

1st Annual MSKCC Cancer Rehabilitation Symposium

Oncology Basics: Rehab Considerations
for Neurology and Neurosurgery Patients

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Objectives


- Understand:
 - Types and symptoms of primary and metastatic CNS tumors
 - Medical treatments and procedures
 - Precautions and contraindications
 - The cancer continuum and its impact on function and rehabilitation
 - Rehabilitation interventions and determine discharge needs



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CNS Tumor Characteristics

- Can be:
 - Benign or malignant
 - Primary or metastatic
- Prognosis depends on:
 - Type and grade of tumor
 - Location
 - Age
 - General health and functional status



CNS Tumor Risk Factors


- Hereditary diseases
- Disorders of the immune system
- Ionizing radiation
- Prior history of cancer (metastatic CNS disease)



Incidence of Oncology CNS Cases¹



< 1% chance that an individual will develop a malignant CNS tumor in his/her lifetime

Estimated New Cases for 2013			Estimated Deaths for 2013		
Both Sexes	Male	Female	Both Sexes	Male	Female
23,130	12,770	10,360	14,080	7,930	6,150




Brain Tumors

- Primary brain tumor types
- Metastatic brain tumors
- Symptoms
- Medical interventions





Primary Brain Tumor Types

- Most **common** primary brain tumors in adults:
 - Meningioma
 - Astrocytomas
 - Oligodendrogliomas
 - Schwannomas
 - Primary central nervous system lymphomas (CNS lymphoma)

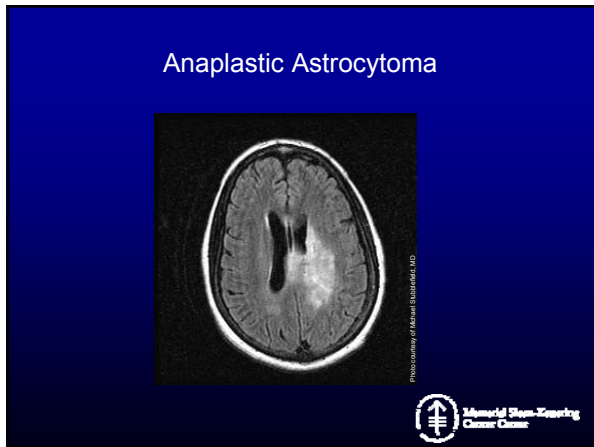


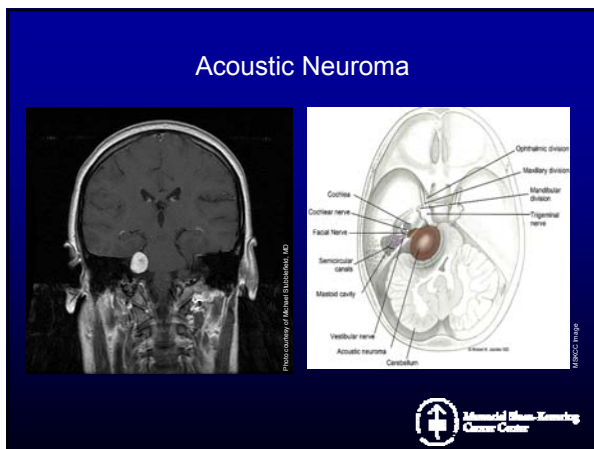
Primary Brain Tumors in Adults: ²	Meningiomas	High Grade (3 & 4) Astrocytomas (Anaplastic astrocytoma and glioblastoma)	Low Grade (1 & 2) Astrocytomas
Origin	Membranes lining the skull, covering the brain	Supportive cells of the brain (astrocytes)	
Characteristics	Affect twice as many women as men; very rarely spread	Grow rapidly and invade nearby tissues	Slow growing
Treatment Approaches	Often curable with surgery	Surgery, radiation, and chemotherapy	Surgery or radiation
Incidence	Account for 27% of primary brain tumors	Account for about 25% of primary brain tumors	Less than 10% of primary brain tumors



Primary Brain Tumors in Adults: ²	Oligodendrogliomas	Schwannomas (Acoustic neuromas)	CNS Lymphomas
Origin	Oligodendrocytes	Schwann cells of vestibulocochlear nerve	Lymph tissue of brain, spinal cord, meninges, eye
Characteristics	Often occur in frontal or temporal lobe; can be low grade or high grade	Benign tumor and usually very slow growing	Develops in people with compromised immune systems
Treatment approaches	Surgery, radiation, and chemotherapy	Surgery and radiation	Chemotherapy and/or radiation
Incidence	Less than 3% of primary brain tumors	Account for 7% of all CNS tumors	Account for 2% of primary brain tumors








