16 year old with Disabling Chest Wall Pain after Thoracoscopic Talc Pleurodesis for Treatment of Recurrent Spontaneous Pneumothoraces

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Objectives:
1. Understand the incidence and pathophysiology of chest wall neuropathic pain after thoracic surgery.
2. Develop a treatment algorithm, including pharmacotherapy for pediatric neuropathic pain.
3. Understand interventional procedures for treatment of neuropathic pain after thoracic surgery, including trigger point injections, safety precautions, informed consent, type of steroid, local anesthetic, frequency of injections, and side effects.
4. Understand psychosocial impact of severe neuropathic pain in a previously healthy adolescent.
5. Understand indications, risk and benefit of spinal cord stimulation for neuropathic pain in adolescents.

Case History: A 16 year old previously healthy male developed severe chest wall pain after left sided video assisted thoracoscopy (VATS) for stapling of blebs and mechanical pleurodesis, and right-sided VATS for talc pleurodesis for recurrent spontaneous pneumothoraces. The pain was stabbing in quality over the posterior chest wall, and worsened with deep breathing. Palliative factors included rest, ibuprofen, ketorolac, and gabapentin. Opioids caused fatigue without pain relief.

Questions:
Is his presentation is consistent with nociceptive, visceral, neuropathic pain, or combination? What would be proposed mechanisms for this pain? Why might he have different post-procedure pain between the mechanical and talc pleurodesis? Is the limited efficacy of opioids surprising?

Examination: On inspection, he had multiple healed scars, with slight hypertrophy consistent with chest tube insertion sites and thoracoscopic port sites. He had significant allodynia over the right chest wall, especially over his right sided incisions. Palpation of the 7th rib produced a positive Tinel’s sign with radiation to the anterior chest. He did not have any other neurologic findings.

Questions:
What is the difference between allodynia and hyperalgesia? Is the management different? Would you recommend further testing?
What non-pharmacologic strategies can be used to treat this pain? How do you teach these strategies to an adolescent?
What pharmacology would you recommend: topicals, oral analgesics? Would opioids likely be beneficial?
Case Progression: His physical and social functioning had declined significantly due to his pain, and fear of episodic severe pain that was disabling and embarrassing in public. His school attendance had significantly declined and his previous A average was now C average. He was spending more time at home and avoiding time with friends.

Questions:
How common is social and functional decline in adolescents with chronic pain? How common is development of a new mood disturbance? Should all adolescents with chronic pain be screened for suicidal ideation? Should all pediatric chronic pain patients be seen with an adolescent psychologist as part of comprehensive pain clinic evaluation? Does treatment of chronic pain alone improve mood disturbance? Does incomplete treatment of mood disturbance contribute to incomplete pain treatment? When should an adolescent be considered for pain rehabilitation?

Case Progression: His gabapentin dose was escalated; lidocaine 5% patches were applied to the incision sites without significant improvement. Other interventions included biofeedback, relaxation therapy and transcutaneous electrical nerve stimulation (TENS unit).

Questions:
When do you consider interventional techniques including injections? What would you inject, and where? How long would you monitor the patient in the office? When would you offer to repeat the injection?

Case Progression: Due to severity of his pain, the patient underwent trigger point injections and right 7th intercostal nerve block with significant palliation of his pain. His allodynia improved as well. However, his pain recurred to baseline after 2 weeks. The injections were repeated, again with excellent relief, but duration of only 8 weeks.

Questions:
Since he experienced excellent pain relief with the injections, would you continue injections with steroids every 2-8 weeks? How many would you do? When do you develop concern for steroid toxicity and steroid side effects? Mother asks, is there a more permanent interventional procedure?

Case Progression: Due to his excellent relief but limited duration from the injections, we discussed spinal cord stimulator (SCS) implantation.

Questions: How would you trial the SCS? Would you obtain further imaging of the spine prior to placement? Would you place with sedation or general anesthesia? What level would you target for the lead placement? Would you place one or two leads?

Case Progression: We first performed percutaneous placement of a trial lead, placed with light sedation. He became agitated with midazolam during sedation, and
described discomfort with lead advancement in the epidural space. Therefore, only one trial lead was placed. He had significant palliation of his pain with the trial lead in place for 5 days, and was able to return to school. We then offered permanent SCS implantation. Sedation was administered with avoidance of midazolam (propofol and fentanyl only) and his cooperation was significantly improved during the procedure. He experienced excellent coverage of his pain with the permanent SCS leads.

