Q.1 A 45 years old diabetic lady presents with a biopsy proven non-keratinizing squamous cell carcinoma of cervix. Clinical examination reveals a large cervical mass fixed to left pelvic side wall. CT scan of chest abdomen and pelvis shows moderate left hydronephrosis with multiple paraaortic nodes all less than 3 cm. Her serum creatinine is 4 mg/dL. Regarding this patient answer the following:

a) What is the FIGO stage?
b) Outline management plan along with radiotherapy techniques.
c) Give brief account of side effects of treatment.

Q.2 A 10 year old child gives history of headache and visual disturbances for the last 2 months. His MRI brain showed 1.5 x 2.5 cm space occupying lesion (SOL) in pineal region.

a) Give your differential diagnosis.
b) Excision biopsy revealed pineoblastoma. What investigations will you advise for this patient?
c) What will be the radiation plan and doses?
d) What will be the chemotherapy plan?

Q.3 A 71 years old female underwent total abdominal hysterectomy and bilateral salpingo-oophorectomy. Histopathology revealed endometroid adenocarcinoma 4.5 x 3 cm in size, grade III invading 80% of myometrium with lymphovascular invasion, but no vaginal or lower uterine segment involvement. Bilateral tubes and ovaries were histopathologically not involved. No nodes were dissected. Post operative CT chest, abdomen and pelvis was unremarkable.

a) What is her FIGO stage?
b) Enumerate risk factors in this patient.
c) What is your adjuvant treatment plan in this case?
Q.4  a) Draw Bragg Peak in relation to proton beam therapy.
    b) Give advantages of rapid arc treatment.
    c) Enumerate indications of cyber knife treatment.
    d) Compare and contrast HDR and LDR brachytherapy in cervical cancer.

Q.5  A patient is treated by parallel opposed mantle and paraaortic fields of lengths 30 cm and 15 cm respectively. Calculate:

    a) The gap required on the surface for the beam to intersect at a midline depth of 10 cm.
    b) The gap required to just eliminate field overlap on the cord assumed to be at a depth of 15 cm from the anterior surface. Given SSD is 100 cm for all the fields.
    c) While doing craniospinal radiotherapy, how would you match lateral brain fields and posterior spinal field?

Q.6  a) Which radioisotopes are used for permanent implant of prostate and what are their characteristics that make them suitable for this indication?
    b) Write down the uses of the following:
        1. Dose volume histogram (DVH)
        2. Multileaf collimators (MLCs)
        3. Internal target volume (ITV)
Q. 7 Mother of 4 years old boy notices leukocoria in his left eye with impairment of vision. Examination reveals white pupillary reflex, conjunctival erythema and reduced visual acuity.

a) What is your most likely diagnosis?
b) What investigations will you advise to reach the diagnosis and staging?
c) If clinical and radiological examination reveals right sided retinoblastoma involving more than one half of retina with vitreous seeding, what will be the stage according to Reese-Elsworth classification?
d) What are the treatment options?
e) If optic nerve margin is found involved histopathologically and you decide to radiate, outline your radiotherapy technique?
f) If 5 years after treatment patient develops retinoblastoma in opposite eye. Examination and workup reveals multiple tumours more than 10 disc diameter. What will be your treatment plan?

Q. 8 A 38 years old woman presents with a 2.5 x 2.2 cm hypoechoic left breast upper outer quadrant lesion on ultrasound which on core biopsy is infiltrating ductal carcinoma Grade III. Mammography reveals no other lesion and axilla is clinically and radiologically negative.

a) What investigations will you advise for this patient?
b) If metastatic workup is negative what is the standard surgical recommendation for this case?
c) Enlist the risk factors for local relapse in such cases?
d) Outline radiation technique (Axilla is pathologically negative).
e) What are the possible radiation side effects in this case?
Q.9 A 20 years old footballer presented with painful right leg. Examination revealed swelling in lower thigh. Overlying skin was normal with no dilated veins and movement of right knee joint was slightly limited. MRI revealed tumor involving lower end of right femur with clear neurovascular bundle and periosteum was intact. Systemic workup revealed no metastatic disease.

a) What is your differential diagnosis?

