Complications of Bone Metastases in Prostate Cancer: A Radiation Oncologist’s Perspective

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Faculty Disclosure Statement

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- **Honorarium/consultant fees/ grant:**
  - Amgen, Janssen, Bayer, Astellas

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Key Learning Objectives

By participating in this session, health care professionals will:

• Describe four skeletal related events secondary to bone metastases
• Understand the role of the radiation oncologist in managing skeletal related events
• Present a case to illustrate the management and impact of skeletal related events in a patient with metastatic prostate cancer
Complications of Bone Metastases in Prostate Cancer: A Radiation Oncologist’s Perspective

ICUC 2015

Brita Danielson MD FRCPC
Radiation Oncology,
Cross Cancer Institute
Overview

- Bone metastases and skeletal related events (SREs)
- Role of radiation oncology in managing SREs
- Metastatic prostate cancer: A case illustration
COMMON!

- Much more common than primary bone tumors
- 3rd most common site of metastatic disease (after lung and liver)

Breast, prostate, and lung cancers account for >80% of bone metastases

With improved effective systemic therapies and supportive care, cancer patients are living longer with bone metastases
The Majority of Patients With Advanced Prostate Cancer are Likely to Get Bone Metastases

Percentage of Patients with Bone Metastases

<table>
<thead>
<tr>
<th>Condition</th>
<th>% of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate Cancer†</td>
<td>90</td>
</tr>
<tr>
<td>Breast Cancer*2</td>
<td>73</td>
</tr>
<tr>
<td>Thyroid*3</td>
<td>60</td>
</tr>
<tr>
<td>Bladder Cancer*3</td>
<td>40</td>
</tr>
<tr>
<td>Lung Cancer*2</td>
<td>36</td>
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*Data are from autopsy studies.
†Data based on castrate and non-castrate patients where bone lesions detected by radionuclide bone scan

Consequences of Bone Metastases: Skeletal Related Events (SREs)

- Radiotherapy to Bone
- Spinal Cord Compression
- Pathologic Fracture
- Surgery to Bone
The Radiation Oncologist and SREs

Radiation to Bone
Pathologic Fracture
Surgery to Bone
Spinal Cord Compression

Bone Pain

The Radiation Oncologist and SREs

- Radiation to Bone
- Pathologic Fracture
- Surgery to Bone
- Spinal Cord Compression

RT to bone  RT to bone  RT to bone
1) Radiation to Bone

- **Goals of palliative RT to bone:**
  - Pain relief
  - Decrease analgesic requirements
  - Preserve function (mobility, personal care activities, daily activities)

- **Logistics:**
  - Planning CT scan
  - Treatment often given in a single fraction (uncomplicated bone mets)
    - In BC, 56% of patients with bone mets from prostate cancer are treated with a single fraction (Olson et al, Int J Radiat Oncol Biol Phys, 2014)
1) Radiation to Bone

- **Response to palliative RT:**
  - At least 60% of patients have an improvement in pain after initial RT, whether receiving single or multiple fractions
  - If repeat palliative RT is given, overall response rates are higher (80%)
  - Therefore, a single fraction should be the treatment of choice for uncomplicated painful bone mets
  - Multiple fractions (5-10) usually preferred for “complicated” bone mets
The Radiation Oncologist and SREs

Radiation to Bone
Pathologic Fracture
Surgery to Bone
Spinal Cord Compression

“Complicated” bone mets
2) Pathologic Fracture

- **Orthopedic surgery** consultation first: role of surgery for fixation?
  - If surgery: post-op RT
  - If no surgery: RT alone

- RT given in 5-10 fractions
3) Surgery to Bone

- Surgery performed for pathologic fracture, or “impending” pathologic fracture
  - Risk of pathologic fracture:
    - weight-bearing bone (femur)
    - lytic lesion, >2.5cm
    - >50% circumferential cortex destruction
    - pain with weight-bearing

- RT given post-op (5-10 fractions)
  - pain control
  - prevent loosening of hardware from tumor progression
4) Spinal Cord compression

- **Neurosurgery consultation first: role of surgery for decompression?**

- Randomized evidence that surgery + RT is better than RT alone (Patchell, NEJM 2005)
  - *Design*: patients randomized between surgery → RT vs RT alone
  - *Criteria*: life expectancy of >3 mos, recent onset symptoms, single level of compression
  - *Results*: with surgery, more patients regained ability to walk, retained ability to walk longer, less narcotic and steroid requirements, ↑ QOL, ↑ median survival by 1 month (from 3 to 4 mos)
4) Spinal Cord compression

- If surgery done, post-op RT given with 2 weeks of surgery
  - Longer if concern regarding wound healing
- If surgery not possible, RT alone
- Role of RT in spinal cord compression:
  - pain control
  - preserve neurologic function
  *Pre-RT neurologic function is the strongest predictor of post-treatment function*
Case Study

Mr. H.N.
Mr. H.N.

