

Sarcoma

A mini review for clinicians

For postgraduate residents, medical students and practising clinicians

Dr. Haritha Chiramana

MD (Internal Medicine), DM (Medical Oncology)

Senior Medical Oncologist & Hemato-Oncologist

C.R. Reddy Cancer Center, C.R. Reddy Superspeciality Hospital, Nellore

0861 232 5344 · info@drharitha.co.in · drharitha.co.in

Learning objectives

- Recognise the lumps and bone pains that need imaging before a knife
- Order MRI, then a planned core biopsy, then expert pathology and molecular testing
- Use grade, size, subtype and fusions to plan treatment
- Plan surgery and radiotherapy for limb, trunk and retroperitoneal sarcoma
- Apply chemotherapy by setting: osteosarcoma, Ewing sarcoma, advanced soft tissue sarcoma
- Plan surveillance, rehabilitation and late-effect care (no drug doses)

Roadmap

- 1 Burden and biology
- 2 Presentation and traps
- 3 Workup and staging
- 4 Biomarkers
- 5 Local therapy: surgery and radiotherapy
- 6 Systemic therapy
- 7 Algorithms
- 8 Survivorship
- 9 Evidence and cases

1

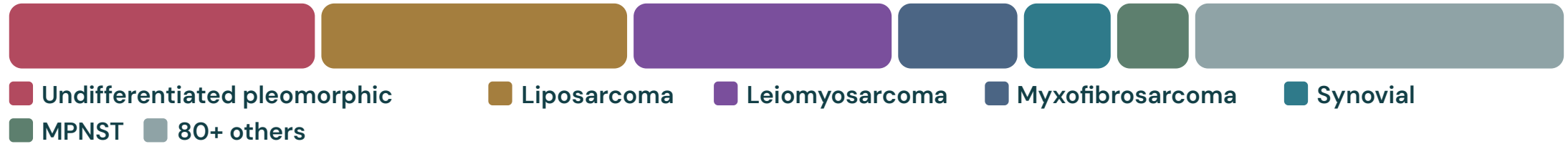
Burden and biology

Sarcoma in India

- About 1% of adult cancers but 1 in 7 to 1 in 10 childhood and adolescent cancers
- More than 100 subtypes; soft tissue outnumbers bone about 4 to 1
- No reliable Indian incidence figures; patients present younger, with larger tumours
- Outcome is decided early: the first biopsy and the first operation
- Commonest avoidable harm: unplanned excision of a “lipoma”, and bone pain called growing pains

More than 100 diseases

Soft tissue sarcoma (about 80% of sarcomas): main types in adults



Bone sarcoma (about 20%): main types



Limb and trunk soft tissue

- Painless enlarging lump
- >5 cm or deep = image before cutting
- Surgery ± RT; lung is the usual metastatic site

Retroperitoneum and viscera

- Silent until large (median ~15 cm)
- Liposarcoma and leiomyosarcoma
- Local relapse is the main threat

Bone (teens and young adults)

- Night pain, swelling, limp
- Osteosarcoma and Ewing need chemotherapy
- Chondrosarcoma: surgery

Adult soft tissue: UPS, liposarcoma, leiomyosarcoma. Bone: osteosarcoma, Ewing, chondrosarcoma

Soft tissue and bone sarcomas

Soft tissue sarcoma

- About half arise in the thigh and limbs
- Then retroperitoneum, viscera, trunk, head and neck
- Adults: UPS, liposarcoma, leiomyosarcoma
- Retroperitoneal: 10–15%, about 15 cm at diagnosis
- Lung is the commonest site of metastasis (about 80%)

Bone sarcoma

- Osteosarcoma: teenagers, around the knee; second peak over 60
- Ewing sarcoma: children and young adults; long bones, pelvis, ribs
- Chondrosarcoma: adults over 40; pelvis, femur, shoulder girdle
- Chondrosarcoma resists chemotherapy
- Referral to a sarcoma centre improves survival

2

Presentation and traps

When to suspect sarcoma

Soft tissue lump: refer before any cut if

- Larger than 5 cm (a golf ball)
- Deep to the fascia (fixed, under muscle)
- Growing, or recurred after excision
- Painful, or new in an irradiated field
- Firm, irregular or rapidly enlarging
- Any of these: ultrasound then MRI

Bone: image urgently if

- Pain at night or at rest, not settling
- Swelling or a limp in a teenager
- Fracture after trivial injury
- Fever with a bone mass (Ewing mimics infection)
- Back pain with neurological signs
- First test: plain X-ray of the whole bone

Common traps in Indian practice

- "Lipoma" or "cyst" shelled out in a minor theatre, with no imaging: the commonest route to a spoiled limb.
- Bone pain in a teenager called "growing pains" or a sports injury; Ewing sarcoma treated for weeks as osteomyelitis or TB.
- FNAC used to "rule out" sarcoma: a benign or inconclusive cytology report does not close the question.

A deep, large or growing lump, and persistent bone pain in a young person, are imaging questions

How sarcomas present

Site	Typical story	What to do
Limb or trunk	Painless, enlarging lump; pain only when large	Ultrasound, then MRI if over 5 cm, deep or growing
Retroperitoneum	Silent until large: fullness, early satiety, leg oedema	CT chest–abdomen–pelvis; posterior core biopsy
Irradiated breast	Bruise–like violet patch or nodules years later	Punch biopsies of the darkest area
Uterus	Fibroid that grows fast or recurs	Avoid morcellation when suspicious
Bone	Night pain for weeks, swelling, limp	X-ray of the whole bone, then MRI

Indian traps

- “Lipoma” or “cyst” shelled out in a minor theatre without imaging
- Pain in a teenager called growing pains, injury, osteomyelitis or tuberculosis
- Antituberculous drugs started for a lytic bone lesion without biopsy
- FNAC used as the only test, and a benign report taken as proof
- A “bruise” on an irradiated breast treated as cellulitis

Who is at risk

Factor	Risk	Clinical note
Prior radiotherapy	Low absolute risk, for decades	Latency 7–16 years; angiosarcoma 4–8
Chronic lymphoedema	Stewart–Treves angiosarcoma	Purple nodules: punch biopsy
Li–Fraumeni (TP53)	Very high; young age	Sarcoma under 46 with family cancers: test
NF1	MPNST 8–13%	Painful, growing neurofibroma: MRI, biopsy
Hereditary retinoblastoma	Osteosarcoma, soft tissue sarcoma	Lifelong vigilance for bone pain
A single fall or injury	Not a cause	Draws attention to an existing tumour

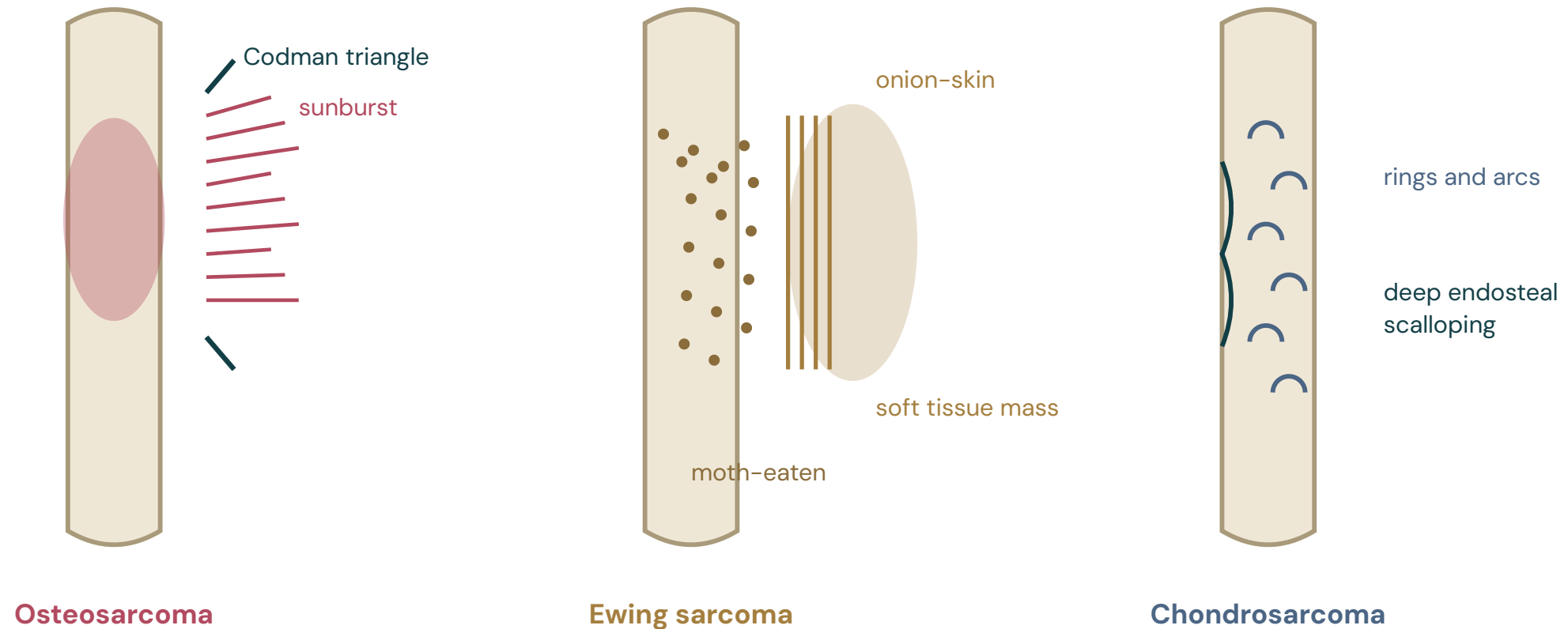
Retroperitoneal mass: think before you cut

