

Sarcoma Radiation Oncology

10 High-Yield Board-Style Practice Questions

Original board-style practice questions for radiation oncology residents, written in ABR single-best-answer format with detailed rationales. These are original questions created for educational review and are not reproductions of actual ABR examination content.

Question 1

A 3 cm high-grade (FNCLCC grade 3) soft tissue sarcoma of the thigh is compared with an 8 cm low-grade (FNCLCC grade 1) sarcoma of the thigh. Both are N0 and M0. Which statement about AJCC 8th edition stage is most accurate?

- A. The 8 cm low-grade tumor must have the higher stage because size always overrides grade
- B. The 3 cm high-grade tumor can have the higher overall stage because histologic grade is incorporated directly into prognostic stage grouping along with T, N, and M
- C. Depth relative to the investing fascia determines the T category in AJCC 8th edition
- D. Both tumors are staged identically because grade is not used
- E. Histologic grade has no role in soft tissue sarcoma stage grouping

Answer: B. The 3 cm high-grade tumor can have the higher overall stage because histologic grade is incorporated directly into prognostic stage grouping along with T, N, and M

Rationale: For extremity and trunk soft tissue sarcoma in AJCC 8th edition, the T category is based on tumor size, while FNCLCC histologic grade is incorporated directly into prognostic stage grouping together with N and M status. Thus, a 3 cm grade 3 T1N0M0 tumor is Stage II, whereas an 8 cm grade 1 T2N0M0 tumor is Stage IB. Depth relative to the investing fascia was removed as a T-category criterion in AJCC 8th edition.

References:

Yoon SS, Maki RG, Pollock RE, et al. Soft Tissue Sarcoma of the Trunk and Extremities. In: Amin MB, Edge SB, Greene FL, et al., eds. AJCC Cancer Staging Manual. 8th ed. Springer; 2017:507-515.

Tanaka K, Ozaki T. New TNM classification (AJCC eighth edition) of bone and soft tissue sarcomas: JCOG Bone and Soft Tissue Tumor Study Group. Jpn J Clin Oncol. 2019;49(2):103-107.

Question 2

A high-grade osteosarcoma of the femur is found on MRI to have a discontinuous tumor focus elsewhere within the same femur, separate from the main tumor mass. How is this finding classified in AJCC 8th edition for appendicular bone sarcoma?

- A. T1
- B. T2
- C. M1b because any separate bone focus is distant metastasis
- D. N1
- E. T3, representing discontinuous tumors (skip lesions) at the primary bone site

Answer: E. T3, representing discontinuous tumors (skip lesions) at the primary bone site

Rationale: A discontinuous tumor focus within the same primary bone represents a skip lesion and is classified as T3 for appendicular/trunk/skull/facial bone sarcoma in AJCC 8th edition. A tumor focus involving a different bone represents distant metastatic disease rather than T3 disease.

References:

Kneisl JS, Rosenberg AE, et al. Bone. In: Amin MB, Edge SB, Greene FL, et al., eds. AJCC Cancer Staging Manual. 8th ed. Springer; 2017:471-486.

Tanaka K, Ozaki T. New TNM classification (AJCC eighth edition) of bone and soft tissue sarcomas: JCOG Bone and Soft Tissue Tumor Study Group. Jpn J Clin Oncol. 2019;49(2):103-107.

Question 3

For a patient with extremity soft tissue sarcoma treated with preoperative radiation therapy followed by limb-sparing resection, what is the standard conventional preoperative radiation dose?

- A. 30 Gy in 10 fractions
- B. 50 Gy in 25 fractions
- C. 60 Gy in 30 fractions
- D. 66 Gy in 33 fractions
- E. 70 Gy in 35 fractions

Answer: B. 50 Gy in 25 fractions

Rationale: 50 Gy in 25 fractions remains the standard reference regimen for conventionally fractionated preoperative RT for extremity soft tissue sarcoma. In the landmark randomized Canadian trial, preoperative RT consisted of 50 Gy in 25 fractions, compared with 66 Gy in 33 fractions postoperatively. Preoperative RT was associated with more acute wound complications but generally less long-term fibrosis, edema, and joint stiffness. Current ESTRO guidance endorsed by ASTRO identifies preoperative RT followed by surgery as the preferred treatment sequence when RT is indicated, with conventionally fractionated RT remaining the standard reference approach. Hypofractionated preoperative regimens remain investigational pending stronger randomized evidence.

