The Royal Australian and New Zealand College of Radiologists®

The Faculty of Radiation Oncology

Candidate Number: _____

FRANZCR Examination

Phase 2 Radiation Oncology

Pathology

July 2021

Time Allowed: 3 Hours

INSTRUCTIONS

ALL QUESTIONS are to be attempted.

There are a total of SIX (6) questions.

All questions are of equal value.

The marks allocated to each subpart is indicated in brackets.

Hand **all** papers to the invigilator.

No papers are allowed to be taken from the examination room.

THIS INCLUDES THE QUESTION PAPERS.

Question 1

a. A 65-year-old presents with post-menopausal bleeding. A pelvic ultrasound demonstrates an enlarged uterus with endometrial mass.

i. What are the differential diagnoses? **(1)**

ii. What are the risk factors and biological behaviour for Type 1 and Type 2 endometrial carcinoma? **(3)**

b. The patient undergoes TAHBSO. What features of the pathology report would guide adjuvant therapy? **(2)**

c. Describe the FIGO histological grading system for endometrioid adenocarcinoma. **(2)**

d. **(2)**

i. What is Lynch syndrome?

ii. What are the genetic mutation characteristics of this syndrome and how do you test these in a hysterectomy specimen?

iii. List the malignancies associated with Lynch syndrome.

Question 2

a. Breast cancers can be classified into 4 main molecular subtypes: **(5)**

- Luminal A
- Luminal B
- HER-2 enriched
- Triple Negative (ER negative)

For each of the 4 main molecular subtypes:

i. What is the frequency in which they occur?

ii. What is the typical grade and immunohistochemical profile, including the proliferation index?

iii. What is the prognosis and typical biological behaviour?

iv. What are the implications for systemic treatment?

b. In carcinogenesis, what are the typical characteristics of a driver mutation? **(1)**

c. For lung adenocarcinoma: **(1.5)**

i. What is the clinical significance of detecting an Epidermal Growth Factor Receptor (EGFR) mutation?

ii. What are the potential mechanisms of acquired treatment resistance to 1st generation EGFR tyrosine kinase inhibitors?

iii. What are two other examples of driver mutations? Include their frequency of occurrence.

d. What is the most common molecular abnormality of Nevoid Basal cell carcinoma/Gorlin's syndrome and how does it relate to development of medulloblastoma? **(1.5)**

e. Name one other pathways that gives rise to medulloblastoma. How will the prognosis differ from that of Gorlin's Syndrome related medulloblastoma? **(1)**

Question 3

a. A previously well 35-year-old women presents with an anterior mediastinal mass and small volume supraclavicular adenopathy. A diagnosis of lymphoma is suspected. **(1.5)**

Describe the utility of Fine Needle Aspiration (FNA) cytology, core biopsy and excision/incision biopsy in establishing the diagnosis of lymphoma and its subtyping.

b. Using a table briefly compare and contrast the: **(3)**

i. Clinical;

ii. Histological; and

iii. Immunohistochemical features:

of Primary Mediastinal B Cell Non-Hodgkin's Lymphoma (NHL) and Classical (Nodular Sclerosing) Hodgkin's Lymphoma affecting the mediastinum.

c. Regarding gastric extra-nodal marginal zone Non-Hodgkin's Lymphoma (MALT) describe the: **(2.5)**

i. Clinical and endoscopic features.

ii. Immunohistochemical (IHC) characteristics.

iii. Adverse prognostic factors.

d. Regarding follicular Non-Hodgkin's Lymphoma, describe: **(2)**

i. The microscopic features.

ii. How are they graded?

e. Describe the criteria and scoring system for **<u>ONE</u>** of the following: **(1)**

i. The Follicular Lymphoma International Prognostic Index [FLIPI].

or

ii. The Follicular Lymphoma International Prognostic Index -2 [FLIPI 2].

that may be used to assess prognosis in patients diagnosed to have follicular NHL.

Question 4

a. A 59-year-old male receives radiation therapy for a mid-oesophageal SCC. Both the lungs and heart are organs at risk. **(1)**

What are the potential acute and late effects of radiation therapy on the structures of the heart?

b. What are the aetiology/risk factors that increase the risk of cardiac effects after radiation therapy? **(1)**

c. Describe the pathogenesis of cardiac complications following radiation therapy. **(2)**

d.

i. Describe the pathogenesis of radiation induced pneumonitis and fibrosis including the timing of these from radiation exposure. **(4)**

ii. How do the radiologic findings differ in the acute and late settings? **(2)**

Question 5

a. List the risk factors for the development of gastric cancer including hereditary syndromes. **(2)**

b. In a table, compare and contrast the macroscopic and microscopic features of diffuse type and intestinal type gastric carcinoma? **(3)**

c. Regarding HER2 and microsatellite instability (MSI):

i. What is the clinical significance in patients with metastatic gastric cancer? ~~**(1)**~~

ii. Briefly describe the methods used for molecular testing for HER2. ~~**(2)**~~

iii. How is microsatellite instability assessed? ~~**(1)**~~

d. Regarding hereditary diffuse gastric cancer: **(1)**

i. What is the underlying mutation?

ii. What other malignancy is associated with the mutation?

