Radiotherapy in Pediatric Sarcoma

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Radiotherapy

- How dose it work?

1) Ionization ,H_2O to (H^+) and (OH^-)
2) Intervention with DNA
3) Apoptosis

   mostly effective during mitosis

Radiobiology

Why sometimes dose not work?
How could we improve RT effect ?
How could we protect normal organ ?
Type of radiation
1)Photon
2)Electron
3)Proton and Heavy Particle
Dose per fraction
Timing
Oxygen Efecct

Is Radiotherapy a Local Treatment?

- YES in most of the case

BUT with some systemic effect

Concurrent CHT and or Immunotherapy can improve RT effect

(Both local and systemic)

Why Radiotherapy?

- Local control in Sarcoma is very important

RT Indication in Sarcoma:

- Definitive

- Post surgery

  1) Adjuvant

  2) Margin positive

  3) Grade

  4) Response

  Palliative

Radiotherapy in Pediatric Sarcoma

- Sarcoma is a heterogenic group of ca
- Different type need different approach
- Team work is key to success
- Timing and cooperation only can be achieved by good organization

RT Side effect

- Effect on normal tissue function
- Gross Effect in pediatric patients
- Second primary cancer

Ewing Sarcoma

- Surgery is the primary local treatment
- Can be cure by RT (54Gy)
- If margin + or less than 90% response to neoadjuvant CHT,
  RT improve local control (45 to 50.4 Gy)
- Lung Met. (12 to18Gy)
- Palliative

Osteosarcoma

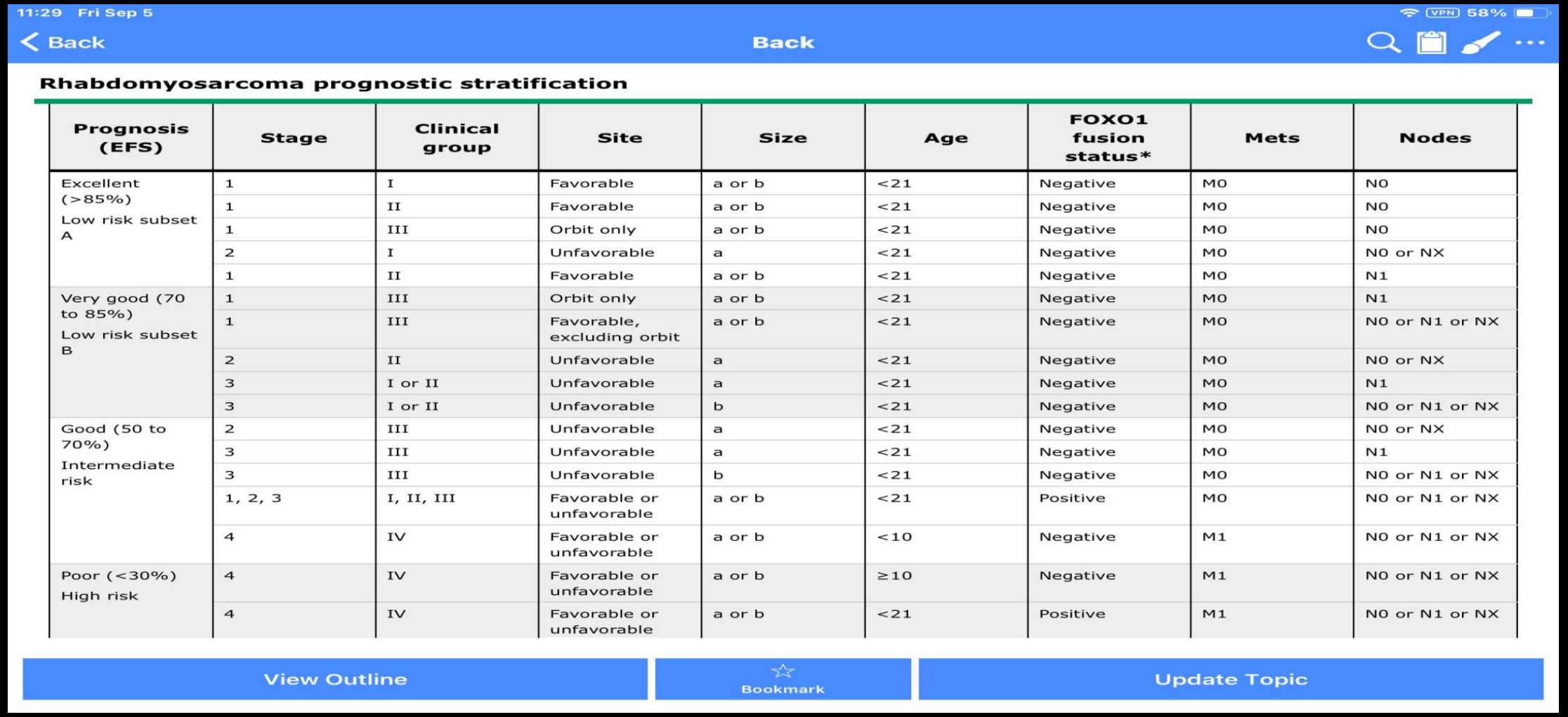
- Surgery is the primary local treatment
- RT dose not work very well
- Small cell variant have better response
- If surgery is not possible we can use RT BUT we need higher dose
- If margin +