References:

- O'Sullivan B, Davis AM, Turcotte R, et al. Preoperative versus postoperative radiotherapy in soft-tissue sarcoma of the limbs: a randomised trial. *Lancet*. 2002;359(9325):2235-2241.
- Roohani S, Spalek MJ, Aggerholm-Pedersen N, et al. ESTRO clinical practice guideline on radiotherapy for adult soft tissue sarcoma of the extremities and trunk wall—endorsed by ASTRO. *Radiother Oncol*. 2026;220:111535.

Question 4

Regional lymph-node involvement in appendicular bone sarcoma is best characterized as which of the following?

- A. A benign finding
- B. Not assessed in AJCC staging
- C. Common at diagnosis
- D. More common than pulmonary metastasis
- E. Rare, adverse disease classified as N1; in AJCC 8th edition prognostic stage grouping, N1 disease is Stage IVB

Answer: E. Rare, adverse disease classified as N1; in AJCC 8th edition prognostic stage grouping, N1 disease is Stage IVB

Rationale: Regional nodal metastasis is uncommon in primary bone sarcoma, which more typically spreads hematogenously, particularly to the lungs. When regional lymph-node metastasis occurs, it is classified as N1 and represents an adverse prognostic feature. For appendicular/trunk/skull/facial bone sarcoma, any T, N1, any M is grouped as Stage IVB in AJCC 8th edition.

Reference:

- Kneisl JS, Rosenberg AE, et al. Bone. In: Amin MB, Edge SB, Greene FL, et al., eds. *AJCC Cancer Staging Manual*. 8th ed. Springer; 2017:471-486.

Question 5

Which statement best describes standard multimodality treatment for localized high-grade osteosarcoma and Ewing sarcoma?

- A. Both require systemic chemotherapy plus definitive local control; surgery is the principal local treatment for resectable osteosarcoma, whereas Ewing sarcoma may use surgery, radiation, or both depending on site, resectability, margins, and response
- B. Hormonal therapy is the primary treatment for both
- C. Surgery alone is sufficient for both

- D. Radiation alone without chemotherapy is standard for both
- E. Observation is appropriate until metastatic progression

Answer: A. Both require systemic chemotherapy plus definitive local control; surgery is the principal local treatment for resectable osteosarcoma, whereas Ewing sarcoma may use surgery, radiation, or both depending on site, resectability, margins, and response

Rationale: Both localized high-grade osteosarcoma and Ewing sarcoma require systemic chemotherapy because of their substantial risk of micrometastatic disease. Their local-control strategies differ. Complete surgical resection is the principal definitive local treatment for resectable conventional osteosarcoma because it is relatively radioresistant. Ewing sarcoma is radiosensitive and may be managed locally with surgery, RT, or a combination of surgery and RT depending on tumor site, resectability, surgical margins, treatment response, and anticipated functional outcome.

Reference:

Kneisl JS, Rosenberg AE, et al. Bone. In: Amin MB, Edge SB, Greene FL, et al., eds. AJCC Cancer Staging Manual. 8th ed. Springer; 2017:471-486.

Question 6

For a patient with localized Ewing sarcoma treated with definitive radiation therapy after induction chemotherapy because surgery is not feasible or appropriate, what is a standard conventional total radiation dose to the primary tumor?

- A. 36 Gy
- B. 45 Gy
- C. 50.4 Gy
- D. 55.8 Gy
- E. 70.2 Gy

Answer: D. 55.8 Gy

Rationale: 55.8 Gy in 1.8 Gy fractions remains a standard conventional definitive RT dose for Ewing sarcoma when surgical resection is not performed. A commonly used approach delivers approximately 45 Gy to the initial prechemotherapy tumor volume followed by a boost to a cumulative dose of 55.8 Gy. Importantly, 55.8 Gy should not be interpreted as the only contemporary definitive dose. A randomized phase III trial in patients with nonmetastatic, surgically unresectable Ewing sarcoma demonstrated improved 5-year local control with dose escalation to 70.2 Gy compared with 55.8 Gy (76.4% vs 49.4%), although DFS and OS were not significantly improved. Thus, dose escalation may be considered in selected unresectable tumors, while 55.8 Gy remains a standard conventional reference dose.