- Lymphoma: widespread nodes, raised LDH
- Germ cell tumour: examine the testis; AFP and β -hCG
- Schwannoma, paraganglioma, retroperitoneal fibrosis, Castleman disease
- Primary kidney, adrenal or pancreatic tumours arise from the organ
- Unifocal, extravisceral mass: sarcoma until proven otherwise

Osteosarcoma or osteomyelitis?

- Both cause pain and periosteal reaction
- Fever, raised ESR and anaemia occur in 10–20% of Ewing sarcoma
- Send biopsy for histology and culture together
- Never curette a suspected sarcoma as if it were infection
- A permeative lesion with a soft tissue mass needs biopsy, not antibiotics

The plain X-ray comes first for bone



Aggressive signs on any film: wide zone of transition, cortical breach, interrupted periosteal reaction, soft tissue mass.

Osteosarcoma: metaphysis, sunburst. Ewing: diaphysis, onion skin. Chondrosarcoma: calcified cartilage

3

Workup and staging

Image first, biopsy second, operate last

1 Examine and image

Ultrasound triage; MRI with contrast for limb, trunk, head and neck; CT for abdomen and retroperitoneum

2 Plan the biopsy

Core needle biopsy AFTER MRI, along the line of the future incision, decided with the operating surgeon

3 Expert pathology

Subtype by IHC ± molecular test; FNCLCC grade; review by a sarcoma pathologist

4 Stage

CT chest for all; extra by subtype (abdomen–pelvis, spine MRI, PET-CT, bone marrow)

5 Sarcoma MDT

Surgeon, radiation and medical oncologist, radiologist, pathologist decide the sequence

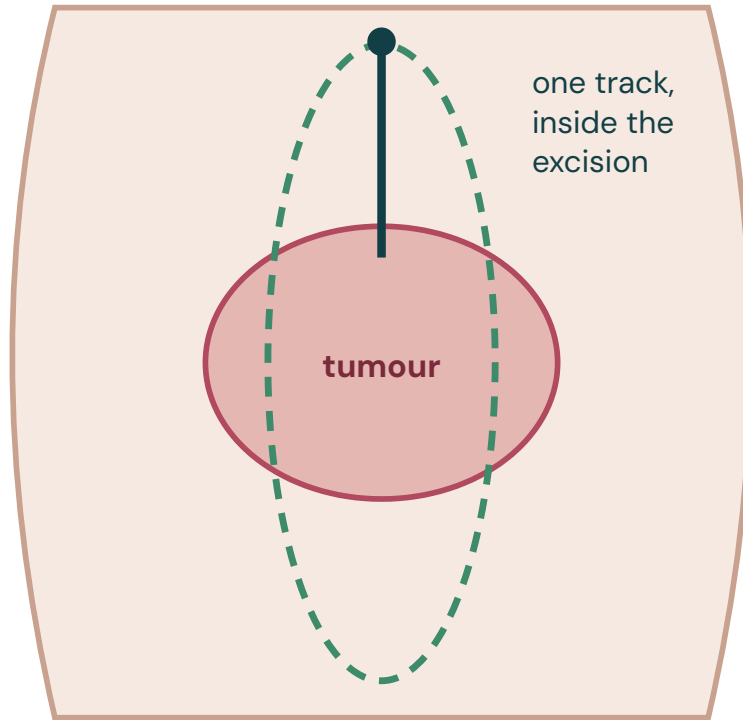
MRI before biopsy avoids post-biopsy oedema confusing the picture

Imaging: what to ask for

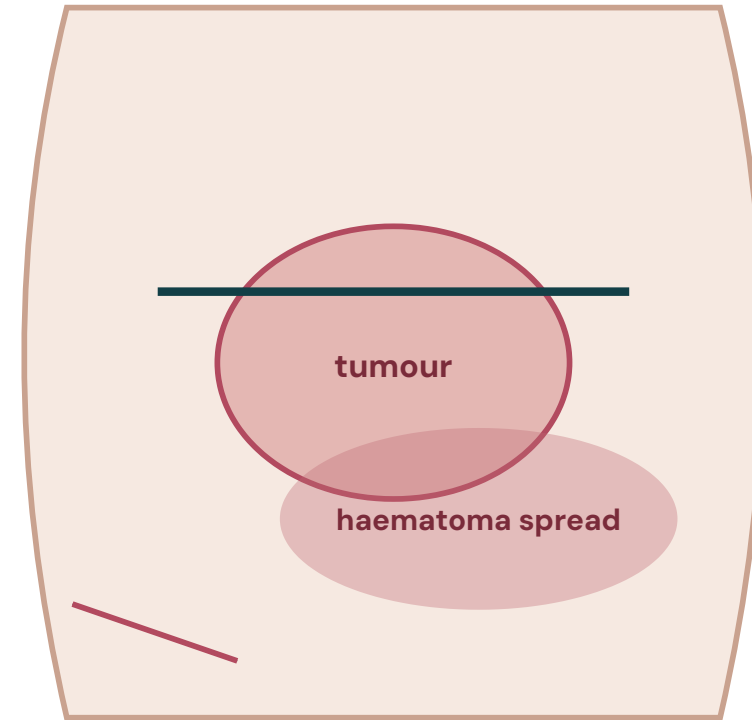
Question	Test	Note
Suspicious soft tissue lump	Ultrasound by an expert	Small superficial fatty lesions can be watched
Extent of limb or trunk mass	MRI with contrast	Before biopsy
Retroperitoneal mass	Contrast CT abdomen–pelvis	Fat plus solid nodule: dedifferentiation
Lung metastases	CT chest in everyone	Lung holds about 80% of metastases
Myxoid liposarcoma	CT abdomen–pelvis and spine MRI	PET misses it
Bone lesion	X-ray, MRI of whole bone, CT chest, PET–CT	Look for skip lesions

The biopsy decides the operation

Planned: core needle along the future incision



Unplanned: transverse cut, haematoma, contamination



Core needle (image-guided, several cores, 14–16 G) is the default; avoid FNAC as the only test; incisional biopsy only by the treating team.