Question 6

a. A 44-year-old man presents with headache and imaging demonstrates a lesion consistent with a meningioma. **(1)**

What are the risk factors for the development of meningioma?

b. Regarding benign meningioma: **(3)**

i. What are the common intracranial locations?

ii. Describe the macroscopic appearance.

iii. Describe the microscopic appearance.

c. Describe the WHO classification system for meningioma. **(3.5)**

d. On imaging, what features may indicate a higher grade of meningioma? **(1)**

e. **(1.5)**

i. Name the system used to grade the extent of resection in meningioma.

ii. What are the categories of resection described by this system?

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Candidate Number: _____

FRANZCR Examination

Phase 2 Radiation Oncology

Clinical Oncology

July 2021

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Question 1

a. What factors would you consider when deciding on optimal management for an acoustic neuroma? **(3)**

Include in your answer how those factors influence your treatment decision.

b. A 64-year-old female presents with unilateral hearing loss. She is diagnosed with a 2.5 x 2 cm acoustic neuroma. **(5)**

i. Describe an appropriate radiation therapy technique and dose fractionation schedule.

ii. Justify your choice of fractionation schedule.

iii. Describe an appropriate image guidance and verification protocol for your chosen technique?

c. What is the expected outcome, and possible side effects of radiation therapy for acoustic neuroma? **(2)**

Question 2

a. In general, what factors are taken into consideration when determining the treatment of a patient with hepatocellular carcinoma? **(2)**

b. Discuss the treatment modalities which are used in the management of hepatocellular carcinoma? **(8)**

Discuss each treatment, including the indications and contraindications of each.

Question 3

a. A 40-year-old premenopausal woman with node positive breast cancer is referred for adjuvant radiation. Pregnancy testing at time of simulation was negative. At fraction 18 of treatment (last menstrual period + 58 days), a pregnancy test is positive. **(5)**

i. Discuss the effects of ionising radiation on the foetus in the first trimester, and how these are known.

ii. Discuss the technical factors affecting the dose received by the foetus.

iii How would you evaluate the dose received by the foetus in this patient?

iv. What exposure levels are relevant when advising the patient on how to proceed with the pregnancy?

b. A 36-year-old woman presents with a mobile, 3 cm breast mass at 22 weeks gestation. Biopsy of the breast lesion confirms malignancy. **(5)**

Discuss how does pregnancy impacts staging and treatment decisions.

Question 4

a. COVID-19 has resulted in resource stress in the healthcare system and in some cases delays in access to medical services. **(4)**

What are the potential implications of delayed access to medical services for cancer patients?

b. Your department has a significant service capability reduction as a result of COVID-19. **(6)**

Discuss the general principles of a departmental plan of triaging patient access to limited radiation therapy services.

Use the following patient examples to illustrate your approach.

i. Localised prostate cancer.

ii. Breast cancer following breast conserving surgery.

iii. An early stage larynx cancer unsuitable for local resection.

Question 5

a. You have been tasked with establishing a new head and neck cancer multi-disciplinary team meeting in a tertiary cancer centre. **(3)**

Outline the resources, including personnel and infrastructure, required to facilitate this.

b. What strategies would you use to facilitate appropriate patient presentation/documentation and communicate the outcomes of discussions? **(3)**

c. What are the benefits of multi-disciplinary team meetings from the perspective of the: **(4)**

i. Patient?

ii. Health care providers?

Question 6

a. A 60-year-old patient learns of a new herbal medication reported to be able to cure cancer. During a consultation he mentions that he wishes to take this whilst having curative radiation therapy with concurrent chemotherapy for bladder cancer. **(2)**

Define:

i. Conventional medicine

ii. Complementary medicine

iii. Alternative medicine

iv. Integrative medicine

b. The patient learns about another new herbal medication online. How would you help the patient to evaluate the online health information to assess its validity? **(3)**

c. What are the potential benefits of integrative medicine? Give two examples of complementary therapies with proven benefits for cancer patients and describe the benefits. **(2)**

d. The patient insists that he wishes to take black cohosh and high dose antioxidants despite your advice that this may be harmful during his chemo radiation treatment. **(3)**

How would you approach this situation?

