

The Impact of Chemotherapy and Radiotherapy on Bowel Health



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- Uncontrolled growth of cells with malignant behaviour
- Range of pre-disposing factors
- **Chemotherapy:** any cancers
 - Chemotherapy: systemic effect
- **Radiotherapy:**
 - Local bowel effects from pelvic radiotherapy
 - Defined bowel effects

in the Context of Cancer

- Patients of all ages
- Pre-existing co-morbidities and bowel irregularities
- Lifestyle factors requiring regular medications
- Added complications to bowel habits caused by cancer / treatment(s)



erapy



Mustard gas victim, showing effects of this gas on the skin.



Radiotherapy

- **Radium and Radioactivity**
By Mme. Sklodowska Curie, Discoverer
of Radium from *Century*
Magazine (January 1904), pp. 461-466

Marie Curie and the Science of Radioactivity

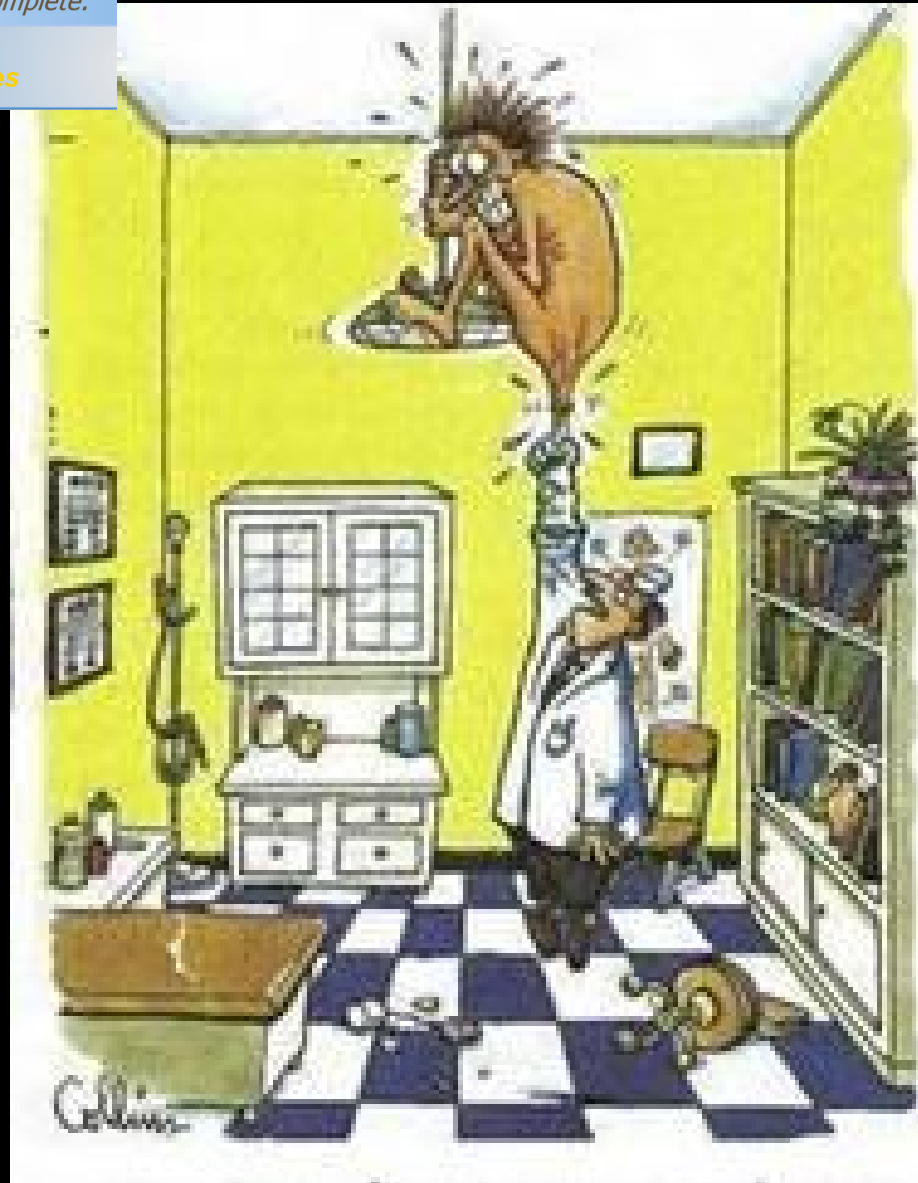


ments

Cancer treatments
based on a 'recipe' book of
appropriate interventions

- ❑ Chemotherapy
- ❑ Radiotherapy
- ❑ Combined Modality Treatment
- ❑ Surgery
- ❑ Biologic agents