Q.10 A 9 years old boy with solid right renal mass underwent right nephrectomy. Histopathology showed Wilm’s tumor favorable histology. Post operative CT chest abdomen and pelvis showed a 1 cm residual mass in tumor bed.

a) What is the stage of this patient?

b) What are the indications of flank radiation in Wilm’s tumor?

c) Outline your radiation technique.

d) How can you minimize short and long term radiation side effect in this patient?
Q.11 In external beam radiation therapy (EBRT) planning:

a) Enumerate steps necessary to ensure quality assurance (QA).
b) Comparison between IMRT and 3DCRT treatment planning.
c) Indications for external beam radiotherapy in the management of a differentiated thyroid cancer.
d) How would you compensate for a gap of 4 days after 10 fractions, in a patient undergoing radical radiotherapy 70 Gy / 35 fractions over 7 weeks for head and neck cancer?

Q.12 a) What are the indications and techniques of total body irradiation?
b) What is informed consent in radiation therapy?
c) Draw a diagram for palliative radiotherapy for skull base metastasis.
d) State BIRADS categories in screening mammogram.

Q.13 a) The importance of 4Rs of radiobiology in the management of limited stage small cell lung carcinoma.
b) Relationship of OER and RBE of high LET radiation?
c) Define non-stochastic (deterministic) and stochastic effects of radiation and give one example of each.
d) Enlist 3 tumours which exhibit the shoulder phenomenon.

Q.14 A 45 years old male presented with multiple enlarged lymph nodes in left axillary region. Excision biopsy of one lymph node reveals follicular lymphoma Grade I. There was no history of fever and weight loss.

a) What staging workup will you advise?
b) What are the factors used in such cases for prognostic grouping? What are the chances of survival on the basis of this grouping?
c) On staging workup left axilla is the only site of disease, what will be the stage?
d) What will be your treatment plan?
| Q.15 A 50 year old fit patient presents with painful ulceration on oral tongue. On examination there is a 4.5 cm x 1.5 cm infiltrative lesion on the left lateral border extending across the midline invading the floor of mouth. Tongue is fixed. 2 cm x 1 cm node is palpable in left level II A. Incisional biopsy of tongue lesion confirms squamous cell carcinoma. |
|---|---|
| a) What is the clinical AJCC stage? |
| b) Which staging investigations would you do? |
| c) Outline your chemoradiation technique for this patient. |
| d) What is the prognosis for this patient? |

| Q.16 A 55 year old fit man has been found to have a 4 cm squamous cell carcinoma of the mid esophagus. There is no evidence of locoregional lymphadenopathy or metastatic disease on his staging CT scan. |
|---|---|
| a) Outline your chemoradiation treatment plan. |
| b) Enumerate organs at risk with tolerance doses for each. |
| c) What is the prognosis for this patient? |

| Q.17 A 75 year old fit man presents with a 3 years history of slowly enlarging, slightly pigmented skin lesion measuring 3 cm x 2 cm on the right cheek. Biopsy shows basal cell carcinoma. |
|---|---|
| a) How will you stage this patient? |
| b) What are his treatment options? |
| c) How will you treat with radiotherapy, outline your radiotherapy technique? |
Q.18 A 54 year old male smoker is brought to your clinic on wheel chair with history of headache, vomiting and left sided hemiparesis for 2 days. Further inquiry revealed ignored symptoms of left sided chest pain and hemoptysis for 6 months. If workup reveals 4 cm lesion involving peripheral part of lower lobe of left lung with ipsilateral mediastinal adenopathy and 2 metastatic lesions in brain.

a) What will be the TNM stage according to AJCC?
b) Which IHC markers help in the diagnosis of adenocarcinoma lung?
c) What will be your treatment plan?
d) What are the ways by which you can minimize the effects of lung movements during chest radiotherapy?
e) In a patient never smoker and stage IV adenocarcinoma lung with no brain metastases, positive EGFR mutation, not fit for chemotherapy, what systemic treatment will you advise?

Q.19 A 60 years old male on routine screening is found to have PSA value of 9 ng/mL. Rectal examination is normal. TRUS guided biopsy showed moderately differentiated adenocarcinoma with Gleason score of 5.

a) What investigations will you advise for staging?
b) What are the treatment options?
c) Outline your external beam radiotherapy technique, specifying total dose, fractionation, overall treatment time, field arrangement, machine energy, organs at risk. Gross tumour volume, clinical target volume and planning target volume.

Q.20 a) According to RECIST criteria define complete response, partial response, progressive disease and stable disease.
b) Write 2 sentences on phase IV study and case fatality rate.
c) Cross sectional studies.
d) Case control study.

THE END