The Royal Australian and New Zealand College of Radiologists®

The Faculty of Radiation Oncology

Candidate Number: _____

FRANZCR Examination

Phase 2 Radiation Oncology

Pathology

July 2022

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. Regarding Barrett's oesophagus, describe the:

i. Macroscopic and microscopic appearance. **(1)**

ii. Pathogenesis and clinical significance. **(2)**

b. For Squamous Cell Carcinoma and Adenocarcinoma of the oesophagus compare, in a table format, the following:

i. Epidemiological factors. **(2)**

ii. Risk factors. **(3)**

iii. Microscopic and Immunohistochemical features. **(2)**

Question 2

a. List the risk factors for the development of lung cancer. **(1.5)**

b. For squamous cell and adenocarcinoma of the lung, compare and contrast the following: **(5)**

i. Epidemiology.

ii. Radiological findings.

iii. Microscopic appearance and immunohistochemistry.

iv. Biological behaviour and associated paraneoplastic syndrome.

c. For lung adenocarcinoma: **(2)**

i. Describe the role of driver mutations in its carcinogenesis and treatment.

ii. List four clinically relevant driver mutations (including the incidence).

d. Tumour Proportion Score (TPS) IHC is often performed on Non Small Cell Lung Cancers. **(1.5)**

i. What is the TPS?

ii. How is it catergorised?

iii. How does it guide management?

Question 3

a. According to the 2021 WHO Classification of CNS tumours, the diagnosis of both oligodendroglioma and glioblastoma can now be made in the absence of the classic histologic features.

For oligodendroglioma and glioblastoma:

i. What are their classic histologic features? **(2)**

ii. What molecular findings are consistent with these diagnoses? **(2)**

iii. What are their typical MRI findings? **(1)**

b. Regarding Glioblastoma, IDH-wildtype:

i. How IDH status is determined? **(1)**

ii. What is the natural history and prognosis? **(1)**

iii. What are the key prognostic factors? **(1)**

c. Molecular characteristics of tumours are increasingly being incorporating into modern tumour classification systems. **(2)**

Give two advantages and two disadvantages of adding molecular features to classification systems?

Question 4

a. **(2)**

i. Define a tumour marker.

ii. In general, describe how tumour markers are used in clinical practice and give examples.

b. A 35-year-old male presents with a mass in the right testis. The ultrasound demonstrates a 3cm malignant appearing mass. **(2)**

Outline the WHO classification of:

i. Germ Cell Tumours.

ii. Sex Cord and Stromal Tumours of the testis.

c. What are the risk factors for the development of testicular germ cell tumours? **(2)**

d. Regarding Seminoma and Choriocarcinoma, using a table, list the: **(4)**

i. Macroscopic features.

ii. Microscopic features.

iii. Immunohistochemistry.

Question 5

a. For Ewing's Sarcoma of bone, what are the typical: **(3)**

i. Ages of diagnosis.

ii. Locations in which it occurs.

iii. Plain x-ray findings.

b. Discuss the general principles when planning a biopsy for a suspected sarcoma. **(1.5)**

c. List the microscopic appearances, immunohistochemical profile and cytogenetic marker of Ewing's Sarcoma. **(2.5)**

d. List the adverse prognostic factors for both localised and metastatic Ewing's Sarcoma. **(3)**

Question 6

a. A 75-year-old male smoker presents with haematuria. He has a past medical history of rectal cancer and underwent neoadjuvant pelvic radiotherapy 8 years ago. **(1)**

List the potential benign and malignant causes of haematuria in this patient.

b. A multifocal urothelial cancer of the bladder is suspected.