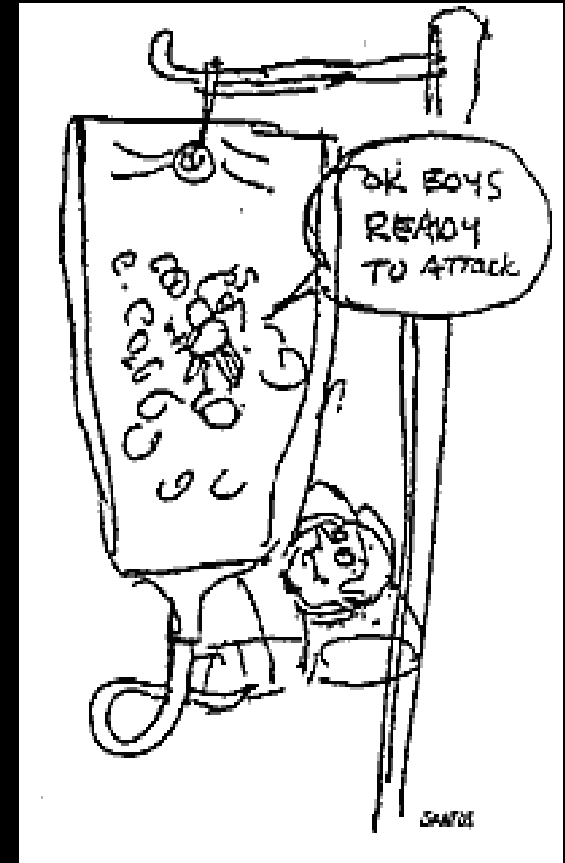


Interdisciplinary Team



Chemotherapy

- Anti-cancer drugs
- Impairs mitosis (cell division)
- Cytotoxic: damage to cells
- Single agent or in combination
- IV, oral, SC, intrathecal
intracavity
- Adjuvant therapy for many
solid tumours
- Primary treatment in haematology



Chemotherapy Bowel Toxicities

- Gastrointestinal toxicity due to chemotherapy common in cancer patients
 - diarrhoea
 - constipation
 - colitis
 - possibly intestinal perforation

Chemotherapy and
other drugs that may
cause constipation
in cancer patients

- Vinca alkaloids
- Opioid therapy eg
Morphine
- Anticholinergic
preparations
- Phenothiazines
(antipsychotic)
- Some antidepressants
- Diuretics
- 5-HT₃ antagonists

Constipation

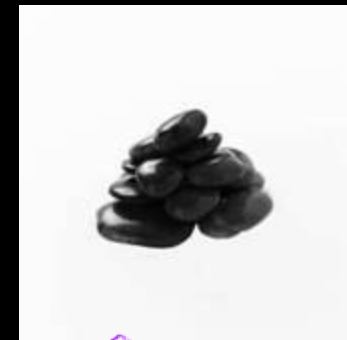


- ❑ Pain in the stomach
- ❑ Fever
- ❑ Inability to pass gas
- ❑ Nausea, and/or vomiting along with constipation
- ❑ No bowel movement in three days despite following the recommendations of health team
- ❑ If the stomach looks swollen and/or feels hard to the touch
- ❑ Impact on nutritional status

Assessment of Constipation

Bowel history:

- ❑ Infrequent bowel movements
 - no "normal" schedule for bowel movements
 - frequent or infrequent should be determined based on a patient's own "normal" schedule
- ❑ Hard, difficult to pass, bowel movements
 - small marble-like pieces of stool
 - without a satisfactory elimination



Management of Constipation

- Drink plenty of fluids
- Review eating habits
- May need to use a laxative
- Enemas must be given very carefully
- Glycerin suppositories
- Monitor for signs of bowel obstruction

Diagnosis: Diarrhoea



- Diarrhoea: most often seen with
 - 5-Fluorouracil (5-FU)
 - capecitabine
 - Irinotecan
 - Damage to intestinal mucosa
 - Increased volume exceed absorptive capacity of the colon
 - Dose limiting
 - Treatment routinely withheld for >grade 2 diarrhoea
 - Scheduling of the 5-FU appears to impact enterotoxicity
 - Etoposide: paralytic ileus
-

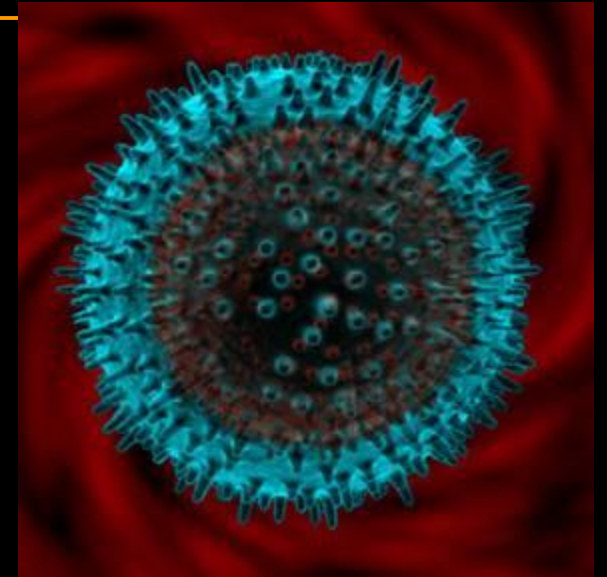
Cancer Treatment-Induced Diarrhoea

- History of onset / duration of diarrhoea
- Describe number of stools and composition
 - watery, blood in stool, nocturnal
- Assess patient for fever, dizziness, abdominal pain/cramping, or weakness
- Medications profile
 - diarrhoea-inducing agents
 - Pharmacological interventions
- Dietary profile
 - identify diarrhoea-enhancing foods

Management of Diarrhoea

- Some chemotherapy agents: severe diarrhoea
 - dehydration
 - serious complications
- First treated with medication at home
- Severe diarrhoea may require hospitalisation
 - more than 3 extra bowel actions a day
 - If loose or watery or contain blood
- Increase intake of fluids to avoid dehydration.
- After diarrhoea has settled:
 - return to a balanced diet
- Dietitian

Agents



- Manipulates the hosts' immune system
 - Monoclonal antibodies
 - Haemopoietic growth factors

