Overview of Kyphoplasty in the Management of Spinal Tumors

Surgical Technique and Application in Multiple Myeloma

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Clinical Presentation of Patient with Multiple Myeloma in the Spine

- Pain
- Neural Impairment
- Spinal Instability
- Deformity
Multiple myeloma in the spine characteristically leads to osteolysis, fracture, and progressive kyphotic deformity.
Clinical Presentation of Patient with Multiple Myeloma in the Spine

**Spinal Deformity:**
- Vertebral body infiltrated with tumor cells
- Endplate fracture due to axial load
- Potential retropulsion of the posterior vertebral wall
- Cervical/Lumbar spine: Symmetric collapse
- Thoracic Spine: Kyphosis
Clinical Presentation of Patient with Multiple Myeloma in the Spine

**Neural Impairment**

- <10% of patients present with neural deficit
- Radiculopathy (lumbar)
- Myelopathy/weakness (thoracic)
- Sensory deficits
- Bowel/Bladder dysfunction
Treatment Options

Critical Importance of Spinal Stability:

- The stable spine is able to withstand physiologic loads without fracture, progressive deformity, or risk to the neural elements.
GW

- 38-year-old with lymphoma, diagnoses in 6/01
- Treated with chemotherapy and radiation to spine
- Patient with progressive back pain and right leg weakness presents for urgent evaluation
Treatment Options

Stable Spine:

- Radiation Therapy/Chemotherapy
  - Reliable for pain relief in responsive tumors
    - Myeloma/Solitary Plasmacytoma, Lymphoma, Breast, Lung
  - Regional selectivity with cyberknife
  - Pre-treatment neurologic status is predictive of post-treatment neural function
Radiation Therapy

- May leave bone unstable
- Radiation may increase risk of fracture\(^1\)
  - Up to 41% of patients who undergo radiation experience bone fractures
- Cannot correct an anatomic abnormality such as a fracture\(^2\)

Unstable Spine

Operative Stabilization may be the most reliable methods for restoring stability to the spine and correcting deformity due to pathologic fracture.

• Open Reconstruction
• Kyphoplasty
Indications for Operative Care

- Progressive neural deterioration
- Progressive deformity of the spine
- Osseous impingement of neural elements
- Radio-resistant tumor
- Diagnosis
- Intractable pain despite nonoperative care
Spinal Column Reconstruction

- En Bloc Excision
- Marginal Excision
54-year-old with open reconstruction and XRT

Significant post-operative complications
Vertebral Augmentation as a Minimally Invasive Technique for the Management of Spinal Tumors
86-year-old
Progressive back pain and progressive kyphotic deformity after fall in 12/00
History of multiple myeloma
1) The balloon is inserted into the fractured vertebral body
2) The balloon is inflated, reducing the fracture and elevating the endplates.
Minimally Invasive Fracture Reduction
Overview of Treatment Steps

3) The balloon is deflated and withdrawn, leaving a cavity within the vertebra.
CA

- 46-year-old
- Diagnosed with MM in 6/02
- Preparing for bone marrow transplant
- Developed progressive back pain and deformity to spine over 3 months, hospitalized for pain management
MW

- 57-year-old
- Diagnoses with multiple myeloma in 12/03
- Treated with chemotherapy and XRT to spine
- Developed progressive spinal deformity and neural compromise
- Transferred for surgical evaluation
Vertebral Augmentation and Multiple Myeloma

Indications:

- Adjuvant or supplement to radiation/chemotherapy
- Restoration of height and stability in vertebral body affected by myeloma and fracture
- Treatment of pain related to vertebral insufficiency
- Role of prophylactic intervention to prevent fracture?
Surgical Outcomes

Axial skeleton involved in majority of patients
- Thoracic spine 59%
- Lumbrosacral spine 31%
- Cervical spine 10%

Spine involvement results in severe pain & progressive Kyphosis
Patient Demographics

- 242 levels treated in 52 patients with myeloma, (May 1999 – September 2002)

- Mean age 60 years (34-82)

- Mean follow-up 6 months

- Mean duration of symptoms = 11 months (Failed non-operative treatment)

- Patients with Plasmacytomomas & posterior cortical insufficiency were excluded

First 18 patients published in Journal of Clinical Oncology, May 2002
Levels Treated
Multiple Myeloma Series

T6
T8
T10
T11
T12
L1
L2
L4
L5
Kyphoplasty Case
Multiple Myeloma

Depressed endplate
Buckled anterior cortex
Reduced

Augmented
Myeloma Patients Results

- All patients tolerated the procedure well
- Virtually all reported some immediate relief of their symptoms
- Discharge >70% same day
SF-36 Outcome
Multiple Myeloma, n = 52 (242 levels, 6 month F/U)
VAS & ODI outcome scores
Multiple Myeloma, n = 52 (242 levels, 6 month F/U)
Conclusions

An assessment of stability of the spine

Stable Spine
  • Radiation/chemotherapy
  • Vertebral augmentation for persistent pain

Unstable spine
  • Open treatment for neural compromise
  • Vertebral augmentation with or without instrumentation with no neural deficit.
Algorithm for the Management of Myeloma Involving the Spinal Column

Diagnosis and Staging

Solitary Tumor
- Radiation

Widely Metastatic Disease
- Stable Spine
  - Radiation
  - Kyphoplasty
- Unstable Spine
  - Open Surgical Fixation
    +/− kyphoplasty
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