i. Describe the concept of field cancerisation, including sites where it is observed. **(2.5)**

ii. List the chemical carcinogens implicated in the development of carcinoma of the bladder. **(0.5)**

iii. Outline the steps of chemical carcinogenesis. **(2)**

c. Regarding radiation-induced carcinogenesis:

i. What is the underlying mechanism of carcinogenesis? **(1)**

ii. Describe the clinical features of radiation-induced tumours. **(1.5)**

iii. List the patient and treatment factors that may influence risk. **(1.5)**

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Question 1

a. A previously well 53-year-old man presents with back pain and fatigue. A CT scan demonstrates an expansile soft tissue lesion in the body of T4. Biopsy shows plasmacytoma. **(3)**

Describe the initial workup that should be performed.

b. **(3)**

i. What other criteria must be met in this man order to confirm a diagnosis of multiple myeloma?

ii. What factors dictate prognosis in patients with newly diagnosed myeloma?

c. In general, what is first line treatment for symptomatic multiple myeloma in a fit patient? Give examples of systemic agents that might be used. **(2)**

d. What are symptoms of hyperviscosity syndrome? How is it treated? **(2)**

Question 2

a. **(2)**

i. What are the important features of a cancer type that would warrant consideration of a screening program?

ii. What are the important features of a suitable screening test?

b.

i. What are important differences between chest X-ray vs CT scan in screening for lung cancer, and the implications arising from these? **(2)**

ii. You have been appointed to an advisory panel to consider the implementation of a national lung cancer screening program. **(4)**

Discuss the important points in the trials examining the role of lung cancer screening. Define the target population and the screening test you would recommend.

c. What arguments would you present to the advisory panel regarding the potential health economic benefits of early detection of lung cancer? **(2)**

Question 3

a. List six symptoms of hypercalcaemia. **(1)**

b. Explain the causes of hypercalcaemia in cancer patients. **(2)**

c. What should be the initial management of this patient? Include doses of the main agent. If resistant, what other agents can be used? **(3.5)**

d. What are the potential reversible causes of acute confusion in a patient with advanced metastatic disease (apart from hypercalcaemia)? How would you manage these causes? **(3.5)**

Question 4

a. Anticancer treatments may impair fertility in cancer patients. **(4)**

What are the mechanisms by which anticancer treatments may impair fertility?

b. A 55-year-old man was treated for prostate cancer 18 months ago. He is currently having significant distress due to erectile dysfunction. **(2)**

Outline the possible causes for erectile dysfunction in this patient.

c. How would you further counsel him? What management options would you discuss with him? **(4)**

Question 5

a. Adenocarcinoma of unknown primary (ACUP) accounts for a small percentage of cancer presentations. **(4)**

Describe the biological hallmarks of metastatic malignancy and include the key pathways that may become therapeutic targets.

b. Using examples, outline your approach to the PATHOLOGICAL assessment of a patient with a new presentation of ACUP. **(2)**

c. What are the standard first line systemic agents used to treat a patient with ACUP? In what circumstances may alternative agents be used? **(2)**

d. What is the prognosis for patients with ACUP? What factors are prognostic? **(2)**

Question 6

a. A 13-year-old girl is referred to you for consideration of radical radiation therapy for a 15cm, inoperable Ewing's sarcoma of the left hemi-pelvis **(2)**

Describe the target volumes and dose fractionation schedule to treat this girl and the timing of her radiation therapy in relation to her systemic treatment.

b. In general, what are the late toxicities from pelvic radiation therapy in children and young adults? **(8)**

Describe general and radiation therapy recommendations on how to prevent or minimise these late toxicities.

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Candidate Number: _____

FRANZCR Examination

Phase 2 Radiation Oncology

Radiation Therapy 1

July 2022

Time Allowed: 2.5 Hours

INSTRUCTIONS

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THIS INCLUDES THE QUESTION PAPER.