**Questions:**
What restrictions would you give this otherwise healthy and active adolescent? Would you anticipate he will need lifelong SCS therapy? What are the largest risks of SCS maintenance in an adolescent?

**SCS Maintenance:** The patient experienced excellent palliation of his pain and was able to return to life activities including school. He had one episode of subjective “snap” sensation when rolling over in bed, however, evaluation with x-ray did not show lead migration. The stimulator was reprogrammed with return of pain palliation. He had another episode where he was punched in the battery pack while playing with friends and change in stimulation intensity. This was also resolved with reprogramming.

**Discussion:**
Neuropathic pain is both debilitating and challenging to treat. Patients typically require multimodal therapy including topical analgesics, oral medications of different classes, biobehavioral strategies, and finally interventional procedures. The primary goal is to palliate pain enough to allow functioning in life activities.

Pediatric and adolescents are especially vulnerable, as physical debility rapidly leads to inability to participate in school, social activities, personal development and future career development. Adolescents in particular are vulnerable to significant mood disturbance due to pain and loss of functioning. Isolation is common, as peers may not understand/accept limited functioning or the patient’s fear avoidance of activities. Treatment of the pain without treatment of the mood disturbance often leads to inadequate pain control despite aggressive pain management.

Due to these features of pediatric pain, we feel this patient population is best evaluated in a multidisciplinary pain clinic that includes pediatric pain medicine, pediatric physical medicine and pediatric psychology. This approach is effective, and although time consuming and expensive, can thwart further expensive and inappropriate medical interventions. Also, comprehensive pain management decreases the patient’s usage of medical appointments, thus overall decreasing medical expenditure.

Medications to treat neuropathic pain with allodynia in adolescents are multimodal. Topical analgesics including lidocaine 5% patches (which may be cut to size), or compounded lidocaine creams treat allodynia as well as facilitate desensitization. First line oral medication is typically gabapentin, starting at 5 to 10 mg/kg/day, divided in 3 daily doses. Typically the first dose is given at bedtime, and if tolerated
after 3 days, the dose is escalated to morning and evening, and finally 3 times daily. Gabapentin dosing is cumbersome for adolescents, particularly the midday dose which would normally be taken at school. Having your patient take the midday dose immediately after school may facilitate compliance. Pregabalin, which is normally dosed twice daily, is another reasonable alternative. Tricyclic antidepressants (amitriptyline or nortriptyline) may also be used as first line therapy or in addition to gabapentin, particularly if sleep is disturbed. Adolescents must be screened for suicidal ideation. Scheduled non steroidal anti inflammatory (NSAID) medications may be used, with counseling regarding risk of gastrointestinal pain. Long duration of action NSAIDs, such as naproxen or nabumetone, may facilitate compliance. Scheduled acetaminophen may also be additive for analgesia. Opioids are usually not effective, although the patient may perceive relief due to side effect of somnolence.

Interventional procedures may be considered in addition to medications. Typically a trial of topical and oral analgesics is trailed before starting injections, however, injections may be considered earlier depending on severity of pain and dysfunction. Injections typically include a long duration of action local anesthetic (bupivacaine 0.25% to 0.75%), with volume and concentration determined by weight of the patient and calculated toxic dose. Small amounts of steroids may be added to prolong duration of the injection (dexamethasone, triamcinolone or betamethasone). The patient and parents should be counseled regarding risk of injection, including skin dimpling from the steroid and pneumothorax with intercostal injections.

Should injections be beneficial but provide only temporary relief, the patient may benefit from SCS. SCS has been effective to treat chronic thoracic neuropathic pain in adults, however, a similar case in an adolescent has not been reported. SCS has been used with good success in adolescents for treatment of complex regional pain syndrome. The most common complication of SCS is lead migration requiring revision. Other complications include infection requiring explantation, nerve damage or bleeding. Contraindications include use of anticoagulation or untreated bleeding disorder, active infection, prohibitive anatomy (including after some spine surgery), or non compliance with follow up.

We typically perform a trail with a percutaneous lead to evaluate efficacy of SCS prior to implantation. SCS typically requires modest follow up. Initially after placement, the leads may require reprogramming due to modest migration. As the pain syndrome may change, the program may again need to be modified. The patient can titrate strength of stimulation to comfort, and turn the device on or off. In our patient, we anticipate removal of the system once the underlying neurologic injury from the VATS heals, and he has turned the SCS off for a period of weeks to months.

References: