Staging and Biopsy of Bone Tumours

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28th February, 1997
Staging of Benign and Malignant Tumours

- First used for Cervical carcinoma, (TNM)
- 1980 Enneking, (GTM)
- Adopted by Musculoskeletal Tumour Society, (MTS)
- For mesenchymal neoplasm's only
Why Stage a lesion?

- prognosis depends on stage
- allow planning of surgical margins
- guidelines to adjuvant therapy
- communication/comparison of data
Pre Staging Workup

- History/examination
- Radiological investigation
  - XR
  - MRI
  - CT
  - Isotope Bone Scan
  - Angiography
- Biopsy
The MTS System

Based on the following:

- Tumour grade - G
- Tumour site - T
- Metastases - M
Grade

Combines radiological and histological factors

- G0 - benign lesion
- G1 - low grade malignant
- G2 - high grade malignant
Site - T

- **T0** - within capsule
  - no spread to other compartments
- **T1** - no true capsule
  - compressed local tissue
  - satellite lesion
  - intracompartmental
- **T2** - extracompartmental
Metastasis - M

- either - M0
  M1

- Haematogenous spread - lungs
  skeletal

- M1 includes - LN (synovial cell, rhabdo)
  - skip metastases
Staging of Benign Lesions

- Stage 1 - latent: \( G0 \ T0 \ M0 \)
- Stage 2 - active: \( G0 \ T0 \ M0 \)
- Stage 3 - aggressive: \( G0 \ T1-2 \ M0-1 \)
Stage 1 - Latent Benign

- G0 T0 M0
- asymptomatic and incidental
- rare pathological fracture
- mobile if soft tissue
- if bony little cortical deformation
Stage 2 - Active Benign

- G0 T0 M0
- steady growth
- may be asymptomatic
- tender in soft tissues
- XR show irregular borders
- differ from 1 in symptomatology
Stage 3 - Aggressive Benign

- G0 T1-2 M0-1
- generally symptomatic
- can fracture
- rapid growth rate
- XR show reactive bone, Codman’s
- Satellite lesions present
Staging of Malignant Lesions

- IA  G1 T1 M0
- IB  G1 T2 M0
- IIA G2 T1 M0
- IIB G2 T2 M0
- III M1
Staging Malignant Lesions

- Stage IA
  - low grade, intracompartmental
  - slow growing, painless
  - cancellous rim active bone, Codman’s triangle
  - mature matrix, well differentiated, pseudocapsule & satellite lesions
Staging Malignant Lesions

- Stage IB
  - low grade, extracompartmental
  - similar clinically to 1A
  - direct spread
Staging Malignant Lesions

- Stage IIA
  - high grade, intracompartmental
  - symptomatic, painful, invasive
  - poor marginated XR, +ve IBS
  - hyperchromatic nuclei, anaplastic & pleomorphic, vascular invasion, necrosis and haemorrhage
Staging Malignant Lesions

- Stage IIB
  - occasionally pathological fracture
  - cortical destruction, soft tissue extension
  - histologically resemble IIA
Staging Malignant Lesions

- **Stage III**
  - metastatic
  - diagnosis by CT/MRI/IBS or regional lymph node examination
Surgical Margins

Four levels of surgical margins, staging defines these and the subsequent level of resection or amputation:

- **intralesional** - within lesion
- **marginal** - reactive zone - extracapsular
- **wide** - through normal tissue compartment
- **radical** - normal tissue extracompartmental
Stage and Margin

For benign lesions:

- Stage 1 - intracapsular
- Stage 2 - marginal or intracapsular + adjuvant therapy
- Stage 3 - wide or marginal + adjuvant therapy
Stage and Margin

Malignant lesions:

- Stage IA - wide excision
- Stage IB - wide, possible amputation
- Stage IIA - radical resection
- Stage IIB - radical, exarticulation/wide excision/amputation
- Stage III - thoracotomy, radical resection/palliative
Biopsy of Bone Tumours

- crucial part of diagnosis & staging
- complex procedure
- multidisciplinary
- **must** be performed by individual/unit experienced in it and further treatment
Biopsy

- last investigation for staging
- imposes real/artifactual change
- not all lesions need biopsy
- differentials - tumour, trauma, metabolic, vascular, synovial, infection
Biopsy Method

Open - more reliable?, better tissue sample, more invasive, more complications

- Incisional - for diagnosis
  - large/deep lesions

- Excisional - < 5cm small
  - take en bloc
  - osteochondroma
  - parosteal chond
  - osteoid osteoma

- Open
  - more reliable ?, better tissue sample, more invasive, more complications
Biopsy Method

Closed method - less invasive, LA/GA, minimal contamination, less complications, can be localised & lower cost

- needle - cytology
- trephine - Jamshidi, Trucut
Closed Biopsy

Disadvantages:

- small tissue sample, insufficient 30%
- variable tumour homogeneity
- accuracy dependent on histopathologist
- grading difficult on sample
- RNOH 97% accuracy
Biopsy Placement

- critical
- access
- position for *en bloc* excision - open closed
- respect anatomical compartments
- avoid joint space/tendons
Closed Biopsy

Technique:

- planned, prepared patient
- LA/GA/sedation
- aseptic technique
- stab incision to skin
- fluoroscopic needle placement
- minimum of two passes
- mark skin/check sample after
Open Biopsy

**Technique 1:**

- GA
- longitudinal incision, small
- no flaps raised
- gentle soft tissue dissection
- sample pseudocapsule/tumour jct
- don’t sample local reactive bone
Open Biopsy

Technique 2:

- meticulous haemostasis
- bone wax ?/cement
- Layered closure
- no drains/LA infiltration
- +/- tourniquet
- compressive dressing/elevation/AB
Biopsy Sample

What now?

- microbiology - microscopy & culture
- histopathology - 4-6 imprints, air dry core fixed in formalin
- samples transferred cold
- frozen section
- gluteraldehyde
Biopsy Complications

369 patients, MTS questionnaire

- 25% diagnostic variation, (71% ref center)
- 10% poor specimen, (28% needle biopsy)
- 17% wound problems, (infection, bleeding)
- 18% treatment altered by biopsy

Mankin HJ, JBJS, 64-A, no 8, 1982
Closed Biopsy Complications

- low complications, 1% (neurological)
- 91-97% accurate in specialist center
- low tumour recurrence rate
- must excise all biopsy sites

Stoker DJ, JBJS, 73-B, 1991, 498-500
Moore TM, JBJS, 61-A, 1979, 375-380
In Summary

- staging is vital
- Biopsy performed at treating center
- If in doubt refer

Thank you