 patients while one patient had a continuous spinal catheter. There were no conversions from RA to GA. NTG iv was the most common uterine relaxant agent in all RA and TIVA cases. It was used as an adjunct to inhalational agents in 5 cases. Duration of placental support ranged from 3 to 93 minutes in the GA group and 1 to 21 minutes in the RA group. Fetal monitoring was achieved with pulse oximetry in most cases. Supplemental fetal anesthesia was not commonly required in either GA or RA groups. Oxytocin was the primary uterotonic in all cases. Additional uterotonics were more often used in the RA group. Six maternal hemorrhages were reported in the GA group and 5 patients required blood transfusions. There were no maternal hemorrhages in the RA group. One patient in the GA group required ICU admission vs. no ICU admissions in the RA group. There were no maternal or fetal complications due to anesthesia in either group.

Discussion: GA with inhalational agents is commonly reported for EXIT procedure. RA with CSE appears to be well tolerated. Nitroglycerine iv is often required with both techniques. There have been no reports of maternal hemorrhage or ICU admission with RA.

ANESTHETIC MANAGEMENT OF BILATERAL JUGULAR VENOUS RESECTION

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Purpose: To describe the anesthetic management of a patient who underwent a bilateral neck dissection complicated by the loss of venous drainage through bilateral jugular veins. The incidence of intra-operative loss of jugular venous drainage is rare, and the anesthetic considerations for this scenario have not been well described in the literature.

Clinical Features: Consent was obtained for presentation of this case. A 54 year-old man presented for total laryngopharyngectomy and bilateral neck dissection of recurrent squamous cell carcinoma of the hypopharynx. Monitoring, induction and intubation proceeded without difficulty.

After surgical resection of the left-sided jugular venous structures, it was discovered that the right-sided jugular venous structures were also extensively invaded. Emergent vascular surgery assistance was obtained, and a saphenous vein graft bypass of the RIJV was established to maintain anterior venous drainage from the head. Unfortunately, graft patency was dependent upon extreme neck extension and jaw thrust.

Upon recognition of the right-sided jugular obstruction, a variety of measures were undertaken to minimize increases in ICP and brain edema. These included: switching from inhalational to TIVA, hyperventilation, furosemide, mannitol, labetalol, and head-up position. The procedure lasted for another 7 hours, and despite all measures, the patient had a decreased level of consciousness with significant facial edema and plethora postoperatively. CT scan of the head showed diffuse scalp edema, but no evidence of intracranial pathology. Postoperatively, the patient remained in ICU for 2 days, after which time, the facial plethora and depressed level of consciousness had resolved. He was eventually discharged home with no neurologic deficits.

The venous drainage of the head and neck is primarily through the external and internal jugular veins. Loss of this pathway can lead to increased ICP.(1) A brief literature search revealed little information about the anesthetic management of this type of case. We propose that flow restriction may interfere with commonly known measures to reduce ICP, such as diuretics and positioning. Nevertheless, these measures could be of use prior to the loss of bilateral jugular venous drainage. Measures that may be beneficial after the loss of venous drainage are: hyperventilation, avoiding increased cerebral blood flow, avoiding high airway pressures and sympathetic stimulation, and avoiding secondary brain injury by maintaining normoglycemia and normothermia.

Conclusion: The intraoperative loss of bilateral internal and external jugular venous drainage presents a challenging scenario for the anesthesiologist, as this situation can lead to increased intracranial pressures and subsequent neurological sequelae.(2) In our case, the patient demonstrated delayed emergence and significant edema in the distribution of jugular venous drainage, but was discharged home without residual neurologic deficits. We hope this case report provides the stimulus for discussion of the anesthetic management of this rare intraoperative phenomenon.

1653598 - ULTRA-LOW DOSE KETAMINE INFUSION FOR LIMB ISCHEMIA- A CASE REPORT

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Purpose: Ketamine has been widely used in anesthesia and pain management [1]. It has found special application in the pain management of patients with opioid tolerance, acute hyperalgesia and chronic neuropathic pain [2]. The conventional "low-dose" ketamine described is as bolus of 0.1–0.2 mg/kg and continuous infusions of 0.1–0.2 mg/kg/hr [3]. We report the use of an ultra-low dose ketamine infusion for a patient with limb ischemia.