 - Different toxicity profile to chemotherapy agents
 - Definite synergy with radiotherapy
 - Cetuximab: beneficial combined with RT in head and neck cancer

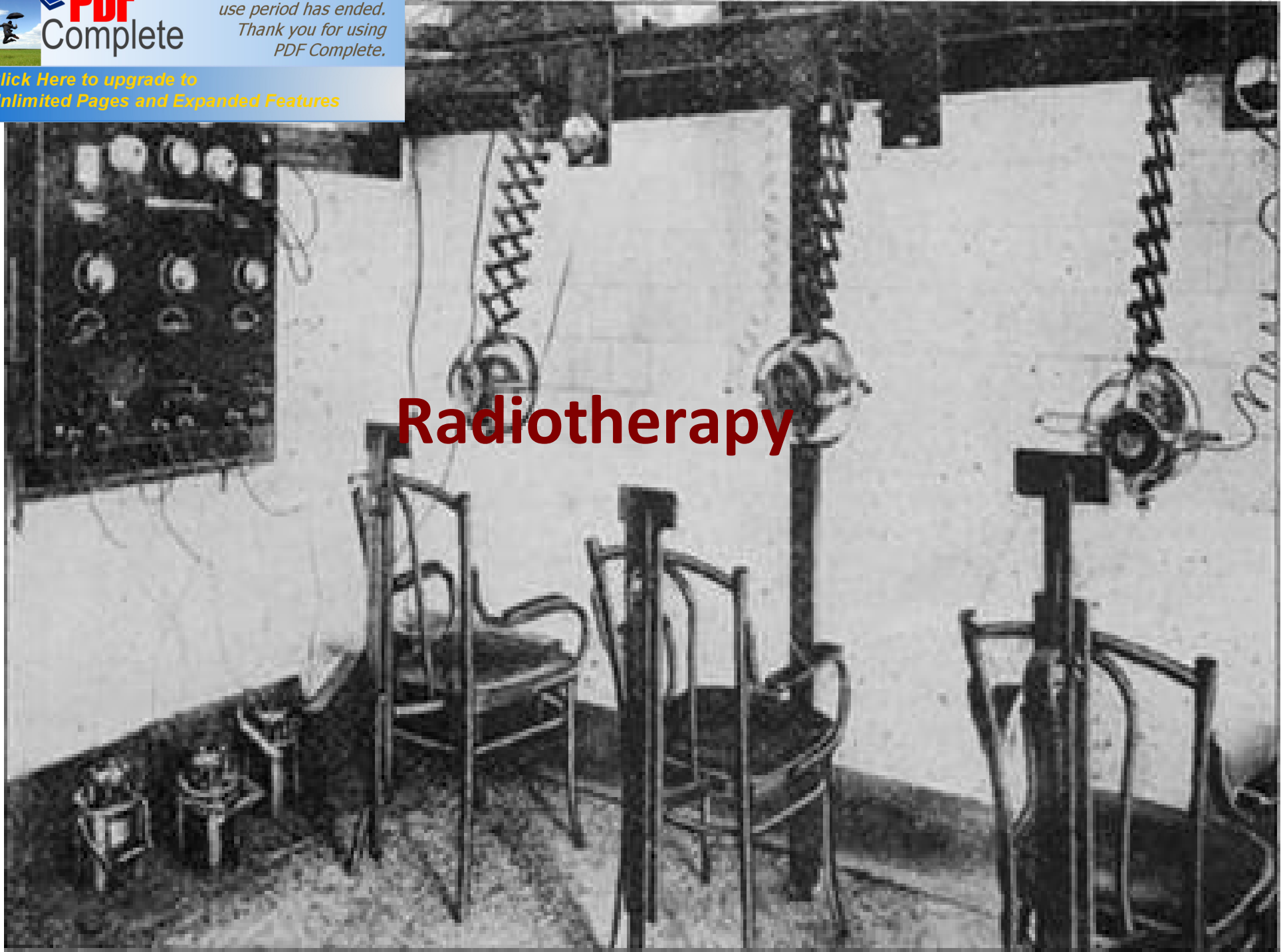
 - Diarrhoea a significant dose-limiting toxicity
 - Causes moderate to severe diarrhoea from 30 – 60%
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Chemotherapy bowel effects generally acute
and manageable



Radiotherapy can cause both acute and late
effects

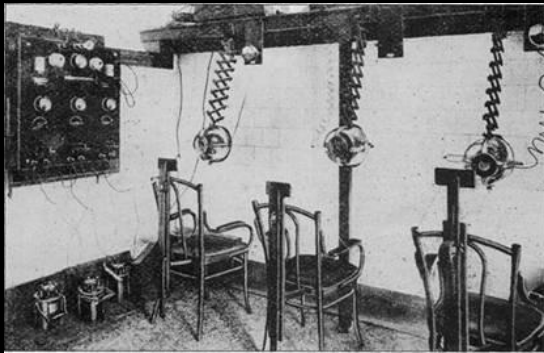




Radiotherapy

Ionising radiation to treat cancer

- electromagnetic radiation interacts with matter at the molecular level



- Local treatment
- Curative or palliative
- Acute and late effects: acute effects generally predictable



Main goal: to destroy or inactivate cells

Parallel goal: to preserve and maintain integrity of normal tissues being treated

Linear Accelerator



Effects of Radiation

Treatment

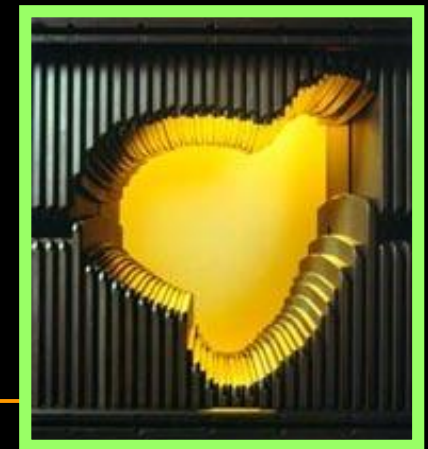
Acute and late effects

- ❑ Acute reactions are those which occur within days to weeks after commencing treatment
- ❑ Late effects can occur from weeks to years after completion of the radiation treatment; related to the type of cell or tissue involved.