Question 1

a. With reference to a published guideline, what patients may it be reasonable to consider using a partial breast radiation technique as an alternative to adjuvant whole breast radiation therapy? **(2)**

b. By comparing with the IMPORT LOW approach, discuss the different ways that partial breast radiation can be delivered. **(3)**

Why do you think the IMPORT LOW approach has seen relatively more widespread uptake in comparison with the other approaches?

c. Partial breast re-irradiation following further breast conservation surgery as an alternate to mastectomy is increasingly being utilised. **(2)**

Discuss why and how the dose fractionation differs in this setting when using photon-based treatment.

d. When delivering post mastectomy radiation to the chest wall:

i. What is the rationale for the use of bolus? **(1)**

ii. Which patients require bolus? **(2)**

Question 2

a. Regarding Stereotactic Body Radiotherapy (SBRT) for medically inoperable lung cancer:

i. What is the definition of SBRT? **(2)**

ii. What is the definition of a central lung tumour? **(1)**

iii. What are the specific toxicities to be considered in SBRT treatment for a central lung tumour? **(1)**

b. An 80-year-old man is diagnosed with a 3cm squamous cell cancer near the hilum of his right lung (cT2N0M0). Investigations reveal no other sites of disease. **(4)**

A decision is made to treat with definitive SBRT using a linear accelerator.

Describe a suitable radiation therapy technique and dose fractionation schedule.

c. In general, discuss the advantages and disadvantages of radical surgery compared with SABR in early-stage non-small cell lung cancer. **(2)**

Question 3

a. A 60-year-old male is referred back by his ENT surgeon with a 2.5cm mass in the right fossa of Rosenmuller. He had been treated for a T2N2M0 Nasopharynx cancer with radical chemoradiotherapy 4 years earlier (70Gy in 35 Fractions). **(1.5)**

Discuss in general the factors to consider in regard to Head and Neck cancer recurrence retreatment post radiation therapy.

b. Discuss your initial assessment of this patient prior to consideration of further treatment including history, physical examination and staging investigations. **(3)**

c. Staging confirms a 2.5cm isolated recurrence in the right fossa of Rosenmuller with no paraphayngeal extension. There is no disease elsewhere. **(3)**

Discuss the management options.

d. A decision is made to retreat with radiation therapy. Discuss a suitable external beam radiation non-proton technique. **(2.5)**

Question 4

a. A 57-year-old female presents with seizures. She is otherwise well, ECOG0, with unremarkable examination. MRI brain shows periventricular enhancing posterior cerebral mass without significant mass effect and biopsy confirms primary CNS lymphoma. **(1.5)**

List the investigations you would request.

b. What are the key patient and tumour related prognostic factors in this disease? **(1)**

c. Outline the preferred initial treatment for this patient. What is the disadvantage of initial radiation therapy? **(2)**

d. Following initial induction chemotherapy, a complete response is achieved. What are the options for consolidation therapy? Summarise the highest evidence for each consolidation strategy. **(3.5)**

e. The patient elects to have consolidation radiation therapy. Please describe your target volume, dose and fractionation schedule. **(2)**

Question 5

a. Outline the different types and associated natural histories of Kaposi's Sarcoma. **(2)**

b. A decision is made to treat a 57-year-old, HIV positive man with a solitary Kaposi Sarcoma lesion on the hard palate with radiation therapy. The lesion is painful and covers the anterior 2/3rds of the mucosal surface of the hard palate. **(3)**

Describe a suitable radiation therapy technique and dose fractionation schedule.

c. In general, what are the treatment options available for cutaneous HIV-related Kaposi's Sarcoma? **(2)**

d. An elderly male presents with classical Kaposi Sarcoma, extensively involving the dorsal surface of the foot and extending around onto the ventral surface (sole) of the foot causing pain and oedema. A decision is made to treat the whole foot with radiation therapy.

i. Discuss the challenge in simulation and planning for such a patient and outline a suitable radiation therapy technique including dose fractionation schedule. **(2)**

ii. What probable response/outcomes would you discuss with the patient? **(1)**

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Candidate Number: _____

FRANZCR Examination

Phase 2 Radiation Oncology

Radiation Therapy 2

July 2022

Time Allowed: 2.5 Hours

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Question 6

a. A previously well 65-year-old male is referred from his GP with a recent history of right cheek pain and a CT reporting a mass in the floor of the right maxillary sinus. **(2)**