Metastatic Brain Tumors³

- 10x **more** common than primary brain tumors
- Cancers **originating** in the lung, breast, colon, kidney, along with malignant melanoma, are most likely to metastasize to brain
- 5% to 25% of cancer patients will develop brain mets
- About half of patients with brain metastases will have multiple brain lesions
- Typically associated with a **poor prognosis**; median survival < 6 months⁴



Metastatic Colon Cancer to Brain

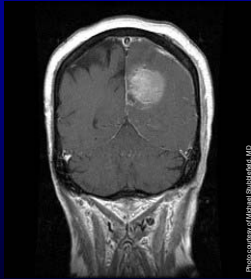




Photo courtesy of Thomas S. Subramanian, MD





Brain Tumors

- General symptoms / presentation
 - **Headache**
 - **Seizures**
 - Nausea and vomiting
 - Neurological dysfunction (hemiparesis, visual field cut, sensory loss, aphasia)
 - Cognitive / behavioral changes
 - Site specific focal symptoms




Medical Interventions for Brain Tumors

- Surgical procedures
 - Biopsy
 - Craniotomy
 - VP shunt
 - Ommaya reservoir
- Radiation
- Chemotherapy
- Corticosteroids




Surgery

- Types
 - Biopsy
 - Surgical removal of a sample of tumor tissue
 - Craniotomy
 - Incision made in skull
 - Removal of skull (bone flap) overlying tumor
 - Resection of tumor
 - Replacement of bone flap




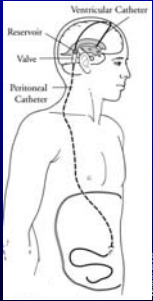
Surgery

- Goals:
 - Provide a tumor sample to establish an accurate diagnosis
 - Remove as much of the tumor as possible
 - Relieve seizures





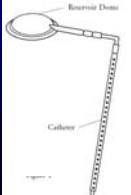
Ventriculoperitoneal Shunt (VP Shunt)

- Shunt placed to relieve blockage or excess fluid
- Relieve intracranial pressure




Ommaya Reservoir

- Used to:
 - Obtain samples of CSF used to find cancer cells or infection in lining of brain
 - Deliver chemotherapy and antibiotics into the CSF





Radiation Therapy

- Types:
 - Whole Brain Radiation Therapy (WBRT)
 - Stereotactic Radiation Therapy
 - Intensity Modulated Radiation Therapy (IMRT)
 - Image-Guided Radiation Therapy (IGRT)
- Indications:
 - After surgery to destroy any remaining tumor cells
 - To treat tumors that cannot be surgically removed and for metastatic brain tumors
 - To relieve symptoms




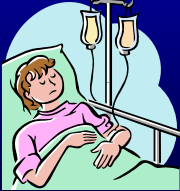
Radiation Therapy

- Possible side effects:
 - Fatigue
 - Nausea
 - Vomiting
 - Decreased cognition and memory
 - Radiation necrosis




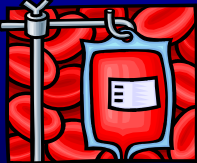
Chemotherapy

- Blood brain barrier
- Methods of delivery
 - Systemic
 - Oral
 - IV
 - Local
 - Wafers
 - Ommaya reservoir





Chemotherapy

- Possible side effects:
 - Fatigue
 - Headaches
 - Nausea
 - Vomiting
 - Infection
 - Easy bruising or bleeding
 - Peripheral neuropathy





Corticosteroids (Decadron)

- Decrease edema around the tumor
- Improve neurological symptoms
- Help relieve pre-surgery symptoms such as headache
- Used following surgery or radiation
- Used for recurrent or metastatic brain tumors



Corticosteroids (Decadron)

- Common side-effects
 - Proximal muscle weakness / wasting
 - Osteoporosis
 - Weight gain
 - Hyperglycemia
 - GI problems
 - Insomnia and mood changes
 - Decreased immune response



Spinal Cord Disease



Spinal Cord Disease

- Characteristics and symptoms
- Spine tumor types
- Medical interventions and general precautions






