

// November 2024

Radiotherapy Navigating the Gray zone

Tuan Ha, GenesisCare Oncology QLD

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Historical Perspective

- 1895 X-rays discovered
- 1907 First breast cancer treated
- 1953 First clinical MV linear accelerator



Wilhelm Röntgen

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Georges Chicotot

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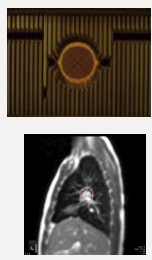
Technology word salad

- IMRT
- VMAT
- IGRT
- Stereotactic
- SRS, SRT, SBRT
- GammaKnife
- Cyberknife
- Protons

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- Hit the target
 - Better locate and define the tumour
 - Account for uncertainties during & between treatments
- Maximise tumour injury
 - Escalate dose
 - Add chemotherapy or other drugs
- Minimise normal tissue injury
 - Limit dose-volume
 - Add other drugs



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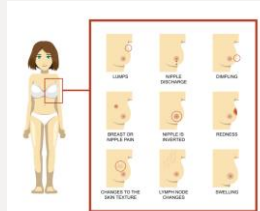
Breast Radiotherapy

Is less more?

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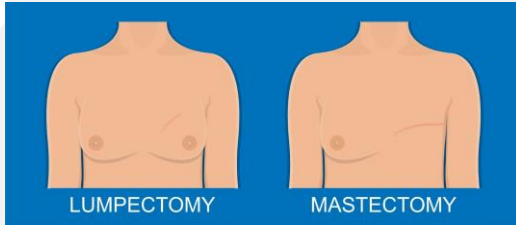
Breast Cancer Early Management

- Symptoms require a triple assessment
- - history and examination
- - imaging – bilateral mammogram and ultrasound scan
- - biopsy if indicated
- Breast cancer is common – Lifetime risk - 1/7 Australian women
- will be diagnosed with breast cancer
- Only 5-10% of breast cancers are related to genetic risk



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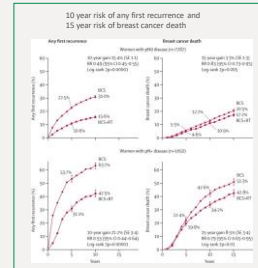
Treatment de-escalation



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Radiotherapy in breast cancer

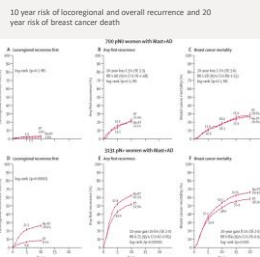
- Breast conservation
- Wide local excision – invasive disease
- Early Breast Cancer Trialists' Collaborative Group 2011
- Meta-analysis >10000 women
- Conclusion: Radiotherapy after wide local excision
 - Reduces risk of recurrence at 10 years
 - Node neg 15.4%, Node pos 21.2%
 - Reduces risk of breast cancer death at 15 years
 - Node neg 3.3%, Node pos 8.5%



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Radiotherapy in breast cancer

- Mastectomy
- Early Breast Cancer Trialists' Collaborative Group 2014
- Meta-analysis >8000 women
- Conclusion: Radiotherapy after mastectomy
 - Node negative - No benefit
 - Node positive
 - Reduces risk of locoregional recurrence at 10 years – 17.9%
 - Reduces risk of any recurrence at 10 years – 10.6%
 - Reduces risk of breast cancer death at 20 years – 8.1%

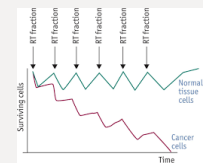


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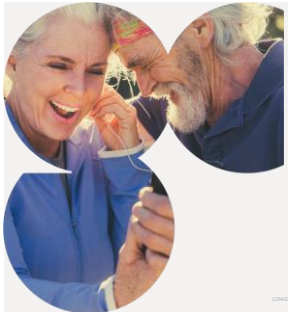


Radiobiology of fractionation

- Normal fractionation:
 - 2Gy per fraction
 - Traditionally 50Gy in 25# over 5 weeks
- Increase death of tumour cells
- Allow normal cells to repair



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Hypofractionation

- Fewer fractions, higher dose per fraction
 - >2Gy per fraction
 - Convenient and cheaper
 - Free up resources
- Need to be safe
 - UK – Radiation Induced Plexopathy
 - 63Gy in 12#
 - 73% + plexopathy

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LESS Fractions - Hypofractionation

What is hypofractionation?
Total dose of radiation is divided into:

- Smaller number of fractions
- Larger dose per fraction

- Equivalent biological effect on tissues
- Need to be safe

Schedules:

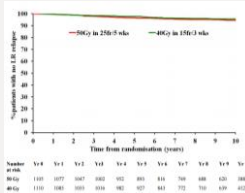
- 3-4 weeks**
 - 40-42.5Gy in 15-16# +/- boost 10Gy in 4# or
 - 40-42.5Gy in 15-16# with 48Gy to surgical bed in 15-16# (concurrent boost)
- 1 week**
 - 26Gy in 5#
 - x1 per week for 5 weeks
 - 28Gy in 5#

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Hypofractionation - 3 week schedules

- Evidence:**
 - Meta-analysis 2016:**
 - 8228 women
 - 9 randomised trials, comparing with conventional fractionation
 - Median FU 10 years
- Results:**
 - No difference
 - Breast cancer specific survival
 - 10 year mortality
 - Breast appearance
 - Late radiation subcutaneous toxicity
 - Decreased acute radiation toxicity