A longitudinal track inside the future excision is removed with the tumour; a transverse cut is not

Biopsy rules

- Image-guided core needle biopsy with several cores is the default
- Incisional biopsy only by the team that will operate
- Never a transverse incision on a limb; no drains far from the wound
- Avoid FNAC as the only test: a false negative delays care
- Tract seeding after core biopsy is rare
- Retroperitoneum: percutaneous posterior core; avoid open or laparoscopic biopsy

Pathology and grade

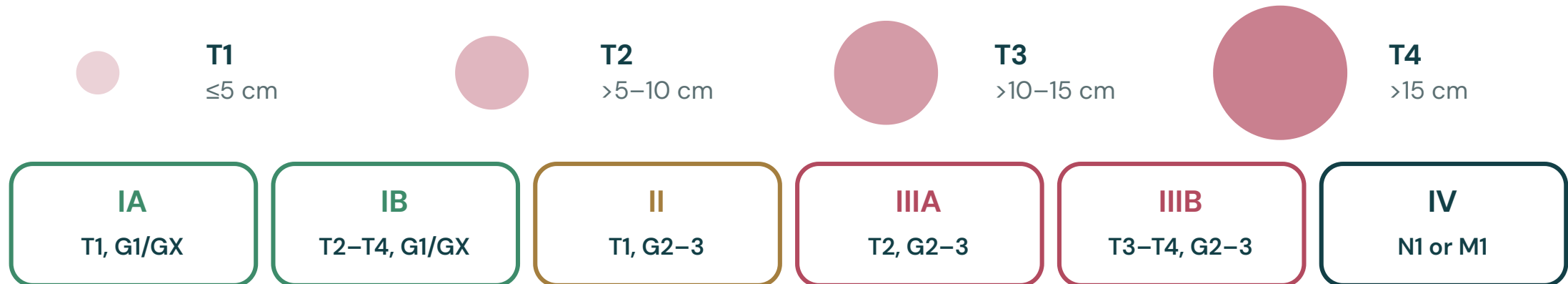
- Morphology plus immunohistochemistry plus a molecular test (FISH, RT-PCR or NGS)
- Ask for review by a sarcoma pathologist: discordance is common
- Grade with FNCLCC: differentiation, mitoses, necrosis
- Some types are not graded: angiosarcoma, epithelioid, alveolar soft part, clear cell
- The resection specimen re-grades the tumour

Grade and size are the stage

FNCLCC grade = differentiation (1–3) + mitoses (1–3) + necrosis (0–2)



AJCC 8th edition, limb and trunk: size (T) + grade decide the stage



Retroperitoneum: same T sizes, but N1 is stage IIIB, and a histology-specific nomogram predicts better than TNM.
Bone: separate AJCC system (appendicular/trunk 8 cm cut-off; spine and pelvis by segments); grade is low or high.

Grade predicts metastasis better than any other factor; nodal spread makes limb or trunk sarcoma stage IV

Prognostic tools and bone biopsy

- AJCC 8th edition for limb and trunk
- Sarculator for extremity sarcoma; histology-specific nomogram for retroperitoneum
- A 10-year metastasis risk of about 40% or more is high risk
- Bone biopsy at, or planned with, the centre that will operate
- A poorly placed track can turn limb salvage into amputation
- Ewing sarcoma needs fresh or frozen tissue for molecular confirmation

4

Biomarkers that change treatment

Four families by genetics

Translocation-driven

- Synovial: SS18::SSX
- Myxoid liposarcoma: FUS::DDIT3
- Ewing: EWSR1::FLI1 (~85%)
- Alveolar RMS: PAX3/7::FOXO1
- DSRCT: EWSR1::WT1
- Younger patients; simple karyotype

Amplification

- WD / dedifferentiated liposarcoma
- MDM2 and CDK4 (12q13–15)
- MDM2 FISH separates them from lipoma
- Palbociclib, MDM2 inhibitors in trials

Complex karyotype

- UPS, myxofibrosarcoma
- Leiomyosarcoma
- Osteosarcoma, MPNST, angiosarcoma
- Older adults; TP53/RB1 loss
- Chemotherapy-responsive to a degree

Single driver / pathway

- GIST: KIT/PDGFR
- Desmoid: CTNNB1/APC
- PEComa: TSC1/2 → mTOR
- Any: NTRK fusion (rare, test)
- Matched drugs work best

Why it matters: the subtype, not the word "sarcoma", decides chemosensitivity, the drug and the follow-up scans.

Translocation, MDM2/CDK4 amplified, complex karyotype, single targetable driver

Fusions that make the diagnosis

Alteration	Tumour
SS18::SSX1/2/4	Synovial sarcoma
FUS::DDIT3	Myxoid liposarcoma
MDM2 / CDK4 amplification	Well-differentiated and dedifferentiated liposarcoma
EWSR1::FLI1, EWSR1::ERG	Ewing sarcoma
PAX3/7::FOXO1	Alveolar rhabdomyosarcoma
EWSR1::WT1	Desmoplastic small round cell tumour
SMARCB1 loss	Epithelioid sarcoma

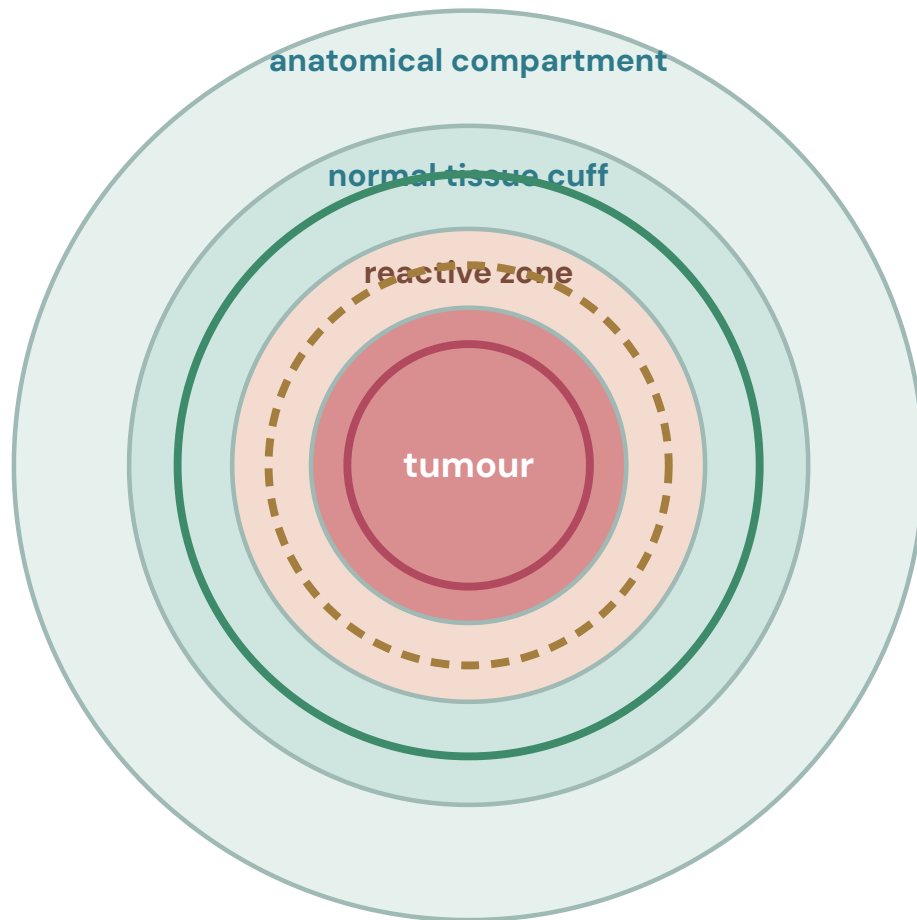
Molecular tests that change treatment

- Molecular testing is diagnostic first: the fusion usually confirms the subtype
- MDM2 FISH: lipoma versus liposarcoma; liposarcoma versus UPS
- NTRK fusions: larotrectinib or entrectinib; screen with pan-TRK, confirm by RNA NGS
- HLA-A*02 and MAGE-A4 for engineered T cells (trial referral; not yet available in India)
- PD-L1 is not a useful selector for immunotherapy
- Osteosarcoma: necrosis after chemotherapy is the strongest marker

5

Local therapy: surgery and radiotherapy

Margins (Enneking/MSTS)



Intralesional

Through tumour: gross residual; local relapse very likely. Avoid.

Marginal

Through the reactive zone (shelling out a "lipoma"): satellites left; relapse common.

Wide

Whole tumour en bloc with a cuff of normal tissue: the standard, usually with RT.

Radical

Whole compartment or amputation: rarely needed today.