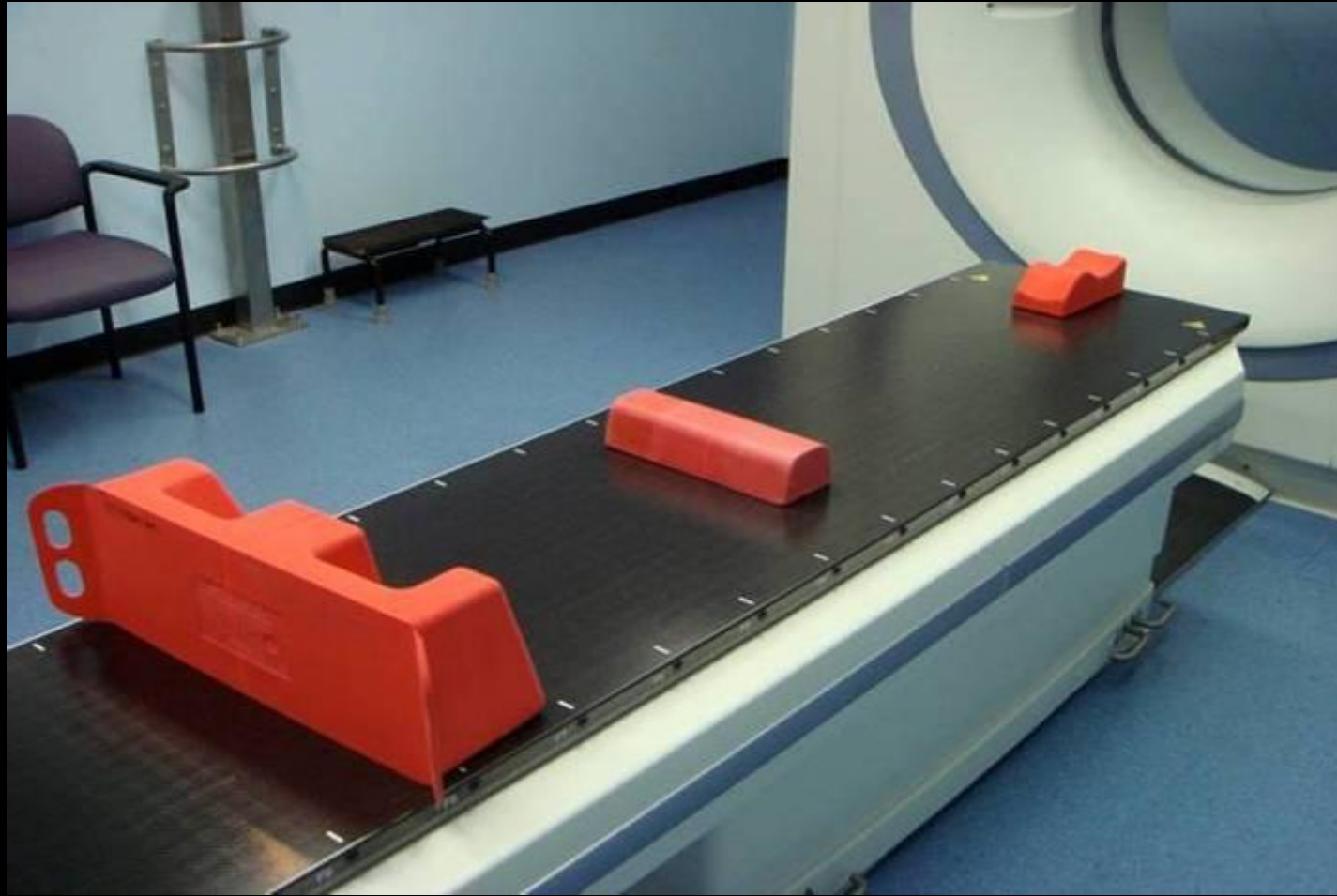
Copy Factors & Tumour

Effects

- ❑ radiosensitivity of the tissue
- ❑ the dose of radiation
- ❑ number of fractions (number of daily treatments)
- ❑ treatment timing
- ❑ the energy source (generally 10Mv)



Body Pelvic Positioning Device





Radiotherapy console outside linear accelerator room

Pelvic Sites treated with

Radiotherapy

- Colorectal:
 - most common site for females
 - second most common for males
- Prostate:
 - most common site for males
- Kidney
- Bladder
- Gynaecological
 - Cervix
 - Uterus
 - vulva



therapy

(GY = unit of radiation)

- Commonly used to treat pelvic cancers
- Doses in the 50-70Gy region
 - approx. 80% of patients: GI symptoms

Spry et al, 2008, *Int J Radiation Biol. Phys.* 72(2): 522-528



Proximal tissues to the tumour site are exposed

- Acute symptoms: settle three months
- Median time for late intestinal injury 8-12 months