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Candidate Number: _____

FRANZCR Examination

Phase 2 Radiation Oncology

Radiation Therapy 1

July 2021

Time Allowed: 2.5 Hours

INSTRUCTIONS

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Question 1

a. A 70-year-old with a PSA of 12 has an MRI that shows a lesion in the right peripheral zone. TRUS-guided prostate biopsies reveal adenocarcinoma (Gleason 4+3=7, ISUP grade group 3) in all cores from the right side of the gland. **(3)**

What further information do you require to determine the potential treatment options for this patient?

Outline how these factors may influence management options.

b. The patient is fit and well. He undergoes a robotic-assisted radical prostatectomy without pelvic lymphadenectomy. **(2)**

Histology demonstrates - multifocal adenocarcinoma (Gleason 4+3=7, ISUP 3) with extensive extracapsular extension at the right base, with a positive margin of 4 mm. Right seminal vesicle was involved - pT3bNx

At 10 weeks post-surgery, the PSA is undetectable and urinary continence has returned.

The histopathology is discussed at the MDT.

You are asked for your opinion regarding further management. Justify your response.

c. A 62-year-old man presents 2 years post prostatectomy with a PSA of 0.4 ng/mL and staging showed an isolated left external iliac node measuring 8mm. There is no evidence of distant metastatic disease or prostate bed recurrence. His initial histopathology demonstrated Gleason 4+4 ISUP grade group 4 disease with negative margins. **(5)**

Describe in detail the CTV that you would delineate and a suitable dose fractionation schedule.

Question 2

a. A 54-year-old woman undergoes left breast conserving surgery. Pathology shows 12 mm of intermediate grade DCIS. **(5)**

i. Discuss the role of predictive tools in the post-operative setting for this woman?

ii. Compare and contrast two predictive tools that are commonly used in assessing patients with DCIS?

iii. In general, what is the goal and magnitude of the benefit from adjuvant radiation therapy for DCIS.

b. The woman is referred with a request for adjuvant radiation therapy to be delivered over three weeks noting that she is a country patient. **(3)**

i. Discuss and justify your recommended dose fractionation for this patient.

ii. What is the role of the boost in DCIS?

c. Discuss the ways in which the heart dose can be minimised when planning and delivering adjuvant radiation therapy to this patient. **(2)**

Question 3

a. A 64-year-old man presents with a 4-week history of dysphagia. History and examination is otherwise unremarkable. Endoscopic ultrasound and biopsy reveal an adenocarcinoma in the distal oesophagus (35 – 38 cm from incisors) invading the adventitia. Staging investigations show no nodal or distant metastatic disease (T3N0M0). **(5)**

Discuss the curative treatment options available for this man. Justify your answer.

b. The primary lesion is not visible on CT scan or PET/CT. The decision is made to treat with neoadjuvant chemo-radiation therapy. **(3)**

Describe a suitable radiation therapy technique and dose fractionation schedule. Include in your answer your chosen concurrent chemotherapy regimen.

c. In the definitive chemoradiation setting, there is controversy around prophylactic nodal irradiation for oesophageal cancer. What are the arguments for and against prophylactic nodal irradiation in patients with no radiological evidence of nodal disease? **(2)**

Question 4

a. A fit 62-year-old woman is found to have a 4 cm right lower lobe mass and a 10 cm mediastinal mass. Biopsy confirms small cell lung cancer. She has limited stage disease. **(4)**

What are the options for radiation therapy dose fractionation schedules in the curative intent management of this patient?

Discuss the advantages and disadvantages of each option.

b. Describe a suitable radiation therapy technique and discussion of organ at risk tolerances. **(2)**

c. The patient is planned for VMAT radiation therapy to be given with the first cycle of chemotherapy but the lung DVH constraints cannot be met. **(2)**

What are the options for managing this situation? Justify your answer.

d. Discuss the role of prophylactic whole brain radiation in this patient. **(2)**

Question 5

a. A 63-year-old man presents with chest wall pain. Imaging, biopsy and MDT discussion confirm an unresectable 2 x 4 x 5cm desmoid tumour arising from the 6th intercostal space on the left. He has a permanent pacemaker in situ on the same side. **(3)**

The decision is made to offer definitive radiation therapy.

