The Royal Australian and New Zealand College of Radiologists®

The Faculty of Radiation Oncology

Candidate Number: _____

FRANZCR Examination

Phase 2 Radiation Oncology

Pathology

February 2020

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 45 year old male presents with a mass in his neck. Biopsy shows the presence of poorly differentiated malignant cells. **(3)**

i. List the possible differential diagnoses (primary head and neck cancers) in this setting.

ii. How may immunohistochemistry assist in identifying the potential primary tumour?

b. If the biopsy shows Squamous Cell Carcinoma: **(3)**

i. What are the clinical and radiological features that would suggest a diagnosis of HPV-associated oropharyngeal cancer?

ii. List the cytological features that are seen with HPV-associated squamous cell carcinoma.

ii. What are the diagnostic criteria for p16 positivity?

c. Describe the key steps leading to HPV carcinogenesis. **(2)**

d. Describe the implications of EGFR over-expression in head and neck mucosal squamous cell carcinoma. **(2)**

Question 2

a. **(2)**

i. Define a tumour marker.

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

A 40 year old male presents with a mass in the left testis. The ultrasound shows a 4cm malignant mass.

b. Outline the WHO classification of **(2)**

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. Using a table, list the: **(3)**

- macroscopic features
- microscopic features

for

i. seminoma

ii. embryonal carcinoma

e. What is the typical immunohistochemistry profile of a seminoma? **(1)**

Question 3

A 60-year-old man presents with lower urinary tract symptoms (LUTS) and haematuria. On abdomino-pelvic ultrasound examination he is found to have a mass lesion arising from the trigone/bladder neck region of the urinary bladder. Urinary cytology is suspicious for high grade urothelial carcinoma.

a. What further investigations and procedures would you undertake in this patient? Justify your answer. **(2)**

b. List the clinical and histopathological features in localised muscle invasive urothelial carcinoma of the urinary bladder which adversely impact on prognosis. **(3)**

c. Describe: **(2)**

- **i.** the two theories for the multifocal nature of urothelial carcinomas of the urinary tract.
- **ii.** the clinical observations which support these.

d. Briefly describe the epidemiology, risk factors and histopathology of primary Squamous Cell Carcinoma (SCC) arising in the urinary bladder. **(1.5)**

e. Histopathology of the TURBT specimen on this patient indicates that this in fact is an invasive ductal carcinoma of the prostate.

- **i.** Briefly describe the key microscopic features of invasive ductal carcinoma of the prostate. **(1)**
- **ii.** List immunohistochemical (IHC) markers which may assist in confirming the diagnosis. **(0.5)**

Question 4

a. A 70 year old woman presents with several lytic lesions on her spine. You suspect this is myeloma. **(2.5)**

- **i.** What investigations would you request?
- **ii.** List the common clinical consequences of multiple myeloma.

b. Describe the pathogenesis of lytic metastases in multiple myeloma. **(2)**

c. With regards to solitary extramedullary plasmacytoma, describe the: **(3)**

- **i.** epidemiology
- **ii.** most common location in which it occurs
- **iii.** immunostaining pattern
- **iv.** prognosis after curative radiotherapy and how this differs from solitary plasmacytoma of bone.

d. For monoclonal gammopathy of unknown significance: **(2.5)**

- **i.** provide the definition
- **ii.** describe how it differs to smouldering myeloma
- **iii.** list the risk factors for progression to multiple myeloma.

Question 5

A 39 year old female with irregular bowel habits has a colonoscopy and was found to have multiple polyps.

a. Regarding neo-plastic polyps in the colon, describe: **(2.5)**

- **i.** The gross appearance and general structure.
- **ii.** The histologic subtypes and their relative frequency.
- **iii.** The risk factors for malignant transformation.

b. What is the cyto-genetic abnormality and inheritance pattern of: **(2)**

- **i.** FAP
- **ii.** HNPCC

c. Describe the adenoma carcinoma sequence in Familial Adenomatous Polyposis (FAP). **(3)**