References:

Donaldson SS. Ewing sarcoma: radiation dose and target volume. *Pediatr Blood Cancer*. 2004;42(5):471-476.

National Cancer Institute. Ewing Sarcoma Treatment (PDQ®)—Health Professional Version.

Ghosh-Laskar S, et al. Radiation therapy dose escalation in unresectable Ewing sarcoma: final results of a phase 3 randomized controlled trial. *Int J Radiat Oncol Biol Phys*. 2022;113(5):996-1002.

Question 7

The phase III STRASS trial evaluated which treatment strategy for patients with primary localized retroperitoneal sarcoma?

- A. Preoperative radiation therapy followed by surgery versus surgery alone
- B. Postoperative radiation dose escalation versus standard-dose radiation
- C. Proton versus photon preoperative radiation
- D. Preoperative chemoradiation versus preoperative radiation alone
- E. Intraoperative radiation versus postoperative radiation

Answer: A. Preoperative radiation therapy followed by surgery versus surgery alone

Rationale: STRASS randomized 266 patients with primary localized retroperitoneal sarcoma to surgery alone or preoperative RT followed by surgery. RT was delivered to 50.4 Gy in 28 fractions. The trial demonstrated no significant improvement in abdominal recurrence-free survival in the overall study population; median abdominal recurrence-free survival was 4.5 years with RT plus surgery versus 5.0 years with surgery alone (HR 1.01; P=.95). Therefore, routine preoperative RT is not standard for all retroperitoneal sarcomas.

Reference:

Bonvalot S, Gronchi A, Le Péchoux C, et al. Preoperative radiotherapy plus surgery versus surgery alone for patients with primary retroperitoneal sarcoma (EORTC-62092: STRASS): a multicentre, open-label, randomised, phase 3 trial. *Lancet Oncol.* 2020;21(10):1366-1377.

Question 8

The randomized phase III VORTEX trial evaluated reduced-volume postoperative radiation therapy for extremity soft tissue sarcoma. What was the key finding?

- A. Reduced-volume radiation significantly improved limb function and reduced late toxicity
- B. Reduced-volume radiation resulted in significantly worse local control
- C. Reduced-volume radiation did not significantly improve limb function or late toxicity, and noninferiority for local control could not be formally established
- D. Preoperative radiation was superior to postoperative radiation
- E. Reduced-volume radiation eliminated the need for a postoperative boost

Answer: C. Reduced-volume radiation did not significantly improve limb function or late toxicity, and noninferiority for local control could not be formally established

Rationale: VORTEX compared a conventional postoperative approach of 50 Gy to a larger volume followed by a 16 Gy boost with 66 Gy delivered to the smaller high-risk volume alone. There was no significant difference in limb function at 2 years and no statistically significant reduction in late skin, subcutaneous, bone, or joint toxicity. Five-year local recurrence-free survival was approximately 86% versus 84%. Because of the small number of recurrence events, noninferiority of the reduced-volume approach could not be formally established.

Reference:

Robinson MH, Gaunt P, Grimer R, et al. Vortex Trial: a randomized controlled multicenter phase 3 trial of volume of postoperative radiation therapy given to adult patients with extremity soft tissue sarcoma. *Int J Radiat Oncol Biol Phys.* 2016;96(2 Suppl).

Question 9

What do contemporary prospective studies suggest about 5-fraction preoperative radiation therapy for extremity soft tissue sarcoma compared with the conventional regimen of 50 Gy in 25 fractions?

