



Dr Charles De Groot

Radiation Oncologist

Hamilton

Radiation Oncology Snippets - Concurrent Workshop Repeated

Saturday, 22 June 2013

Start 2:00pm

Duration: 55mins

Warhol

Start 3:05pm

Duration: 55mins

Warhol



 **Rotorua GP CME 2013** 

General Practice Conference & Medical Exhibition

20-23 June 2013 | Energy Events Centre | Rotorua

No conflict of interest?



What a GP should know about Radiation Oncology

Charles De Groot
Radiation Oncologist
Waikato Hospital

Overview

- History.
- How does radiation work?
- The role of radiation.
- Different techniques.
- The process of radiation (patient experience).
- Side effects and how to manage them.
- Future directions.

History of Radiation Delivery

- 1895 Wilhelm Roentgen discovered x-rays.



History of Radiation Delivery

- First radiation oncologist Emile Grubbe (1875-1960).
- As a medical student he treated Rose Lee with locally advanced breast cancer with good results.



History of Radiation Delivery

- 1900-1960's concepts of fractionation and field shaping with low energy RT refined.
- 1960 first linear accelerator capable of much higher energies (more penetrating) of radiation.

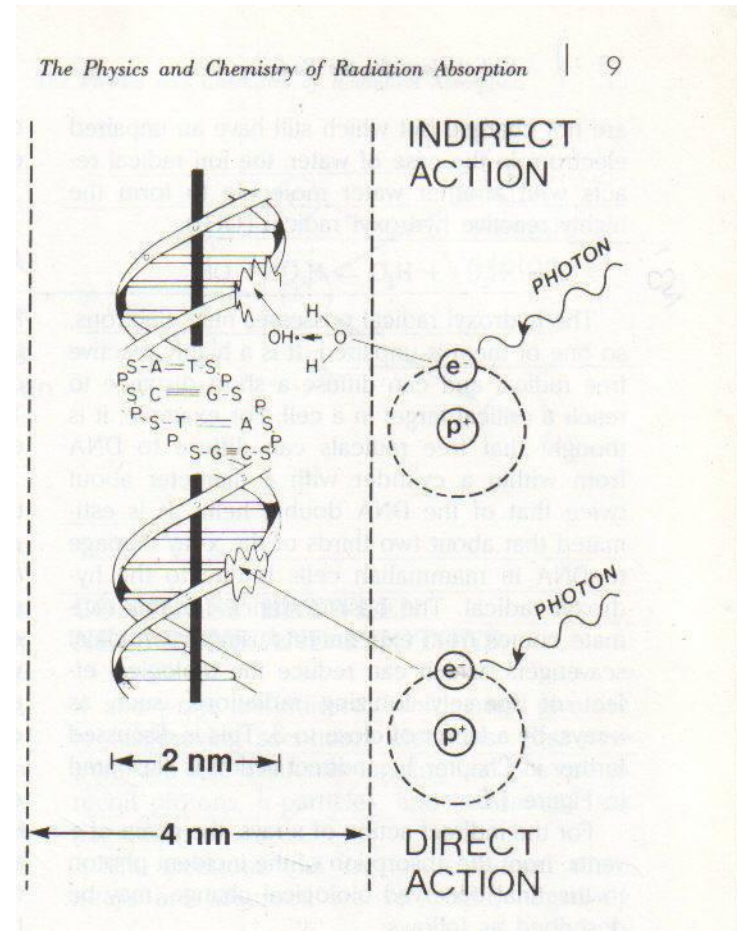


How radiation works



How Radiation Works

- Indirect effects
 - Free Radicals
- Direct effects



How radiation works

- The production of free radicals is an oxygen dependant process so radiation is less effective in hypoxic tissues.
- Given that anti-oxidants absorb free radical they may protect both normal tissues as well as the targeted malignancy.

