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COURSE: **Cancer Pain**

DATES: **10/30/22 – 12/03/22**

FACULTY: **Xiaobin Yi, MD**
Jack Jennings, MD
Rajiv Shah, MD
Matthew Sanzalone, MD

TEXT:
Becker.wustl.edu → resources → e-books

1. **Approach to the Management of Cancer Pain.** Britni L. Lookabaugh MD and Charles F. Von Gunten MD, PhD. Essentials of Pain Medicine, Chapter 34, 299-308.e1

2. **Intravenous Infusions for Refractory Cancer and Chronic Pain States.** Sheetal K. DeCaria MD and Magdalena Anitescu MD, PhD. Essentials of Pain Medicine, Chapter52, 469-474.e1

3. **Vertebroplasty and Kyphoplasty.** Haroon Hameed MD, Mariam Hameed MD and Steven P. Cohen MD. Essentials of Pain Medicine, Chapter 70, 639-646.e2

4. **Neurolytic Sympathetic Blocks.** Sandy Christiansen MD and Michael Erdek MD. Essentials of Pain Medicine, Chapter 71, 647-654.e1

5. **Central and Peripheral Neurolysis.** Kashif Saeed MD, Meredith C.B. Adams MD, MS and Robert W. Hurley MD, PhD. Essentials of Pain Medicine, Chapter 72, 655-662.e1

6. **Implanted Drug Delivery Systems for Control of Chronic Pain.** David E. Jamison MD, Steven P. Cohen MD and Joshua Rosenow MD, FAANS, FACS. Essentials of Pain Medicine, Chapter 76, 693-702.e2

RESOURCES:

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Essentials of Interventional Cancer Pain Management. Gulati, Amitabh. Springer 2019

Gulati A, **Shah R**, Puttanniah V, Hung JC, Malhotra V. A retrospective review and treatment paradigm of interventional therapies for patients suffering from intractable thoracic chest wall pain in the oncologic population. Pain Med. 2015 Apr;16(4):802-10. doi: 10.1111/pme.12558. Epub 2014 Sep 19. PMID: 25236160.

Deer TR, Pope JE, Hayek SM, Bux A, Buchser E, Eldabe S, De Andrés JA, Erdek M, Patin D, Grider JS, Doleys DM, Jacobs MS, Yaksh TL, Poree L, Wallace MS, Prager J, Rauck R, DeLeon O, Diwan S, Falowski SM, Gazelka HM, Kim P, Leong M, Levy RM, McDowell G II, McRoberts P, Naidu R, Narouze S, Perruchoud C, Rosen SM, Rosenberg WS, Saulino M, Staats P, Stearns LJ, Willis D, Krames E, Huntoon M, Mekhail N. The Polyanalgesic Consensus Conference (PACC): Recommendations on Intrathecal Drug Infusion Systems Best Practices and Guidelines. Neuromodulation. 2017 Feb;20(2):96-132. doi: 10.1111/ner.12538. Epub 2017 Jan 2. Erratum in: Neuromodulation. 2017 Jun;20(4):405-406. PMID: 28042904.

Voormolen MH, Mali WP, Lohle PN, Fransen H, Lampmann LE, van der Graaf Y, Juttmann JR, Jansssens X, Verhaar HJ. Percutaneous vertebroplasty compared with optimal pain medication treatment: short-term clinical outcome of patients with subacute or chronic painful osteoporotic vertebral compression fractures. The VERTOS study. AJNR Am J Neuroradiol. 2007 Mar;28(3):555-60. PMID: 17353335; PMCID: PMC7977842.

Buchbinder R, Johnston RV, Rischin KJ, Homik J, Jones CA, Golmohammadi K, Kallmes DF. Percutaneous vertebroplasty for osteoporotic vertebral compression fracture. Cochrane Database Syst Rev. 2018 Apr 4;4(4):CD006349. doi: 10.1002/14651858.CD006349.pub3. Update in: Cochrane Database Syst Rev. 2018 Nov 06;11:CD006349. PMID: 29618171; PMCID: PMC6494647.

Kallmes DF, Comstock BA, Heagerty PJ, Turner JA, Wilson DJ, Diamond TH, Edwards R, Gray LA, Stout L, Owen S, Hollingworth W, Ghdoke B, Annesley-Williams DJ, Ralston SH, Jarvik JG. A randomized trial of vertebroplasty for osteoporotic spinal fractures. N Engl J Med. 2009 Aug 6;361(6):569-79. doi: 10.1056/NEJMoa0900563. Erratum in: N Engl J Med. 2012 Mar 8;366(10):970. PMID: 19657122; PMCID: PMC2930487.