- A. Five-fraction radiation has substantially inferior local control
- B. Five-fraction radiation eliminates postoperative wound complications
- C. Five-fraction regimens have shown promising local control and acceptable wound-complication rates with substantially shorter treatment duration, but remain investigational because randomized equivalence to 50 Gy in 25 fractions has not been established
- D. Five-fraction radiation eliminates the need for surgery
- E. Five-fraction radiation is contraindicated for extremity sarcoma

Answer: C. Five-fraction regimens have shown promising local control and acceptable wound-complication rates with substantially shorter treatment duration, but remain investigational because randomized equivalence to 50 Gy in 25 fractions has not been established

Rationale: Prospective studies of abbreviated preoperative RT, including 30 Gy in 5 fractions, have reported encouraging local-control and toxicity outcomes while reducing radiation treatment from approximately 5 weeks to 5 treatment days. However, these studies have largely been nonrandomized, and definitive randomized equivalence to conventional 50 Gy in 25 fractions has not been established. The 2026 ESTRO clinical practice guideline endorsed by ASTRO states that preoperative hypofractionation remains investigational and that routine clinical use is not currently

recommended until optimal regimens are validated in randomized trials. Therefore, 5-fraction preoperative RT is promising but should not yet be regarded as equivalent to the conventional standard regimen.

References:

- Nikitas J, Kendal JK, Savjani RR, et al. Five-Day Preoperative Radiation Therapy for Patients With High-Risk Soft Tissue Sarcoma: A Nonrandomized Clinical Trial. *JAMA Netw Open*. 2025;8(12).
- Roohani S, Spalek MJ, Aggerholm-Pedersen N, et al. ESTRO clinical practice guideline on radiotherapy for adult soft tissue sarcoma of the extremities and trunk wall—endorsed by ASTRO. *Radiother Oncol*. 2026;220:111535.

Question 10

Following STRASS and subsequent analyses, which statement best describes the contemporary role of preoperative radiation therapy for primary retroperitoneal sarcoma?

- A. Preoperative radiation should routinely be used for all retroperitoneal sarcomas
- B. Radiation should be omitted for all retroperitoneal sarcomas
- C. Preoperative radiation may be considered selectively based on histology, anatomy, grade, and risk of local recurrence, particularly in selected liposarcoma cases, but a benefit for broad liposarcoma subgroups has not been definitively established
- D. Postoperative radiation is preferred in all patients
- E. Routine dose escalation above 70 Gy is recommended

Answer: C. Preoperative radiation may be considered selectively based on histology, anatomy, grade, and risk of local recurrence, particularly in selected liposarcoma cases, but a benefit for broad liposarcoma subgroups has not been definitively established

Rationale: STRASS was negative for its primary endpoint in the overall retroperitoneal sarcoma population. Subsequent pooled STRASS/STREXIT analyses suggested that selected patients with liposarcoma—particularly well-differentiated and lower-grade dedifferentiated liposarcoma—might derive improved abdominal disease control from preoperative RT. However, these analyses do not constitute definitive randomized evidence of benefit. A 2026 reanalysis of the original randomized STRASS dataset further challenged broad application of RT to all patients with well-differentiated or low/intermediate-grade dedifferentiated liposarcoma. The conventional STRASS- and STREXIT-defined subgroups did not demonstrate statistically significant abdominal recurrence-free survival improvement when re-evaluated within the randomized dataset. More restricted exploratory subgroups were identified in which RT appeared beneficial, but these findings require prospective validation. Therefore, preoperative RT should remain selective and multidisciplinary rather than routine, with consideration of histology, tumor anatomy, grade, local-recurrence risk, expected surgical margins, morbidity, and patient-specific factors.

References:

- Bonvalot S, Gronchi A, Le Péchoux C, et al. Preoperative radiotherapy plus surgery versus surgery alone for patients with primary retroperitoneal sarcoma (EORTC-62092: STRASS). *Lancet Oncol*. 2020;21(10):1366-1377.
- Callegaro D, Raut CP, Ajayi T, et al. Preoperative radiotherapy in patients with primary retroperitoneal sarcoma: EORTC-62092 Trial (STRASS) versus off-trial (STREXIT) results. *Ann Surg*. 2023;278(1):127-134.
- Bertsimas D, Margonis GA, Koulouras A, et al. Identifying subsets of patients with retroperitoneal sarcoma who benefit from radiotherapy: an interpretable AI reanalysis of the STRASS randomised trial. *Lancet Digit Health*. 2026.

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