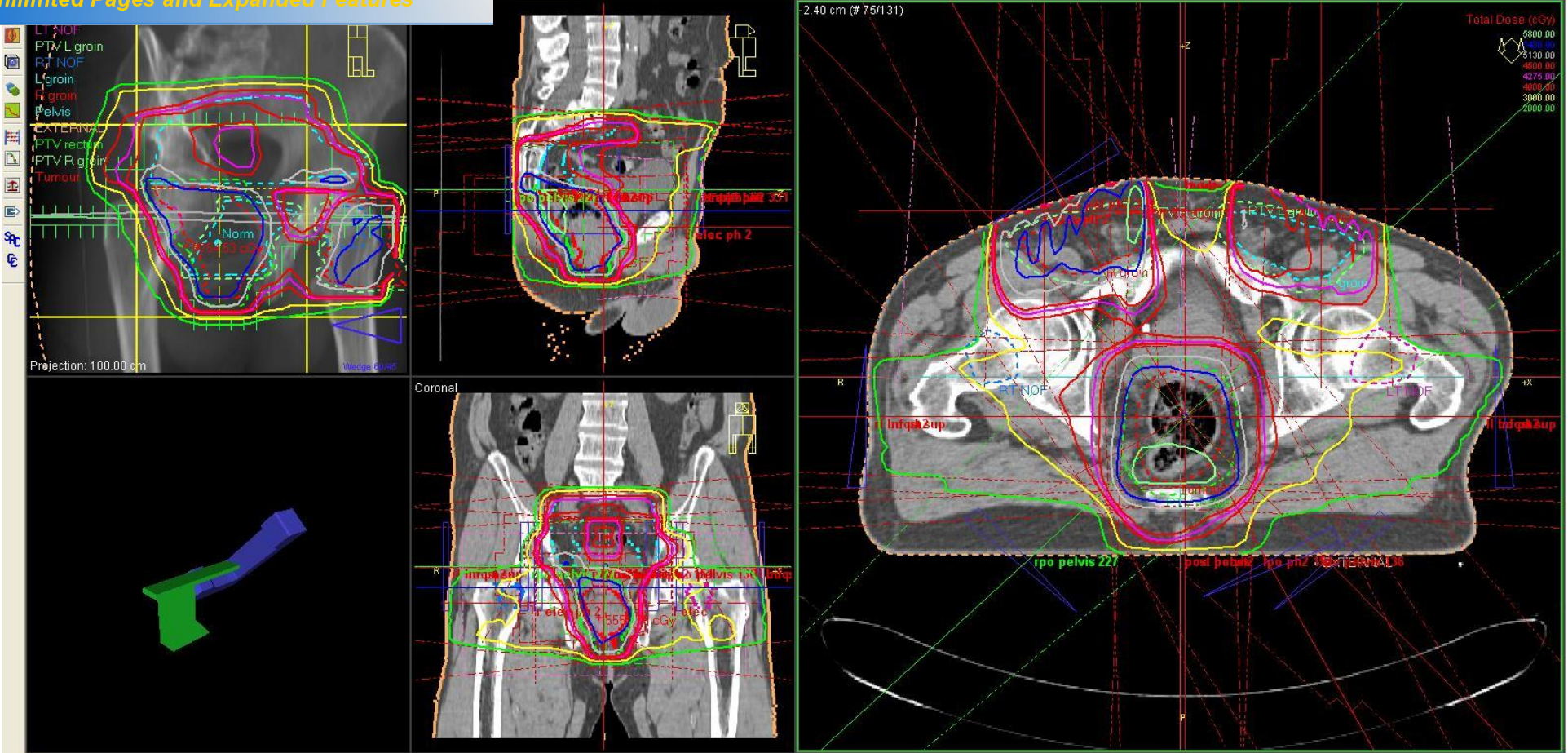
Haddock et al, 2007. *Journal of Clinical Oncology* 25(10): 1255-1259.

