

# Chapter 21:

## Tumors of the Upper Extremity

*B. Hudson Berrey Jr., M.D.*

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### GENERAL CONCEPTS<sup>1,2,3</sup>

- I. Staging – the development of an understanding of a tumor related to its location(anatomy), its grade(degree of cellular aggressiveness) and its possible spread to either regional lymph nodes or distantly (usually to the lungs).
- II. Anatomy – tumors by and large respect fascial planes and anatomic compartments. These compartments are common in the arm and forearm but not in the hand, around the elbow or up in the shoulder or axilla.
  - a. No two tumors are alike- which makes evaluation and treatment of them difficult to standardize; must use principals of treatment.
  - b. Complex hand anatomy causes difficulty in operating on tumors of the hand and wrist.
    - i. Benign tumors may be removed with a marginal margin.
    - ii. Malignant tumors require resection of all structures involved with the tumor.
- III. Grade – based on the cellularity and differentiation of the tumor. Benign tumors have a spectrum of aggressiveness as do malignant tumors. Differentiation is defined as how closely the cells look like the parent tissue.
  - a. Benign tumors resemble the parent tissue (cartilage, bone, fibrous tissue, etc.) very closely. X-rays may be a better way to define aggressiveness of benign bone tumors.
  - b. Malignant tumors may vary widely in how close they resemble the parent tissue.
    - i. Grade 1 – Able to recognize the parent tissue easily (fat, cartilage, etc.).
    - ii. Grade 2 – Some resemblance to parent tissue.
    - iii. Grade 3 – Little resemblance to parent tissue.
- IV. Metastases – most primary sarcomas of extremities spread by way of the blood stream and show up first in the lung. Some exceptions exist.<sup>2(p273)</sup>
  - a. Epithelioid sarcoma, synovial sarcoma and rhabdomyosarcoma spread to regional lymph nodes. Epithelioid sarcoma, clear cell sarcoma, angiosarcoma and synovial sarcoma are often found in the hand and upper extremity.

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- b. Benign tumors may spread to the lungs and still be benign. Chondroblastoma and Giant cell tumor are the two most common.
  - i. GCT commonly involves the distal radius and proximal humerus.
  - ii. Chondroblastoma often involves the proximal humerus epiphysis in the adolescent.

### V. PRINCIPALS-

- a. Benign better than malignant!
- b. For malignant tumors, low grade (grade 1) is better than higher grade (grade 2/3).
- c. Small (<5cm) better than big (esp. >10cm).
- d. The more distal, the better. (Hand > forearm > shoulder).
- e. The more superficial the better. (Skin is better than subcutis is better than deep to the fascia).
- f. No metastasis is better than any metastases.
- g. Lymph node metastases may be as bad as lung metastases.
- h. Metastatic disease from other cancers (breast, thyroid, prostate, etc.) uncommon below the elbow.

### VI. SURGERY<sup>1(p20),2(p143)</sup>

- a. Removal of the tumor is job 1, function after surgery is second for malignant tumors.
- b. Function may be considered with removal of benign tumors; recurrence may be preferable to function loss.
- c. Margins: the margin of the tumor surgery in respect to the tumor.
  - i. Intralesional – gross positive margins, gross tumor left behind.
  - ii. Marginal – through reactive zone around tumor.
  - iii. Wide – through normal tissue around the tumor.
  - iv. Radical – removing all contents of anatomic compartment.
- d. Benign tumors may be removed in a marginal status, leaving adjacent nerves and tendons.
  - i. GCT of distal radius may have to be resected (removal of distal radius) to achieve disease control.