What considerations and precautions need to be taken regarding the pacemaker?

b. Describe a suitable radiation therapy technique and dose fractionation schedule. **(3)**

c. What would you tell him about the expected outcome of treatment? **(1)**

d. What are the potential late toxicities? **(1)**

e. What are the options if there is unequivocal local progression after treatment? **(2)**

The Royal Australian and New Zealand College of Radiologists®

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Candidate Number: _____

FRANZCR Examination

Phase 2 Radiation Oncology

Radiation Therapy 2

July 2021

Time Allowed: 2.5 Hours

INSTRUCTIONS

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Question 6

a. A 44-year-old woman presents with vaginal bleeding. Clinical examination reveals a 5 cm ulcerative mass in the lower third of the vagina. **(4)**

Biopsy confirms a primary vaginal squamous cell carcinoma with no evidence of nodal or distant spread.

The decision is made to treat the patient with curative intent. The first phase involves external beam radiotherapy with concurrent chemotherapy.

Describe a suitable radiation therapy technique and dose fractionation schedule.

b. Discuss the different radiation therapy techniques available to be used as a boost in vaginal cancer. Include in your answer the advantages and disadvantages of each technique. **(2)**

c. The patient is reviewed 6 months after her treatment is complete. She is disease free and presents with sexual dysfunction. **(2)**

List the possible causes and your management.

d. The patient presents 2 years following her treatment with a faeculent discharge from the vagina. **(2)**

Outline your likely diagnosis and management of this.

Question 7

a. A fit 66-year-old male with nausea and reflux undergoes gastroscopy showing diffuse thickening of the gastric mucosal folds in the body of the stomach. Multiple endoscopic biopsies confirm MALT/extra-nodal marginal zone lymphoma. **(2)**

Outline your initial assessment.

b. In general, outline the management options for gastric MALT/extra-nodal marginal zone lymphoma and the indications for each option. **(3)**

c. The patient has localised gastric MALT lymphoma. **(3)**

Discuss a suitable radiation therapy technique and dose fractionation schedule.

d. **(2)**

i. In general, discuss the outcomes associated with the different treatment options for localised Gastric MALT lymphoma. Include in your answer a discussion of response rates and relapse rates.

ii. Discuss the potential toxicity associated with radiation treatment in this setting and an appropriate follow up schedule.

Question 8

a. A 35-year-old woman is referred with a mass in her left thigh. A CT scan reveals a heterogenous tumour measuring 10 x 9 x 8 cm in the proximal anterior compartment of her left thigh, suggestive of a soft tissue sarcoma. **(2)**

Describe your initial management of this patient.

b. A biopsy shows a poorly differentiated synovial sarcoma. Staging investigations do not show any metastatic disease. **(2)**

What are the potential advantages of preoperative radiation treatment as compared with post-operative radiation treatment? Justify your answer.

c. A decision has been made to treat with preoperative radiation therapy treatment. **(3)**

Describe a suitable radiation therapy treatment technique and dose fractionation schedule for this patient.

d. What is the role of adjuvant/ neoadjuvant chemotherapy for this patient? Justify your answer. **(1.5)**

e. Describe a suitable follow-up schedule for this patient. Justify your answer. **(1.5)**

Question 9

a. A 60-year-old woman presents with a 6 mm nodule of the right ala nasi after a 2 mm punch biopsy via her GP. **(2)**

The biopsy confirms a Merkel Cell Carcinoma at least 4 mm deep, with all margins involved and evidence of lymphovascular space invasion.

What further information do you require to determine a management plan for this patient?

b. There is no other evidence of disease. She is staged T1N0M0. **(2)**

What management would you recommend for this patient? Justify your answer.

c. Describe a suitable radiation therapy technique and dose fractionation schedule for this patient. **(4)**

d. A 70-year-old woman is referred for adjuvant treatment following resection of a 1 cm sclerosing basal cell carcinoma from the right ala nasi. The histology shows a close deep margin of 0.6 mm but no perineural or lymphovascular invasion. She has declined further surgery due to the potential adverse cosmesis. **(2)**

Discuss the advantages and disadvantages of using superficial radiation versus electron beam radiation techniques to treat this lesion.

Question 10

a. A 58-year-old Caucasian man presents with a right neck node. A CT scan describes a solitary 5 cm node in the right level 2 neck and a mass in the right nasopharynx extending into the parapharyngeal space. **(3)**

Describe how you would further evaluate the patient.

b. Subsequent biopsy confirms a poorly differentiated p16 positive squamous cell carcinoma of the nasopharynx (EBV negative). In addition to the right level 2 node there is a necrotic 10mm left level 2 node. Clinical stage is T2N2M0. **(4)**

Describe a suitable radiation therapy technique and dose fractionation schedule.

c. The patient remains well for 5 years and then develops a numbness in the right V2 distribution. There are no other symptoms or signs on thorough examination. **(3)**

Discuss the differential diagnosis and your approach to diagnosis.