ications / Radiotherapy

Rectum

Therefore: Pelvic radiotherapy 50-70Gy

- Small bowel 45-60Gy
- Femoral head and neck 42Gy
- Bladder 65Gy
- Rectum 60 Gy



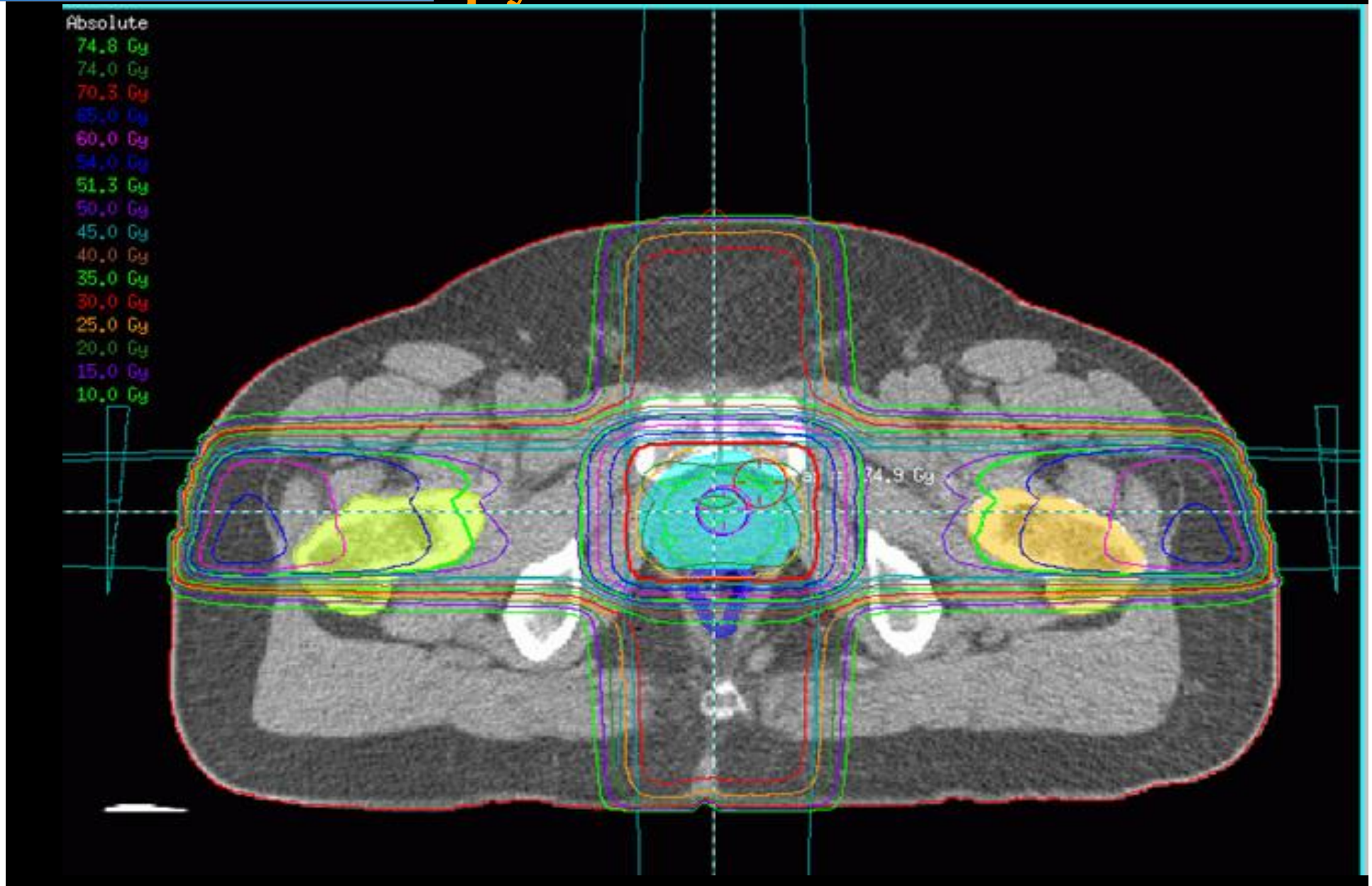
2.40 cm (# 75/131)

Total Dose (cGy)
5800.00
20130.00
4600.00
4275.00
4000.00
3000.00
2000.00

Label	Unit	Energy	FX (cm)	X1 (cm)	X2 (cm)	FY (cm)	Y1 (cm)	Y2 (cm)	X (cm)	Y (cm)	Z (cm)	Y Offset (cm)	Depth (cm)	SSD (cm)	Gantry (deg)	Arc Dir	Collimator (deg)	Couch (deg)	Wedge Label	Wedge Angle (deg)	Wedge dir	Bolus	Applicat
rpo	LA4	10.00 MV	15.60	-10.50	5.10	13.53	-7.06	6.48	0.02	-0.00	14.04	2.40	11.30	88.70	227.00	N/A	90.00	0.00	Wedge	60 / 45	IN	N/A	N/A
post	LA4	10.00 MV	16.20	-8.52	7.67	19.82	-11.11	8.72	0.02	-0.00	14.04	2.40										N/A	N/A
ant	LA4	10.00 MV	19.55	-9.33	10.22	19.82	-11.11	8.72	0.02	-0.00	14.04	2.40										N/A	N/A
lt ant	LA4	10.00 MV	8.30	1.70	10.00	5.67	0.00	5.67	0.02	-0.00	14.04	2.40										N/A	N/A
rt ant	LA4	10.00 MV	7.10	-9.20	-2.10	5.63	0.00	5.63	0.02	-0.00	14.04	2.40										N/A	N/A
lpo	LA4	10.00 MV	15.70	-5.40	10.30	13.60	-7.00	6.60	0.02	-0.00	14.04	2.40										N/A	N/A
post	LA4	10.00 MV	3.32	-1.47	1.85	6.71	-0.39	6.32	0.02	-0.00	14.04	2.40										N/A	N/A
ant	LA4	10.00 MV	3.63	5.17	8.79	14.23	-6.90	7.33	0.02	-0.00	14.04	2.40										N/A	N/A
post	LA4	10.00 MV	3.55	-8.79	-5.24	14.23	-6.90	7.33	0.02	-0.00	14.04	2.40										N/A	N/A
ll	LA4	10.00 MV	3.30	5.50	8.80	10.90	-4.80	6.10	0.02	-0.00	14.04	2.40										N/A	N/A
rl	LA4	10.00 MV	3.30	-8.80	-5.50	9.99	-3.90	6.10	0.02	-0.00	14.04	2.40										N/A	N/A