- ii. Some benign tumors may grow so large and involve so many structures that some deficit will occur.
  - e. Malignant tumors need to be removed with a margin of normal tissue around them, such as tendons, muscle, nerve and bone, if those structures are involved. The higher the grade and the larger the tumor, the larger the resection.
- VII. Rehabilitation – depends on the tumor, the operation and the residual structures. Very variable.
- a. Following aggressive resection of malignant tumor, stiffness may be the major concern so early, aggressive therapy is appropriate.
  - b. For tumors treated with a local procedure (GCT of distal radius treated with curettage and grafting), therapy directed at finger ROM only may be the key. Attempts to address wrist ROM may lead to pathologic fracture if done too early.
  - c. Tendon reconstructions/substitutions must be addressed individually so as not to disrupt repair while trying to maximize function/motion. Tendon transfer timing might be done at a second stage after surgical recovery and rehabilitation have occurred
  - d. Resection of muscle (esp. in forearm or arm) may limit the amount of recovery of strength possible with therapy.
  - e. Nerve resection is often necessary in aggressive tumors, dependent on tumor location. Treatment for nerve deficits may be by orthosis, tendon transfer or nerve grafting. Success may depend on use of adjuvants (chemotherapy or radiation therapy)

### COMMON HAND AND UPPER EXTREMITY TUMORS:<sup>4</sup>

- VIII. Benign Soft tissue tumors of the Hand and Upper Extremity:
- i. Ganglion cyst:<sup>1(p1081),2(p235)</sup> - synovial fluid filled shell with thin lining of fibrovascular stroma.
    - 1. Most common tumor in hand/wrist
    - 2. Transilluminates
    - 3. May arise from any synovial structure (joint, tendon sheath, etc.)
    - 4. Treatment
      - a. Aspiration
      - b. Aspiration and injection
      - c. Resection

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- i. Recurrence with aspiration common
  - ii. Resection requires removal of stalk from joint capsule or tendon sheath
  - iii. Preferred method for volar ganglions near radial artery
- ii. Giant Cell Tumor of Tendon Sheath (Xanthoma)<sup>1(p770)</sup>- giant cells, histiocytes, hemosiderin deposition, fibrosis
  1. Very common
  2. Firm and slow growing
  3. Arise on dorsal surfaces (usually)
  4. Excise easily unless encapsulating vital structure (nerve)
  5. Low recurrence rate
- iii. Fatty Tumors<sup>1(p431)</sup>
  1. Lipoma – looks like normal fat (Figure 1)
    - a. Most common benign soft tissue tumor of entire body
    - b. Common in upper extremity, not so much in the hand
    - c. Usually soft, small, superficial to the fascia
    - d. Intramuscular / deep variety may involve vital structures (e.g. axillary nerve with deltoid IM Lipoma)
    - e. May be removed with marginal margin.
  2. Angiolipoma – benign lipoma associated with blood vessels, painful
  3. Fibrolipoma – benign fat and spindle cells (fibrocytes)
  4. Atypical Lipoma – large, deep, may have mineralization on radiographs, prominent septations and higher recurrence rate than typical lipoma
- iv. Fibrous Tumors- tumors of fibrous tissue (spindle cells)
  1. Fibroma of Tendon sheath<sup>1(p203)</sup>
    - a. Firm, attached to tendon sheath
    - b. Small, usually <2cm

- c. Slow growing
- 2. Fibromatosis (Desmoid tumor)<sup>1(p227),2(p253)</sup>
  - a. Benign fibrous tumor
  - b. Deep, firm
  - c. Infiltrating margins
  - d. Progressive disease
  - e. Hard to treat, high recurrence rate
  - f. May be multiple
- 3. Dermatofibroma – small cutaneous fibrous nodule
- 4. Keloid-abundant scar production<sup>1(p215)</sup>
- 5. Nodular fasciitis<sup>1(p189)</sup>
  - a. Rapidly growing tumor
  - b. Self limiting
  - c. “pseudo-sarcoma”, looks worrisome
  - d. Volar forearm
- 6. Fibrous histiocytoma – small extremity lesion, most often superficial<sup>1(p331)</sup>
- v. Neural Tumors- tumors of nerve or nerve sheath origin
  - 1. Neuroma<sup>1(p827)</sup>
    - a. Injury response of nerve to trauma
    - b. May be seen post-operatively or post trauma
    - c. Positive percussion (Tinel’s) test
    - d. Proliferation of nerve fascicles and Schwann cells
    - e. May be palpable as small tender nodule
    - f. Maybe injected or removed
  - 2. Schwannoma (Figure 2)<sup>1(p853)</sup>
    - a. Proliferation of schwann cells, the cells surrounding the nerves