How radiation works

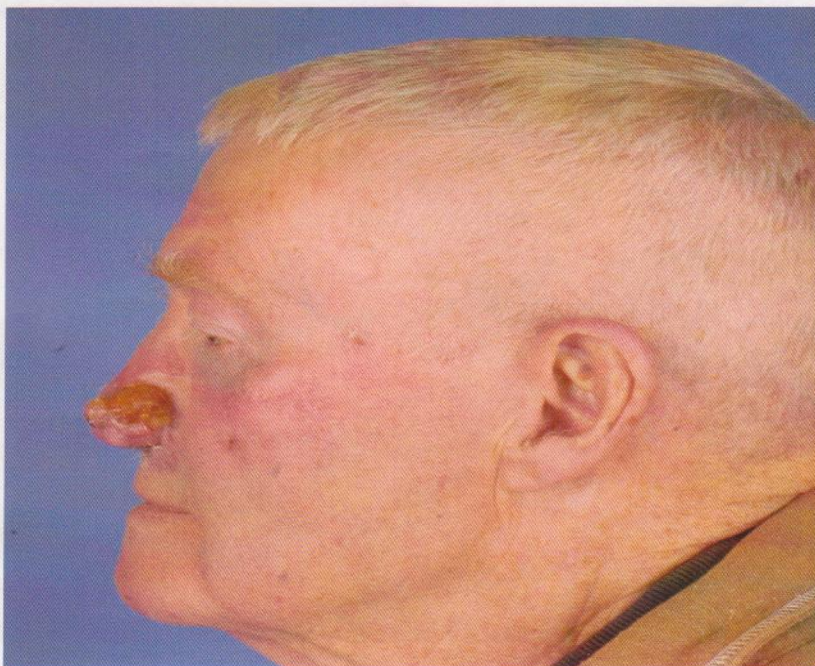
- A clinical target is defined, which encompasses the macroscopic and expected microscopic extent of the malignancy.
- The planning team then solves the geometric and biologic problem of how best to cover the clinical target with the appropriate radiation dose – see later..

The role of radiation

- Cancer management
 - Primary curative
 - Adjuvant curative
 - Palliative
 - Prophylactic
- Benign disease

The role of radiation

- Radiation therapy can cure cancer!





Definitive curative radiation

- Localised head and neck cancer.
- Localised lung cancer.
- Prostate cancer.
- Skin cancer.
- Localised haematological malignancy – lymphoma, plasmacytoma.

Adjuvant curative radiation

- Head and neck
- Breast cancer
- Rectal cancer
- Sarcoma.
- High grade lymphoma.
- Skin

Curative radiation

- Often but not always high dose.
- Side effects can be significant.

Palliative radiation

- To relieve or prevent localised symptoms of virtually any malignancy.
- May be life prolonging.
- Can vary from single treatment (e.g. simple bone metastasis) to multiple treatments(e.g glioblastoma multiforme).
- Generally aim for low morbidity – lower doses.