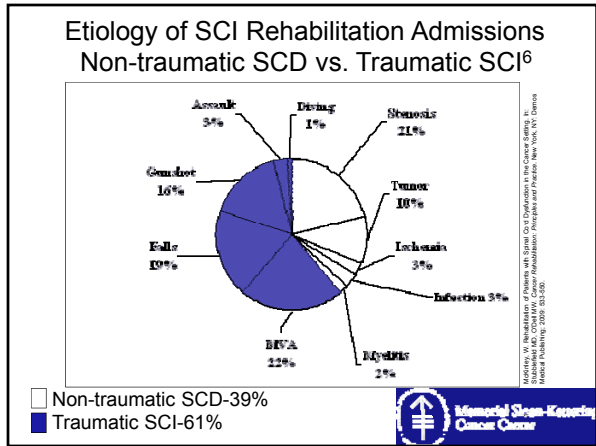
Photo Courtesy: Pathology, Brookhaven, MD



Spine Tumor Characteristics

- Growing tumors cause spinal cord compression
- Location of the lesion in spinal cord determine symptoms
- Severity of symptoms does not correlate with tumor size
- Primary tumors in spinal cord are rare compared to brain (1 spine: 4 brain)⁵
- Majority of spinal tumors are metastatic





Spinal Cord Disease Symptoms

Pain	Neurological Deficits	Clinical Signs
Biologic	Loss of Sensation	Palpation Tenderness
Mechanical Instability	Paresis/Loss of Motor Function	Hypoactive DTR
Radiculopathy	Ataxia	Hyperreflexia, clonus, +Babinski
	Loss of Bowel and Bladder	

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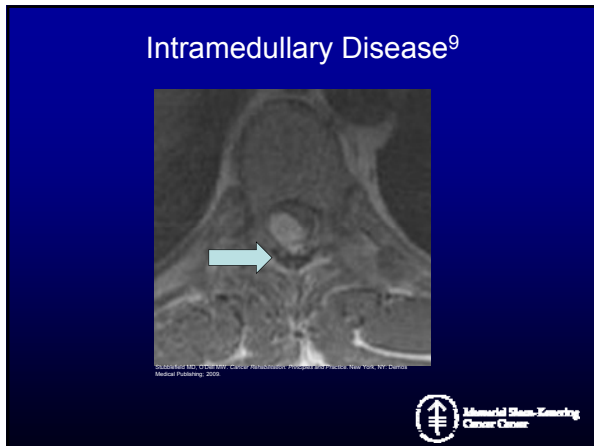
Spine Tumors

	Intraductal	Intradural/Leptomeningeal	Extradural
Location			
Incidence ⁷			
Symptoms			

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Spine Tumors⁸

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Metastatic Spine Tumors

- 30-70% of patients with skeletal mets will have vertebral involvement⁷
- Systemic treatments have improved survival leading to an increased number of metastases
- **Breast** (women), **lung** (men), prostate, and thyroid and kidney most common origins
- Paravertebral involvement and pathological fracture cause pain
- Frequency of location of resected metastatic tumors from highest to lowest are thoracic, lumbar, cervical and sacral¹⁰



Medical Intervention

Goals

- Alleviate pain
- Local tumor control
- Mechanical stability
- Decompress spinal cord
- Improve neurological function
- Improve quality of life

Treatments

- Local therapies:
 - Radiation and surgery
- Systemic therapies:
 - Chemotherapy
 - Medications

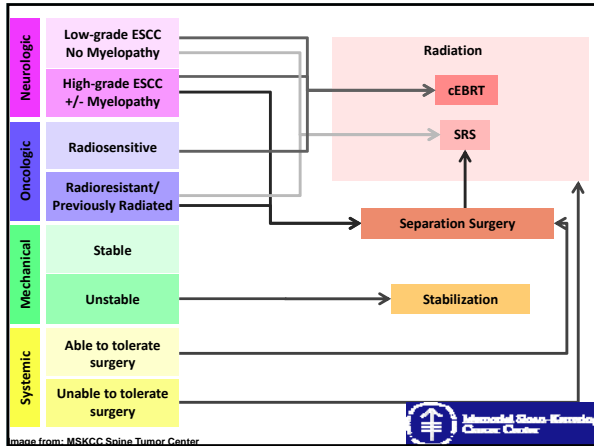


Medical Intervention

• NOMS framework¹¹



- **N**eurologic
 - Myelopathy
 - Functional radiculopathy
 - Degree of epidural spinal cord compression
- **O**ncologic
 - Tumor histology
 - Radiation or chemosensitivity
- **M**echanical instability
- **S**ystemic disease and medical co-morbidity





