CLINICAL SURGERY PEARLS

This is an examination-oriented clinical book meant for both undergraduates and postgraduates in question-answer format. The questions for postgraduates are purposely marked in the questions with a case example followed by a checklist for history and physical examination followed by the diagnostic points for that particular case. This is followed by the community asked examination questions related to those cases concerning the relevant anatomy, physiology, investigation, differential diagnosis and appropriate management. The book is highlighted with flow charts and boxes. There is a separate section for definitions of various clinical terminologies. The presentation and style are unique.

Review by J V Swaminathan on “Clinical Surgery Pearls”

I give my warmest pleasure to write a reference to this wonderful compendium of Surgical Wisdom by Professor R Dayanand Babu, The Clinical Scenario with the problem-solving approach being Surgical principles to bedside. This is a long-felt need and Clinical Surgery Pearls has bridged the gap very effectively. Each section starts with a Clinical Scenario, Containing the basic fundamentals of the diseases, followed by patient presentations to meet advanced cognitive levels. The approach from the known to the unknown and from the simple to complex, it is in conformity with sound learning principles. This is why the vast student population has accepted this book as an introduction. This question-answer format was further clarified by learning process. Hence a tidy way, each section is complete in itself and of great help to our student community. I am happy to note that the second edition of this book is being released with updated information. It will further enhance the ability of the work, especially for our postgraduate students. I have no hesitation in recommending this book for our undergraduate and postgraduate students in General Surgery.

R Dayanandas Babu is Professor and Head, Department of Surgery, Sree Gokulam Medical College, Vellanur, Tamilnadu, India. He has been a Teacher of Surgery for undergraduate and postgraduate students for the last 30 years. He has been the Professor and Head of Department, Government Medical College, Kollam, Trichy倪, PG Deanships and Postgraduate Medical College, Tamilnadu. Teaching is his passion and is a popular teacher for his clarity and communication skills. He has been the former President of the Indian Association of Endoscopists. Chairman and Secretary, Association of Surgeons of India, Kerala Chapter, National Board of Examiners for all South Indian Universities, Governing Council, Thiruvananthapuram, Kerala, India. He is a Fellow of the Academician and Member of the Association of Surgeons of India, former Fellow of Board of Studies, MG University, Member PG Board of Studies. Anitha Medical College and Hospital, Coimbatore. He has received several awards and prizes in India. Dr. R V Srinivasan Memorial Award of KSCSTE (2001). Dr. D. C. Rangaswami Memorial Award of K SCSTE (2001). Dr. JS: Srengottu Memorial Award of KMC (2002). Dr. PA Alexander Oratorical Award of RPS (2006). Dr. KSG Perumal Oratorical Award of Srinivasa Cancer Society (2009). Professor Dr. J. G. Jayaram Oratorical Award of Medical Board of AI (2005) and Dr. Jayaram Oratorical Award of National Cancer Board of AI (2009). He was awarded the Honorary Fellowship of the Indian Association of Endoscopic Surgeons (2009). He has published several papers and written two chapters for the book A Practical Guide to Colon Cancer written by Dr. George Keyousher published by Jaypee Brothers Medical Publishers (P) Ltd., New Delhi and edited the Puchmann Manual for House Surgeons.

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R DAYANANDA BABU

Foreword Mathew Varghese

Shefiling
Recommendation
SURGERY
CLINICAL SURGERY PEARLS

SECOND EDITION

R Dayananda Babu  MS  MNAMS
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Foreword
Mathew Varghese

JAYPEE BROTHERS MEDICAL PUBLISHERS (P) LTD.
New Delhi • London • Philadelphia • Panama
Dedicated to
My late parents for their love and affection – Mr Raghavan and Mrs Mallakshy
My only sister – late Ms Damayanthy
My wife – Professor (Dr) Geetha Bhai and to my beloved son Deepak D Babu for their moral support
My teachers for their wisdom
My patients for their trust and support
My students for their assistance
Professor R Dayananda Babu is known to me for the past forty years. I have great admiration for his wealth of knowledge in the subject of surgery.

He has written the book *Clinical Surgery Pearls* with careful and persistent effort. The overriding goal has been the mobilization of information relative to the science and skills of surgery. In addition to defining the frontiers of surgical knowledge, it affords the student to assimilate the fundamentals in an easy way.

This book will be an enormous help to those who are studying surgery at both undergraduate and postgraduate levels.

I wish the book a great success.

*Professor (Dr) Mathew Varghese*

MS FRCS Ed
Emeritus Professor of Surgery
Government Medical College
Kottayam, Kerala, India
Preface to the Second Edition

The first edition of this book was published in 2010. It is gratifying to note the wide acceptance of this book as an exam cracker by undergraduates and postgraduates alike; and, therefore, I was forced to bring out the second edition within 2 years of the initial publication. I am happy to note that now this book is recommended by many universities.

There is no need to stress the importance of refreshing a book like this. I was forced to spend many hours in rectifying the errors which have crept up in the first edition. The old chapters have been thoroughly revised and updated. The new American Joint Committee on Cancer (AJCC), 7th edition, has been used for staging and management, instead of the 6th edition of AJCC as used in the first edition. At the end of some of the important cases, colored boxes have been used under the title “What is new—for postgraduates, the unique unorthodox style, the student-oriented approach and the question-answer format are still retained.”

I am grateful to Professor John S Kurian, who is Professor of Surgery at Government Medical College, Kottayam, Kerala, India, for the effort he has taken to find out the errors and for coming up with suggestions for improvement. I also thank Dr Deepak George, for his valuable suggestions for improvement of many of the chapters.

I also thank the publisher M/s Jaypee Brothers Medical Publishers (P) Ltd, New Delhi, India, for bringing out a high-quality second edition book quickly.

R Dayananda Babu
Preface to the First Edition

This book is the final result of my continuous teaching and learning process with my undergraduate and postgraduate students in surgery. Whenever I interact with my students, I realize their problems and deficiencies and find out the solutions, so that it reaches them. Whenever I read a chapter, a series of questions will come to my mind and then I will try to answer those questions. That is exactly the reason why this book is in question-answer format. The flow charts and tables in this book are evolved in the classrooms and bedside teaching area.

Whenever I read a topic, I try to define the condition. I feel that when you define something, half the problem is solved; and, therefore, the first chapter is devoted to definitions. There are more than 100 definitions in this book.

Another important aspect of any learning process is to find out the concepts behind the disease process and management. These concepts are converted to an easily digestible capsule form in this book for the students. As an examiner at undergraduate and postgraduate levels, I realized that most of the time the students miss many important clinical points during case presentation, not because they do not know them but because they do not have a checklist. Therefore, I have given the checklist for all clinical cases. The questions for the postgraduate (PG) students are marked as PG in brackets so that the undergraduate students can skip them if they feel so.

More than 50 clinical cases are discussed in this book (both long ones and short ones). Each case starts with a clinical capsule and questions are formulated based on the clinical capsule. There is a separate chapter for radiology and imaging and about 32 skiagrams are discussed. Important tables and charts are included as a separate chapter for ready reference.

This is a clinical book of definitions, checklists, tables, flow charts, questions and answers. All my classes are distilled into a book and the title is Clinical Surgery Pearls. The preparation of this book took seven long years of hard work, and I completed this book single handedly. All the clinical photographs are taken by me with a small Kodak digital camera. The highlighted boxes and charts in this book will make it easily readable. I am sure, the unique style and the student-oriented approach will make the learning process a pleasant experience.

R Dayananda Babu
Acknowledgments

I am grateful to:

• All my patients, for permitting me to take clinical photographs.
• My favorite student Dr Suraj Rajan, who has drawn the medical illustrations in Adobe photoshop and who is now working in the US. He also read the first “raw copy” and gave suggestions from the “student point of view”, which is incorporated as student review. I am short of words to thank him.
• All my Professors and teachers in surgery. I remember my great teachers like Professor CKP Menon, Professor KJ Jacob, Professor Mathew Varghese, Professor Balsalam, Professor Mohankumar, Professor KY Roy and Professor CK Bahuleyan.
• My wife Dr Geetha Bhai, who helped me in proofreading and editing this book and without her help this could not have been possible.
• All my postgraduate and undergraduate students in surgery.
• Shri Jitendar P Vij (Group Chairman), Mr Ankit Vij (Managing Director) and Mr Tarun Duneja (Director-Publishing) of M/s Jaypee Brothers Medical Publishers (P) Ltd, New Delhi, India.
• Mr PM Sebastian (Branch Manager, Jaypee Brothers, Kochi) and Mr Arun Kumar (Senior Sales Executive, Jaypee Brothers, Kochi) and all the staff of Kochi Branch for bringing out this book in time.
• Finally, Mr Subramanian, for spending time with me and doing the DTP work of this book.
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1. Take up one idea
   Make that one idea your life
   Think of it, dream of it, live on it
   Let the brain, muscle, nerves and every part of your body be full of that idea
   Leave the other ideas alone.
   —Swami Vivekananda

2. Give the best you have and the best shall come back to you.
   —Holy Bible

3. Reading maketh a full man, conference a ready man and writing an exact man.
   —Francis Bacon

4. All truth passes through three stages
   First, it is ridiculed
   Second, it is violently opposed
   Third, it is accepted as being self-evident.
   —Schopenhauer

5. The world is not divided into the rich and poor, the successes and failures,
   but into learners and non-learners.
   —Benjamin Barber
Case 32

Soft Tissue Sarcoma

Case Capsule
A 50-year-old male patient presents with swelling in front and lateral part of right thigh of about 15 x 10 cm size, hard in consistency, deep to deep fascia with restricted mobility. The regional nodes are not palpable. There is no distal neurovascular deficit. The movements of right knee joint are normal. The flexion of right hip joint is restricted due to the size of the swelling. Abdominal and chest examination are normal.

Read the diagnostic algorithm for a swelling.

Checklist for history
- History of radiation
- History of chemical exposure—Arsenic, vinyl chloride
- History of lymphedema
- History of familial lymphedema
- History of neurofibromatosis
- History of retinoblastoma
- History of familial polyposis coli.

Checklist for examination
1. Look for other swellings
2. Look for pigmented lesions in the body
3. Local rise of temperature and tenderness
4. Look for dilated veins over the swelling

Contd...

5. Assessment of the plane of the swelling
6. Involvement of muscle groups
7. Involvement of neurovascular bundle with distal neurovascular deficit—check for distal pulsations and sensations
8. Look for movement of the swellings (whether it is fixed to the bone or not)
9. Check for movement of the joints both proximal and distal
10. Look for wasting of muscles
11. Look for regional nodes
12. Examine the chest for metastasis.

Contd...

Soft tissue sarcoma back of right thigh
Q 1. What is the most probable diagnosis in this case? Soft tissue sarcoma (STS).

Q 2. What is soft tissue sarcoma? They are malignant tumors that arise from skeletal and extraskeletal connective tissue, mesenchymal cells including adipose tissue, bone, cartilage, smooth muscle and skeletal muscle. As per the new definition they are thought to arise from undifferentiated mesenchymal stem cells that may be found virtually anywhere. This will explain the origin of a sarcoma from smooth muscle where anatomically smooth muscle is not present.

Q 3. What are the differential diagnoses? Benign soft tissue swelling such as:
- Lipoma
- Myositis ossificans
Angiomyolipoma
Hematoma
Angiomyxoma.

Q 4. What are the etiological factors for soft tissue sarcoma?

1. **Genetic predisposition**
   - Neurofibromatosis – Von Recklinghausen’s disease
   - Li-Fraumeni syndrome
   - Retinoblastoma
   - Gardner’s syndrome (familial adenomatous polyposis)

2. **Radiation exposure**

3. **Lymphedema**
   - Postsurgical
   - Postirradiation
   - Parasitic infection (filariasis)

4. **Trauma**

5. **Oncogene activation**
   - MDM2, C-erB2, C-KIT

6. **Chemical**
   - 2, 3, 7, 8 – Tetrachlorodibenzodioxin
   - Polyvinyl chloride
   - Chlorophenols
   - Phenoxycetic acid.

Q 5. What is the pathogenesis of soft tissue sarcoma (STS)?

- Specific genetic alterations—fusion genes due to reciprocal translocations and specific point mutations
- Nonspecific genetic alterations—genetic losses and gains
- The tumor suppressor genes—p53 and RB1.

Q 6. What is the order of investigation in this case? **Imaging** is the first investigation of choice which may be either **CT or MRI for extremity and CT** for retroperitoneum. This is followed by carefully planned biopsy—**Core biopsy or incisional biopsy**. The entry point of the core needle biopsy must be carefully placed such that it does not compromise subsequent radical excision. The incision is placed along the future resection axis, i.e. longitudinal for extremity soft tissue sarcoma.

Q 7. Why not FNAC?

There is **no role for FNAC in a suspected case of soft tissue sarcoma**. By FNAC you get a report of spindle cell neoplasm which is not going to guide the further management. The core biopsy will give the following:

1. Histopathological confirmation
2. Evaluate the grade
3. Identify the prognostic factors.
   - The only role of FNAC is for the confirmation of recurrence rather than the primary diagnosis.

Q 8. If the core biopsy is negative, is there any role for biopsy and what are the precautions to be taken?

Yes. A carefully planned incision biopsy is done with following precautions:

**Precautions for biopsy**

1. The incision must always be vertical and not horizontal centered over the mass in its most superficial location (An elliptical incision to include the scar of the biopsy is used for formal wide excision later on). No tissue flaps are raised
2. Hemostasis is very important at the time of biopsy (hematoma can distort anatomy)
3. Use drains only if it is absolutely necessary. (Should not be used lateral to the vertical incision). The drain site should be as close to the incision as possible
4. If the swelling is less than 3 cm size, **excisional biopsy** is recommended.
The biopsy should establish the grade and the histologic subtype.

Q 9. What are the soft tissue sarcomas where lymph node metastases are seen? (PG)

<table>
<thead>
<tr>
<th>Soft tissue sarcomas with nodal metastasis (&lt; 3% of adult STS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Synovial sarcoma</td>
</tr>
<tr>
<td>2. Ewing's sarcoma</td>
</tr>
<tr>
<td>3. Embryonal rhabdomyosarcoma</td>
</tr>
<tr>
<td>4. Epithelioid sarcoma</td>
</tr>
<tr>
<td>5. Lymphangiosarcoma</td>
</tr>
<tr>
<td>6. Angiosarcoma</td>
</tr>
<tr>
<td>7. Kaposi sarcoma</td>
</tr>
<tr>
<td>8. Malignant fibrous histiocytoma (MFH).</td>
</tr>
</tbody>
</table>

Q 10. What are the common sites of soft tissue sarcoma and what is the incidence?

It forms 1% of adult human malignancy and 15% of pediatric malignancy.

- Extremities – 50% (35% in lower limb and 15% in upper limb)
- Trunk – 31%
- Head and Neck – 9%
- Others –

Q 11. What are the most common histopathological subtypes?

1. MFH (the new terminology as per WHO is High grade undifferentiated pleomorphic sarcoma) – 24%
2. Liposarcoma – 19%
3. Leiomyosarcoma – 21%
4. Synovial sarcoma – 12%
5. Nerve sheath tumors – 6%
6. Fibrosarcoma – 11%
7. Other types – 7%

Q 12. What is the age group affected?

- Childhood – Embryonal rhabdomyosarcoma
- Less than 35 years – Synovial sarcoma
- Older patients – MFH and liposarcoma

Q 13. Why the grade is important in STS?

Grade of the tumor is included in stage grouping.

Q 14. What are the factors considered for grade?

They include:
- Cellularity
- Differentiation
- Pleomorphism
- Necrosis
- Number of mitosis.

Q 15. Based on mitotic activity how is grading done?

- Mitotic activity 0–9 / high power field
- 10 – 19
- 20 or more.

Q 16. What are the imaging studies of choice?

- Plain radiograph—underlying skeletal deformities, callus and bony exostosis can be identified
- CT is preferred for intra-abdominal lesion because one can identify both primary and potential metastasis
Soft Tissue Sarcoma

- **MRI**—Best suited for accurate anatomical localization
  - Whether lesion is intra or extra compartmental
  - Can diagnose lipoma and hemangioma with reasonable accuracy
  - Identify the relationship of the sarcoma to neurovascular structures.
- **MR angiography** (The role of arteriography has decreased markedly after MR angiography)
- **Ultrasound**—can guide biopsy. *Useful under certain circumstances*

1. **PET CT scan** may be useful for targeting biopsy, in prognostication, grading and determining response to preoperative chemotherapy. **MR spectroscopy is coming up in a big way for grading of the tumor.**
2. Consider **abdominal/pelvic CT** for the following types of extremity soft tissue sarcoma:
   - Myxoid liposarcoma
   - Epithelioid sarcoma
   - Angiosarcoma
   - Leiomyosarcoma
3. **MRI** of spine for myxoid round cell liposarcoma
4. **CNS imaging for alveolar sarcoma** and angiosarcoma.

**Q 17. What is the timing of imaging?**
Imaging is done prior to core biopsy and incision biopsy. The core biopsy will produce architectural alterations in the lesion.

**Q 18. What is the metastatic work up?**
- **X-ray chest** – 70% of the extremity sarcomas metastasize to the lungs
  - Retroperitoneal or visceral lesions metastasize to the liver parenchyma
- **CT scan of the chest** is recommended for high grade tumors and for all tumors > 5 cm size. Metastases are seen in the periphery of the lung. It is superior to chest X-ray for identifying metastasis for low grade tumors.

**Q 19. What is the staging of soft tissue sarcoma?**

*TNM Staging: AJCC 7th Edition.*
- Grading has been reformatted from a four grade to a 3 grade system as per the criteria recommended by the College of American Pathologists
- N1 disease has been reclassified as stage III rather than stage IV.

**Primary Tumor (T)**
- **TX** – Primary tumor cannot be assessed
- **T0** – No evidence of primary tumor
- **T1** – Tumor 5 cm or less in greatest dimension
  - **T1a** – Superficial tumor
  - **T1b** – Deep tumor
- **T2** – Tumor more than 5 cm in greatest dimension
  - **T2a** – Superficial tumor
  - **T2b** – Deep tumor

**Regional Lymph Nodes (N)**
- **NX** – Regional lymph nodes cannot be assessed
- **N0** – No regional lymph node metastasis
- **N1** – Regional lymph node metastasis

*Note: Presence of positive nodes (N1) is considered Stage IV (the outcome of patients with N1 disease is similar to those with M1 disease).*

**Distant Metastasis (M)**
- **MX** – Distant metastasis cannot be assessed
- **M0** – No distant metastasis
- **M1** – Distant metastasis

**Histologic Grade**
- **GX** – Grade cannot be assessed
- **G1** – Grade 1
- **G2** – Grade 2
- **G3** – Grade 3
**Clinical Surgery Pearls**

**Stage Grouping**

<table>
<thead>
<tr>
<th>Stage</th>
<th>T size</th>
<th>N size</th>
<th>M</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>IA</td>
<td>T1a</td>
<td>N0</td>
<td>M0</td>
<td>G1, Gx</td>
</tr>
<tr>
<td></td>
<td>T1b</td>
<td>N0</td>
<td>M0</td>
<td>G1, Gx</td>
</tr>
<tr>
<td>IB</td>
<td>T2a</td>
<td>N0</td>
<td>M0</td>
<td>G1, Gx</td>
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<td></td>
<td>T2b</td>
<td>N0</td>
<td>M0</td>
<td>G1, Gx</td>
</tr>
<tr>
<td>IIA</td>
<td>T1a</td>
<td>N0</td>
<td>M0</td>
<td>G2, G3</td>
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<td>T1b</td>
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<td>IIB</td>
<td>T2a</td>
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<td></td>
<td>T2b</td>
<td>N0</td>
<td>M0</td>
<td>G2</td>
</tr>
<tr>
<td>III</td>
<td>T2a, T2b</td>
<td>N0</td>
<td>M0</td>
<td>G3</td>
</tr>
<tr>
<td></td>
<td>Any T</td>
<td>N1</td>
<td>M0</td>
<td>Any G</td>
</tr>
<tr>
<td>IV</td>
<td>Any T</td>
<td>Any N</td>
<td>M1</td>
<td>Any G</td>
</tr>
</tbody>
</table>

Q 20. What are the immunohistochemical markers for soft tissue sarcoma? (PG)

<table>
<thead>
<tr>
<th>IHC marker</th>
<th>Type of sarcoma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desmin</td>
<td>Sarcoma from smooth, skeletal muscle</td>
</tr>
<tr>
<td>CD 31, CD 34</td>
<td>Vascular sarcomas</td>
</tr>
<tr>
<td>S 100</td>
<td>Sarcoma with neural, lipomatous, chondroid differentiation</td>
</tr>
<tr>
<td>Vimentin</td>
<td>Many sarcomas—non specific</td>
</tr>
<tr>
<td>CD 117</td>
<td>Gastrointestinal stromial tumor</td>
</tr>
<tr>
<td>CD 57, Vimentin</td>
<td>Chondrosarcoma</td>
</tr>
<tr>
<td>CD 99, S 100, NET, Vimentin</td>
<td>PNET/Ewing's sarcoma</td>
</tr>
<tr>
<td>Cytokeratin, CD 99, NET, Desmin</td>
<td>Desmoplastic round cell tumors</td>
</tr>
<tr>
<td>CD 57, EMA, Vimentin</td>
<td>Osteosarcoma</td>
</tr>
</tbody>
</table>

Q 21. What is the staging proposed by Memorial Sloan Kettering Cancer Centre (MSKCC)? (PG)

This is a simple staging system based on the three important prognostic factors namely:

1. High grade — 1 point
2. Tumor size > 5 cm — 1 point
3. Deep tumor — 1 point
4. 

<table>
<thead>
<tr>
<th>Good prognostic factor</th>
<th>Poor prognostic factor</th>
<th>Staging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 0 - no poor prognostic feature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage 1 – 1 poor prognostic feature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage 2 – 2 poor prognostic feature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage 3 – 3 poor prognostic feature</td>
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<td></td>
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<tr>
<td>Stage 4 – metastatic sarcoma</td>
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</tr>
</tbody>
</table>

Q 22. What you mean by superficial and deep in staging? (PG)

**Superficial lesions**—lesions not involving the superficial fascia.

**Deep:**

a. Lesions deep to, or involves the superficial fascia
b. All intraperitoneal visceral lesions
c. Retroperitoneal lesions
d. Mediastinal (Intrathoracic lesions)
e. Pelvic sarcomas
f. Head and neck tumors.

Q 23. What is the metastatic potential of low grade and high grade STS? (PG)

- Less than 15% risk of metastasis for low grade tumors
- More than 50% risk for high grade tumors
Note: For retroperitoneal sarcoma liver is the principal site of metastasis. For extremity sarcoma, lung is the principal site of metastasis.

Q 24. What are the sarcomas excluded from this staging system?
- Kaposi's sarcoma
- Dermatofibrosarcoma protuberans
- Infantile fibrosarcoma
- Angiosarcoma
- Sarcomas arising from the dura mater including brain
- Sarcoma arising in the parenchymatous organs
- Hollow viscera
- Inflammatory myofibroblastic tumor
- Fibromatosis (Desmoid tumor)
- Mesothelioma.

Q 25. What is fibromatosis?
Original fibrosarcoma grade I is now mentioned as fibromatosis (Desmoid) and they are not in soft tissue sarcomas.

Q 26. What is the staging in this case?
T2b, N0, M0 (Stage 3).

Q 27. What is the management of soft tissue sarcoma?
Multidisciplinary approach is recommended comprising expertise in the following specialties:
- Radiology
- Clinical oncology
- Surgical oncology.

Note: Limb sparing surgery is preferred. Amputation is performed in < 5–10% of cases.

Q 28. What is the surgical management of this tumor?
Limb sparing, function preserving, margin free (microscopically negative) wide excision is the treatment of choice.

Q 29. What is wide excision?
It is a wide en-bloc resection to obtain 1 cm uninvolved tissue in all directions for low grade tumors and 2 cm in all directions for high grade tumors (3-dimensional). A 3-dimensional clearance without seeing the tumor is achieved.

Note: All earlier scars, fine needle aspiration tracts and biopsy areas with hematoma should be excised en-bloc with the underlying tumor.

Q 30. What is “Pseudocapsule” in soft tissue sarcoma?
The sarcomas grow in an expansive fashion, flattening the normal soft tissue structures around them in a concentric manner and creating a compression zone of condensed and atrophic tissue. Outside this zone lies edematous neovascularized tissue called reactive zone. Together the compression and reactive zones comprise the pseudocapsule.

Small tentacles (small finger-like extensions) extend for variable distance from the parent lesion perforating the pseudocapsule to form clinically occult deposits beyond the pseudocapsule. Therefore, tumor masses will be seen outside the pseudocapsule.

Q 31. What are the barriers for the infiltrative growth of the sarcomas?
The expansive growth stops at the following boundaries:
1. Fascial boundaries
2. Periosteal structures
3. Adventitia of the vessels

Note: Gross involvement of these structures is seen early (may become infiltrated).

Q 32. What is intralional excision?
When you leave behind the pseudocapsule and remove the lesion, it is called intralional excision. It is not recommended.
Q 33. What is marginal excision? (PG) Removal of tumor along with its pseudocapsule is called marginal excision (Not recommended).

Q 34. What is compartment excision? (PG) Compartment excisions are done for soft tissue sarcomas of the extremities. Removal of muscle bundles from origin to insertion and all other structures in the compartment is called compartment excision. This is also given up in favor of wide excision.

Q 35. What is the role of amputation in soft tissue sarcoma? There is a paradigm shift from radical amputation to limb salvage procedure in the treatment of soft tissue sarcoma.

- Amputation as an initial treatment did not decrease the probability of regional metastasis and did not improve the disease specific survival and therefore, a limb sparing attitude is taken
- Patient preference when gross total resection of the tumor is expected to render the limb non-functional
- Sarcomas involving bone or joint.

Note: Amputation should be performed one joint above the tumor.

Q 36. When complete encirclement of major neurovascular bundle occurs what should be the surgical approach? (PG)

1. Nerve resection: It may be necessary to sacrifice these structures and give braces for footdrop after sciatic nerve resection, knee brace for joint stability after loss of quadriceps function secondary to femoral nerve resection.
2. Resection of a major artery followed by saphenous vein graft or prosthetic graft for restoration of arterial flow.
3. If 1 and 2 are not feasible do amputations.

Q 37. In the given patient what will be the treatment option? In the given case the wide excision will involve removal of part of the quadriceps muscle, resection of femoral nerve followed by knee brace for stability of the knee. The femoral vessels are unlikely to be encircled by the tumor.

Q 38. What is the role of adjuvant radiation therapy? Radiotherapy is not a substitute for suboptimal surgery. There are three types of radiotherapy:
- Brachytherapy
- IORT
- XRT

The indications for radiotherapy are:
- High grade lesions
- Low grade lesions > 5 cm
- Margin positive
- Close soft tissue margin < 1 cm
- Recurrent sarcomas.

Q 39. What are the advantages and disadvantages of preoperative radiotherapy and the indications? (PG) Preoperative radiotherapy is indicated for stage II and III disease. The advantages are:

- Reduces seeding in surgical manipulation
- Pseudocapsule may thicken and become acellular, easing resection
- To tackle occult micrometastasis
- To do less radical surgery later on
- In patients with unresectable tumors for limb sparing surgery later on

The disadvantages are:
- Wound healing problems—may need the help of plastic surgeon
- Resection is possible only after 3–6 weeks

The dose of radiotherapy is 50 Gy.
Q 40. What is the role of brachytherapy? (PG)
Adjuvant brachytherapy is being used increasingly nowadays. Brachytherapy will treat the tumor bed, within 2 cm of the margin. Radioactive wires are placed into the operative bed to improve local control. It will not treat large margins, overlying skin, and scar or drain site. It has got a short duration of treatment (4–6 days) compared to the external beam therapy consisting of 6–8 weeks duration.

Q 41. What are the indications for chemotherapy?
• High grade liposarcoma
• High grade synovial sarcoma
• Ewing’s sarcoma
• Rhabdomyosarcoma.

Q 42. What is rationale for preoperative chemotherapy?
• Preoperative chemotherapy is indicated for stage II and III
• To limit the spread of tumor at the time of surgery.

Q 43. What are the chemotherapeutic regimens?
• The single agents used are:
  – Doxorubicin, Ifosfamide and Dacarbazine
• Combination
  – Gemcitabine and Docetaxel combination
  – MAID: Mesna, Adriamycin, Ifosfamide, Dacarbazine

Q 44. What is the treatment protocol for the various stages?
It is managed by multidisciplinary team—Surgeon, Radiation Oncologist and Medical Oncologist. The diagnosis is established by a carefully planned biopsy which is done after imaging. Establish the grade of the tumor and histological type before treatment. Limb sparing, function preserving, margin free wide excision is the surgical procedure of choice.

Treatment protocol based on the staging:
Stage 1A (T1a - 1b N0, M0)/Stage IB:
• Wide excision—final margin > 1cm or intact fascial plane—follow-up
• Final margin < 1cm or without intact fascial plane—consider radiotherapy
• Follow-up evaluation for rehabilitation, chest imaging every 6–12 months
• Stage II and III Resectable/potentially resectable disease
  • Surgery/preoperative radiotherapy/preoperative chemotherapy, preoperative chemoradiation followed by surgery
  • RT/consider RT boost/ consider adjuvant chemotherapy
  • Follow-up.

Unresectable primary disease:
• RT/Chemotherapy/Chemoradiation/isolated regional limb therapy
• Changes to resectable—surgery
• Unresectable—definitive RT/Chemotherapy/ Palliative surgery
• Follow-up.

Stage IV–Metastasis:
• Single organ/limited tumor bulk – primary tumor management and metastatectomy and RT/ chemotherapy and follow-up
• Disseminated metastasis—palliative chemo/palliative surgery/palliative RT.