(Annotated diagram can be used)

d. In the setting of a hemicolectomy for colon carcinoma, list the microscopic features that should be included in the synoptic pathology report. **(2.5)**

Question 6

A 46 year old woman presents with a palpable mass in the right lobe of the thyroid.

a. List risk factors for the development of thyroid carcinoma. **(1)**

b. Discuss the usefulness of FNA biopsy in distinguishing the various types of thyroid carcinoma. **(2)**

c. Using a table compare the epidemiology, natural history and microscopic features of Papillary Thyroid Carcinoma and Anaplastic Thyroid Carcinoma. **(4)**

Following surgical resection of a papillary thyroid carcinoma, the patient is referred to you for a discussion regarding I-131.

d. What clinical and pathological factors would guide your decision to offer radioablative iodine? **(2)**

Papillary thyroid carcinomas commonly have genetic alterations of the MAPK growth factor receptor signalling pathway.

e. Name the 2 different genetic alterations that can occur. **(1)**

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Clinical Oncology

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Question 1

Valid consent is required prior to the delivery of radiation treatment.

a. Identify six different patient cohorts in which obtaining valid consent may be difficult and outline methods that could be used to overcome these difficulties. **(4)**

b. What are the basic principles of obtaining valid consent for medical treatment? **(2)**

c. Outline the potential reversible causes of acute confusion in a patient with advanced metastatic disease. How you would manage these causes? **(4)**

Question 2

a. A 61 year old woman presents with unresectable, locally advanced pancreatic carcinoma. She has pruritis, jaundice, a 7 kg weight loss and anorexia.

i. Discuss the management options for her pruritis and jaundice. **(2)**

ii. Define cancer related cachexia and discuss its aetiology and treatment in this patient. **(4)**

b. The patient's tumour related epigastric pain becomes severe. **(2)**

Discuss the options available to manage her pain.

c. In general, what is the role of chemotherapy in exocrine pancreatic carcinoma. Include examples of regimens used. **(2)**

Question 3

A 70 year old man with metastatic lung cancer presents with confusion, nausea and constipation. He is found to have a corrected serum calcium of 3.2 mmol/L (normal range 2.2 - 2.6 mmol/L).

a. How would you manage this patient's hypercalcaemia? **(3)**

b. What are the indications for the use of bisphosphonates in the treatment of the following primary cancers: **(4)**

i. Breast carcinoma

ii. Prostate carcinoma

Include in your answer the evidence supporting your recommendations.

c. What is the role of surgery and radiation therapy in patients with metastatic disease to long bones? What factors would you consider when deciding between them? **(3)**

Question 4

A 62 year old man presents with right upper quadrant pain and weight loss on the background of a resected sigmoid colon carcinoma 5 years ago. Abdominal ultrasound shows a liver lesion.

a. How would you further assess this patient? Justify your answer. **(2)**

b. Investigations confirm a solitary 3cm liver metastasis with no other systemic disease. What are the management options available to this patient? Justify your answer. **(3)**

c. In general, what factors would you consider when selecting patients for surgical resection of liver metastases? **(2)**

d. Paracentesis is commonly used to drain symptomatic ascites in patients with metastatic liver disease.

i. Describe the technique for this procedure. **(2)**

ii. List two alternatives to paracentesis for the management of ascites. **(1)**

Question 5

An 18 year old male with a past history of testicular rhabdomyosarcoma treated with a combination of surgery, chemotherapy and adjuvant radiation therapy, is referred for long term follow up.

a. What issues would you need to address and what strategies would you put into place for his survivorship care? **(6)**

b. What are the challenges to the provision of survivorship care in adolescents and young adults and how may they be overcome? **(4)**

Question 6

Regarding Clinical Trials:

a. What are the barriers to enrolment in clinical trials? **(6)**

b. Define and outline the advantages and limitations of the following commonly used endpoints in oncology clinical trials: **(4)**

i. Overall Survival (OS)

ii. Progression Free Survival (PFS)

iii. Disease Free Survival (DFS)

iv. Time to Treatment Failure (TTF)