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- b. Positive percussion test
  - c. Slow growing
  - d. Characteristic MRI finding of swelling within a nerve, like a football; also the target sign (dark center in higher signal mass on T2 images)
  - e. Treatment – resection
3. Neurofibroma<sup>1(p835)</sup>
- a. Proliferation of Schwann cell, nerve cells
  - b. May be solitary, diffuse or plexiform
  - c. Solitary may be resected, not associated with NF-1
  - d. Diffuse and plexiform related to neurofibromatosis (von Recklinghausen’s disease) NF-1
    - i. Autosomal dominant
    - ii. 1:3000 live births
    - iii. Variable expression – mild to severe
  - e. Cutaneous manifestations of NF-1
    - i. Café-au-lait spots (>1cm)
    - ii. Fibroma molluscum (skin nodules)
    - iii. Axillary and inguinal freckling
  - f. Hard to resect
  - g. Patients with NF-1 may develop malignant peripheral nerve sheath tumors (MPNST)
- vi. Vascular Tumors
1. Hemangioma<sup>1(p636)</sup>
- a. Capillary hemangioma
    - i. Most common type
    - ii. Young age
  - b. Juvenile Hemangioma- “strawberry nevus”
    - i. Type of capillary hemangioma

- ii. Infancy
      - iii. Usually regress over years
    - c. Cherry angioma
      - i. Acquired, not developmental
      - ii. Adult onset
      - iii. Common in extremity
    - d. Cavernous Hemangioma
      - i. Like capillary hemangioma only larger and deeper
      - ii. May be symptomatic
      - iii. Irregular margins
  - 2. Arterio-venous malformations (AVMs)<sup>1(p659)</sup>
    - a. Adult age group
    - b. Hemangioma with both arteries and veins
    - c. May have high flow
  - 3. Glomus Tumor<sup>1(p751)</sup>
    - a. Sub-ungual region
    - b. Very painful, out of proportion to size
    - c. Sensitive to changes in temperature (esp. cold) and touch
    - d. May erode bone in distal phalanx
    - e. Reddish-blue nodule
  - vii. Muscle Tumors<sup>1(p1066)</sup>
    - 1. Myxoma
      - a. Intramuscular tumor
      - b. Myxoid consistency
- IX. Malignant soft tissue sarcomas (STSa) of the Hand and Upper extremity<sup>5</sup>
- a. General Rules for STSa
    - i. Treatment is usually surgery alone for low grade tumors

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- ii. Surgery plus radiation for high grade tumors
  - iii. Radiation difficult in hand due to lack of soft tissue
  - iv. Chemotherapy may be indicated for some patients (Synovial sarcoma, young patients, metastatic disease, etc.)
- b. Synovial sarcoma (misnomer – does not originate from synovial cells)<sup>1(p1161),2(p284)</sup>
- i. High grade STSa
  - ii. Common in young adolescent/young adult
  - iii. Arises near but not of joints (almost always)
  - iv. May be present for long time without growth (months/years)
  - v. Lymph node metastases
  - vi. Treatment
    - 1. Radiation therapy
    - 2. Surgery
    - 3. +/- chemotherapy
- c. Epithelioid Sarcoma<sup>1(p1191)</sup>
- i. Common STSa in hand
  - ii. Common to ulcerate, maybe confused with infection (cutaneous or deep)
  - iii. Very aggressive
  - iv. Early lymph node involvement – requires sentinel node(SN) biopsy
  - v. Treatment
    - 1. Surgery – aggressive resection or amputation
    - 2. Lymph node dissection if SN biopsy positive
    - 3. Chemo non-responsive
  - vi. Outcomes-poor
- d. Clear Cell Sarcoma<sup>1(p926)</sup>
- i. Mis-called “amelanotic” melanoma (not related to melanoma)
  - ii. Share some histology markers with melanoma
  - iii. Involves tendinous structures

