Ewing’s Sarcoma Of The Rib: Outcomes Of Multimodality Treatment at a Single Institute

Dr. Sajid. S. Qureshi
Associate Professor, Pediatric Oncology
Tata Memorial Hospital
Mumbai, INDIA
Ewing sarcoma

- Commonest malignant tumor of chest wall - >50%
- Chest wall ES - 6% to 16% of all sites
- Rib – 50% of all chest wall ES
- Sparse literature of ES of ribs, usually combined with other primary sites (clavicle, sternum, scapula, thoracic vertebra and soft tissue) of chest wall.
• ES of the ribs treated between January 2004 and January 2011
• Lesion without rib involvement on radiology or surgery or surgical pathology were excluded
Radiology

- Chest X-ray
- CT scan - localization, tumor size, pleural effusion or pulmonary metastases.
- MRI (posterior lesions)
A large tumor was defined as a neoplasm more than 8 cm in greatest dimension.
Depending on level of involved rib, tumors were classed in two groups: the upper ribs (1st–4th) and the middle or lower ribs (5th–12th).
• The rib component in which the primary tumor occurred was classified into three groups: anterior, lateral or posterior.
Investigation

- Core biopsy
- Whole-body technetium bone scan,
- Bone marrow aspirates and biopsy
- Whole-body PET scan
Chemotherapy

- 2 courses of VIE couplet followed by 2 courses of VAC couplet administered every 3 weekly.
- Maintenance therapy 10 courses of alternating VAC and VIE couplets.
- Actinomycin D substituted for doxorubicin after a total dose of 360mg/m2.
- Vincristine weekly chemotherapy pulses.
Surgery

• Postero-lateral thoracotomy

• Anterior lesion incision were placed over the corresponding ribs

• Borderline resectable tumors underwent exploration and if disease was unresectable biopsy performed.
Uninvolved ribs adjacent to the tumors, resected or periosteum stripped from inner surface of ribs.

Entire rib from costal cartilage to vertebra removed.
Adjacent lung parenchyma if densely adherent resected as a wedge.
Reconstruction:
- Polypropylene mesh
- Mesh with cement
- Free vascularized flap
Local muscle transposed between skin and mesh when overlying muscles have been excised.
• Specimen entirely sampled in grid fashion.
  – Good response: no viable tumor or < 5% residual tumor cells
  – Poor response: >5% residual tumor cells.

• Surgical margins: tumor-negative or tumor-positive.
Radiotherapy

– Positive surgical margins
– Poor response to chemotherapy.
– Large primary tumors with significant soft tissue component at presentation

• 45Gy in 25 fractions over 5 weeks.
  – Boost of 10Gy for gross residual disease or incompletely resected tumors.
  – Ipsilateral hemithorax irradiation for pleural effusion.
Follow-up

• 3 monthly for first 2 years; 6 monthly for next 3 years.
• Imaging at end of chemotherapy and later 6 monthly during the first 3 years off therapy.
• Patients contacted by telephone or mail.
  – Follow-up completed till September 2011.
  – 1 patient lost to follow-up
<table>
<thead>
<tr>
<th>Sex</th>
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</thead>
<tbody>
<tr>
<td>Male</td>
<td>28 (62%)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>17 (38%)</td>
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<table>
<thead>
<tr>
<th>Age at diagnosis</th>
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<tbody>
<tr>
<td>&lt; 15 years</td>
<td>26 (58%)</td>
<td>median age- 14 years (range, 2 - 24 years)</td>
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<tr>
<td>&gt;15 years</td>
<td>19 (42%)</td>
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<thead>
<tr>
<th>Interval *</th>
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<tbody>
<tr>
<td>&lt; 2 months</td>
<td>14</td>
<td>pain alone – 17</td>
</tr>
<tr>
<td>&gt; 2 months</td>
<td>21</td>
<td>painless mass -15</td>
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</tbody>
</table>

|                     |        | painful mass – 5 |
|                     |        |                  |