Radiation

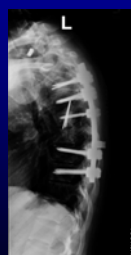

- External Beam RT
 - Conventional EBRT (Radiosensitive)
 - Stereotactic radiosurgery (Radioresistant)
 - Image-guided intensity modulated
- Internal RT
 - High-dose rate brachytherapy
- Radiation Considerations
 - Wound healing
 - Radiation necrosis

Surgery

Surgical procedures



- Percutaneous cement augmentation
 - Kyphoplasty
 - Vertebroplasty
- Posterolateral decompression (laminectomy)
- Posterior segmental fixation

Surgery



Surgical Considerations

- CSF leak
- Wound dehiscence
- Bracing
- Spine precautions





Chemotherapy

- Systemic therapy used to slow the growth of metastatic spine tumors and reduce risk of vertebral fractures
- Treats metastatic disease typically arising from lymphoma, myeloma, breast and prostate CA





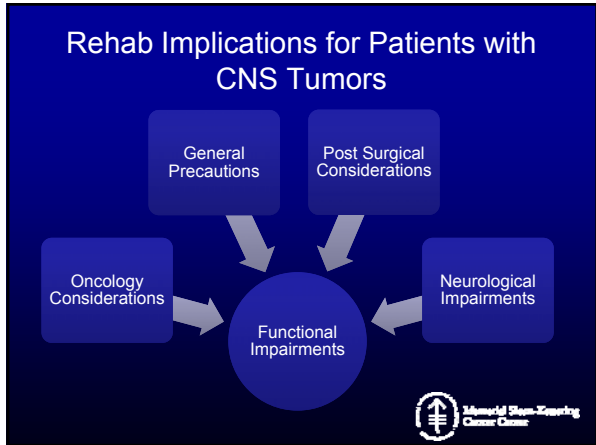
Medications

- Narcotics/Pain medications (Percocet)
- Corticosteroids (Decadron, Dexamethasone)
- NSAIDS, anti-inflammatory (Toradol, Naproxen, Celebrex, Voltaren, Mobic)
- Muscle relaxors (Baclofen, Valium)
- Neurogenic pain meds (Lyrica, Neurontin)

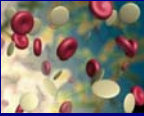


Neurology / Neurosurgery Rehabilitation






Rehab Implications for Patients with CNS Tumors





- General oncology considerations
 - Pain, fatigue, DVT/PE, bony metastasis, lab values
- Precautions
 - Seizure, spinal cord compression fracture, fall, safety
- Post-surgical considerations
 - Wound dehiscence, CSF leak, crani, spine precautions





Craniotomy Precautions

- HOB at 30 degrees
- Avoid bending forward
- Avoid strenuous activities
- No isometric exercises
- Avoid Valsalva maneuver
- No patient helper / trapeze
- Monitor for activities that increase pain, headache





Spine Precautions

- No bending, lifting, twisting (BLT)
- 5 lb lifting limit
- No bilateral horizontal adduction
- No resistance for MMT or ther-ex
- Range of motion restrictions
- No trapeze
- Log roll
- Monitor for activities that increase pain, headache or appearance of clear fluid





Rehab Implications for Patients with CNS Tumors

- Neurological impairments
 - Cognition, speech, vision, strength, spasticity, coordination, sensation, neglect, bowel/bladder
- Functional impairments
 - Ambulation / mobility, balance, ADL performance

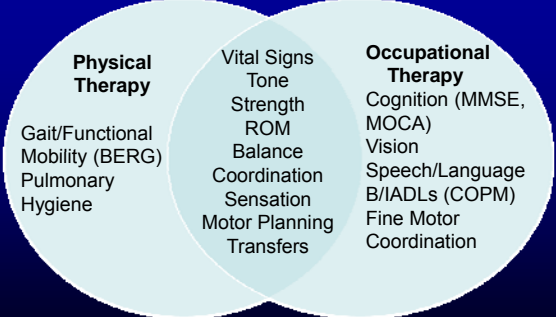


Evaluation Process in Acute Care


- Reasons for OT/PT referral:
 - Symptom presentation / decline in function
 - Post-operative patients
 - Evaluation for discharge recommendations and DME needs