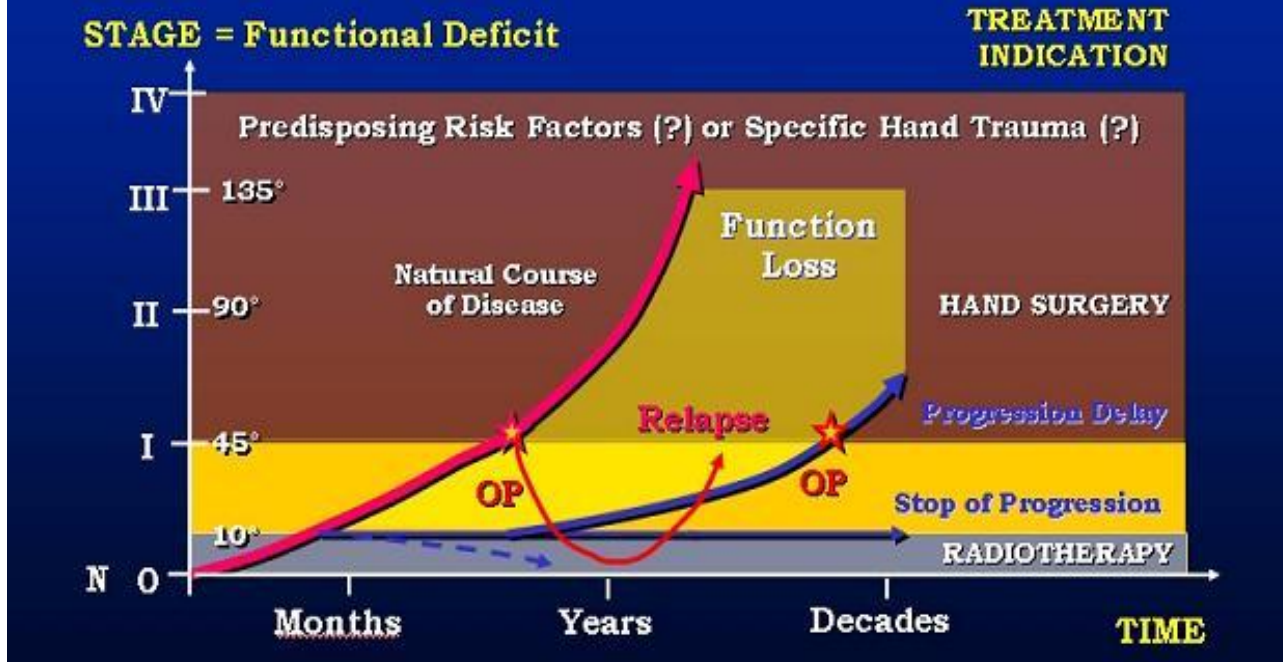
Prophylactic radiation

- Usually preventative radiation to chemotherapy sanctuary sites – typically CNS, occasional scrotal.
- Usually relatively low dose.

Radiation for benign disease.

- Benign tumours –meningioma, dermoid.
- Dupuytren's contracture – prevents progression.
- Thyroid ophthalmopathy.
- Heterotopic ossification.
- Keloid scars.
- Arteriovenous malformation.
- Pterygium.