Rousing R, Hansen KL, Andersen MO, Jespersen SM, Thomsen K, Lauritsen JM. Twelve-months follow-up in forty-nine patients with acute/semiacute osteoporotic vertebral fractures treated conservatively or with percutaneous vertebroplasty: a clinical randomized study. Spine (Phila Pa 1976). 2010 Mar 1;35(5):478-82. doi: 10.1097/BRS.0b013e3181b71bd1. PMID: 20190623.

Washington University in St. Louis
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Klazen CA, Lohle PN, de Vries J, Jansen FH, Tielbeek AV, Blonk MC, Venmans A, van Rooij WJ, Schoemaker MC, Juttmann JR, Lo TH, Verhaar HJ, van der Graaf Y, van Everdingen KJ, Muller AF, Elgersma OE, Halkema DR, Fransen H, Janssens X, Buskens E, Mali WP. Vertebroplasty versus conservative treatment in acute osteoporotic vertebral compression fractures (Vertos II): an open-label randomised trial. Lancet. 2010 Sep 25;376(9746):1085-92. doi: 10.1016/S0140-6736(10)60954-3. Epub 2010 Aug 9. PMID: 20701962.

Farrokhi MR, Alibai E, Maghami Z. Randomized controlled trial of percutaneous vertebroplasty versus optimal medical management for the relief of pain and disability in acute osteoporotic vertebral compression fractures. J Neurosurg Spine. 2011 May;14(5):561-9. doi: 10.3171/2010.12.SPINE10286. Epub 2011 Mar 4. PMID: 21375382.

Diamond T, Clark W, Bird P, Gonski P. Percutaneous Vertebroplasty for Acute Painful Osteoporotic Vertebral Fractures-Benefits Shown in VAPOUR Trial Masked When Pooled With Other Clinical Trials. J Bone Miner Res. 2019 Jun;34(6):1182-1184. doi: 10.1002/jbmr.3725. Epub 2019 May 28. PMID: 31136012.

Firanescu CE, de Vries J, Lodder P, Venmans A, Schoemaker MC, Smeets AJ, Donga E, Juttmann JR, Klazen CAH, Elgersma OEH, Jansen FH, Tielbeek AV, Boukrab I, Schonenberg K, van Rooij WJJ, Hirsch JA, Lohle PNM. Vertebroplasty versus sham procedure for painful acute osteoporotic vertebral compression fractures (VERTOS IV): randomised sham controlled clinical trial. BMJ. 2018 May 9;361:k1551. doi: 10.1136/bmj.k1551. Erratum in: BMJ. 2018 Jul 4;362:k2937. Smeet AJ [corrected to Smeets AJ]. PMID: 29743284; PMCID: PMC5941218.

BLOCK DESCRIPTION & OBJECTIVES

At the end of this block, fellows should be able to: 1) understand the indications for the use of ablation of tumor to treat bone pain. 2) understand the medical/interventional treatments of cancer pain. 3) understand the indication and data behind using vertebroplasty in the treatment of vertebral compression fracture. 4) Understand the basic principles of intrathecal analgesia pump therapy for chronic/cancer pain, indication, contraindication, catheter placement, medication selection, surgery, and complication management.

COURSE STANDARDS & PHILOSOPHY

Didactics are intended to supplement independent study and “hands-on” clinical learning. Fellows are expected to make every effort to arrive on time for all didactic sessions. Remember that active participation in the session enhances learning and generates further discussion.

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COURSE COMPONENTS

1. Virtual discussion – Weekly attending-led lecture held on Tuesday from 5-6pm, covering basic pain topics
2. Seminar – Weekly lecture held on Thursday from 6:30-7:30 am. Topics are selected to fulfill and/or complement the Pain Medicine Curriculum
3. Multidisciplinary rounds – Weekly case conference held on Thursday from 7:30-8:30 am designed to discuss complex pain cases with pain physician colleagues, clinical psychologists, physical therapists and a clinical pharmacist.
4. Journal Club – Weekly conference held on Friday from 6:30-7:30 am to discuss current literature influencing our pain medicine practice.
5. Cadaver session- Used to complement instruction in interventional pain management techniques.
6. Other (joint journal club, etc.)
7. Sample board review questions- Sample questions copied from a variety of board review sources meant to exemplify the type and depth of material the fellow should be studying. This is not meant to replace regular board review books or question banks.