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FRANZCR Examination

Phase 2 Radiation Oncology

Radiation Therapy 1

February 2020

Time Allowed: 2.5 Hours

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Question 1

A well 50 year old man undergoes resection of a desmoplastic cutaneous melanoma medial to his right scapula. There is no disease beyond the primary site. Histology shows perineural invasion of multiple nerves up to 0.4mm diameter.

a.

i. What other features would you like to review on the pathology report when deciding on further management? **(0.5)**

ii. If no other high risk features are present, what would be your recommended management and justify your answer? **(2)**

One year later he presents with right axillary lymphadenopathy. Axillary dissection reveals complete resection of melanoma in the affected lymph nodes.

b. What features in the pathology specimen could prompt consideration of adjuvant radiation therapy? **(1.5)**

c. Adjuvant radiation therapy is recommended. **(3)**

Describe a suitable radiation therapy technique and dose fractionation schedule. Include expected side effects in your answer.

A year later he develops metastatic disease to the brain which is asymptomatic. Staging reveals no other disease. Performance status remains excellent.

d.

i. If there were a single 1.5cm lesion in the motor cortex, what treatment would you recommend and why? **(1)**

ii. If there were 15 small lesions scattered throughout the brain parenchyma, what therapeutic options exist and what are the advantages and disadvantages of each. Which is your preferred option? Justify your answer. **(3)**

Question 2

A 35 year old woman presents with a red, swollen left breast with peau d'orange involving two thirds of the breast and palpable axillary nodes.

a. Describe the initial management of this patient. **(2)**

Biopsy shows an infiltrating ductal carcinoma ER/PR/Her 2 negative. There is no systemic spread.

b. Outline a preferred management plan for the patient and justify your answer. **(2)**

The patient has a clinical partial response to chemotherapy with residual palpable disease in the breast, but no palpable adenopathy.

c. A decision is made to proceed to radiation therapy immediately post chemotherapy. **(4)**

Describe a suitable radiation therapy technique and dose fractionation schedule.

The patient develops a brain metastasis. This is resected and she is referred for a discussion of post operative cavity radiation.

d. Discuss **(2)**

i. the rationale and

ii. the evidence

for cavity radiation treatment.

Question 3

a. A fit 68 year old male presents with a PSA of 18ng/ml. Rectal examination demonstrates possible extracapsular invasion. 30% of biopsy cores are positive for adenocarcinoma, Gleason 4+4=8.

i. What risk group does this patient fall into? Justify your answer. **(2)**

ii. How would you further investigate this patient? Justify your answer. **(1)**

The investigations confirm the primary tumour is confined to the prostate gland, with no extracapsular extension. There are 2 pelvic lymph node metastases (10 and 12mm respectively). There is no evidence of disease elsewhere.

b. What are the appropriate treatment options for this patient? Justify your answer. **(3)**

c. The patient opts for radiation therapy. **(4)**

Describe a suitable radiation technique and dose fractionation schedule.

Question 4

A 45 year old female presents with anorectal pain for 3 months. Examination shows an anorectal mass. Biopsy shows a moderately differentiated Squamous Cell Carcinoma (SCC).

a. How would you further investigate this patient? **(1)**

Staging reveals a 6cm anorectal mass with a 2cm left inguinal lymph node (cT3N1aM0).

b. The patient is recommended for concurrent chemoradiotherapy. **(4)**

Describe a suitable radiation therapy technique and dose fractionation schedule.

c. What are the implications for HIV positive patients with locally advanced anal SCC in terms of: **(2)**

i. treatment outcome and

ii. treatment toxicity?

Three months post treatment clinical examination reveals a persistent anorectal mass.

d. How would you manage this patient? **(3)**

Question 5

a. What are the management options available for Arterio-Venous Malformations of the brain? **(4)**

Include in your answer the advantages and disadvantages of each option.

b. In the treatment of thyroid eye disease with radiation therapy; what are the: **(3)**

i. indications

ii. contraindications

iii. target volumes

iv. radiation dose fractionation schedules and

v. expected response rates

to therapy?

c. In the treatment of heterotopic ossification with radiation therapy, what is: **(3)**

i. the role of radiation therapy

ii. the timing of the treatment

iii. the target volume, and

iv. the radiation dose fractionation schedule?

