Pediatric Osteosarcoma (High Grade)

Disclaimer: This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson’s specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient's care. This algorithm should not be used to treat pregnant women

Note: Consider Clinical Trials as treatment options for eligible patients. Referral to a center with both pediatric oncology and orthopedic surgery is essential.

CLINICAL EVALUATION

- History and physical
- CBC with differential, sodium, potassium, chloride, carbon dioxide, BUN, creatinine, phosphorus, magnesium, total protein, albumin, calcium, total bilirubin, alkaline phosphatase, LDH, AST, PT/INR, and PTT
- Plain films of primary
- MRI of primary with and without contrast
- Bone scan
- Chest x-ray
- CT chest with contrast
- Consider PET scan
- Biopsy (open vs. needle)
- Histology review by Bone Tumor Pathologist
- EKG/ECHO
- CVAD
- Urine pregnancy test if clinically indicated
- Discuss fertility
- Audiogram
- Consult Physical Therapy/ Occupational Therapy and Childlife

Metastasis present?

Yes

Neoadjuvant chemotherapy\(^1\) for 2 cycles

Assess treatment response:
- Clinical exam of primary tumor
- Reimage:
  - X-ray of primary
  - CT chest with contrast
  - Bone scan
  - MRI of primary with and without contrast

Progressive disease of primary site?

Yes

Surgery: limb salvage\(^2\) vs. amputation

No

Is primary tumor resectable?

Yes

Consider definitive radiation therapy

No

Consider definitive radiation therapy

Continue adjuvant chemotherapy and consider high-dose ifosfamide with or without etoposide

ADJUVANT TREATMENT

Approximately 4 additional cycles of adjuvant chemotherapy beginning 2 weeks\(^3\) after surgery

See Page 2

See Page 3

NEOADJUVANT TREATMENT

CVAD = central venous access device

\(^1\) Doxorubicin and dexrazoxane for cardioprotection plus cisplatin and high-dose methotrexate

\(^2\) Consider leg length x-ray scanogram pre-operatively of bilateral lower extremities for skeletally immature-limb salvage patients who will receive expandable prosthesis or undergo rotationplasty to monitor and manage limb length discrepancies

\(^3\) After surgical clearance

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**Progressive disease of primary site**

- Pulmonary metastases?
  - Yes
    - Consider local treatment options for primary disease
  - No
    - Is primary tumor resectable?
      - Yes
        - Surgery: limb salvage vs. amputation
      - No
        - Consider definitive radiotherapy

**Consider local treatment options for primary disease**

- One or two cycles of chemotherapy
- Assess histological response of resected tumor
- Consider adding or changing to high dose ifosfamide with or without etoposide

**Is there disease progression?**

- Yes
  - Consider gemcitabine/docetaxel, sorafenib
  - Consider phase I or II clinical trials
  - Consider palliative local therapies to primary and metastatic sites

- No
  - Consider local therapies\(^1\) for pulmonary metastasis and other metastatic sites
  - Complete post-op chemotherapy

\(^1\) Surgery is the primary modality of local therapy

See Page 4 for Surveillance

ADJUVANT TREATMENT

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**Note:** Consider Clinical Trials as treatment options for eligible patients. Referral to a center with both pediatric oncology and orthopedic surgery is essential.

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**PRIMARY TREATMENT**

- **Metastasis**
  - Doxorubicin\(^1\), cisplatin, high dose methotrexate for 2 cycles
  - Restage to assess for progression
  - Is there disease progression?
    - Yes
      - Reassess for treatment response
      - Is there disease progression?
        - Yes
          - Consider gemcitabine/docetaxel, sorafenib
          - Consider phase I or II clinical trials
          - Consider palliative local therapies to primary and metastatic sites
        - No
          - Local control of primary tumor
          - Continue chemotherapy
          - Consider local therapies\(^2\) to metastatic sites
    - No
      - Local control of primary tumor
      - Continue chemotherapy (consider adding high-dose ifosfamide with or without etoposide)
      - Consider local therapies\(^2\) to metastatic sites

**ADJUVANT TREATMENT**

- **High-dose ifosfamide with or without etoposide for 2 cycles**
- **Reassess for treatment response**
- **Is there disease progression?**
  - Yes
    - Consider gemcitabine/docetaxel, sorafenib
    - Consider phase I or II clinical trials
    - Consider palliative local therapies to primary and metastatic sites
  - No
    - Local control of primary tumor
    - Continue chemotherapy
    - Consider local therapies\(^2\) to metastatic sites

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\(^1\) With dexrazoxane for cardioprotection

\(^2\) Surgery is the primary modality of local therapy

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## Pediatric Osteosarcoma Surveillance

**Total Years for Surveillance**

<table>
<thead>
<tr>
<th>Frequency of Surveillance by month</th>
<th>Yr 1</th>
<th>Yr 2</th>
<th>Yr 3</th>
<th>Yr 4</th>
<th>Yr 5</th>
<th>Yr 10</th>
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<tbody>
<tr>
<td>History and physical</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>Monitor and discuss with patient late effects of primary treatment</td>
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<td>CBC with differential</td>
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<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Total protein, albumin, calcium, phosphorous, magnesium, glucose, AST, creatinine, total bilirubin, alkaline phosphatase, LDH</td>
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<td>x</td>
<td>x</td>
<td>x</td>
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<td>x</td>
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<td>Plain films of primary</td>
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<tr>
<td>Pelvic primaries: MRI with and without contrast</td>
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<td>Bone scan(^1)</td>
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<tr>
<td>CT chest with contrast(^2)</td>
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<tr>
<td>Leg-length x-ray scanogram(^3)</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

Note: Functional assessments post-limb salvage and cardiac surveillance should continue for life

\(^1\) Consider PETCT in patients with metastatic disease, those who underwent surgery for resection of lung nodules, or at relapse

\(^2\) May omit if concurrent with PET CT

\(^3\) Leg length x-ray scanogram of bilateral lower extremities for skeletally immature-limb salvage patients who received expandable prosthesis or underwent rotationplasty to monitor and manage limb length discrepancies

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SUGGESTED READINGS


Children’s Oncology Group Protocols: CCG7921 and COG AOST 0331


DEVELOPMENT CREDITS

This practice algorithm is based on majority expert opinion of the Pediatric Osteosarcoma workgroup at the University of Texas MD Anderson Cancer Center. It was developed using a multidisciplinary approach that included input from the following:

Najat Daw, MD (Pediatrics)‡
Eugenie Kleinerman, MD (Pediatrics)
Valerae Lewis, MD (Orthopaedic Oncology)‡
Patrick Lin, MD (Orthopaedic Oncology)
Mary McAleer, MD, PhD (Radiation Oncology)
Kevin McEnery, MD (Diagnostic Radiology)
Bryan Moon, MD (Orthopaedic Oncology)
Amy Pai, PharmD, BCPS*  
David Rice, MD (Thoracic & Cardiovascular Surgery)
Janie Rutledge, RN, MS, ANP, OCN (Orthopaedic Oncology)

‡Core Development Team  
*Clinical Effectiveness Development Team