Clinical Features: A 40-yr-old male patient (ASA 3, 85kgs) was admitted to the surgical ward with a complex medical history (diabetes mellitus type 2, diabetic neuropathy, end stage renal disease on dialysis, peripheral vascular disease and hypertension) presented with worsening ischemia of his right leg. His pain was being treated with acetaminophen 650mg q 4h, pregabalin 50mg q am, tramadol 25 mg q 12 and nortriptyline 10 mg q hs. In addition, he would receive intermittent doses of hydromorphone, 0.5 mg sc or 1-2mg po q4h prn. The patient appeared to be very sensitive to small doses of opioids used to manage his pain- he complained of nausea, vomiting, sedation and hallucinations. These prevented him from receiving adequate analgesia and or us from increasing the opioid dose. He remained in the hospital for another 3 weeks due to poor healing of the stump, with the possibility of requiring an above knee amputation. His pain control became more and more difficult to control and the patient started to refuse any form of opioid analgesia. The Acute Pain Service (APS) was then re-consulted for advice on pain management. The patient reported a pain score of 8/10 at rest and 12/10 with simple movement. In addition to phantom pain, there was shooting, sharp, lightening like pain in the stump . After discussing the options of pain management, a small dose of ketamine (2mg iv q 15min, 6 mg total) was administered. The pain decreased to 4/10 with no side effects. All opioids were discontinued and the ketamine infusion (1mg/ml) was started at 5 mg/hr for few hours then reduced to 3mg/hr for the first day. On the next day the infusion was dropped to 1.5 mg/hr. The ketamine infusion was continued till the surgeons decided to proceed with above knee amputation for stump ischemia and infection. Surgery was done under general anesthesia supplemented with femoral nerve block. The ketamine infusion was started at 5 mg/h after the femoral block resolved. This was reduced to 3mg/hr and then to 1.5 mg/hr before it was discontinued. The patient was discharged home after one week with minimal pain or side effects from analgesia. Daily ketamine requirement and pain scores are shown in Figure1.

Conclusion: We report the analgesic "rescue" with an ultra low dose ketamine infusion (<0.1mg/kg/hr) in a patient with renal failure and limb ischemia not amenable to opioids. The significant neuropathic component to this patient’s ischemic pain may explain the efficacy of low dose ketamine. We will review the acute pain management in acute renal failure and comment on the role of ketamine in acute pain management.

Purpose: Pulmonary hypertension may worsen during pregnancy due to cardiovascular and pulmonary changes, with recent reported mortality of 25-30%. Most studies report successful management of these patients with neuraxial anesthesia (1-4). We describe a parturient with instrumented scoliosis, released tethered spinal cord, and previously normal functional status who presented with severe pulmonary hypertension (pHTN) in the third trimester.

Clinical Features: Written informed consent for publication was obtained. We present the case of a 28-year-old G1P0 parturient with history of repaired congenital diaphragmatic hernia, left lung hypoplasia, instrumented scoliosis, and released tethered cord. She presented at 37 weeks with a 2-week history of severe dyspnea, orthopnea and SpO2 85%. Pulmonary CT scan was negative for embolism, but demonstrated an enlarged main pulmonary artery. Echocardiogram demonstrated right ventricular dysfunction. Cardiac catheterization revealed mPAP of 56 mmHg (78/45), confirming the diagnosis of severe pHTN.

Harrington rods from T2 to sacrum and tethered cord release precluded neuraxial anesthesia. With multidisciplinary team, elective cesarean delivery under general anesthesia with cardiac team and CPB on stand-by was planned. In addition to routine monitors, a 5-lead ECG, 16G intravenous, 20G arterial radial canula, and 7F right internal jugular cordis were placed. Baseline vitals were BP 132/81, HR 80-90, SpO2 95% 2L/min O2, with respiratory acidosis (pH 7.34, pCO2 63, pO2 152, Bic 34), and haemoglobin (Hb) 117 g/L. After 500ml of crystalloid, rapid sequence induction consisted of midazolam 1mg, fentanyl 150mcg, propofol 40mg, ketamine 40mg, and succinylcholine 140mg, maintaining hemodynamic stability. Three minutes after intubation, delivery occurred with concurrent blood loss of 600 ml. This resulted in hemodynamic instability lasting 60-90s with hypotension (SBP 60mmHg), bradycardia (37-40 bpm) and CVP 2mmHg. This was aggressively managed with IV ephedrine (25+25mg) and atropine 0.6mg. Volume resuscitation under pressure with 1L of crystalloid and 1L of colloid was instituted. Transesophageal echocardiogram determined normal right ventricular systolic function and CVP improved to 12mmHg. The remainder of the intraoperative course was uneventful. The patient was transferred intubated, stable to cardiovascular intensive care (BP 135/65mmHg, HR 75bpm, SpO2100% (FiO2 100%), Hb 78 g/L, mPAP 25mmHg, CVP 10mmHg).

Postpartum investigation revealed restrictive lung disease secondary to scoliosis and left lung hypoplasia, reversible obstructive lung disease, and nocturnal hypoventilation. She was discharged four weeks postpartum with fluticasone/salmeterol and home BiPAP with oxygen. Three-month follow-up showed clinical improvement and better saturation at rest (SpO2 94%).

Conclusion: This patient was previously asymptomatic and presented in late pregnancy with decompensated pHTN. Pregnant patients with pHTN poorly tolerate peri-partum fluid shifts and mortality is four times higher in those who receive general anesthesia rather than regional anesthesia. Neuraxial anesthesia was not possible and this highlights the importance of multidisciplinary management in these complex obstetric cases (1-4).

2. Anesthesiology 2005 102: 1137-7
3. Eur heart 2009 30: 256-65