Wide en bloc excision through normal tissue; fascia, periosteum and adventitia are good barriers

Soft tissue sarcoma: surgery

- Wide en bloc excision, never through the tumour or its pseudocapsule
- Limb-sparing surgery with RT equals amputation for survival; amputation now under 5–10%
- Adequate margin: about 1 cm of fat or muscle, or an intact fascial plane
- Unplanned excision: MRI, then re-excise the scar and bed; residual tumour in about half
- Dissect only involved nodes; sentinel biopsy is not routine
- Plan flaps and reconstruction with plastic surgery up front

Radiotherapy timing

Feature	Preoperative RT (preferred)	Postoperative RT
Dose	50 Gy in 25 fractions	60–66 Gy (higher if margin positive)
Volume	Smaller: tumour seen on MRI	Larger: operative bed, scar, drains
Wound complications	More: ~35% (mostly lower limb)	Fewer: ~17%
Late fibrosis, oedema, stiffness	Less: grade ≥ 2 fibrosis ~32%	More: ~48%, permanent
Surgery	4–6 weeks after RT	RT starts 4–6 weeks after surgery
Best for	Most grade 2–3 or large tumours	Infiltrative myxofibrosarcoma; wound risk

NCIC SR2: equal control and survival; preoperative RT gives more wound problems, less late fibrosis

Radiotherapy: key questions

Question	Answer
Does RT add to surgery?	Local control, not survival; for tumours over 5 cm or deep, grade 2–3
Before or after?	Preoperative for most (NCIC SR2)
Technique	IMRT with daily image guidance
Preoperative dose and volume	50 Gy in 25; tumour plus 1.5 cm radially, 3–4 cm along muscle (RTOG 0630)
Postoperative dose	60 Gy (clear), 66 Gy (positive margin), up to 75 Gy (gross residual)
Shorter courses	Promising but investigational (HYPORT-STs)

Myxoid liposarcoma: the radiosensitive exception

- Exceptionally radiosensitive: 36 Gy gave 91% pathological response in DOREMY
- Stage the spine, abdomen and chest; PET misses it
- Metastasises to bone marrow, soft tissue and the retroperitoneum
- Trabectedin is particularly active
- Round cell component and large size mark higher risk

Retroperitoneal sarcoma

Before treatment

- CT chest–abdomen–pelvis with contrast
- Core biopsy (posterior, retroperitoneal route)
- Not needed only for classic WD liposarcoma going straight to surgery
- Check split renal function

Surgery: the only cure

- First operation, in a high-volume centre
- En bloc with adherent kidney, colon, psoas
- Complete macroscopic (R0/R1) resection
- Never enucleate or morcellate

Around surgery

- Preop RT: no gain overall (STRASS)
- Possible fewer local relapses in WD / low-grade DD liposarcoma
- Chemotherapy: trials, or chemosensitive high-grade types
- No routine postoperative RT

Different subtypes fail differently

Liposarcoma relapses locally (scan the abdomen for years); leiomyosarcoma metastasises to lung and liver (scan the chest and liver). Well-differentiated liposarcoma can return as dedifferentiated disease; median size at diagnosis is about 15 cm.

A surgical disease won or lost at the first operation

Retroperitoneal sarcoma: principles

- Complete en bloc resection with adherent organs at the first operation
- Never enucleate, morcellate or “debulk”; refer before laparotomy
- STRASS: preoperative RT gave no overall gain; option in well-differentiated and low-grade dedifferentiated liposarcoma
- Postoperative RT is avoided
- Liposarcoma recurs locally and late; leiomyosarcoma metastasises

Head and neck, radiation-associated and breast sarcomas

- Head and neck: narrow spaces make wide margins harder; MRI plus CT for bone
- Childhood rhabdomyosarcoma: chemotherapy with RT, not radical surgery
- Scalp and face angiosarcoma: wide surgery with RT, taxanes, checkpoint inhibitors
- Radiation-associated: field, different histology, latency over 3 (classically 5) years
- Breast angiosarcoma: resect all irradiated skin; 10-year incidence 0.16% after breast RT
- Not a reason to withhold breast radiotherapy

Reconstruction

Endoprosthesis

- Modular metal joint
- Quick weight-bearing
- Infection, loosening, revisions
- Expandable in children

Allograft / autograft

- Bone bank or vascularised fibula
- Biological; lasts if it unites
- Non-union, fracture
- Slow rehabilitation

Rotationplasty

- Ankle becomes the knee
- Durable, active children
- Appearance needs counselling
- Good function, few revisions

Amputation

- When a functional limb cannot be saved
- Same survival as limb salvage
- Early prosthetic fitting
- Phantom pain care

Limb salvage is possible in most (about 85–90%) limb bone sarcomas; expendable bones (fibula, rib) need no reconstruction.

Choose for durability, age and function; the wide margin comes first

Bone sarcoma: local control

- Wide resection with the biopsy track; margin under 1 mm raises recurrence
- Limb salvage possible in most after preoperative chemotherapy; survival equals amputation
- Ewing: surgery if the margin is adequate; definitive RT (about 55 Gy) if unresectable or mutilating
- Osteosarcoma is radioresistant: RT only for unresectable or incomplete resection
- Chondrosarcoma: curettage for grade 1 limb; wide resection for grade 2–3, pelvis, axial

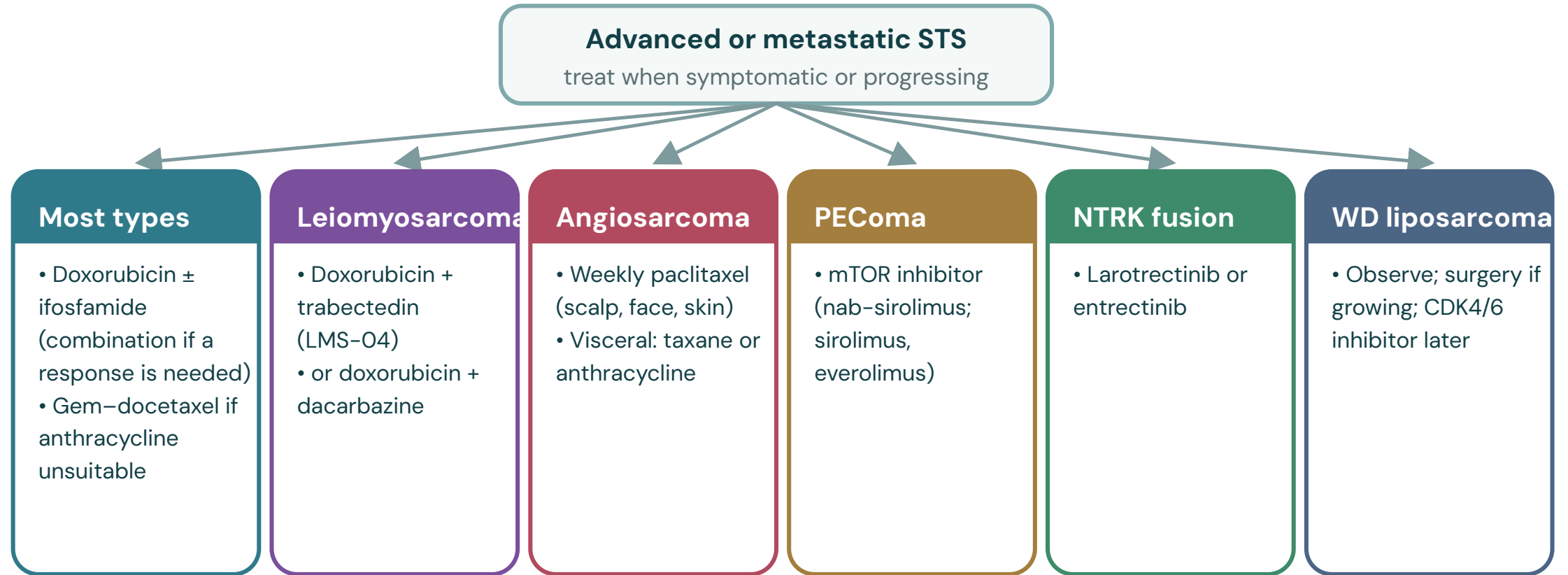
6

Systemic therapy

Soft tissue sarcoma: chemotherapy and immunotherapy around surgery

- Paediatric-type sarcomas always receive protocol chemotherapy
- Adult-type: only fit patients with high-risk, chemosensitive tumours, after shared decision-making
- Meta-analysis: 11% survival gain; largest trial (EORTC 62931) negative
- Three cycles of epirubicin plus ifosfamide beat histotype-tailored regimens (ISG-STS 1001)
- Stage III limb UPS: pembrolizumab with RT improved 2-year DFS 67 vs 52% (SU2C-SARCO32); toxicity 56 vs 31%