- iv. Requires extensive surgical resection
- v. Early metastases; especially lymphatic
- e. MPNST – Malignant Peripheral Nerve Sheath Tumor ( previously known as malignant schwannoma or neurofibrosarcoma)<sup>1(p903)</sup>
  - i. Arising in prior neurofibroma, diffuse or plexiform
  - ii. Very aggressive
  - iii. Requires extensive resection or amputation, especially if involved with brachial plexus
  - iv. Suspect in any person with NF-1 and an enlarging lesion
- f. Rhabdomyosarcoma<sup>1(p595)</sup>
  - i. Cancer of voluntary muscle
  - ii. Young age group – most common STSa of children
  - iii. Aggressive – lymph node involvement
  - iv. Treatment-
    - 1. Chemotherapy
    - 2. Radiation therapy
    - 3. Surgery
- g. Liposarcoma<sup>1(p477)</sup>
  - i. Common STSa in elderly
  - ii. More common in arm than forearm/hand
  - iii. Grade may vary from grade 1( low grade) to grade 3 (high grade)
- h. Undifferentiated Pleomorphic sarcoma (UPS) – previously known as malignant fibrous histiocyoma (MFH)<sup>1(p406)</sup>
  - i. Older population
  - ii. Upper extremity arm and shoulder
  - iii. May involve brachial plexus
  - iv. Treatment
    - 1. Radiation

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### 2. Surgery

- i. Malignant Giant Cell Tumor of Tendon Sheath<sup>1(p782)</sup>
  - i. Uncommon
  - ii. May originate as atypical GCTTS
- j. Angiosarcoma<sup>1(p731)</sup>
  - i. Malignant cancer of vascular structures
  - ii. May arise in areas of prior irradiation (arm, shoulder for breast CA)
  - iii. Higher rate of lymph node involvement than other ST sarcomas
- k. Kaposi's sarcoma<sup>1(p721)</sup>
  - i. Cutaneous vascular tumor
  - ii. May arise de-novo (elderly men) or be HIV associated
- l. Dermatofibrosarcoma Protuberans (DFSP)<sup>1(p371)</sup>
  - i. Low grade tumor
  - ii. Superficial
  - iii. High recurrence if not completely excised
  - iv. May benefit from chemotherapy (Gleevac)
- m. Skin Tumors<sup>6</sup> –
  - i. Melanoma- not a sarcoma but common upper extremity tumor
    - 1. Cutaneous lesion
    - 2. May be subungual – suspect if discoloration is longitudinal band in nail
    - 3. Requires excision and SN biopsy
  - ii. Actinic Keratosis
    - 1. Sun damaged skin
    - 2. May progress to malignancy
    - 3. Common in elderly
  - iii. Basal Cell Carcinoma
    - 1. Most common skin tumor

## Chapter 21 Figures



**Figure 1.** Intramuscular lipoma within the deltoid muscle at the shoulder. Notice the thin layer of deltoid muscle overlying the lipoma and some strands of muscle within the top portion of the lipoma.



**Figure 2.** Schwannoma, within nerve. The nerve is the white structure going into the mass at the top and exiting the mass at the bottom. The dark center of the mass is typical for schwannoma and this is called the "target sign".



**Figure 3.** Enchondroma of the middle finger proximal phalanx with the typical "arcs and rings" appearance associated with cartilage tumors. Patient sustained a pathologic fracture which brought the lesion to attention.

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2. Most common in skin in sun exposed areas
  3. Usually small pearl like tumor
  4. Progressive growth
  5. Rarely metastasize
- iv. Squamous Cell Carcinoma
1. Sun exposure related (hands – arm), may be extensive in shoulder
  2. M>F
  3. Rare before age 50
  4. Involves superficial layer of skin
  5. Size and grade predict lymph node involvement
- X. Benign Bone Tumors of the Hand and Upper Extremity<sup>2(p35-36)</sup>
- a. Enchondroma<sup>3(479)</sup>
- i. Solitary (Figure 3)
    1. Single bone involved
    2. Common in phalanges
    3. Often discovered due to fracture
    4. Typical cartilage appearance on x-rays ( enlarged bone, arcs and rings, stipples and floccules)
    5. May have more dramatic radiographic changes in small bone than in large bones
  - ii. Multiple enchondromatosis<sup>3(p439)</sup>
    1. Ollier's Disease
      - a. multiple bones involved (phalanges, metacarpals)
      - b. Disfiguring
      - c. High rate of malignant transformation
    2. Maffucci's Disease
      - a. Enchondromatosis + hemangiomas
      - b. Disfiguring

