Fine Needle Aspiration of Bone Tumours

The Clinical, Radiological, Cytological Approach

Måns Åkerman  Lund
Henryk A. Domanski  Lund
Kjell Jonsson  Lund

88 figures, 61 in color, and 10 tables, 2010
# Contents

## Preface

### Chapter 1

1. **Epidemiology of Bone Tumours**

### Chapter 2

3. **Radiological Investigation of Bone Tumours**
   3. Tumour Type and Radiological Appearance
   3. Tumour Matrix Calcifications
   3. Periosteal Reaction
   4. Soft Tissue Component
   4. Tumour Position
   5. Other Investigations
   5. Magnetic Resonance Imaging
   5. Computed Tomography
   5. Ultrasonography
   5. Scintigraphy
   5. Positron Emission Tomography
   5. Fine Needle Aspiration Cytology
   6. Conclusion

### Chapter 3

7. **Morphological Diagnosis of Bone Tumours**
   7. Biopsies
   7. Open Biopsy
   7. Percutaneous Biopsy
   7. Fine Needle Aspiration Cytology
   7. FNAC Procedure
   8. Staining Methods
Ancillary Diagnostic Techniques

8 Direct Smears
8 Cytospin Preparations
8 Cell Block Preparation from Formalin-Fixed and Paraffin-Embedded Aspirates
8 Liquid-Based Cytology: ThinPrep
9 Cytochemistry
9 Immunocytochemistry
9 Flow Cytometric Immunophenotyping
9 DNA Ploidy Analysis
10 Cytogenetic and Molecular Genetic Investigations
10 Electron Microscopic Examination
10 Diagnosis of Bone Tumours/Lesions
10 Classification of the Cytodiagnosis
11 Diagnostic Accuracy Bone Lesion FNA
11 Pitfalls in Bone Tumour FNA
12 Complications of Bone Tumour FNA

Chapter 4

13 Cytology of Normal Constituents in Bone Aspirates and of Reactive Changes
13 Normal Cells in Bone Aspirates
13 Osteoblasts
13 Osteoclasts
13 Chondrocytes
14 Bone Marrow Cells
14 Mesothelial Cells
15 Reactive Changes
15 Pseudomalignant Myositis Ossificans

Chapter 5

18 Cytological Features of Bone Tumours in FNA Smears I: Osteogenic Tumours
18 Osteid Osteoma and Osteoblastoma
18 Radiology
18 Histopathology
18 Cytological Features of Osteoblastoma
18 Differential Diagnosis
18 Comments
21 Osteosarcoma
21 Radiology
21 Histopathology
23 Cytological Features
23 Differential Diagnosis
24 Comments
28 Case Report 1
29 Comments
29 Case Report 2
30 Comments

Chapter 6

31 Cytological Features of Bone Tumours in FNA Smears II: Cartilaginous Tumours
31 Chondroma
Chapter 7

Cytological Features of Bone Tumours in FNA Smears III: Ewing Family Tumours

The Ewing Family of Tumours

Radiology

Histopathology

Cytological Features of Classical Ewing’s Sarcoma

Cytological Features of Atypical Ewing’s Sarcoma and PNET

Differential Diagnosis

Contents
Chapter 8

Cytological Features of Bone Tumours in FNA Smears IV: Notochordal Tumours

Chapter 9

Cytological Features of Bone Tumours in FNA Smears V: Giant-Cell Lesions

Chapter 10

Rare Targets for FNAC and Diagnostic Problems with Benign Tumours/Lesions with Variable Numbers of Osteoclast-Like Giant Cells
Chapter 11

**Lymphohaematopoetic and Histiocytic Tumours**

65 Solitary Plasmacytoma of Bone
   - Radiology
   - Histopathology
   - Cytological Features
   - Differential Diagnosis
   - Comments
68 Primary Lymphoma of Bone
   - Radiology
   - Histopathology
   - Differential Diagnosis
   - Comments
68 Langerhans Cell Histiocytosis
   - Radiology
   - Histopathology
   - Cytological Features
   - Differential Diagnosis
   - Comments

Chapter 12

**Inflammatory Lesions**

73 Non-Specific Osteomyelitis
   - Radiology
   - Histopathology
   - Cytological Features of Acute Osteomyelitis
   - Differential Diagnosis
   - Comments
74 Tuberculous Osteomyelitis
   - Radiology
   - Histopathology

Chapter 13

**Bone Metastases**

75 Metastatic Cancer
   - Radiology
   - Cytodiagnosis
   - Diagnostic Problems
   - Case Report 6
   - Comments
At the beginning of the 1960s Nils Stormby, at that time head of the recently founded Cytodiagnostic Laboratory, introduced fine needle aspiration (FNA) and cytodiagnosis as the primary diagnostic modality in cases of bone tumours/lesions in Lund, Sweden. When the Musculoskeletal Tumour Centre was created at the University Hospital, FNA became the primary diagnostic method for bone tumours/lesions in patients referred to the centre. From the beginning, the centre’s orthopaedic surgeons and radiologists established a close working relationship, and their experience clearly demonstrated the importance of the clinical, radiological and cytological approach to diagnosis. In 1973, the diagnostic outcome of the first 94 cases, which were investigated between 1966 and 1969, was presented and discussed [1].

Although it has been strongly recommended that patients with suspected bone tumours/lesions should be referred to multidisciplinary centres for primary diagnosis and treatment, in practice this is not always the case, especially in patients with suspected metastatic deposits. The purpose of this book is to emphasize the value of the combined diagnostic approach, and to facilitate the cytological evaluation of FNA smears from hard tissue lesions. We also suggest criteria for histotype diagnosis based on the combined evaluation of clinical and radiographic data and cytologic features. Our main aim is to thoroughly describe and illustrate the most common entities. A number of primary bone tumours/lesions, benign as well as malignant, are very rare and their cytologic features have been described only incompletely, if at all.

The use of adjunctive diagnostic methods is also described, discussed and illustrated. The selection of entities described and illustrated are based mainly on experiences with patients referred to the Musculoskeletal Centre over a 35-year period. Case reports and illustrations are culled from cases in the files of the Department of Pathology and Cytology, Lund University Hospital, which now comprise smears from approximately 1,000 hard tissue tumours/lesions dated between 1966 and 2006.

Acknowledgements

The authors are grateful for the help given by Dr. Svante Orell, Adelaide, Australia. Dr. Orell is the scientific editor for the series Monographs in Clinical Cytology and his comments on the text and revisions of the language have been of great help. We also thank Dr. Walter Ryd, Head of the Division of Cytology, Department of Pathology, Sahlgren’s Hospital, Gothenburg, Sweden, for letting us use illustrations of cases of very rare bone tumours.

Måns Åkerman
Henryk A. Domanski
Kjell Jonsson
Lund