Radiation Therapy of M. Dupuytren



- 5yr progression of 67% observation vs 22% when treated with RT. $P=0.001$

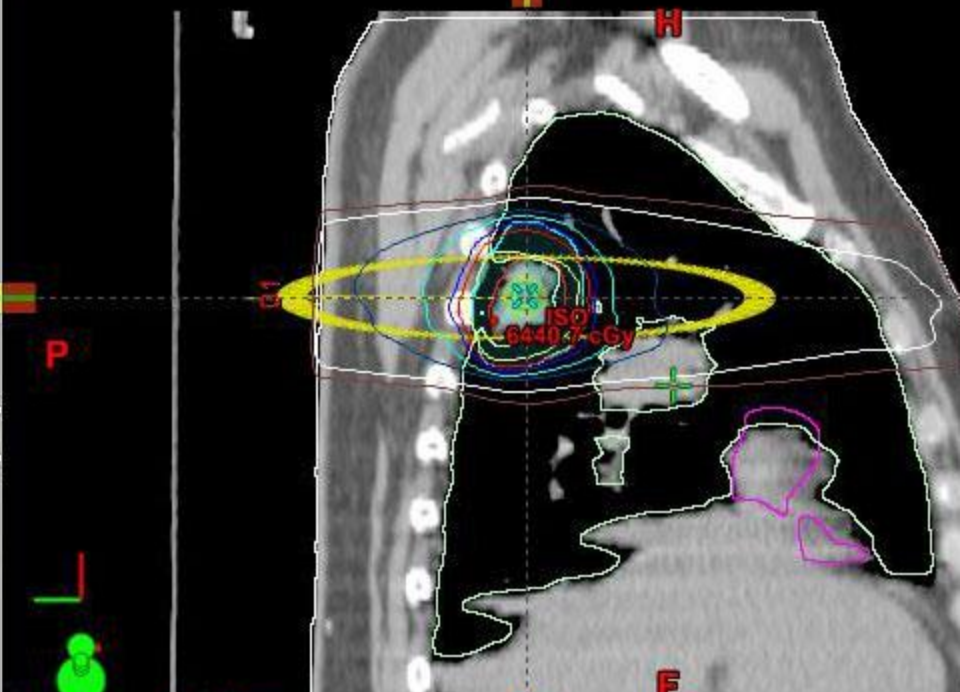
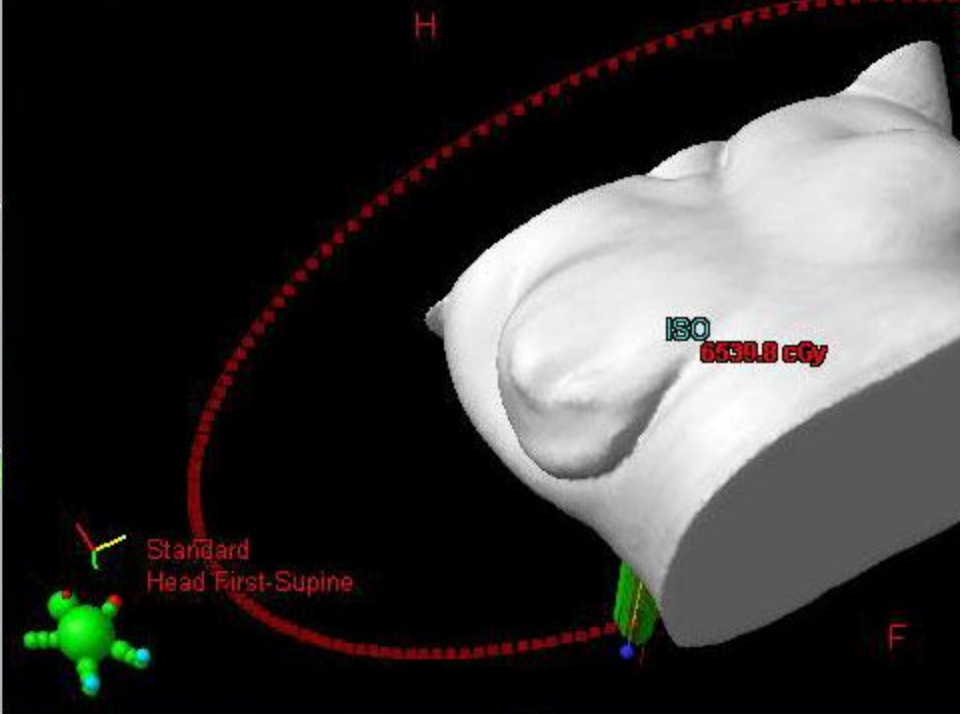
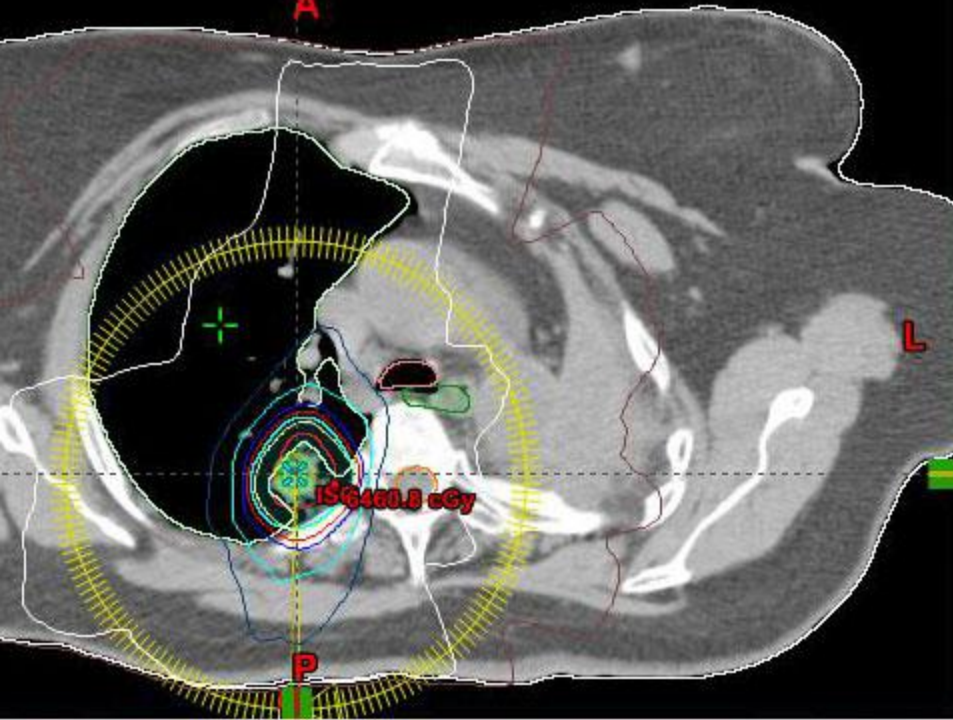
Different techniques

- External beam radiation
 - High energy
 - Superficial voltage
- Brachytherapy
 - Interstitial
 - Mould
 - Intracavitary
- Isotopes

