Role of En Bloc Resection in Malignant Spine Tumors

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Case

• 44 year old man
  – Complaining of pain in back
  – Fairly constant and worse at night
  – Not relieved with medications
  – Neurologically without deficit

Oncologic Principles

• Lessons from long bones
  – High propensity for local recurrence
  – Usually due to incomplete surgical resection via intralesional techniques
  – En bloc technique is superior for primary malignant bone tumors outside the spine

Definitions

• Many words used among ourselves and in literature which remain confusing
  – Vertebrectomy
  – Spondylecotmy
  – Corpectomy
• Little meaning without a descriptor

Disclosures

• Royalties
  – Biomet Spine
• Consulting
  – Biomet Spine
  – Intellirod
• Speaking/education
  – Stryker Spine
  – Globus
• Board Membership
  – Vice President-Congress of Neurological Surgeons
  – Secretary-Council of State Neurosurgical Societies
  – Chair-Exhibits Committee-DSPN
Weinstein-Boriani-Biagini

- Curettage: piecemeal removal
  - intralesional
- En bloc: whole tumor in one piece
  - intralesional
  - marginal (pseudocapsule)
  - Wide (shell of normal tissue)


En bloc Resection

Primary Bone Tumor Location

Surgical Indications Based on Pathology

- Determined by biopsy
  - Should be guided by spine surgeon oncologist
  - Proper orientation and planned resection
  - Permanent marking is encouraged
  - Closed CT based biopsy FNA or via trochar
  - Biopsy done at outside institution especially if open has been associated with greater risk of recurrence
  - Fourney et al. noted 78% disease free survival if biopsy and surgery done at index institution vs. 55% if prior procedure done at other facility

Pathology

- Lymphoma
- Hodgkin’s disease
- Ewing’s
- Osteosarcoma
- Chordoma
- Sclerosing fibrous dysplasia

Exceptions:
- Noted fibrous dysplasia
- Giant cell granuloma
- Osteoid osteoma

Biopsy

- At times one has only one chance for cure or long term survival with these lesions
- Begins at time of biopsy
- Berg et al. 2000
  - Independent risk factor for tumor recurrence was invasive procedure done outside of index institution

Staging

- Determines the feasibility of En Bloc
  - CT and MRI of spine lesion
  - Often times MRI of rest of neuroaxis
  - CT chest abdomen and pelvis
  - PET scan
- Should be performed at a multidisciplinary spine tumor board

Staging MSTS/Enneking

- Grade IA-IIB primary bone tumor are indicated for wide en bloc resection
  - Also for benign giant cell tumor
- Invasion into nearby unresectable structures precludes wide resection
- Tumor must be able to be removed in 1 piece without disruption vital structures
  - If tumor completely encircles the spinal cord may not be possible
- Upfront chemotherapy in sarcoma


Weinstein-Boriani-Biagini


Posterior Arch Resection
Does Staging Help?

- Fisher et al. Spine 2005
  - Prospective study suggesting that appropriate staging can be applied to the mobile spine with acceptable morbidity, mortality and HRQOL
  - Goal of wide or marginal excision in 23 or 26 primary spine tumors (88%)
    - Follow-up short in their study
    - No local recurrence when principles followed

Should En Bloc Be Performed

- Histopathologic diagnosis
- Staging
- Corridor to deliver spinal cord and roots
- Appropriate coordination with medical and radiation oncology, vascular, colorectal, ENT, plastic surgery (tissue coverage)
- Discussion with patient
  - Considerable risk vs. recurrence
  - Motor, sensory, autonomic, sexual dysfunction

Method of Resection Correlates Strongly with Disease-Free Survival

Boriani et al, SPINE 21:1569-1577, 1996

Boriani Chondrosarcoma Series

<table>
<thead>
<tr>
<th>Table 1: Local Control After 34 Treatment of Spine Chondrosarcoma Performed at Lesion or After Local Recurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (Type)</td>
</tr>
<tr>
<td>Plasmocel (osteotomy)</td>
</tr>
<tr>
<td>Plasmocel + ETR</td>
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<tr>
<td>ETR</td>
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<tr>
<td>5-Bis-enfor (targeted)</td>
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<tr>
<td>5-Bis-enfor (extended/distributed)</td>
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<tr>
<td>Total</td>
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</tbody>
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Outcomes

- Chordoma
  - Frequent local recurrent within 2 year with piecemeal resection-100%
  - 5 year survival 50 to 70% without XRT
  - En bloc excision
    - 5 year survival have been reported to be as high as 100%

- Primary malignant tumors
  - High risk for local recurrence
  - <50 % 5 year survival
  - With en bloc
    - 5 year survival may reach 60-70%
  - Bilskey et al. reported a median survival of 18 months for 59 pts with sarcomas and metastatic tumors treated with intralesional piecemeal resection

Outcomes

- Talac et al. reported on 18 pts with sarcoma treated with piecemeal resection, median survival was 18 months

Complications

  - 134 en bloc excisions between 1990 and 2007
  - 43 major complications in 27 pts
  - 29 minor complications in 28 pts
  - Among 35 first operated elsewhere, 48.5% had at least 1 complication (23 major, 12 minor)
    - 1 intraop death and 1 delayed to aortic injury
  - Among 99 previously unoperated cased, 31% suffered 20 major and 17 minor complications
Complications

Mortality

• Up to 7.7%

Outcomes

• Literature very biased
• Largely based on small series
• Largely retrospective
• Confusing terminology
• Endpoints and outcomes not standardized
• Done in very experienced centers
Role of Radiotherapy

- En bloc resection with wide margin provides the best chance of disease free survival
- Not possible in many cases
  - 35-65% of sacral chordomas are not amenable to en bloc resection
  - In mobile spine 21% underwent wide or marginal resection Boriani Spine 2006

- With long term follow-up, recurrences seen in 17-60% of cases even with wide marginal resections
- If in epidural space, wide margin cannot be obtained
- Neurological sacrifice is needed (incontinence)
- Significant wound healing and infection occurs

Bilskey et al. Neurosurg 2013

- 21 pts chordoma of sacrum and mobile spine
- SRS single fraction 2400 cGy
- 21 primary and 3 metastatic tumors
  - 7 postop recurrence
  - 7 adjuvant therapy
  - 13 neoadjuvant therapy

- Median follow-up 24 months
  - 23 pts (95%) stable or reduced tumor burden
  - 1 with radiographic progression 11 months post SRS
  - 6 of 13 with neoadjuvant SRS proceeded to surgery
  - complications
    - 1 sciatic neuropathy, 1 vocal cord paralysis

Conclusions

- Intralesional resection results in unacceptably high tumor recurrence
  - Independent risk factor for mortality
- En bloc resection, when possible, results in the greatest chance for wide resection with normal margins
  - Extended disease free survival, cure?????

- Not possible in all cases
- In many cases, planned wide resection results in positive margins
- Extensive risks and morbidity
- Decisions must be guided by a multidisciplinary tumor team and include the patient
- Carbon ion and SRS evolving front line treatments