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FRANZCR Examination

Phase 2 Radiation Oncology

Radiation Therapy 2

February 2020

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Question 6

An 80 year old patient has a basal cell carcinoma (BCC) excised from the midline left lower eyelid. The lesion is 5mm in size with a focally positive deep margin and clear peripheral margins of 3mm. There is no perineural or lymphovascular invasion.

a. **(3)**

i. How would you further assess this patient?

ii. Discuss the management options for this patient.

Clinically the patient has a 12mm vertical scar in the midline lower eyelid. There is no obvious residual BCC.

A decision is made to offer adjuvant radiation therapy.

b. Describe an appropriate radiation therapy technique and dose fractionation schedule. **(3)**

c. What are the potential complications of adjuvant radiation therapy in this patient? **(2)**

d. Following surgery for cutaneous Squamous Cell Carcinoma (SCC**)** in the Head and Neck area, what high-risk factors would you consider when recommending adjuvant radiation therapy. **(2)**

Question 7

A 47 year old woman is diagnosed with a 3cm squamous cell cancer in the right upper lobe of her lung. Investigations reveal that the only other disease is a right hilar node.

A decision is made to treat with definitive chemoradiotherapy.

a. Describe a suitable radiation therapy technique and dose fractionation schedule. **(4)**

Six years later the patient is found to have a 24mm adenocarcinoma in the peripheral region of the left lower lobe. There is no evidence of disease elsewhere.

b. With regard to Stereotactic Ablative Body Radiation Therapy (SABR) for lung cancer, what are the general principles of SABR for lung tumours? **(2)**

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

d. In general, what factors would you consider when selecting a patient for SABR treatment? **(2)**

Question 8

a. In general, what is the role for post operative radiation therapy in meningioma? **(3)**

A fit 59 year old male with a 3x3x4cm WHO Grade 2 right sphenoid wing meningioma is to be treated with definitive radiation therapy.

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

c. What would you tell the patient about the potential late effects of radiation therapy to this site? **(2)**

d. List the pre-disposing factors for the development of meningioma. **(2)**

Question 9

A 48 year old female presents with a six month history of severe oral pain radiating to her jaw. Examination demonstrates an ulcerated lesion on the left lateral edge of the anterior two thirds of the tongue.

a. List the key investigations required to work up this patient. **(1)**

Pathology from a left hemi glossectomy and ipsilateral neck dissection confirms a 28mm poorly differentiated discohesive SCC with a depth of invasion 11mm, medial margin 1mm, perineural invasion of lingual nerve and 2/16 nodes, both at level 2, with no extra nodal extension.

The decision is made to treat the patient with radical radiation therapy.

b. Describe in detail your: **(4)**

i. clinical target volumes,

ii. dose fractionation schedule, and

iii. organs at risk dose constraints.

After three weeks of treatment the patient requires a replan for weight loss. This results in a treatment break of 4 treatment days.

c. What are the management options for this patient? **(2)**

Justify your answer.

At her 12 month follow up visit she has an area of exposed bone on her mandible consistent with osteoradionecrosis (ORN).

d. Discuss the optimal management of ORN for this patient. **(3)**

Question 10

A fit 45 year old female presents with a 3 cm vulval mass in the periclitoral region. Biopsy confirms squamous cell carcinoma (SCC).

a. Discuss the possible curative treatment options and the advantages and disadvantages for each treatment option for this patient. **(3)**

A fit 65 year old female has surgery for a locally advanced 5cm vulval cancer. The pathology confirms a 5cm Squamous Cell Carcinoma with a positive deep margin and bilateral involved groin nodes.

She is recommended to undergo postoperative chemoradiotherapy.

b. Describe a suitable radiation therapy technique and dose fractionation schedule. **(4)**

c. List the advantages and disadvantages of modern radiation therapy techniques (such as intensity modulated and volumetric arc therapy), as compared to field based techniques in vulval cancer. **(3)**