- c. Malignant transformation of enchondromas or cancers arising in other organ systems
- b. Osteochondroma<sup>3(p1626)</sup>
  - i. Solitary
    - 1. Presents as a mass usually near a joint
    - 2. May cause pain due to:
      - a. Interference with muscle function
      - b. Compression on local nerves
    - 3. Two types
      - a. Pedunculated – most common
      - b. Sessile – broad based
    - 4. Cortical-medullary continuity on x-rays
    - 5. Treatment - excision
  - ii. Multiple (MHE –multiple hereditary exocytosis)(Figure 4)
    - 1. Autosomal Dominant condition
    - 2. Variable expression
    - 3. Malignant transformation common especially proximal large tumors
    - 4. Suspect malignant change if growth occurs after skeletal maturity.
- c. Fibrous dysplasia<sup>3(p191)</sup>
  - i. Monostotic
    - 1. solitary bone involved
    - 2. may present as pathologic fracture
    - 3. no treatment unless fractured
  - ii. polyostotic
    - 1. multiple bones involved with deformity
    - 2. Pain from structural insufficiency
    - 3. Café-au-lait skin lesions (Coast of Maine – irregular margins)

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4. May be associated with endocrine changes
    - a. McKune-Albright syndrome
    - b. Precocious puberty
  5. Mazabraud's Syndrome – Polyostotic fibrous dysplasia plus myxomas
- d. Unicameral Bone Cyst<sup>3(p1235)</sup>
- i. Central metaphyseal location
  - ii. Aggressive, active or latent – dependent on proximity to physis and bone involvement
  - iii. May present as fracture
  - iv. Common in proximal humerus
  - v. Treatment
    1. Observation
    2. Aspiration – 1 needle vs. 2 needle technique
    3. Aspiration and Steroid injection
    4. Aspiration and injection of bone marrow aspirate
    5. Cement injection
    6. Open curettage and bone grafting
- e. Aneurysmal Bone Cyst<sup>3(p1267)</sup> (Figure 5)
- i. Aggressive lesion
  - ii. Pain
  - iii. Swelling
  - iv. Involves bone surface
  - v. Can be destructive of bone
  - vi. Fluid-fluid levels on MRI figure 5
  - vii. Treatment - curettage and bone grafting
- f. Non-Ossifying Fibroma<sup>2(p131),3(p692)</sup>
- i. Common lesion in children- often found accidentally

- ii. Heal (usually) with skeletal maturation
  - iii. May present as pathologic fracture
  - iv. Metaphyseal lesion
  - v. Eccentric, well-marginated, soap bubble appearance
  - vi. Treatment - observation
- g. BPOP (Nora's lesion) Bizarre parosteal osteochondromatous proliferation<sup>3(p1613)</sup>(Figure 6)
- i. Common in fingers
  - ii. Exuberant exophytic bone formation
  - iii. Looks aggressive – is benign
  - iv. Treatment - excision
- h. Osteoid Osteoma<sup>2(p92),3(p226)</sup>
- i. Night pain
  - ii. Dense bone sclerosis with central nidus on x-ray, may need CT to identify nidus
  - iii. Responds to NSAIDs
  - iv. Treatment
    - 1. Radiofrequency Ablation (RFA) most common treatment
    - 2. Surgery for recurrence or unsure of tumor type
- i. Chondroblastoma<sup>2(p116),3(p589)</sup>
- i. Epiphyseal Tumor
  - ii. Prior to closure of physis in adolescents
  - iii. Pain
  - iv. Loss of motion
  - v. Bone edema on MRI
  - vi. Treatment – curettage and bone grafting; may result in physeal closure
- j. Synovial Chondromatosis<sup>1(p1017),2(p265)</sup>

