Presentation Date/Time: **Saturday, March 14, 2015; 6:50 – 8:00 am**

PBLD Table #: **24**

**A Multimodal Pain Management Strategy for an Adolescent Undergoing Hemi-pelvectomy for Malignancy**

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**Learning Objectives:**

1. Discuss the preoperative considerations related to pain management in pediatric patients with malignancies including chronic narcotic use.
2. Develop strategies for the management of phantom limb pain
3. Discuss the use of neuraxial and regional anesthesia techniques for the treatment of phantom limb pain.
4. Describe the multidisciplinary treatment of amputation pain, including medical management, psychological support, and coping mechanisms.
5. Identify the role of medical therapy in the transition to long term chronic pain care following amputation surgery.

**Case presentation:**

A 16 year old girl diagnosed with a right adductor muscle mass with intrapelvic extension is scheduled for a right hemi-pelvectomy and hip amputation for synovial sarcoma.

***Questions: What are the anticipated problems when this patient presents for the procedure? What more information would you need? What would be your approach?***

**Case progression:**

**History:**

A diagnosis of synovial sarcoma was made following identification of a right leg and hip mass after the patient sustained a fall and experienced significant right hip pain. The right adductor mass measured 9x8 cm and extends into the pelvis via the lymphatic chain with an additional 7x5 cm intrapelvic mass.

***Questions: What are the problems specific to this condition? What pre-operative preparation and optimization would be necessary in this case? Does she need chemotherapy prior to resection? Why?***

Prior to surgical resection, the patient receives chemotherapy with doxorubicin, ifosfamide, and vincristine, as well as radiation therapy.

***Questions: What are the harmful effects of chemotherapy that may be a cause of concern? How should those be dealt with? Why?***

During chemotherapy, the patient suffered from severe nausea and vomiting making oral intake difficult, resulting in a 5lb weight loss. She also develops neutropenia, anemia, and thrombocytopenia secondary to chemotherapy.

The patient continues to complain of severe right leg, groin, and pelvic bone pain throughout medical treatment, and was prescribed escalating high dose narcotics, which also caused constipation. She is able to ambulate, but uses a wheelchair due to severe pain limiting her function. Following her diagnosis, the patient has been suffering from severe anxiety treated with lorazepam.

***Questions: What further management regarding pain would be important at this stage? Does this patient need psychological support?***

She was also evaluated by a pediatric psychologist throughout treatment to help develop coping mechanisms. Following completion of radiation and chemotherapy, she is scheduled for a right posterior flap hemipelvectomy procedure.

PMH: Well controlled asthma with daily fluticasone and prn albuterol
PSH: No prior anesthetics, no family history of anesthetic complications
FH: Mother with hypertension, father deceased presumed from sudden MI at age 42
SH: Lives at home with mother and 1 younger sister
Allergies: NKDA
Vital Signs: Weight 50.8kg, BP 102/60, HR 109, RR 18, Sat 100% RA, Temp 36.2 C

**Physical Exam:**
Constitutional: Awake, Alert, and Oriented x3, Pt appears significantly anxious and tearful
Airway: Normocephalic, MP1, wide mouth opening, dentition intact, 3.5 FB thyromental distance, full range of motion of cervical spine
Neuro: No gross motor or sensory deficits apparent
Cardiac: Regular rate and rhythm, no murmurs
Chest: Clear bilaterally, no wheezes or rhonchi
Abdomen: Soft, nontender, bowel sounds present
Musculoskeletal: Pulses 3+ and present in all extremities, full range of motion and strength in all extremities
Skin: Hypopigmentation of medial right thigh, no skin breakdown

**Medication List:**
Morphine Sulfate Controlled Release 30mg PO BID, Morphine 15mg PO q6 hour prn pain, Lorazepam 1mg PO q6 hour prn anxiety, Lactulose 20g PO TID prn constipation, Magnesium Hydroxide 1.2 g PO TID prn constipation, Megestrol 40mg PO BID, Ondansetron 8mg PO q8 hour prn nausea, Promethazine 12.5

mg PO q6 prn nausea, Pantoprazole 40mg PO daily, Fluticasone 110mcg MDI inhaled BID, Albuterol 90mcg MDI inhaled q4 hour prn wheezing, Enoxaparin 40mg SQ daily

***Questions: What are the important aspects of medication history that are relevant to the intra-operative and post-operative management?***

The patient has completed chemotherapy and has developed neutropenia and thrombocytopenia. She has been receiving anticoagulation therapy at home for thrombosis prophylaxis as she has been increasingly sedentary due to disabling hip pain.

***Questions: What are the problems related to the patient's disease condition that has implications for anesthesia? What is your further management? What are the anticipated problems in case of a patient who is having chronic pain in terms of management for post-operative pain? What multi-modal pain therapy would you consider?***

**Intraoperative management:**

A multimodal pain management strategy is planned, including a combination of perioperative analgesia and medical therapy, surgically placed intraneural infusion catheters, psychological support, and long term chronic pain care.

Following induction with fentanyl, propofol and rocuronium, an endotracheal tube is placed, as well as large bore IV access and a radial arterial line. The patient remained in supine position for the surgical resection. During pelvic dissection and hip disarticulation, one unit of packed red blood cells is required for intraoperative blood loss of 800 ml, although the patient remained hemodynamically stable.