Short 3-week course



Time from randomisation (years)	0	1	2	3	4	5	6	7	8	9	10
20Gy in 5#	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
40Gy in 10#	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

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FAST Forward Trial - 1 week schedule

Hypofractionated breast radiotherapy for 1 week versus 3 weeks (FAST-Forward): 5-year efficacy and late normal tissue effects results from a multicentre, non-inferiority, randomised, phase 3 trial

Adrian Murray Breast, Louise Sutherland*, Duncan A Wheatley, Mark A Symmonds, Abdulla Alhassan, David J Bowerfield, Charlie Chen, Mark Chetty, Susan Clarke, Charlotte E Giles, Andrew Goodwin, Adrian Hayman, Penelope Hopwood, Anna M Kirby, Elena C Kirwan, Gordon Mackay, Zohar Nishi, Eileen Sweeney, Nicola Sorensen, Liza Stevens, Rachel Symonds, Judith M Brier, John P Yarnold†, on behalf of the FAST Forward Trial Management Group†*

- RCT of whole breast XRT
 - 40Gy in 15# vs 26Gy in 5# in 1 week
 - (3rd arm 27Gy in 5# - Increased toxicity)
- 4084 women, 97 UK Centres
- T1-2, NO-1, M0
- Median FU 6 years

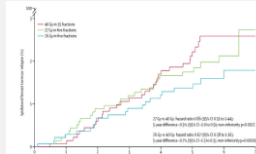
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FAST Forward Trial - 1 week schedule

Results:

- No significant difference:
 - Local recurrence (31 vs 21 = 2.1% vs 1.4%)
 - Regional recurrence (13 vs 10 = 1% vs 0.7%)
 - Deaths (92 vs 90)
 - Breast cancer related deaths (47 vs 53 = 3.5% vs 3.9%)
- Breast appearance
- Late radiation subcutaneous toxicity
- UK standard

56Gy in 5 fractions is non-inferior rates 5 year ipsilateral local tumour relapse



Normal tissue effects up to 5 years similar for 26Gy in 5 to those with 40Gy in 15 – longer term follow up data pending

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Take aways

- Most people diagnosed breast cancers who required radiation therapy will be treated with 15 treatments +/- "boost"
- A select number of patients can have the 5 treatment regimen
- Move toward de-escalation where radiation therapy can be omitted in early favourable breast cancer

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CERVIX CANCER

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Cervix Cancer

About

- Average age at diagnosis 50
- Decreasing incidence since HPV vaccine
- Most common SCC

Signs and symptoms

- Vaginal bleeding between periods
- Menstrual bleeding that is heavier and longer than usual
- Post coital bleeding
- Pelvic pain
- Altered PV discharge
- Post menopausal bleeding

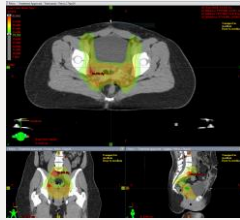
Causes

- HPV
- Smoking
- Immunosuppression
- CIN
- Intrauterine exposure to diethylstilbestrol (DES)

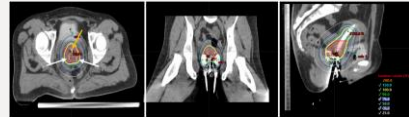
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Cervix cancer

- Radiation therapy and chemotherapy gold standard for curative treatment
- Stage IB-IVA
- Involves external beam radiation with 'internal' brachytherapy component
- Overall treatment time matters (8 Weeks)



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Radiotherapy Process

Ward/Clinic Review + MDT (RO)

Planning/Simulation (RT, RO)

Contouring (RO)

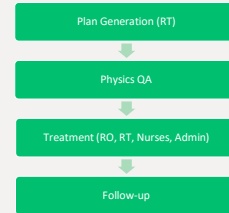
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Contouring



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Radiotherapy Process cont'd



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Common Radiation side effects

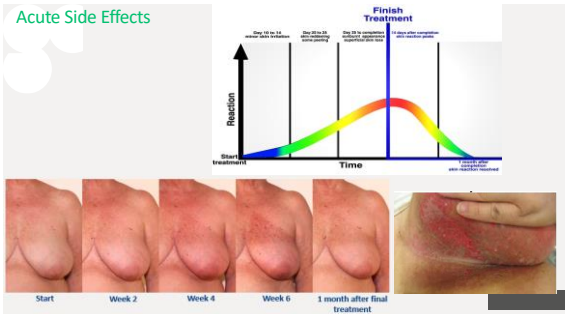
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Side effects - principles

- Lethargy common in short term (variable in degree)
- Depend mainly on site being treated, dose, size of radiation volume, location of tumour (near skin or deep), individual's sensitivity to radiation
- Early versus late side effects – different mechanisms
- ALL other side effects specific to area receiving radiation
- e.g. alopecia only if scalp treated, nausea only if stomach/bowel/liver treated
- Usually resolve 4-6 weeks

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Acute Side Effects



Skin care

Mepitel film and StrataXRT

silicone based products that decrease radiation skin reaction



Thank you
Questions?

Presented by:
Dr. Tuan Ha
Tuan.Ha@genesiscare.com

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