2 patients had 2nd primary (Wilms and Burkitt lymphoma) 8.8 and 5.8 years from the diagnosis of the first disease.
Swelling with or without pain was the commonest symptom.
<table>
<thead>
<tr>
<th>Tumor size</th>
<th>14</th>
<th>31</th>
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<tbody>
<tr>
<td>&lt; 8 cm</td>
<td></td>
<td></td>
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<tr>
<td>&gt; 8 cm</td>
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<table>
<thead>
<tr>
<th>Pleural effusion</th>
<th>Positive in 2</th>
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<tbody>
<tr>
<td>Yes</td>
<td>18</td>
</tr>
<tr>
<td>No</td>
<td>27</td>
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<table>
<thead>
<tr>
<th>Tumor level</th>
<th>14</th>
<th>31</th>
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<tbody>
<tr>
<td>Upper (1st-4th)</td>
<td></td>
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<tr>
<td>Lower (5th-12th)</td>
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<table>
<thead>
<tr>
<th>Rib component</th>
<th>33</th>
<th>12</th>
</tr>
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<tbody>
<tr>
<td>Anterior and lateral</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posterior</td>
<td></td>
<td></td>
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<table>
<thead>
<tr>
<th>Ribs involved</th>
<th>31</th>
<th>14</th>
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<tbody>
<tr>
<td>Single</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiple</td>
<td></td>
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Metastatic disease - bone and bone marrow, bone and lung in 3 patients.
<table>
<thead>
<tr>
<th>Surgical margins</th>
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<tbody>
<tr>
<td>Positive</td>
<td>5</td>
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<tr>
<td>Negative</td>
<td>38</td>
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<table>
<thead>
<tr>
<th>Histology response</th>
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<tbody>
<tr>
<td>Poor</td>
<td>27</td>
</tr>
<tr>
<td>Good</td>
<td>15</td>
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<table>
<thead>
<tr>
<th>Adjacent lung resection</th>
<th>Wedge resection</th>
<th>Pneumonectomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>No</td>
<td>36</td>
<td></td>
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<table>
<thead>
<tr>
<th>Ribs resected</th>
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</thead>
<tbody>
<tr>
<td>Single</td>
<td>9</td>
</tr>
<tr>
<td>Multiple</td>
<td>34</td>
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<thead>
<tr>
<th>Reconstruction</th>
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<tbody>
<tr>
<td>Mesh alone</td>
<td>35</td>
</tr>
<tr>
<td>Mesh with cement</td>
<td>2</td>
</tr>
<tr>
<td>Free vascularized flap</td>
<td>1</td>
</tr>
<tr>
<td>Primary closure</td>
<td>5</td>
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</table>

2 patients with large disease had inoperable disease.
Duration of surgery: 2.35 hours (range, 45 minutes - 9.10 hours)

Median blood loss: 275 ml (range 50-5200 ml)

Median postoperative hospital stay: 7 days (range 3-20 days).

40 received radiotherapy
2/5 progressed before RT, 1/5 lost to follow-up
2/3 had 100% necrosis
Complications

• There was no postoperative mortality.
• Wound infection occurred in one patient.
• Postoperative paraplegia in one patient.
- Median follow-up - 18 months (range, 7 months to 90 months).
- After a median follow-up of 41 months for the survivors, 18 patients are alive.
- 2 patients with inoperable tumors died after progression.
- 7 patients died of treatment related toxicity (4 - neutropenia and sepsis, pneumonia, fulminant measles and radiation pneumonitis).
Relapses

• 19 patients relapsed.
  – Local- 5, local and distant- 4, distant only-10..
  – median time to relapse-13 months (range 6-44 months) with 15 relapses occurring within 18 months.

• 17 patients have died after relapse.

• The median time to death from disease relapse - 2 months (range 1-5 months).
  • 1 alive & disease-free; 1 alive with uncontrolled disease.
The projected cause-specific OS at 5 years was 47%, RFS was 40% and local control was 70%
## Prognostic factors

<table>
<thead>
<tr>
<th>Histology response</th>
<th>32.6</th>
<th>0.05</th>
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<tbody>
<tr>
<td>Poor</td>
<td></td>
<td></td>
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<tr>
<td>Good</td>
<td>64.6</td>
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<table>
<thead>
<tr>
<th>Adjacent lung resection</th>
<th>13</th>
<th>0.03</th>
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<tbody>
<tr>
<td>Yes</td>
<td></td>
<td></td>
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<tr>
<td>No</td>
<td>51.1</td>
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Age, sex, interval between symptoms onset & diagnosis, presence of pleural effusion, tumor size, rib number, level component & tumor margins : NS
Conclusion

• ES of ribs aggressive tumour
• Histological response to chemotherapy and the infiltration of adjacent lung parenchyma requiring resection are important factors influencing outcome.
• Relapses are common, occurring within 18 months and carry a high mortality.
Thank you