Evaluation Process in Acute Care





Physical Therapy	Overlap	Occupational Therapy
Gait/Functional Mobility (BERG)	Vital Signs	Cognition (MMSE, MOCA)
Pulmonary	Tone	Vision
Hygiene	Strength	Speech/Language
	ROM	B/IADLs (COPM)
	Balance	Fine Motor
	Coordination	Coordination
	Sensation	
	Motor Planning	
	Transfers	





Goal Setting for Patients with CNS Tumors

- Considerations:
 - Functional limitations / deficits
 - Medical intervention / treatment options
 - Progression across the cancer continuum
 - Patient centered goals
 - Family / caregiver support
 - Quality of Life


Physical Therapy for Patients with CNS Tumors

- Gait / stair training
- Neuromuscular Re-education (NDT, PNF, Neuro-IFRAH ®)
- Vestibular rehab
- Transfer training
- Therapeutic exercises
- DME training
- Family education / training
- Pulmonary hygiene
- Positioning
- Orthotic training
- Education of crani / spine precautions




PT Goal Setting in Acute Care

- Patients with brain tumors
 - **Goal 1:** Patient will ambulate at least 250 ft wearing a R AFO with RW and min assist x 1 to ambulate in home safely.
 - **Goal 2:** Patient will demonstrate good dynamic standing balance to ambulate on level and uneven surfaces safely.



PT Goal Setting in Acute Care

- Patients with spine tumors
 - **Goal 1:** Patient will perform all bed mobility maintaining spine precautions with modified independence to prep for bed mobility safely.
 - **Goal 2:** Patient will demonstrate minimal assist with sliding board transfer between bed and wheelchair with caregiver to decrease risk for skin breakdown.




Occupational Therapy for Patients with CNS Tumors

- Neuromuscular Re-education (NDT, PNF, Neuro-IFRAH ®)
- Transfer training
- Therapeutic exercise
- Bowel / bladder training
- AE/DME training
- Energy conservation
- Family education / training
- Cognition
- ADL training
- Positioning
- Splint fabrication
- Education of crani / spine precautions
- Psychosocial support





OT Goal Setting in Acute Care

- Patients with brain tumors:
 - **Goal 1:** Pt will be educated in memory compensation strategies to complete multi-step kitchen task with Mod I and min VC to increase ADL performance.
 - **Goal 2:** Pt will don shirt with Min A demo modified single-armed dressing technique to increase participation in ADLs.





OT Goal Setting in Acute Care

- Patients with spine tumors:
 - **Goal 1:** Pt will perform all surface transfers with Mod I and AD prn while maintaining spine precautions to increase safety with OOB ADLs.
 - **Goal 2:** Pt will complete LE dressing with Mod I using AE prn to maintain spine precautions and increase indep with ADLs.




Discharge Planning

- Consider functional status, prognosis, rehab potential, family/caregiver support, home environment, patient's goals
- Home discharge:
 - Determine DME needs
 - Level of assistance needed
 - Therapy needs (home, outpatient)
- Inpatient discharge settings:
 - Rehab hospital (SAR, acute)
 - Nursing home (SNF)
- Palliative care (hospice)




Evidence Based Practice¹²

- Use of vestibular adaptation exercises after acoustic neuroma resection results in:
 - Improved postural stability both in stance and during ambulation
 - Decreased perception of disequilibrium during early stage of recovery



Evidence Based Practice¹³

- Support for inpatient acute rehabilitation for patients with brain tumors:
 - Patients with brain tumors have functional gains comparable to those of patients with stroke in acute rehab setting
 - Patients with brain tumors had a shorter length of stay than stroke patients
 - Both groups had high rates of discharge to the community



Evidence Based Practice

- Support for inpatient acute rehabilitation for patients with spine tumors:
 - 84% of patients with neoplastic spinal cord compression (SCC) were discharged home from rehab; 75% of those patients maintained their mobility, gait and transfer abilities for >= 3 months¹⁴
 - Patients with metastatic tumor related SCI demonstrated improved FIM scores (62 to 84) after stay at inpatient rehab SCI unit¹⁵
 - Patients with SCC due to cancer have similar functional outcomes as patients with traumatic SCI in the rehab setting¹⁶
 - Patients with neoplastic SCC have significantly shorter length of stay than traumatic SCI¹⁷



Conclusion

- CNS tumors are statistically very rare, but have profound effects on a patient's function and QOL
- Physical and occupational therapists must consider and educate patients on precautions and activities that may lead to post-treatment complications
- It is important to consider a patient's stage of disease and prognosis when setting goals
- Physical and occupational therapists play a vital role in restoring function and QOL in the oncology neurology/neurosurgical patient



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