DIDACTIC SEMINARS AND CONFERENCES

WEEK	DATES	VIRTUAL DISCUSSION (Tues 5-6 pm)	SEMINAR (Thurs 6:30-7:30 am)	MULTIDISC.	JOURNAL CLUB
1	10/30/22 – 11/05/22	**Dr. Rajiv Shah** Medical and Interventional Treatment of Cancer Pain (https://wustl-hipaa.zoom.us/j/95103283422)	**Dr. Aaron Chamberlain** Common shoulder diagnoses and treatments		Joint Journal Club Lam / Bertels Dr. Maeng (mentor)
2	11/06/22 – 11/12/22	**Dr. Xiaobin Yi** Introduction to intrathecal analgesia pump therapy for chronic/cancer pain (https://wustl-hipaa.zoom.us/j/99545074150)	**Drs. Hada Nahman-Averbuch and Sarah Buday** Considerations for the Transgender Patients		Miller/Sanzalone

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3	11/13/22 – 11/19/22	**Dr. Jack Jennings** Ablation of tumor to treat bone pain (https://wustl-hipaa.zoom.us/j/98276996547)	**Dr. Thomas Gedulig** Scholarly Presentation		Williams/Thang
4	11/20/22 – 11/26/22	**Dr. Matthew Sanzalone** Medical management of vertebral compression fracture. Indication of VTP vs Kyphoplasty. (https://wustl-hipaa.zoom.us/j/95114037388)	Holiday		Holiday
5	11/27/22 – 12/03/22	Cadaver	**Drs. Rao and Thang** Education		Joint Journal Club

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CADAVER LAB
Cadaver -

KEYWORDS FROM ITE 2016-2019	
Visceral pain and sensitization	Intrathecal granuloma: Dx
Anorexia and cachexia in cancer	Intrathecal opioids
Radiation induced brachial plexitis	Post-mastectomy neuralgia
Brachial plexopathy and cancer	Intercostal nerve block: Cx
Pancoast tumor: Dx	Cancer related pain: Drug tx
Cardiac effects of methadone	Neuropathic pain epidemiology: Cancer
Neurolytic blocks for cancer pain	Radiofrequency cordotomy: indic
Superior hypogastric plexus block	End-of-life and advance directives
Celiac plexus block: Cx	Chronic pain: post-surgery outcomes
Neurolytic celiac plexus complication	Bone cancer pain: Drug Rx
Neurolysis: Agents	Chemotherapy-induced neuropathy
Intrathecal drug delivery: Cx	Pleuritis: Dx
Intrathecal baclofen withdrawal: Dx	Prostate pain syndrome
Ziconotide: Mech of action	WHO pain relief ladder
Intrathecal rx: mechanism of action	

SAMPLE BOARD REVIEW QUESTIONS
A 36-year-old woman has a 2-year history of severe right upper quadrant abdominal pain radiating posteriorly to her back. Imaging reveals a head of pancreas tumor and physical examination is significant

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for a negative Carnett's test. Which of the following interventions is the **MOST** appropriate next step to reduce her pain?

A. Anterior abdominal cutaneous nerve injection

B. Celiac plexus injection

C. Lumborum quadratus block

D. Transversus abdominis plane block

Correct Answer:

B. Celiac plexus injection

Critique: Chronic abdominal pain should first be broken down into visceral and somatic pain. Carnett's test is positive when tenderness on palpation increases with contraction of the abdominal wall muscles and is negative when the pain lessens with contraction. A positive Carnett's test corresponds to somatic or abdominal wall pain, while a negative test points to a visceral etiology. Anterior abdominal cutaneous nerve, transverse abdominis plane, and lumborum quadratus blocks can all be used to manage or help diagnose somatic pain originating from the abdominal wall. A celiac plexus injection would block sympathetic innervation to the pancreas and would be the best next step for this patient with visceral pain.

A 78-year-old woman with metastatic rectal cancer presents with a 4-month history of progressively worsening anal pain. She has failed conservative therapy including use of a foam doughnut, NSAIDs, acetaminophen, duloxetine, and oral opioids. Which of the following neural elements is the **MOST** appropriate target of neurolysis?

A. Pudendal nerves

B. Ganglion Impar

C. Genitofemoral nerves

D. Superior hypogastric plexus

Correct answer:

B. Ganglion Impar

Key point: Neurolysis of the ganglion impar is an effective means of controlling sympathetically mediated pain in the anus.

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Critique: The ganglion impar or ganglion of Walther is an unpaired sympathetic ganglion that carries the neural fibers that supply afferent innervation to the anus. Neurolysis is typically considered in patients that are considered palliative if reasonable conservative care has failed to offer pain relief and a patient's pain is amendable to treatment with such a means. The ganglion impar is responsible for sensory innervation of the anus. While the other neural fibers listed do innervate other structures in the pelvic region, the ganglion impar is specific to the anus.

A 62-year-old woman with a pacemaker has breast cancer resected with close margins. She complains of thoracic paraspinal tenderness 6 months later, but a bone scintigraphy (bone scan) is normal. Which of the following is the **MOST** appropriate next diagnostic modality?

A. Chest x-ray

B. PET/CT scan

C. Diffusion weighted MRI

D. Bone biopsy

Correct answer:

B. PET/CT scan

Key point: A PET/CT scan, a highly sensitive and specific imaging modality using radiolabeled markers, can be completed when a bone scintigraphy is negative to detect early metastasis.