Intra-operatively, analgesia is achieved with intravenous ketamine infusion and hydromorphone boluses.

***Questions: What is the role of evidence for intra-operative intravenous ketamine infusion for post-operative pain? What is the evidence?***

Surgically placed right femoral and sciatic catheters are bolused and continuously infused with ropivacaine prior to the posterior flap reconstruction and surgical closure. Intravenous acetaminophen is administered during surgical closure prior to emergence. The patient was extubated successfully following completion of the 9 hour surgical case.

The femoral and sciatic catheters are continued with ropivacaine infusions and used postoperatively, along with a hydromorphone PCA.

***Questions: What are the benefits to using intraneural catheters? How do neuraxial techniques compare to peripheral nerve catheters in management of limb amputation? Should the timing of placement be considered for neuraxial and regional techniques?***

**Post-operative course:**

The patient has severe anxiety that needs treatment with lorazepam. Despite these efforts, she complains of stump and phantom pain on the first postoperative day.

***Questions: What is phantom pain? What is the pathophysiology?***

Further pain management is supplemented with oral methadone, gabapentin and a clonidine patch.

***Questions: What is the rationale to use gabapentin and clonidine patch? How do they work?***

The patient continues to complain of severe phantom pain, and duloxetine is added.

***Questions: How is duloxetine useful in the treatment of neuropathic pain? What is its mechanism of action?***

A pediatric psychologist is consulted to help the patient develop coping mechanisms.

***Question: What is the role of a pediatric psychologist?***

The IV PCA is weaned to PO narcotic and the intraneural catheters are pulled on postoperative day 10. The duloxetine is discontinued for anticipated chemotherapy with doxorubicin. Arrangements are made for follow up in the chronic pain clinic following discharge.

Two weeks later, the patient is admitted for planned postoperative chemotherapy. During admission she begins to complain of chest pain with syncope.

***Questions: What is your further management? What testing would you order for work up of the chest pain and syncope?***

A prolonged QT interval was found on EKG.

***Questions: What are the risks of a prolonged QT interval? How do you define a prolonged QT interval? How would you proceed with pain management and current medications with prolonged QT?***

The patient is discharged following postoperative chemotherapy and remains in a rehabilitation facility. Four months following her amputation, she continues to suffer from phantom limb pain, although less severe. Her anxiety has been well controlled and she continues to follow with a pediatric psychologist. Her surgical team is now planning to fit her with a limb prosthetic.

**Discussion:**

Pediatric chronic pain, including neuropathic pain, can have detrimental effects on physical well-being and also have significant impact upon psychosocial and behavioral function. In addition to the physical symptoms of pain, many pediatric patients will present with behavioral or psychological components. Psychosocial support is often necessary for parents and family members as well as the pediatric patient. Because of these considerations, a multimodal approach to pain management is necessary in the pediatric population.[1,2]

A unique subset of pediatric chronic pain patients are those presenting for radical surgical resection with amputation for malignancies, including osteosarcoma. These patients often suffer from a myriad of pain symptoms, including preoperative somatic pain related to tumor invasion and bone pain, as well as postoperative phantom limb and stump pain. Osteosarcomas are associated with poor overall survival, despite chemotherapy and surgical resection, especially tumors with intrapelvic extension. This is likely due to difficult tumor resection and inadequate tumor margin removal, making local recurrence and metastases more likely.[3] Palliative surgical resection has been described to improve pain and compressive symptoms of large intrapelvic tumors with poor prognosis or potentially severely disfiguring full radical dissections.[4]

Chronic neuropathic pain in the form of phantom limb pain is not uncommon following pediatric amputation procedures. The development of phantom limb pain typically occurs within the first postoperative week, and the sensation is described by pediatric patients as tingling, pins and needles, throbbing, and sharp pain. Up to 75% of pediatric patients who experience phantom pain also report other pain symptoms such as headache, join pain, sore throat, and abdominal pain. The presence of stump pain should also be investigated following amputation surgery, as up to 80% of pediatric patients with phantom limb pain also experience simultaneous stump pain.[5]

The medical treatment of neuropathic pain, especially phantom limb, pain can be quite difficult and a combination of pharmacological treatments is necessary. Neuraxial and regional anesthesia have both been used in the perioperative period for the prevention and treatment of phantom limb pain.[6,7,8,9] The success of peripheral nerve catheters to treat pediatric phantom limb pain may rely on optimal insertion and positioning of the catheter relative to the desired nerve.[10] Ultrasound has been used for successful catheter placement in several pediatric cases, resulting in the absence of phantom limb pain following amputation surgery.[11,12]

Due to the limited amount of studies involving pediatric chronic pain management, many physicians choose to extrapolate adult data for pain medication therapies.[1,2] The successful use of gabapentin to treat neuropathic pain in the adult population has led to its popular use in the treatment of pediatric chronic pain. Gabapentin has been used in pediatric amputation cases, with successful resolution of phantom limb pain within two months of surgery.[13] The perioperative use of gabapentin within 24 hours of amputation may also help to alleviate long term phantom pain, especially when used in combination with neuraxial or regional anesthesia.[14]

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