Histology chooses the first drug



Anthracyclines are the backbone; no doses shown

Metastatic soft tissue sarcoma: first line

- Incurable in most: treat for symptoms, burden or progression; watch slow, low-volume disease
- Doxorubicin alone is the reference; add ifosfamide when shrinkage is the goal (EORTC 62012)
- Gemcitabine–docetaxel was not better and was more toxic (GeDDiS)
- Leiomyosarcoma: doxorubicin plus trabectedin (LMS-04), or doxorubicin plus dacarbazine
- Angiosarcoma: weekly paclitaxel; PEComa: mTOR inhibitor; NTRK: TRK inhibitor

After the first line

Leiomyosarcoma	Gem–docetaxel → trabectedin, pazopanib, eribulin, dacarbazine
Liposarcoma (DD, pleomorphic)	Gem–docetaxel → eribulin (OS gain); CDK4/6 inhibitor if indolent; no pazopanib
Myxoid / round cell liposarcoma	Trabectedin (targets FUS::DDIT3); eribulin; afami–cel if HLA/MAGE–A4 fit
Synovial sarcoma	Ifosfamide → pazopanib, trabectedin; afami–cel (HLA–A*02, MAGE–A4)
UPS, myxofibrosarcoma	Gem–docetaxel → pazopanib; pembrolizumab or nivolumab–ipilimumab
Angiosarcoma	Taxane ↔ anthracycline; then gemcitabine, pazopanib, checkpoint inhibitors (scalp/face)
MPNST	Ifosfamide/anthracycline → pazopanib; trials
Alveolar soft part, clear cell	Checkpoint inhibitors (atezolizumab in ASPS); chemotherapy rarely works

The subtype map matters even more; trial enrolment is preferred at every step

Later lines

- Pazopanib for non-adipocytic sarcomas (PFS 4.6 vs 1.6 months; no survival gain)
- Trabectedin for leiomyosarcoma and liposarcoma (L-type sarcomas)
- Eribulin: survival gain in liposarcoma
- CDK4/6 inhibitor for indolent dedifferentiated liposarcoma
- Checkpoint inhibitors: UPS, dedifferentiated liposarcoma, alveolar soft part, cutaneous angiosarcoma

Uncommon subtypes that behave differently

Subtype	Key point
Alveolar soft part sarcoma	Indolent; atezolizumab or pembrolizumab; brain MRI
Epithelioid sarcoma	SMARCB1 loss; nodal spread; tazemetostat where approved
Clear cell sarcoma	Melanoma-like, no BRAF; chemotherapy rarely works
Extraskeletal myxoid chondrosarcoma	Indolent; VEGFR TKIs if progressing
Epithelioid haemangioendothelioma	Slow, multifocal; surveillance first
Inflammatory myofibroblastic tumour	ALK inhibitors if unresectable
Desmoplastic small round cell tumour	Ewing-type chemotherapy; poor prognosis

Local treatment of metastases

Favours lung metastasectomy

- All disease removable (R0 likely)
- Few nodules (generally under 5)
- Disease-free interval >12–18 months
- Primary controlled; no extrathoracic disease
- Fit for surgery; VATS often possible

Argues against

- Many or bilateral diffuse nodules
- Short interval or rapid growth
- Pleural effusion or bulky nodes
- Uncontrolled primary or other sites
- Option: SBRT, ablation, systemic therapy

In selected patients about a third are alive at 5 years after pulmonary metastasectomy.

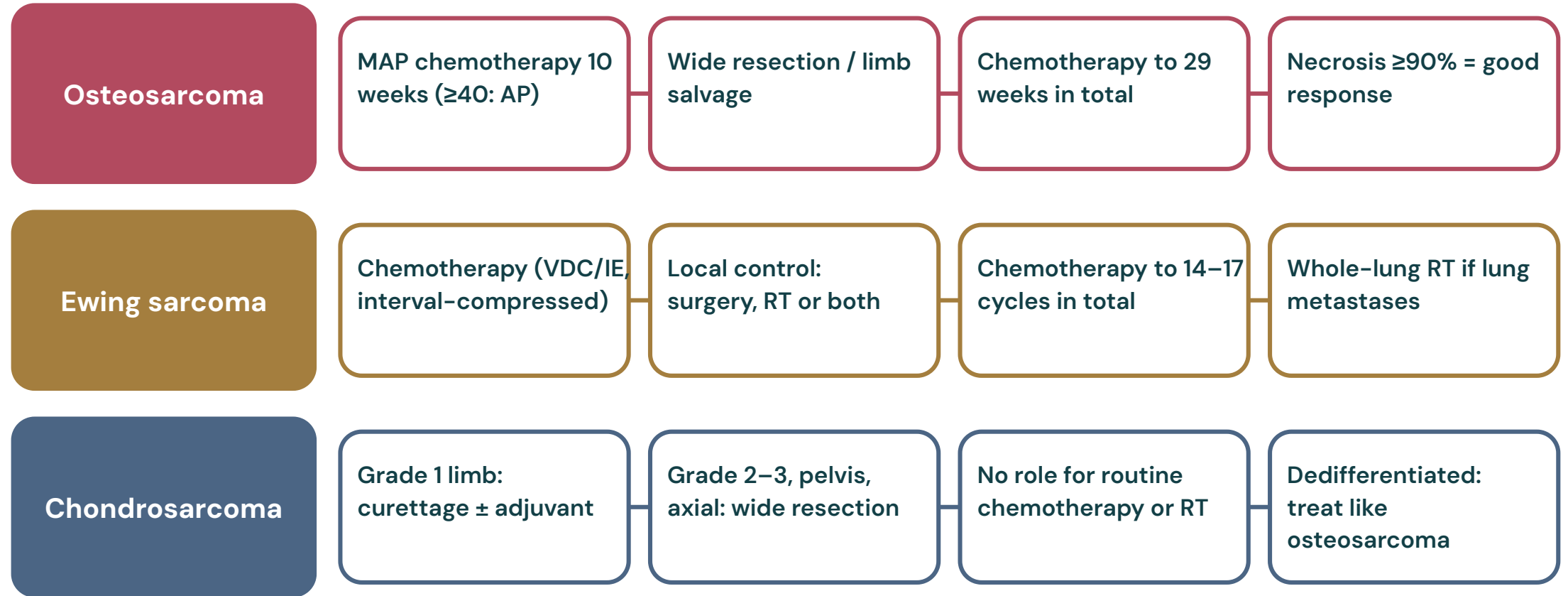
If unsure, rescan after 6–8 weeks and let the biology declare itself before operating.

Oligometastatic sarcoma can still be cured; selection explains much of the benefit

Pulmonary metastasectomy

- Complete resection possible, few nodules, long interval, controlled primary, no extrathoracic disease
- Five-year survival about 30–40% in series; repeat resection is reasonable
- SBRT, radiofrequency ablation and cryoablation are alternatives
- Rescan at 6–8 weeks to test the tempo of disease
- No routine adjuvant chemotherapy for adult-type sarcoma
- Chest CT about every 4 months afterwards

Three bone sarcomas, three strategies



Osteosarcoma and Ewing are systemic at diagnosis; conventional chondrosarcoma is a surgical disease

Osteosarcoma: chemotherapy

- MIOS: chemotherapy raised relapse-free survival from about 17% to about 65%
- MAP up to age 40: 10 weeks before surgery, resumed a week after, to about 29 weeks in all
- Age 40 and over: doxorubicin–cisplatin; methotrexate benefit unproven
- Preoperative timing eases limb salvage; survival is similar
- No adjuvant RT after complete resection
- Low-grade central and parosteal types: surgery alone

Osteosarcoma: what did not help

- Poor responders (necrosis under 90%): changing chemotherapy did not help (EURAMOS-1)
- Adding ifosfamide–etoposide added toxicity only
- Interferon maintenance for good responders was negative
- Zoledronate added nothing (OS2006)
- Mifamurtide with MAP is used where licensed; not available in India

Ewing sarcoma: chemotherapy

- VDC/IE is the backbone: 5-year EFS 69 vs 54% (INT-0091)
- Cycles every 14 instead of 21 days: 10-year EFS 70 vs 61% (AEWS0031)
- Higher doses and extra drugs did not help
- VDC/IE beat VIDE: EFS 67 vs 61%, OS 82 vs 74% (Euro Ewing 2012)
- Adults receive the same protocol at full intensity; under-dosing is a common cause of failure

Ewing sarcoma: sequence, metastatic and relapsed disease

- 12 weeks VDC/IE, then local control, then chemotherapy to 14–17 cycles in total
- Doxorubicin is omitted when RT is given with chemotherapy
- Lung-only metastases: whole-lung RT after chemotherapy
- Bone or marrow metastases fare poorly: protocol or trial
- Relapse: resect lung nodules; irinotecan–temozolomide; topotecan–cyclophosphamide

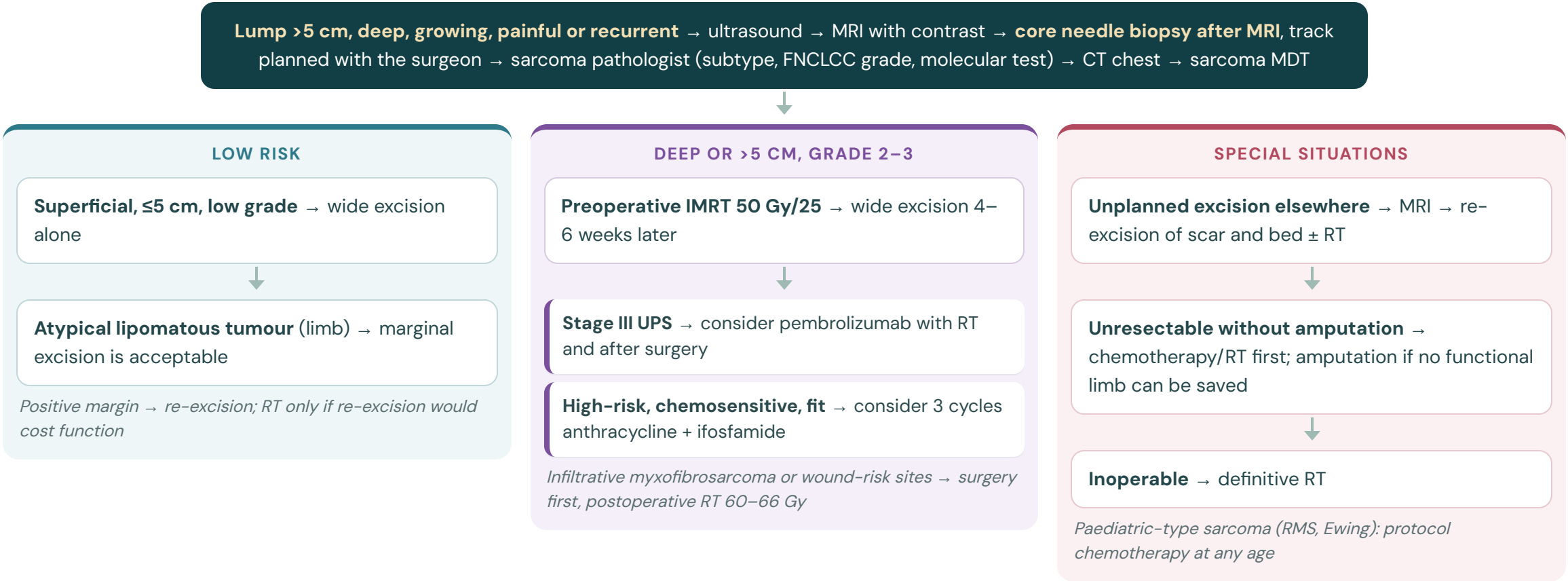
Managing common side effects

Drug	Main problems	Check and act
Doxorubicin	Cardiomyopathy, extravasation	Echo; track lifetime dose
Ifosfamide	Cystitis, encephalopathy, tubulopathy	Mesna; renal function, phosphate
Trabectedin	Transaminitis, rhabdomyolysis	LFTs and CK each cycle
Pazopanib	Hepatotoxicity, hypertension	LFTs at 3, 5, 7, 9 weeks; BP
High-dose methotrexate	Kidney injury, mucositis	Levels, leucovorin; avoid NSAIDs, PPIs
Cisplatin	Deafness, kidney damage	Audiometry, magnesium

7

Management algorithms

Algorithm 1: soft tissue mass of the limb or trunk



All patients: no excision before imaging · no FNAC-only diagnosis · plan flaps up front · physiotherapy and lymphoedema care · fertility counselling before chemotherapy · follow-up by stage (Figure in section O8).

Algorithm 2: retroperitoneal mass

Retroperitoneal mass: CT chest–abdomen–pelvis · testicular examination, AFP, β -hCG, LDH if germ cell or lymphoma possible · **is it extravisceral and unifocal?** → sarcoma likely → percutaneous posterior core biopsy (unless classic WD liposarcoma for upfront surgery) → reference–centre MDT

RESECTABLE

Complete en bloc resection with adherent organs (RO/R1)

↓

WD or low–grade DD liposarcoma → preoperative RT 50 Gy is an option (shared decision)

No routine postoperative RT or chemotherapy; surveillance

BORDERLINE RESECTABLE

Refer to a high–volume sarcoma centre

↓

Chemotherapy (chemosensitive high–grade types) or RT to downstage; trial

Never enucleate, morcellate or “debulk” at the first operation

UNRESECTABLE OR METASTATIC

Indolent WD liposarcoma, asymptomatic → observe

Symptomatic or high grade → systemic therapy by subtype

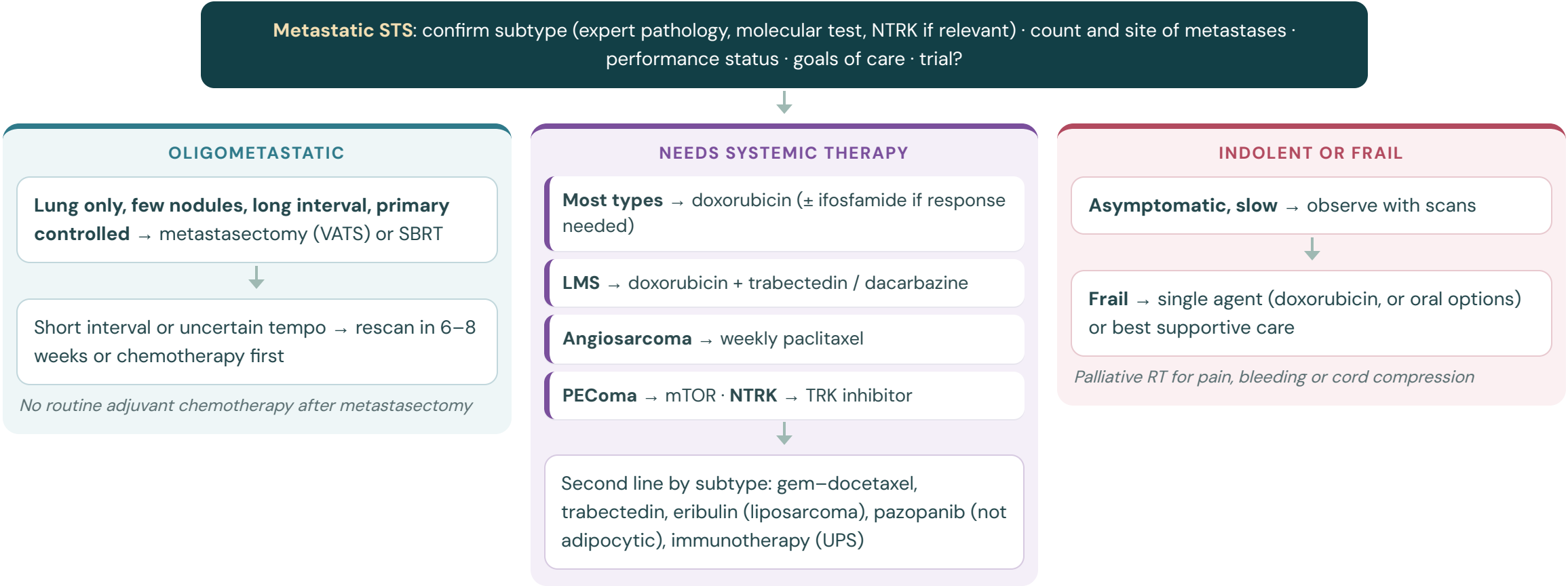
↓

Palliative resection or RT for symptoms

R2 after surgery elsewhere → re–resection if low morbidity, otherwise surveillance

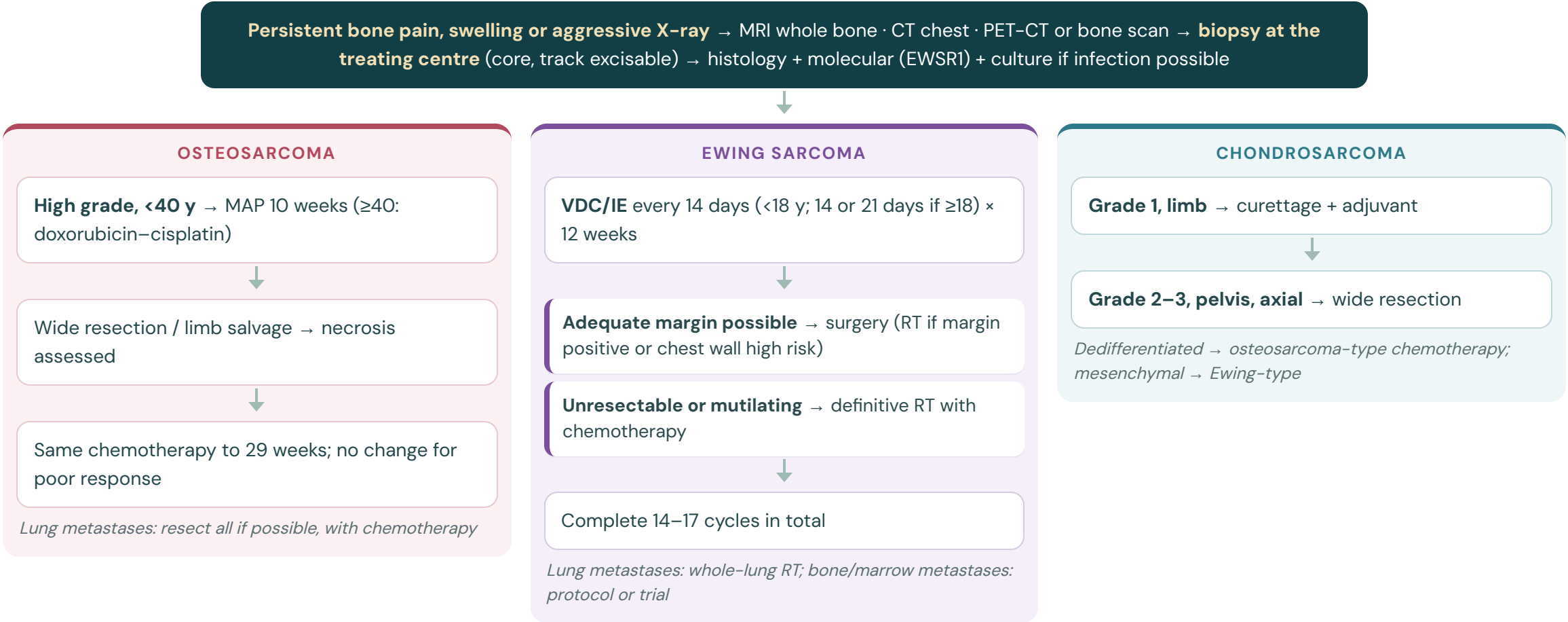
Scan for life in liposarcoma (late local relapse; dedifferentiation can appear years later) · chest and liver imaging in leiomyosarcoma · check renal function before nephrectomy.

Algorithm 3: metastatic soft tissue sarcoma



All patients: cumulative anthracycline dose and echo · fertility · VTE awareness · early palliative care · trial referral at every progression.

Algorithm 4: suspected bone sarcoma

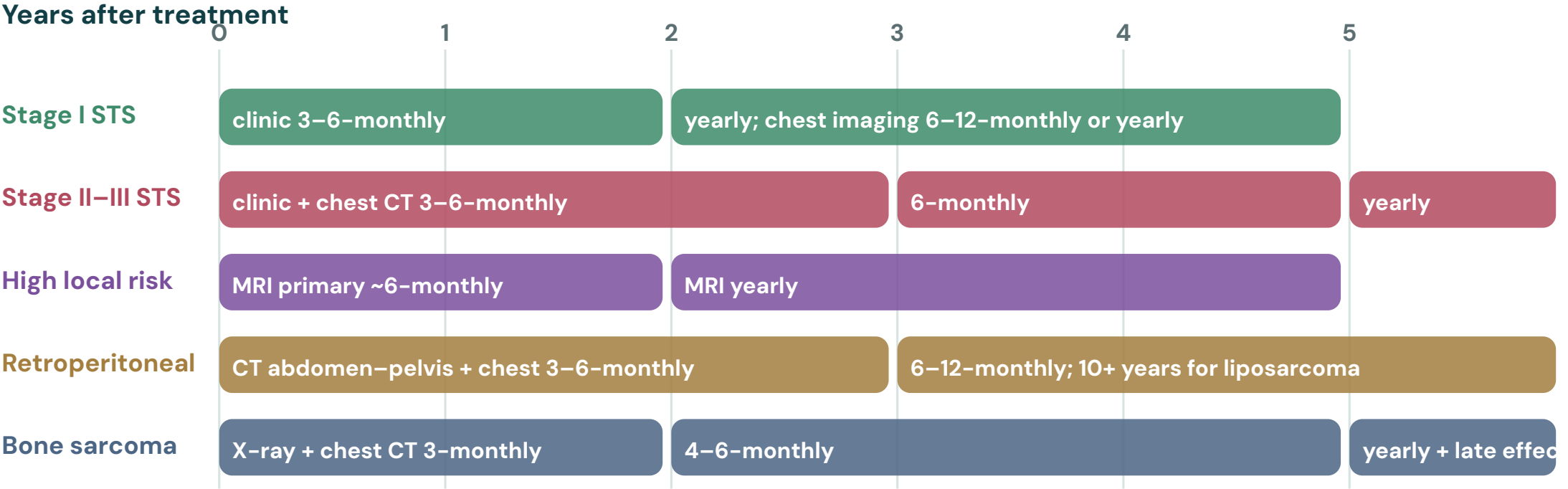


All patients: no curettage of a suspected sarcoma as "infection" · fertility preservation · audiometry and echo · TP53 testing if young with family cancers · rehabilitation and school or work support.

8

Survivorship

Surveillance is front-loaded



Late effects: anthracycline heart (echo), ifosfamide kidney, fertility, second cancers in the RT field, prosthesis care, limb function.

Most relapses occur in the first 2–3 years; MRI is preferred for the primary site

Late effects and function

- Anthracycline cardiomyopathy: echo at the end of treatment and periodically
- Kidney tubular damage after ifosfamide and cisplatin; hearing loss after cisplatin
- Infertility, early menopause and second cancers after alkylators and RT
- Physiotherapy from day one; lymphoedema care; prosthetic and orthotic support
- Many young survivors walk, run and play sport

Survivorship in practice

- No tobacco; keep weight and activity; avoid unnecessary CT in young survivors
- Genetic counselling and cascade testing for TP53, NF1 and RB1 families
- Fear of recurrence, body image and school or work return need support
- Plan travel, lodging and financial help (PM-JAY, state schemes) at diagnosis
- Long treatment far from home drives abandonment in India