External beam workhorse Linear Accelerator

- Complex
- Deeper dosing





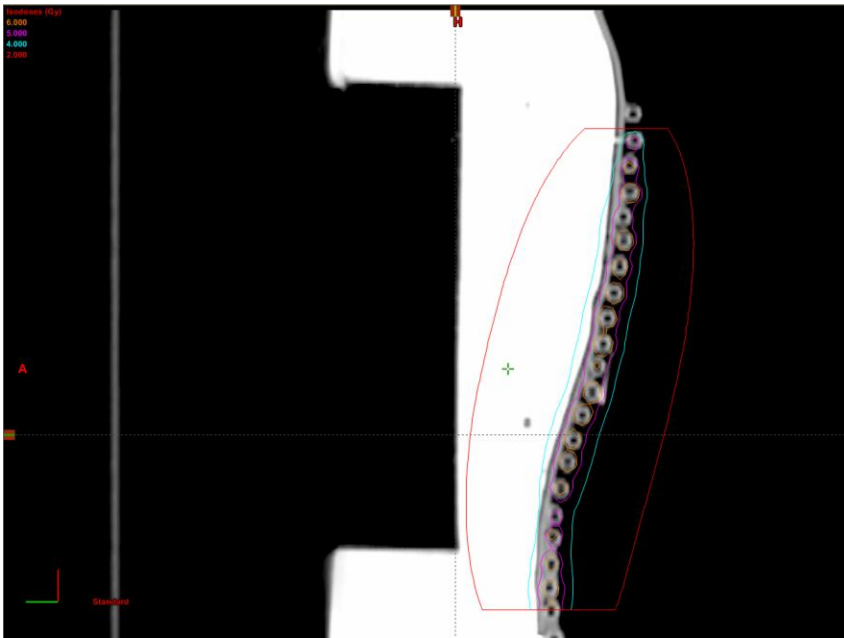
Superficial voltage radiation



Mould brachytherapy



Response to mould therapy



The process of radiation

Patient experience

- First specialist assessment
 - 1 hour
 - explain why needed, or not and side effects.
 - once patient agrees with treatment plan they will have a RT planning session (may be same day, usually within 1 week).

Planning

- May be as simple as delineating area to be treated on skin – sharpie.
- Most common planning requires ct scan of intended treatment volume, done in radiotherapy department.
- Patient will be positioned and immobilised (in comfort) to ensure we can access target tissue with minimal exposure of normal tissue.