  RT improve local control
- Lung Met. If surgery not possible
- Palliative

Soft Tissue sarcoma

- Rhabdomyosarcoma
- Non rhabdomyosarcoma

Rhabdomyosarcoma



Rhabdomyosarcoma prognostic stratification

Prognosis (EFS)	Stage	Clinical group	Site	Size	Age	FOXO1 fusion status*	Mets	Nodes
Excellent (>85%) Low risk subset A	1	I	Favorable	a or b	<21	Negative	M0	N0
	1	II	Favorable	a or b	<21	Negative	M0	N0
	1	III	Orbit only	a or b	<21	Negative	M0	N0
	2	I	Unfavorable	a	<21	Negative	M0	N0 or NX
	1	II	Favorable	a or b	<21	Negative	M0	N1
Very good (70 to 85%) Low risk subset B	1	III	Orbit only	a or b	<21	Negative	M0	N1
	1	III	Favorable, excluding orbit	a or b	<21	Negative	M0	N0 or N1 or NX
	2	II	Unfavorable	a	<21	Negative	M0	N0 or NX
	3	I or II	Unfavorable	a	<21	Negative	M0	N1
	3	I or II	Unfavorable	b	<21	Negative	M0	N0 or N1 or NX
Good (50 to 70%) Intermediate risk	2	III	Unfavorable	a	<21	Negative	M0	N0 or NX
	3	III	Unfavorable	a	<21	Negative	M0	N1
	3	III	Unfavorable	b	<21	Negative	M0	N0 or N1 or NX
	1, 2, 3	I, II, III	Favorable or unfavorable	a or b	<21	Positive	M0	N0 or N1 or NX
	4	IV	Favorable or unfavorable	a or b	<10	Negative	M1	N0 or N1 or NX
Poor (<30%) High risk	4	IV	Favorable or unfavorable	a or b	≥10	Negative	M1	N0 or N1 or NX
	4	IV	Favorable or unfavorable	a or b	<21	Positive	M1	N0 or N1 or NX

Rhabdomyosarcoma

Title:

Clinical grouping of rhabdomyosarcoma by the intergroup rhabdomyosarcoma study group (IRSG)

Clinical grouping of rhabdomyosarcoma by the intergroup rhabdomyosarcoma study group (IRSG)

Clinical group	Extent of disease/surgical result
I	A Localized tumor, confined to site of origin, completely resected
	B Localized tumor, infiltrating beyond site of origin, completely resected
II	A Localized tumor, gross total resection, but with microscopic residual disease
	B Locally extensive tumor (spread to regional lymph nodes), completely resected
	C Locally extensive tumor (spread to regional lymph nodes), gross total resection, but microscopic residual disease
III	A Localized or locally extensive tumor, gross residual disease after biopsy only
	B Localized or locally extensive tumor, gross residual disease after major resection (≥50 percent debulking)
IV*	Any size primary tumor, with or without regional lymph node involvement, with distant metastases, irrespective of surgical approach to primary tumor

* Although current Children's Oncology Group (COG) trials include all patients with metastatic disease in the high-risk category, selected patients with favorable site, histology/molecular features (embryonal or alveolar, and *FOXO1* fusion-negative), and age (under age 10) with limited metastases may have better outcomes with VAC therapy (vincristine, actinomycin D, and cyclophosphamide) or intensified treatments such as those in the completed ARST0431 protocol.

Modified from Crist W, Gehan EA, Ragab AH, et al. The Third Intergroup Rhabdomyosarcoma Study. J Clin Oncol 1995; 13:610; and Crist W, Garnsey L, Beltangady M, et al. Prognosis in children with rhabdomyosarcoma: A report of the intergroup rhabdomyosarcoma studies I and II. Intergroup Rhabdomyosarcoma Committee. J Clin Oncol 1990; 8:443.

Graphic 59875 Version 5.0

Rhabdomyosarcoma

- Most of patients have H&N , Trunk or pelvis tumor
- Surgery with negative margin and organ preservation is not possible
- RT is a major local treatment in RMS
- RT indication depend on pathology and risk group
- Molecular classification is a must for Excellent treatment

Rhabdomyosarcoma

- Most guideline recommend RT in all patients with RMS to enhance local control
- Except who have Embryonal / Fusion negative CG1 Tumor
- It is standard treatment in North America to recommend RT to all patients with alveolar histology regardless of fusion status
- RT is generally given after 4 cycle of CHT
- Emergency RT is recommended if vision loss or spinal cord compression detect

Rhabdomyosarcoma

Clinical Group I:

Embryonal / Fusion negative CG1 Tumor do not need RT

- It is standard treatment in North America to recommend RT to all patients with alveolar histology regardless of fusion status

Dose 36 Gy

Clinical group II:

All patients need RT

Dose 36Gy in microscopic residue and 41.4 to 45 in all others

Rhabdomyosarcoma

- Orbital tumor
- Usually clinical Group III
- Cyclophosphamide and good response = 45Gy
- Otherwise = <50.4GY

in microscopic residue

Non Rhabdo. Sarcoma

- Size
- Grade
- Margin
- Usually need higher dose of RT

Radiotherapy in Pediatric Sarcoma

- We need time ,please involve us from beginning of diagnose
- Guide us with 3 simple clue:
- Who need the treatment
- When
- Why

We need good quality imaging for RT and it need time and money,

Please involve us from the beginning because after surgery and or CHT

we may lost golden time and we could not have access to primary imaging that we need

Try to gather to bring Proton facility

We need good quality imaging for RT and it need time and money,

Please involve us from the beginning because after surgery and or CHT

Why? We may lost golden time and we could not have access to primary imaging that we need

We need more dedicated pediatric radiotherapy facility

Try to gather to bring Proton facility

Best Regards

- Any question