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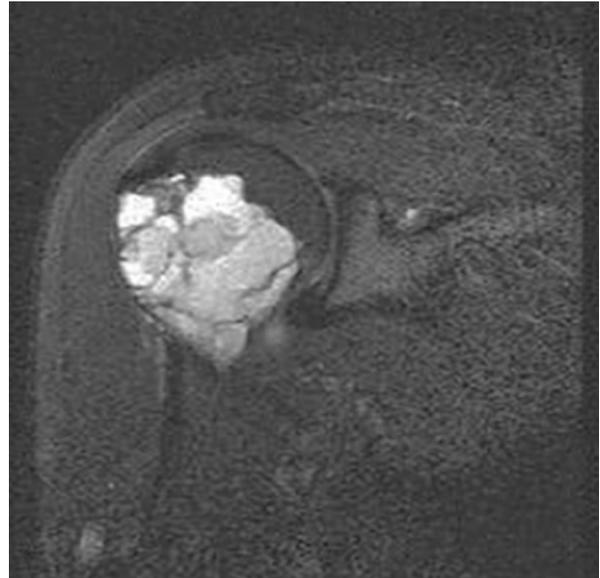
- i. Dysplastic synovial change, “popcorn-like” calcifications in peri-articular space
- ii. Production of cartilaginous loose bodies within synovial structures (joints, tendon sheaths, etc)
- iii. Multiple loose bodies
- iv. High recurrence rate
- v. Common in shoulder (G-H joint)
- vi. Treatment
  1. Arthroscopy – if few nodules, easy to locate
  2. Surgical arthrotomy – if numerous nodules in difficult location
  3. Synovectomy – to prevent development of more nodules
- k. Myositis Ossificans (heterotopic ossification)<sup>2(p251),3(p1550)</sup>
  - i. Reactive change
  - ii. History of trauma / injury
  - iii. Bone formation in soft tissue
  - iv. May affect function
    1. Scarring of muscle
    2. Entrapment of tendons
  - v. Common around elbow
    1. Trauma
    2. Head injury
    3. Burns
  - vi. Treatment
    1. Maintain ROM
    2. Bisphosphonates
    3. Radiation
    4. Excision with post-operative radiation

### XI. Malignant Bone Tumors of the Hand and Upper Extremity<sup>7</sup>

## Chapter 21 Figures



**Figure 4. Proximal humerus and shoulder of patient with multiple hereditary exostosis.**



**Figure 5. Aneurysmal bone cyst of the humerus with the typical “fluid-fluid” levels, representing fluids of differing densities which settle out (like oil and water) when the patient is at rest for the imaging.**



**Figure 6. Patient with bizarre periosteal osteochondromatous proliferation (BPOP) also known as Nora’s lesion, arising from the middle phalanx of the middle finger.**



**Figure 7. Osteosarcoma of the proximal radius just distal to radial head. Note the destruction of cortex and new bone formation. Patient sustained a pathologic fracture playing golf.**

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- a. Osteosarcoma<sup>2(p163),3(p248)</sup> (Figure 7)
  - i. Primarily humerus, less frequently distal radius or small bone
  - ii. Bone producing tumor
  - iii. Aggressive
  - iv. Many subtypes, most common is classic osteosarcoma, appearing in meta-diaphyseal region in proximal humerus in the upper extremity
  - v. Pulmonary metastases in 80% at diagnosis – may not be visible on x-ray or CT scan
  - vi. Treatment
    1. Pre-operative chemotherapy
    2. Surgery – 90% will be able to have limb salvage procedure rather than amputation
    3. Reconstruction
      - a. Bone reconstruction
        - i. Segmental modular prosthesis ( several designs)
        - ii. Allograft prosthetic composite
        - iii. Allograft
      - b. Joint reconstruction –
        - i. Capsule reconstruction
        - ii. Muscle balancing ( difficult with removal of rotator cuff, biceps)
        - iii. May need allograft fusion
      - c. Long rehab process
      - d. Post-operative chemotherapy
    - vii. Survival – 5 years
      1. 20% without chemotherapy
      2. 60-70% with chemotherapy
      3. Response to up-front chemotherapy predictive of prognosis – good response is greater than 95% necrosis of tumor