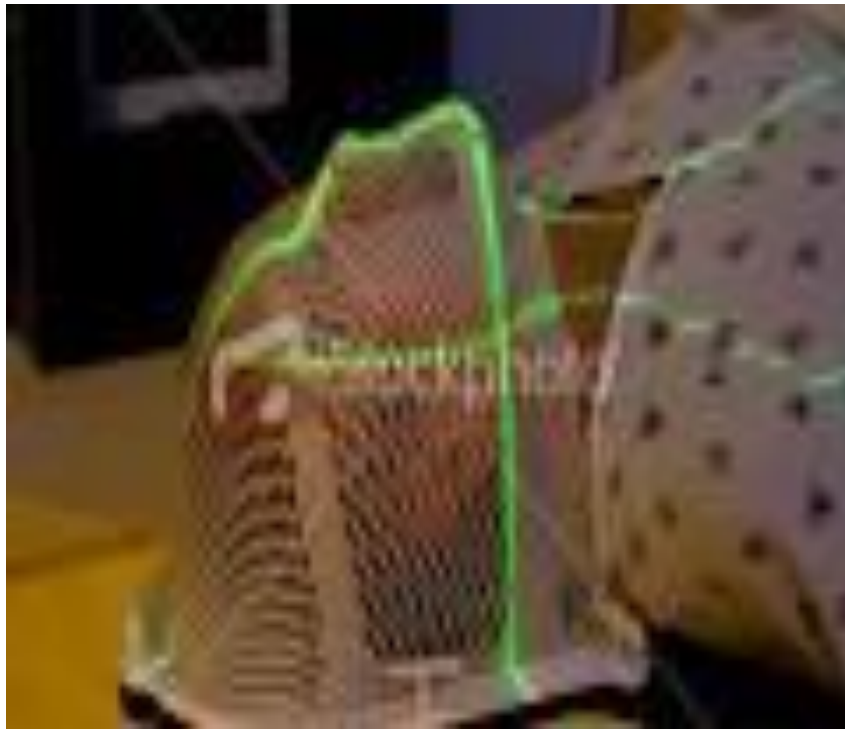
Planning - Ct simulator



Planning - Positioning of breast cancer treatment



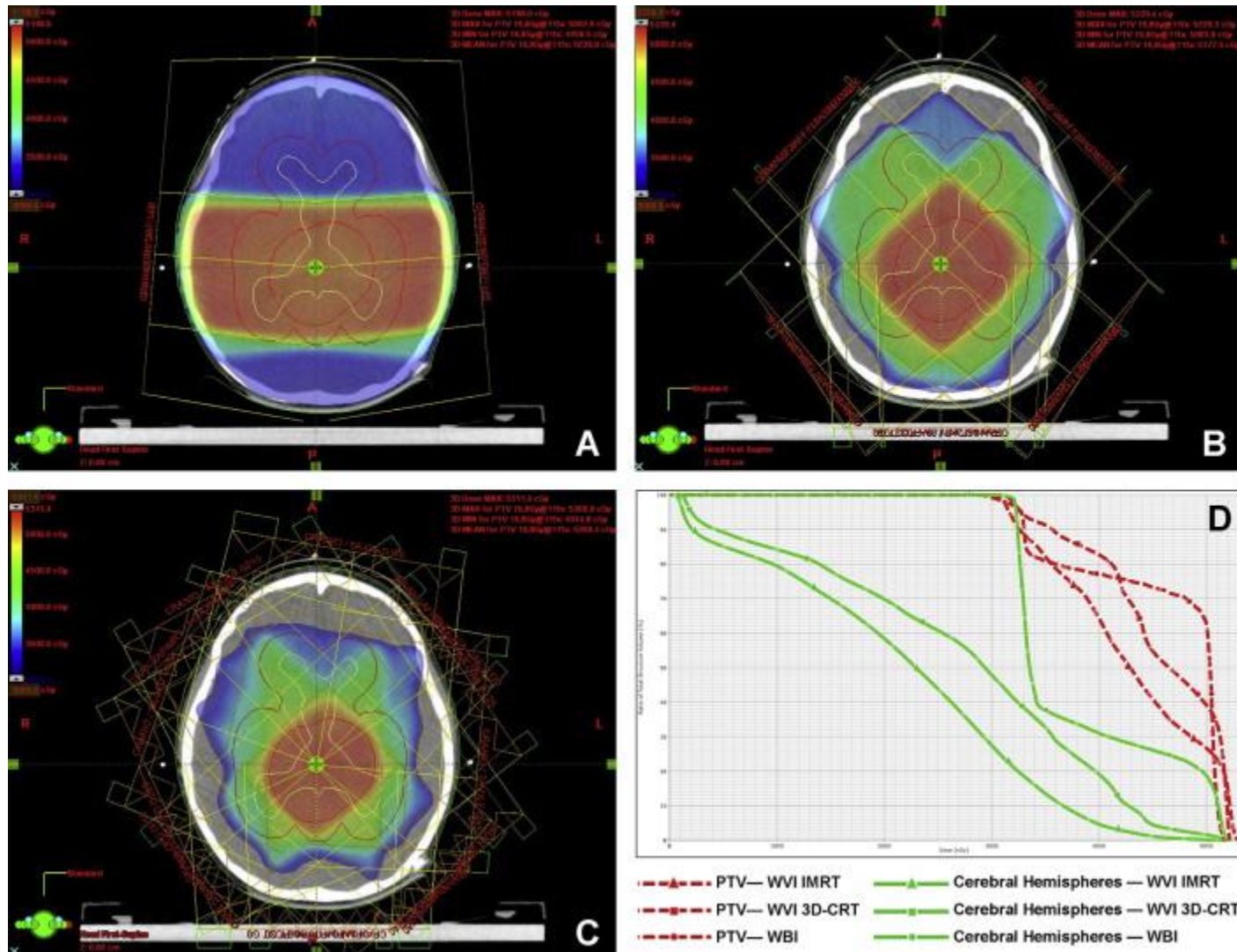
Planning - Shell for head and neck cancer therapy



Planning

- Once ct completed or clinical target delineation completed we plan the radiation.
- This may take from minutes to days, depending on complexity.