IMRT Pelvis for anal tumour. Includes anterior groin electrons

Therapy Treatment Plan



Radiotherapy

- 5-6 week course of treatment, approx. 80% of patients will develop gastrointestinal symptoms
- Acute symptoms will settle within three months
- Late effects
- Half of all patients treated with pelvic radiotherapy will develop some level of diarrhoea or constipation

therapy Side Effects



- Impacts on columnar epithelium of intestinal mucosa
- Denuded areas, superficial ulcerations, inflammation of the submucosa
- Symptoms and signs of acute small bowel toxicity
 - nausea
 - abdominal pain
 - diarrhoea (may be a treatment-limiting side effect)
- Usually resolve 2 to 4 weeks post-radiotherapy

Radiotherapy for Prostate Cancer

- Bowel and bladder protocol
 - planning
 - daily treatment
- Originally Fybergel now Movicol
- Regime to be followed
- Creates concern
- Travelling a problem

symptoms

- Diarrhoea
- Cramping
- Bleeding
- Nocturnal bowel movements
- Gas-stool discriminate ability
- Faecal urgency
- Tenesmus
- Flatulence and frequency



Haddock et al, Journal of Clinical Oncology 25(10): 1255-1259, 2007.

Side Effects of Pelvic Radiotherapy

- Short term side effects occur during treatment
- Usually after approx 10 treatments (fractions)
- Effects continue for a week or two following completion of treatment
 - diarrhoea
 - nausea
 - fatigue
 - urinary frequency
 - skin reactions

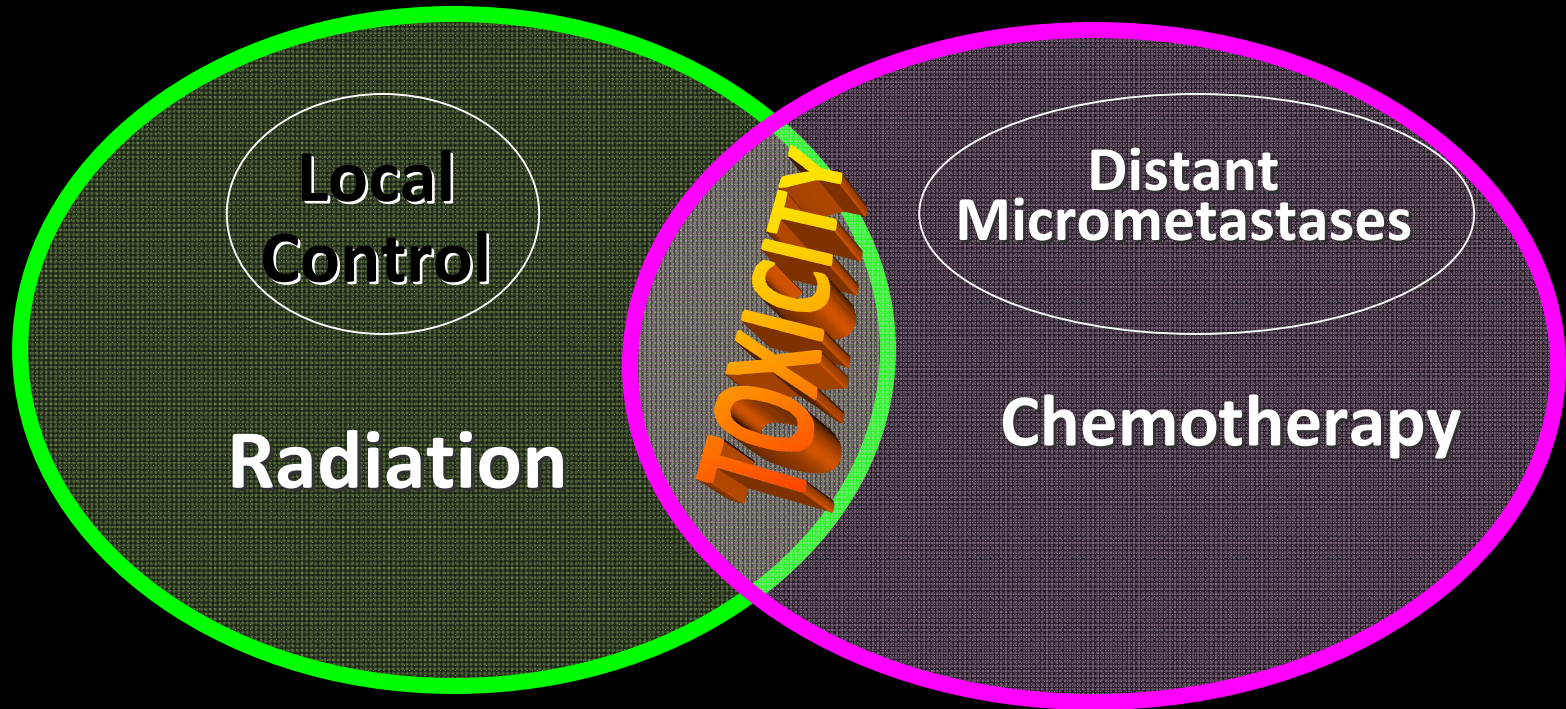
...y to Colostomy/ Stoma

- Colostomy generally located above the potential treatment field
- Acute skin and bowel effects
 - similar to standard effects
- Stomal Therapist
- Dietitian
- Communication
- Consumables
- Referral



"AH - MUST BE MY OSTOMY SUPPLY"

