Strategy for surgical treatment of primary bone tumors of the spine

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A System of Staging
Musculoskeletal Neoplasms

Surgical Staging System
SSS

Clin Orthop, Enneking 1980
3 factors

**Grade**
- Grade 0: benign tumor
- Grade 1: low malignant tumor
- Grade 2: high malignant tumor

**Topography**
- TO: tumor delimited with a capsule
- T1: intracompartimental tumor
- T2: extracompartimental tumor

**Metastasis**
- MO: no metastasis
- M1: metastasis
**Benign tumors**

<table>
<thead>
<tr>
<th>STADE</th>
<th>1 (inactive)</th>
<th>2 (active)</th>
<th>3 (agress ive)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Degré</strong></td>
<td>GO</td>
<td>GO</td>
<td>GO</td>
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<tr>
<td><strong>Situation</strong></td>
<td>TO</td>
<td>TO</td>
<td>T1-2</td>
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<tr>
<td><strong>Anatomique</strong></td>
<td>MO</td>
<td>MO</td>
<td>MO -1</td>
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<td><strong>Méta stases</strong></td>
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<td><strong>Évolution</strong></td>
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<td>Clinique</td>
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<tr>
<td><strong>Grade RX</strong></td>
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<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td><strong>Scintigraphie</strong></td>
<td>négative</td>
<td>positive d ans la lésion</td>
<td>positive au-delà des</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>contours de la lésion</td>
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<tr>
<td><strong>Angiographie</strong></td>
<td>aucune réaction néovasculaire</td>
<td>modeste réaction néovasculaire</td>
<td>importante réaction</td>
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<td></td>
<td></td>
<td></td>
<td>néovasculaire</td>
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<tr>
<td><strong>Scanner</strong></td>
<td>bords nets, capsule épaisse, homogénéité</td>
<td>bords nets mais élargis, capsule mince, homogénéité</td>
<td>bords flous, pas de capsule, inhomogénéité</td>
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</tbody>
</table>

Benign tumors
# Malignant tumors

<table>
<thead>
<tr>
<th>STADE</th>
<th>IA</th>
<th>IB</th>
<th>IIA</th>
<th>IIB</th>
<th>IIIA/IIIB</th>
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</thead>
<tbody>
<tr>
<td>Grade</td>
<td>G1</td>
<td>G1</td>
<td>G2</td>
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<td>G1-2 G1-2</td>
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<tr>
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<td>T1</td>
<td>T2</td>
<td>T1</td>
<td>T2</td>
<td>T1 T2</td>
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<tr>
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<td>M0</td>
<td>M0</td>
<td>M0</td>
<td>M1 M1</td>
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<tr>
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<td>lente</td>
<td>rapide</td>
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<tr>
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<td>positive</td>
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<tr>
<td>Grade RX</td>
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<td>2</td>
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<tr>
<td>Angiographie</td>
<td>moderate reaction néovasculaire péritumorale</td>
<td>moderate reaction néovasculaire péritumorale</td>
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<tr>
<td>Scanner/IRM</td>
<td>bords flous mais intracompartiment</td>
<td>origine ou exp. extracompartiment</td>
<td>bords flous mais intracompartiment</td>
<td>origine ou exp. Extracompartiment</td>
<td>-</td>
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</tbody>
</table>

I : FAIBLE MALIGNITÉ
II : FORTE MALIGNITÉ
I A : INTRACOMPARTIMENTALE
II B : EXTRACOMPARTIMENTALE
Definition of surgical margins

Intralesional: piecemeal removal

Marginal: extracapsular in reactive zone resection

Wide: safe margins

Radical: extracompartimental resection
4 rules specific to spinal surgery

1) Spinal cord must be protected as much as possible

2) The spinal cord cannot be resected « en bloc » with the tumor

« en bloc » Vertebral resection is impossible
3) There is no anatomical compartment limitation of the spinal canal
4) Spinal stability must be preserved

- During surgery
- After surgery
- In the future
Therapeutic strategy begins during the diagnostic phase

- Clinical examination
- Plain films
- CT scan
- MRI
Goals

• Give an idea of the pathological diagnosis
• Obtain a 3D picture of the tumor
3 different situations
First situation

Probable benign lesion

Either surgical treatment alone (intralesionnel resection)

Either no treatment
Second situation

Probable malignant lesion  Doubt about the benignness of the lesion

Biopsy is mandatory
Biopsy

- Surgical
- Transcutaneous, positive in 80% of cases
Third situation

Neurological disorders

Emergent minimal surgical decompression, with biopsy
Results of biopsy

- benign lesion

- surgical treatment alone
  (marginal resection)
Results of biopsy

Malignant lesion

First chemotherapy

Surgery must be done in a second time
Utility of first chemotherapy

- Control micrometastasis
- Reduce the tumoral volume
- Make easier the later surgery
Operative strategy
I. Arteriography

• Determines the level of medullar arteries

• Permits embolization of the main feeding vessels of the tumor
II. Planning the surgical procedure
Which approach?

Vertebral body tumor: anterior

Neural arch tumor: posterior

Circumferencial or hemivertebal tumor: combined approach
Vertebrectomy through a posterior approach

• Stener 1971
• Roy-Camille 1986
• Tomita 1994
Postoperative strategy
Postoperative course of malignant tumor

• Quality of the excision?

• Response to preoperative chemotherapy?
  Histological mapping and grading on the operative resected piece
  Patient is a good answering if > 95 % of necrosis of tumoral cells

• Radiotherapy?
Recurrence of benign lesion

Iterative surgical removal
Recurrence of malignant lesion

Palliative treatment
CONCLUSION

Factors that influence survival in patient with malignant tumors

- Stage of the tumor
- Response to chemotherapy
- Quality of the surgical margins

The first treatment must be the best