Simple vs Complex plan



Treatment

- From 1-37 treatments, Monday to Friday.
- Treatment session 10-15 minutes, don't feel anything.
- Accommodation provided.
- Lots of support provided.

Side effects

- With the exception of lethargy, radiation side effects are confined to the tissues being irradiated.
- Radiation of the big toe will not cause heart attacks, syphilis, dementia etc.etc.etc. It will cause the toenail to fall out!

Acute Side effects

- Affect rapidly multiplying tissues such as mucous membranes and skin.
- Stem cell depletion leads to loss of overlying epithelial layers (desquamation, ulceration).
- Occurs during and shortly after treatment and usually achieve full recovery.

Chronic Side effects

- Damage of vascular endothelial cells leads to small vessel ischaemia/hypoxia.
- Chronic hypoxia leads to fibroblast deposition and clinical fibrosis.
- Fibrosis can lead to stricture, loss elasticity etc.
- Hypoxia leads to poor healing, poor organ function.

Chronic side effects

- DNA damage also occurs and leads to a variable but generally low risk of radiation induced malignancy.

Chronic Side effects

- Chronic radiation side effects occur > 6 months after therapy and are usually irreversible.
- The degree of late damage is dependant on dose given and individuals genetic ability to repair radiation damage.

Side effects

- Serious chronic effects are rare and generally would affect $< 5\%$ of patients treated.

Management of common radiation side effects

Acute radiation dermatitis

- A week 1
- B week 3
- C week 5
- D week 7

End of treatment

- E week 9
- F week 11
- G week 14
- H week 18



Management of radiation dermatitis

- A week 1 aqueous cream
- B week 3
- C week 5 1%hydrocortisone cream
- D week 7 Manuka honey dressings

End of treatment

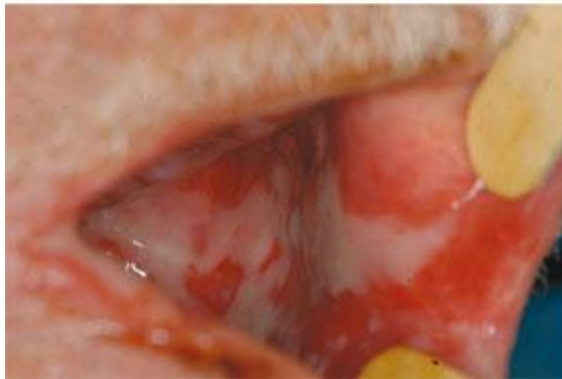
- E week 9 silver sulphadiazine ointment
- F week 11
- G week 14
- H week 18

Management of radiation dermatitis

Principles:

1. Supportive care, it will run its course.
2. Watch for infection (Bactroban, oral antibiotics).
3. Non abrasive dressings/ clothing (silk scarves).
4. Avoid too many dressing changes.

Radiation mucositis



Radiation mucositis

- Very significant issue, especially with oropharyngeal radiation.
- It will run its course.

Symptoms of RT oral mucositis

- Pain.
- Xerostomia.
- Thick, tacky secretions.
- Loss of taste.

Consequently patients are at high risk of dehydration and malnourishment.

Management of oral radiation mucositis

- Analgesia – low index to use opioids, liquid morphine for topical effect as well as easier swallowing. Long acting morphine needs to be used as well.
- Xylocaine gel prn for extreme cases but watch for aspiration risk.

Management of oral radiation mucositis

- Mouth care:

Benzydamine (Diffiam) is mainstay.

Antifungals – remember lozenges don't dissolve in dry mouth. (Mycostatin drops or fluconazole capsules).

Soda bicarb mouthwash very refreshing, lifts secretions ($\frac{1}{2}$ tsp salt, $\frac{1}{2}$ bicarb and $\frac{1}{2}$ glass water).

Management of radiation mucositis

- Make sure they are eating/drinking.
- Liquid food supplements are virtually always mandatory.
- May require alternate feeding such as NG tube or gastrostomy.

Mucositis elsewhere

- Symptomatic, so analgesia again.
Xylocaine excellent for anoproctitis as can steroid suppositories/enemas.
- Loperamide/codiene for loose bowels.
- Sitz bath useful for perineal dermatitis/mucositis.

Future directions