Combined Modality Therapy



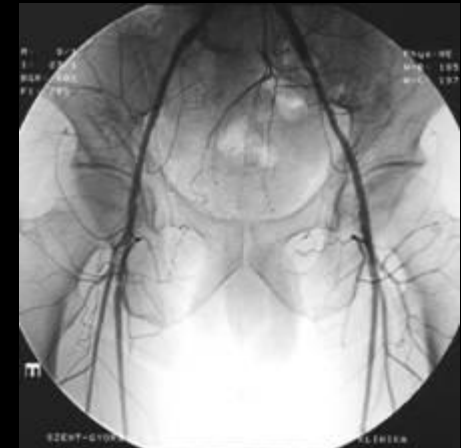
Used Chemotherapy Agents in Combination with Radiation

- Cisplatin: cervix / vulva
- Mitomycin C: Anal canal/vulva
- 5-Fluoruracil: Rectum
- Oxaliplatin: rectum



of Radiotherapy

- Months to years after treatment completion
- Decrease in blood supply to irradiated tissue
 - Fibrosis
- Complex interaction of functions
 - Neurological
 - Hormonal
 - Muscular
 - Immune
 - Enzyme



Gastrointestinal Tract

- Smoking
- Previous abdominal surgery
- Concomitant chemotherapy
- Comorbidities
 - Diabetes
 - Hypertension
 - Pelvic inflammatory disease
 - HIV
 - Connective tissue disorders
 - Inflammatory bowel disease

Andreyev, 2007. Lancet Oncology, 8: 1007-1017.

Gastrointestinal Effects

- Chronic problems: 80%
- Up to 78% long term survivors
 - gastrointestinal symptoms affecting QOL

Andreyev, *Gut*, 54;1051-1054, 2005

- Gynae / GI may be greater than for GU
Olopade et al, *British Journal of Cancer*, 92, 1663-1670, 2005
- Late GI toxicity: interaction of factors
- Common tasks difficult:
 - shopping
 - location of lavatory



ological Problems

- Small bowel bacterial overgrowth
- Bile salt malabsorption
- Carbohydrate malabsorption
- Increase in gastrointestinal transit
- Strictures (3-15% post radiotherapy)

Andreyev, 2007. Lancet Oncology, 8: 1007-1017.

Pathophysiology: Sequelae of Events

- Oedema
- Inflammatory, mucosal reaction
- Extends to submucosa
- Mucosal repair or severe inflammation

Brain Tissue Effects

- Ischaemia
- Fibrosis
- Telangectasia

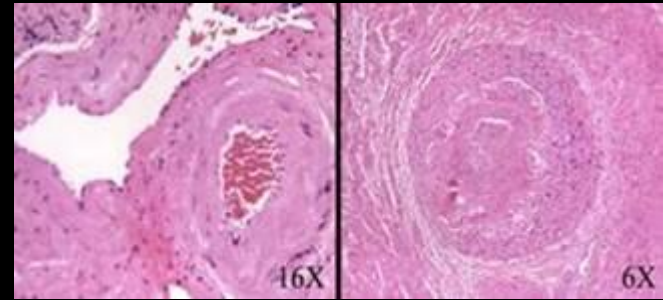
Ischaemic Changes

- Chronic ischaemic enteritis: 5-15%
 - mucosal atrophy
 - fibrosis
 - vascular insufficiency

 - Osmotic / malabsorptive diarrhoea

 - Vascular changes in capillaries
-

Fibrosis



- Acute inflammatory response
- Excess fibrous connective tissue
- Scar tissue forms
- Months or years to develop
- Treated area: stiffened due to scar tissue



Atypical dilation of capillaries

Multiple oozing sites /
moderately severe bleeding

Control of bleeding

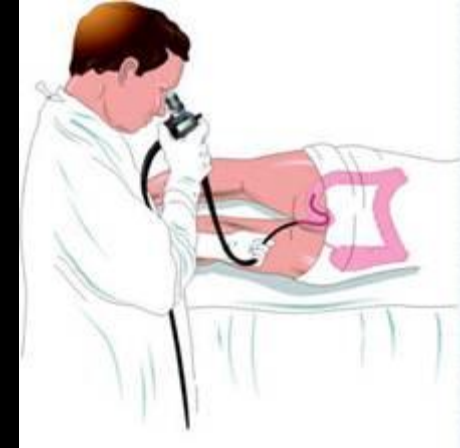
ponses

- Patients fail to report symptoms
 - believe symptoms are inevitable
 - consequences of radiotherapy treatment
 - being old
 - nothing can be done
 - more important issues to discuss with doctor

- Many oncologists may believe little can be done

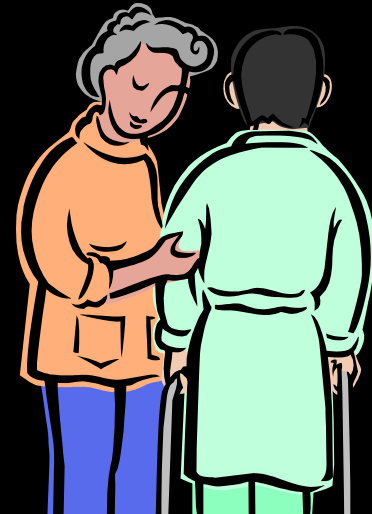
t of Late Effects

- Rectal examination
 - flexible sigmoidoscopy
- Full Blood Count
- Supportive measures
- Pelvic floor exercises
- Fluid intake
- Dietitian
- Exercise
- Stool softeners
- Endoscopy
- Blood replacement if bleeding



Other Interventions

- Toileting exercises
- Effective use of antidiarrhoeals
- Stool bulking agents
- Absorbent pads
- Skin barrier protectants





" It says here that you'd prefer someone with regular bowel movements..Does it matter if they're involuntary ? "