Discuss your workup of this patient including history, examination and staging investigations.

b. Workup suggests a T4N0M0 SCC of the floor of the right maxillary sinus with involvement of the right maxillary alveolar margin clinically and radiologically. He proceeds to a right infrastructure/hemi maxillectomy with free flap reconstruction and limited neck dissection. **(2)**

What factors would you document from the pathology report?

c. A decision has been made to treat the patient with adjuvant radiation therapy. Describe a suitable radiation therapy technique including dose fractionation schedule and organs at risk constraints. **(4)**

d. Xerostomia is a common complication of head and neck radiation treatment. What strategies can be used to reduce the risk of xerostomia? How do you manage a patient with this condition? **(2)**

Question 7

a. A previously well 73-year-old man presents with a hard, ulcerated 3cm mass on his glans penis. A biopsy confirms poorly differentiated squamous cell carcinoma of the penis. **(3)**

How would you further stage this patient? Justify your answer.

b. Clinically there is involvement of a 2cm left inguinal lymph node. Staging investigations show no other disease. He is seen in a multidisciplinary clinic and agrees to partial penectomy and left inguinal node dissection.

i. What are the indications for post operative radiation therapy? **(1)**

ii. He proceeds to surgery, with histology confirming clear margins and three positive left inguinal nodes. Describe your clinical target volume for adjuvant radiation therapy and the dose you would prescribe. **(2)**

c. In general, if a patient with node negative penile carcinoma is unsuitable for surgery, he may be treated with radiation therapy to the primary tumour alone.

i. Describe a suitable external beam radiation therapy dose. Discuss relevant pre-simulation considerations and simulation instructions for the radiation therapists. **(3)**

ii. What are the potential toxicities of this treatment? **(1)**

Question 8

a. A fit 72-year-old man has suspected bladder and prostate cancer. **(2)**

What investigations would you perform? Justify your answer.

b. Investigations revealed high grade urothelial muscle invasive bladder cancer without lymphadenopathy and he has had a TURBT. The prostate biopsies revealed Gleason 4+4 (ISUP Grade 4) carcinoma with seminal vesicle involvement, but no lymphadenopathy. His PSA is 11. There is no distant metastatic disease. His EGFR is 40 and he has good bowel, urinary and sexual function. **(4)**

What are his treatment options and what are the advantages and disadvantages of each approach?

c. The decision has been made to give radiation therapy. Describe a suitable radiation therapy technique and dose fractionation schedule. **(3)**

d. What systemic therapy would you recommend? **(1)**

Question 9

a. A fit 50-year-old man presents with a 6-week history of dysphagia. History and examination are otherwise unremarkable. Endoscopic ultrasound and biopsy reveal a squamous cell in the cervical oesophagus (18-20 cm from incisors) invading the adventitia. Staging investigations show paraesophageal lymphadenopathy but no distant metastatic disease (cT3N1M0). **(4)**

Discuss the curative treatment options available for this man. Include in your answer potential late treatment toxicities from each treatment option.

b. The decision is made to treat with definitive chemo-radiation therapy. **(4)**

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

c. Regarding definitive chemo-radiation for oesophageal cancer, what are the arguments for and against prophylactic nodal irradiation in patients with no radiological evidence of nodal disease? **(2)**

Question 10

a. **(2)**

i. Broadly outline the pathologic classification of pineal tumours.

ii. With regards to pineal tumours in adults, what are the most common symptoms and physical examination findings?

b. What investigations would you request or perform on an adult patient with a pineal tumour? Justify your answer. **(3)**

c. What radiation therapy volumes and radiation dose would you recommend for a 21-year-old man presenting with a localised pineal germinoma to be treated with radiation therapy alone, following a 3rd ventriculostomy. Describe in detail your radiation therapy contours. **(3)**

d. In general, using the radiation volumes and doses you have recommended in part c what potential long term side effects of this treatment might be expected in a boy treated at 9-years-old. **(2)**