- b. Ewing's Sarcoma<sup>2(p175),3(p1087)</sup>
- i. May affect all bones of the upper extremity
  - ii. Common in adolescents / young adults
  - iii. Small round blue cell tumor
  - iv. Common gene rearrangement t(11,22)
  - v. May present similar to infection (fever, redness, swelling, pain, etc.)
  - vi. Metadiaphyseal or Diaphyseal lesion; also clavicle and scapula
  - vii. Treatment - Chemotherapy + radiation and/or surgery
  - viii. Survival – 50% at 5 years with chemo and surgery (dependent on size, location and response to chemotherapy)
- c. Chondrosarcoma<sup>2(p185),3(p476)</sup>
- i. Uncommon in children
  - ii. May arise in prior enchondroma or osteochondroma
  - iii. Pre-existing enchondromatosis
  - iv. Clear Cell Chondrosarcoma - Arises in epiphyseal region in adult (like chondroblastoma in proximal humerus))
  - v. Treatment – usually surgery alone
- d. Undifferentiated Pleomorphic Sarcoma- UPS<sup>2(p197),3(p766)</sup>
- i. May arise in bone or soft tissue
  - ii. Previously called Malignant Fibrous Histiocytoma (MFH)
  - iii. Destructive change in bone
  - iv. Older population
  - v. May arise in pre-existing lesions
    1. Bone infarcts
    2. Prior radiation therapy
    3. Long standing osteomyelitis
    4. Other lesions uncommonly
  - vi. Treatment

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1. Chemotherapy (if tolerated as this occurs in adults)
2. Surgery

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# Multiple Choice Questions

1. A benign soft tissue tumor which may look malignant or as a “pseudo-sarcoma”:
  - A. GCT of tendon sheath
  - B. Nodular fasciitis
  - C. Schwannoma
  - D. Neurofibroma
2. The most common soft tissue sarcoma of the hand is:
  - A. Epithelioid sarcoma
  - B. Osteosarcoma
  - C. Clear cell Sarcoma
  - D. MPNST
3. The tumor commonly arising in the sub-ungual region of the finger presenting with pain and sensitive to temperature and pressure is:
  - A. Lipoma
  - B. Myoma
  - C. Glomus tumor
  - D. Giant cell tumor of tendon sheath
4. The grade of a tumor is related to its:
  - A. Size
  - B. Location
  - C. X- ray appearance
  - D. Similarity to parent tissue
5. Benign skin changes related to sun damage are called:
  - A. Actinic keratosis
  - B. Café-au-lait spots
  - C. Skin pearls
  - D. Squamous cell carcinoma
6. A bone lesion associated with night pain which is relieved with NSAIDS is:
  - A. Enchondroma
  - B. Osteoid Osteoma
  - C. Unicameral Bone cyst
  - D. Non-ossifying fibroma
7. The most common bone sarcoma in the upper extremity is:
  - A. Osteosarcoma
  - B. Osteoblastoma
  - C. Osteoid Osteoma
  - D. Ewing’s sarcoma

## Multiple Choice Questions

8. The second most common malignant bone tumor in children is:
- A. Osteosarcoma
  - B. Undifferentiated Pleomorphic sarcoma
  - C. Ewing's sarcoma
  - D. Chondrosarcoma
9. The most common solid soft tissue tumor of the hand is:
- A. Epithelioid sarcoma
  - B. Giant cell tumor of tendon sheath
  - C. Dermatofibrosarcoma protuberans
  - D. Clear cell sarcoma
10. Radiation therapy in the hand is difficult because:
- A. Lack of soft tissue envelope
  - B. Small bones
  - C. Too many joints
  - D. Poor blood supply
11. Unicameral Bone Cysts:
- A. Require surgery
  - B. Are eccentrically placed
  - C. Often present with fracture
  - D. Common in small bones of the hand
12. Which of the following is not a type of neurofibroma:
- A. Solitary
  - B. Diffuse
  - C. Plexiform
  - D. Pedunculated
13. Which tumor typically trans-illuminates:
- A. GCT of tendon sheath
  - B. Aneurysmal bone cyst
  - C. Ganglion
  - D. Unicameral bone cyst
14. Lymph node metastases are common in all the below except:
- A. Rhabdomyosarcoma
  - B. Synovial sarcoma
  - C. Epithelioid sarcoma
  - D. Chondrosarcoma

## Multiple Choice Questions

**Multiple Choice Question Answer Key  
Chapter 21**

1-B, 2-A, 3-C, 4-D, 5-A, 6-B, 7-A,  
8-C, 9-B, 10-A, 11-C, 12-D, 13-C, 14-D