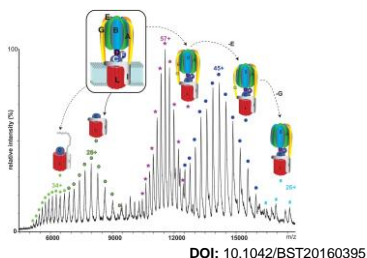


Robustness in Radiation Therapy: Clinician's Perspective and Some History

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Disclosures:
Nothing to declare



10.1186/1748-717X-8-14

History
The Story

Pediatric Indications for Protons



Table 1. 2015 Matrix of Pediatric Proton Therapy

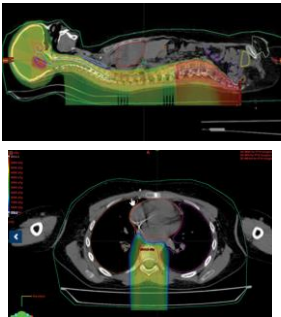
	Indicated	Varies	Not Indicated
CSI	X		
Brain	X		
Base of skull	X	X	
Spine	X		
Hodgkins (female)	X	X	
Hodgkins (male)		X	X
Trunk tumors	X	X	
Retreatment	X	X	
Extremity		X	
Wilms			X
Whole lung			X
Palliative			X
Kinetic target		X	X
Rapidly changing tissue volumes		X	X

<https://appliedradiationoncology.com/articles/pediatric-proton-therapy-in-2015-indications-applications-and-considerations>

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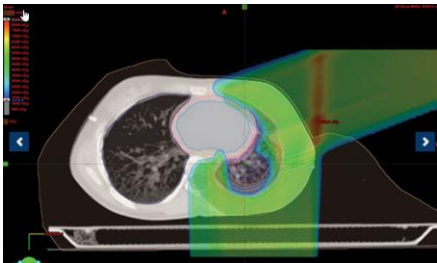
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The Reason – ACNS1422’s Topic



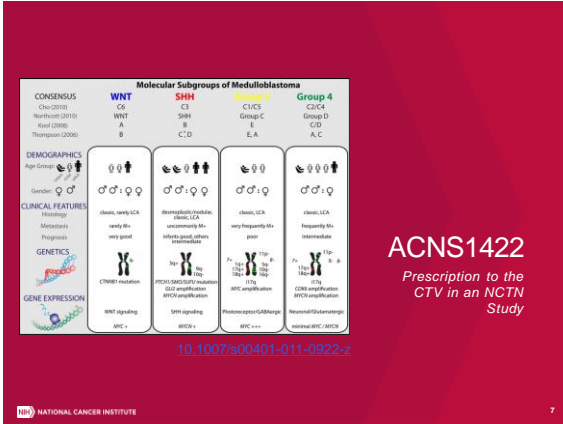
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The RT Team of ACNS1422

- Perhaps a majority of the patients will see protons
- There is no salvage of medulloblastoma (this is the WT1 population, the most favorable)
- We needed a way to say to people
 - How to manage margins
 - That made sense
 - That did not drive people bonkers
 - Or drive IROC bonkers
 - And that somehow was simple

Robustness

- Term is from Latin word **robustus** –
- Oxford Dictionary Website: The ability to withstand or overcome adverse conditions or rigorous testing



travelerofcharleston.com

What we did on COG ACNS1422

For passive or uniform Scanning, a PTV should be created by a uniform expansion from CTV for reporting purposes. It is understood that planning may be optimized to the CTV (protons).

For spot scanning (also called intensity modulated proton therapy or IMPT), the treatment team will employ institutional specific practices regarding evaluation and construction of robust plans that are tolerant of the expected range of set up error, uncertainties in converting CT HU to proton stopping power and tissue volumetric density variation such as sinus filling variation.

ACNS1422 Robustness

- Robustness tests against setup uncertainties
 - Translations (± 3 mm)
 - Rotations (± 2 degrees)
 - Uncertainty in CT HU to proton stopping conversions ($\pm 3.5\%$).
- In any of the scenarios, 99% of CTV must receive equal or greater than 95% of the prescription dose to CTV.
- If not, the margin of the optimization volume needs to be increased.
- It is encouraged to submit a written description of the process used for robustness testing at your center for each case

Language Group	Percentage of Clockwise Circles
Japan	81%
Taiwan (Mandarin)	56%
Egypt (Arabic)	39%
Russia	20%
United States	14%

The Group
Perspectives
And thoughts

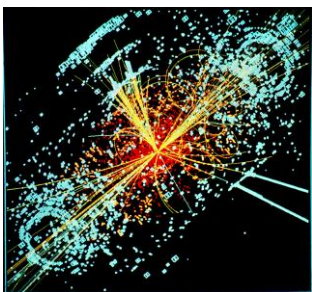
The Hong He & Ishii Somad
Journal of Experimental Psychology, 2017

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Next Steps

- Is one form of robustness better?
- What is better?
 - Cold spots (failures)?
 - Hot spots and integral dose (toxicity)?
- How to standardize robustness?
- Do photons benefit? (beyond PTV)
- In the end, how does one report dose planned, robustness planned, and actual dose delivered?
- How do you add plans and somehow sum robustness?

Next Speakers



CERN

- Robustness
- Uncertainties

www.cancer.gov www.cancer.gov/espanol