9

Evidence and cases

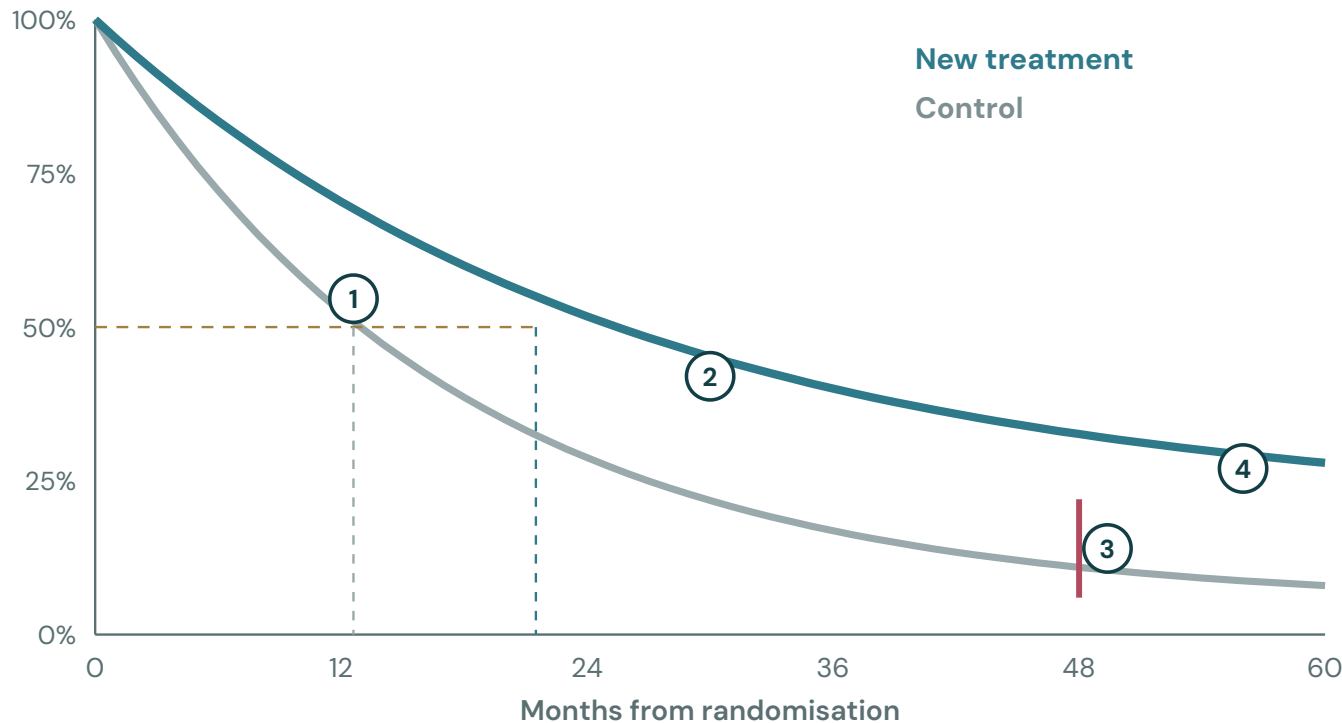
Landmark trials: soft tissue sarcoma

Trial	Result	Message
Rosenberg 1982	Limb salvage plus RT = amputation	Limb salvage standard
NCIC SR2	Pre = post RT; wound 35 vs 17%	Preoperative RT for most
RTOG 0630	Reduced volumes: few marginal failures	Smaller margins are safe
STRASS	No overall gain in retroperitoneum	Select liposarcoma only
EORTC 62012	Doxorubicin ± ifosfamide: no OS gain	Single agent for palliation
LMS-04	PFS 12 vs 6 months; OS 33 vs 24	Standard for fit leiomyosarcoma
SU2C-SARC032	2-year DFS 67 vs 52%	Immunotherapy in stage III UPS

Landmark trials: bone sarcoma

Trial	Result	Message
MIOS	Relapse-free survival about 65 vs 17%	Chemotherapy is standard
EURAMOS-1	No gain from changing chemotherapy	MAP throughout
INT-0091	5-year EFS 69 vs 54%	VDC/IE backbone
AEWS0031	10-year EFS 70 vs 61%	Every 14 days
Euro Ewing 2012	EFS 67 vs 61%; OS 82 vs 74%	VDC/IE over VIDE

How to read a survival curve



- 1 Median**
The time at which half the patients have had the event. A median gain of a few months can hide a long tail of survivors.
- 2 Hazard ratio**
Relative risk of the event at any moment (0.70 = 30% lower risk). It is not an absolute difference.
- 3 Absolute difference**
The vertical gap at a fixed time (here about 20 points at 4 years).
 $NNT = 100 \div \text{gap}$.
- 4 The tail**
A plateau suggests some patients gain long-term control: the typical immunotherapy pattern.
- 5 Crossover and PFS**
If control patients get the new drug later, overall survival differences shrink; a PFS gain alone may not mean longer life.

Use the absolute gap at a fixed time and overall survival, not the median or PFS alone

Case 1: “lipoma” of the thigh

- 52-year-old man; 8 cm deep thigh lump excised as a lipoma
- Pleomorphic sarcoma, grade 3, margins involved; drain 10 cm away
- MRI thigh, CT chest; expert pathology; MDM2 negative
- Preoperative IMRT 50 Gy to bed, scar and drain track; consider pembrolizumab
- Re-excision with plastic closure; residual tumour found; follow-up with MRI

Case 2: retroperitoneal liposarcoma

- 58-year-old woman; 24 cm fatty mass with a 5 cm solid nodule
- Posterior core biopsy of the nodule: dedifferentiated, MDM2 amplified
- Reference-centre MDT; en bloc resection with kidney and colon
- No preoperative RT (STRASS); R1; no adjuvant therapy
- CT every 3–6 months for 3 years, then 6–12-monthly beyond 10 years

Case 3: myxoid liposarcoma

- 34-year-old man; 12 cm soft posterior thigh mass; FUS::DDIT3
- CT chest, CT abdomen–pelvis, whole–spine MRI: clear
- Preoperative RT then wide excision with the sciatic nerve preserved
- High risk (size, round cell): anthracycline plus ifosfamide after fertility preservation
- Late recurrence possible: long follow-up

Case 4: a bruise that will not fade

- 64-year-old woman; breast RT 7 years ago; violet patch and nodules
- Treated as cellulitis; punch biopsies: MYC-amplified angiosarcoma
- MRI breast, CT chest-abdomen: confined to breast
- Mastectomy with all irradiated skin; paclitaxel in some centres
- Local recurrence is common: close skin examination

Case 5: metastatic leiomyosarcoma

- 47-year-old woman; “fibroid” hysterectomy 18 months ago
- Cough; 6 lung nodules and 2 liver lesions; ECOG 1; echo normal
- Doxorubicin plus trabectedin, then trabectedin maintenance
- Growth-factor support; LFT and CK monitoring
- Early palliative care; second line gemcitabine–docetaxel

Case 6: two lung nodules after synovial sarcoma

- 29-year-old woman; grade 3 synovial sarcoma treated 3 years ago
- Two lung nodules; PET-CT otherwise clear
- Rescan at 6–8 weeks, then VATS wedge resections
- No routine adjuvant chemotherapy; chest CT 3-monthly
- HLA-A*02 and MAGE-A4 typing for cell-therapy trials at relapse

Case 7: knee pain in a 15-year-old cricketer

- Three months of pain blamed on a sports injury; now night pain and swelling
- X-ray: Codman triangle and sunburst; MRI whole femur; CT chest clear
- Core biopsy at the treating centre: high-grade osteosarcoma
- Sperm banking, then MAP; wide resection and endoprosthesis; necrosis 95%
- MAP resumed to 29 weeks; late-effects follow-up

Case 8: hip pain treated as tuberculosis

- 24-year-old man; buttock pain, fever, raised ESR; ATT started without biopsy
- Permeative iliac lesion with a large soft tissue mass
- CT-guided biopsy: CD99 positive, EWSR1::FLI1; TB cultures negative
- Fertility preservation; VDC/IE with growth factor
- Resection or definitive RT with chemotherapy; 14–17 cycles in all

Practice pearls for Indian clinics

- Any lump larger than a golf ball, deep to the fascia or growing: MRI before a knife
- Core biopsy after MRI along the future incision; a benign FNAC does not exclude sarcoma
- Night pain in a teenager is not growing pains: X-ray the whole bone
- In the retroperitoneum the first surgeon has the best chance: refer before laparotomy
- Bank sperm before alkylators, cisplatin or pelvic RT
- Plan travel, lodging and financial support at diagnosis

Take-home messages

- Image first, biopsy second, operate last
- Grade, subtype and fusion decide treatment
- The first operation decides local control and whether the limb is kept
- Radiotherapy protects the limb; chemotherapy is by setting and subtype
- Osteosarcoma and Ewing sarcoma are systemic diseases: paediatric-style protocols at any age
- Surveillance is front-loaded; rehabilitation and late-effect care are part of treatment

THANK YOU

Questions and discussion

Dr. Haritha Chiramana

Senior Medical Oncologist & Hemato-Oncologist · C.R. Reddy Cancer Center, C.R. Reddy Superspeciality Hospital

17/406, Old Post Office Road, near Leela Mahal Road, Nellore, Andhra Pradesh 524003

Phone 0861 232 5344 · WhatsApp +91 79896 42272

info@drharitha.co.in · drharitha.co.in

Full mini review, algorithms, MCQ bank and case vignettes: drharitha.co.in/professionals

Cite as: Chiramana H. Sarcoma: a mini review for clinicians. Oncology Knowledge Hub [Internet]. Nellore (India): drharitha.co.in; 2026. Available from: <https://drharitha.co.in/professionals/sarcoma>