Critique: Bone scintigraphy (BS) is the most commonly used diagnostic tool to identify spinal bony metastasis because of its high specificity and ability to scan the entire body. But when bone scintigraphy is negative, a PET/CT scan with radiolabeled markers can be completed, is highly sensitive and specific, and can detect early metastasis. This patient is not able to receive an MRI because of her pacemaker; however, this modality can show the soft tissues and neural systems that may be relevant to this patient's care. While a bone biopsy would be the gold standard in diagnosing metastatic lesions, a lesion must be identified first.

A 37-year-old woman with a history of stage 3 breast cancer reports burning discomfort in the right anterior chest wall and axilla three months after right modified radical mastectomy and axillary lymph node dissection. In addition, she sometimes has a feeling "like my right breast is still present and it feels tight and swollen." Her neurologic exam is normal save for a patch of anesthesia and hyperalgesia around

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School of Medicine

the mastectomy scar and in the right axilla. An injury of which of the following nerves is responsible for this patient's complaints?

A. Axillary
B. Intercostobrachial
C. Long thoracic
D. Thoracodorsal

Correct answer:
B. Intercostobrachial

Key point: The intercostobrachial nerve arises from the second intercostal nerve and courses through the superficial axilla and innervates the axilla and the skin of the medial upper arm. It is one of the primary nerves, when injured that are responsible for persistent pain after breast cancer surgery.

Persistent pain after breast cancer surgery occurs in 20-60% of patients that are treated for breast cancer, even several years after surgery. It is a neuropathic syndrome and related to the injury of the intercostobrachial nerve, intercostal nerves (T2-T6), and other nerves in the region. The intercostobrachial nerve is what is responsible for the innervation of the axilla.

The axillary nerve supplies three muscles in the arm and the sensory innervation is to the shoulder. The long thoracic, thoracodorsal, and lateral/medial pectoral can also be injured, but these injuries tend to lead to functional deficits.

A 48-year-old man with stage IV lung cancer and who is undergoing chemotherapy is admitted to the palliative care floor for symptomatic management. He is experiencing breakthrough nausea, vomiting, and symptoms of neuropathic pain. Which of the following medications will **BEST** treat his symptoms during his admission?

A. Dronabinol

B. Promethazine

C. Droperidol

D. Metoclopromide

Correct answer:

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A. Dronabinol

Key point: Cannabinoid preparations are becoming valuable treatment options for chemotherapy-induced nausea and vomiting, appetite stimulation, and as an adjuvant regimen for chronic pain conditions.

Critique: Dronabinol has been shown to be effective as an adjuvant treatment for chronic pain patients as well as nausea and vomiting. Promethazine, droperidol, and metoclopromide are appropriate treatment options for nausea and vomiting; however, they are not effective for the treatment of neuropathic pain.

A 76-year-old woman has stage 4 metastatic ovarian cancer that is refractory to chemotherapy. She is receiving morphine. On exam she is cachectic, writhing with abdominal pain, and appears to be tachypneic, diaphoretic, and dyspneic. She is unable to speak in full sentences. The patient requests pain relief but her family is concerned with respiratory depression. Which of the following medication changes is **MOST** appropriate?

A. Titrate morphine upward

B. Start midazolam infusion

C. Administer furosemide bolus

D. Deliver inhaled albuterol

Correct answer:

A. Titrate morphine upward

Key point: Patients at the end of life should be treated symptomatically for pain, even at risk of respiratory depression.

Critique: Patients with severe pain at the end of life should be treated appropriately for pain relief. This is at the cornerstone of palliative care. The ethical principle of double effect allows for the administration of morphine, whose primary intention is to relieve pain, even with the unintended but expected side effect of respiratory depression. While anxiolysis is critical to palliative care, it is not intended as primary analgesia. The administration of diuretics and nebulizers may help with dyspnea, but will not address the patient's chief complaint of pain

Activation of which of the following receptors differentiates methadone's mechanism of action from that of fentanyl?

A. Peripheral mu

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B. Central kappa

C. Alpha-adrenergic

D. Central N-methyl-D-aspartate

Correct answer:

D. Central N-methyl-D-aspartate

Key point: Methadone is a mu opioid agonist and N-methyl-D-aspartate (NMDA) antagonist.

Critique: Methadone is both a mu-opioid receptor agonist and an NMDA receptor antagonist. Methadone has a similar mu-opioid receptor affinity to morphine but faster onset and longer elimination half-life. Nalbuphine, unlike methadone, acts secondarily on the central kappa opioid receptors. Gabapentin does not have any effect on opioid receptors, but rather antagonizes voltage gated calcium channels.