- 54 year old man from Edmonton
- Developed diplopia
- On exam: left 6\textsuperscript{th} cranial nerve palsy
- Family Physician arranged MRI brain …
Multiple metastatic deposits involving the skull base and cervical spine

1.5 cm lesion seen to be filling Meckel's cave on the left, likely responsible for left 6th cranial nerve palsy.
Mr. H.N.

- Also complained of back, hip, and knee pain
- GP arranged x-rays of L-spine, pelvis, and hips
  - Multiple lytic and sclerotic foci consistent with metastatic disease
  - Lytic lesion in right proximal femur at risk of pathologic fracture
- Admitted to hospital for further management
Investigations:

- **PSA:** 3,087

- **CT scan chest, abdomen, and pelvis:**
  - multiple lytic and sclerotic bone mets, no LN mets

- **Bone scan:**
  - extensive bone metastases involving the entire spine (from skull base to pelvis), rib cage, scapulae, clavicles, sternum, proximal humeri, and bilateral femora
Mr. H.N.

- Started on leuprolide and bicalutamide
- The next day, developed new leg weakness and urinary retention
- An MRI of the spine was arranged....
MRI Spine

Pathologic fracture at T6 associated with soft tissue in the anterior epidural space, causing compression of the thecal sac and spinal cord.

Posterior epidural space involvement at T9 with minimal spinal cord compression.
Tumor in the posterior epidural space of L2, L3, and L4 (impending cauda equina compression)
SRE: spinal cord compression, surgery to bone

- Underwent instrumentation of T3 to T9, with T6 decompression
  - Pathology from bone fragments confirmed metastatic adenocarcinoma of the prostate
SRE: surgery to bone

- A few days later, underwent a right femur intramedullary nailing for impending pathologic fracture
- Transferred to subacute care
- Referred to Cross Cancer Institute for palliative radiotherapy
Initial radiation oncology consultation

- Requiring inpatient care
- Limited mobility, with leg weakness and numbness
- Ongoing back pain
- No obvious cranial nerve deficit
SRE: RT to bone

Discussed **palliative radiotherapy** with patient:

- **T-spine**: spinal cord compression
  - To help with back pain, prevent further neurologic compromise, and prevent destabilization of the hardware from tumor progression
Discussed palliative radiotherapy with patient:

- **T-spine**: spinal cord compression
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- **L-spine**: impending cauda equina compression
  - To help prevent future neurologic compromise
SRE: RT to bone

Discussed palliative radiotherapy with patient:

- **T-spine**: spinal cord compression
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- **L-spine**: impending cauda equina compression
  - To help prevent future neurologic compromise

- **Base of skull**: multiple metastatic deposits
  - To prevent recurrent cranial nerve deficits and future neurologic deficits
SRE: RT to bone

Discussed palliative radiotherapy with patient:

- **T-spine**: spinal cord compression
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- **L-spine**: impending cauda equina compression
  - To help prevent future neurologic compromise

- **Base of skull**: multiple metastatic deposits
  - To prevent recurrent cranial nerve deficits and future neurologic deficits

- **Right femur**: post-op for impending pathologic fracture
  - To help with pain and prevent destabilization of the hardware from tumor progression
Palliative RT

- Given to all 4 sites concurrently
  - 5 daily fractions over 1 week

- Advised re: possible side effects of palliative RT
  - Fatigue
  - Skin erythema over treated area
  - Possible “pain flare”
    - Temporary worsening of pain before improvement
    - Managed with increased use of analgesics
    - Decadron may help to prevent pain flare
  - Nausea, vomiting (if treatment over abdomen) and loose stool, diarrhea (if treatment over pelvis)
    - minor and very short term
Mr. H.N.

- Over the next 2 years, patient experienced more SREs, and several courses of palliative RT required.…
  
  - **Pathologic fracture** of right humerus (not operable)
  
  - Received **palliative RT** (5 fractions)
Mr. H.N.

- Spinal cord compression at T11
- Received palliative RT (5 fractions)
Mr. H.N.

- **Palliative RT** to right pelvis and right shoulder (repeat RT) for bone pain not controlled with opioids (single fraction to both sites)
## Impact of SREs

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- Reduced quality of life
- Loss of autonomy
- Increased healthcare costs and resources
Patient QOL and Autonomy

- Multiple trips to cancer centre for radiation treatment
  - Discomfort and inconvenience of travel, time away from family, discomfort of simulation/treatment

- Reliance on family members and health care providers
  - Immobility (pain, weakness, neurologic dysfunction)
  - Help with personal care and transportation to appointments
Best management of SREs: Prevention!

- Consider bone-targeted therapy in patients with bone metastases.
- Stay tuned....
Summary

- Bone metastases and SREs are common in prostate cancer
- Radiation therapy plays a role in all SREs
- SREs affect patient QOL and have a large impact on our healthcare system
- *Prevention* of SREs is important!