Thyroid Malignancy in Children: Role of the Pediatric Endocrinologist
Jean-Pierre Chanoine, MD, FRCPC

1. In order to facilitate 131I uptake by residual iodine-avid cancer, the TSH level should be above 30 mIU/L. This can be achieved in almost all children by withdrawing LT4 for a minimum of:
   A. 7 days
   B. 14 days
   C. 21 days
   D. 28 days
   
   Correct Answer: B

Rationale
Discontinuing L-T4 for a prolonged period of time may be unpleasant for the patient. Therefore, it is useful to know the appropriate timing. Another option, more expensive and less studied in children, is the administration of recombinant TSH without stopping L-T4.

Reference
1. Management Guidelines for Children with Thyroid Nodules and Differentiated Thyroid Cancer. The American Thyroid Association Guidelines Task Force on Pediatric Thyroid Cancer. Thyroid (2015) 25, p 734

2. About serum thyroglobulin (Tg) concentrations and Tg antibodies, which of the following answers is correct:
   A. Tg antibodies are present in < 5% of patients
   B. Diagnostic whole-body scan is more specific than Tg for the detection of residual thyroid cancer
   C. Tg determination by immunoassay is affected by Tg antibodies
   D. Tg determination by liquid chromatography and tandem mass spectrometry is affected by Tg antibodies
   
   Correct Answer: C

Rationale
Tg is the most specific marker of recurrence. Tg antibodies are present in 20-25% of patients and need to be requested with each Tg. In contrast to immunoassay, Tg antibodies do not affect the determination of Tg by liquid chromatography and tandem mass spectrometry

Reference
1. Management Guidelines for Children with Thyroid Nodules and Differentiated Thyroid Cancer. The American Thyroid Association Guidelines Task Force on Pediatric Thyroid Cancer. Thyroid (2015) 25, p 738-9
Surgery for Pediatric Thyroid Cancer
Geoffrey K. Blair, MD, FRCS

3. In children with a thyroid nodule of significant size where FNA results are “indeterminate cytology” which of the following is true?
   A. Most cases can be simply followed with serial ultrasonography since follicular adenoma is most likely.
   B. Current recommendations indicate the need for surgical lobectomy + isthmusectomy
   C. Repeat FNA is usually warranted
   D. Management decisions depend on molecular testing

   Correct Answer: B

Reference

4. Which of the following is true regarding intra-operative frozen section exam (FSE) in pediatric thyroid surgery?
   A. FSE may be used to help identify parathyroid glands
   B. FSE may be used to guide the extent of lymph node dissection
   C. FSE has no place in pediatric thyroid surgery.
   D. FSE is used to differentiate benign vs. malignant follicular lesions

   Correct Answer: A

Reference

A Team Approach to Nuclear Medicine Imaging
Helen R. Nadel, MD, FRCPC

5. Use of recombinant TSH for I-123 scanning versus thyroid hormone withdrawal in children who have had thyroidectomy for thyroid carcinoma will result in:
   A. Slower radioiodine clearance
   B. lower remnant ablation
   C. higher stimulated thyroglobulin measurement
   D. longer thyroid remnant retention

   Correct Answer: D

Rationale
Correct answer is D - longer thyroid remnant retention. Recombinant TSH increases the iodine retention in the remaining thyroid tissue and disease. The other answers are incorrect
6. According to ATA guidelines for treatment of thyroid cancer in children, a six year who had total thyroidectomy for intermediate risk papillary thyroid carcinoma showing 6% uptake on post thyroidectomy I-123 whole body scan in the thyroid bed and neck should BEST be managed with:
   A. 200 mCI I-131 treatment
   B. No further treatment
   C. Further neck surgery
   D. External beam radiation

   Correct Answer: C

   Rationale
   Correct answer is C - In the presence of the 6% remaining activity and uptake in thyroid bed and neck, further surgery would be recommended prior to additional possible I-131 therapy. The other answers are incorrect.

Reference

7. Video-EEG monitoring during ictal and interictal SPECT studies is:
   A. invasive
   B. Unhelpful
   C. Necessary for accurate determination of whether the patient is having a seizure
   D. Adds unnecessary expense

   Correct Answer: C

Reference

8. For accurate ictal SPECT studies the tracer injection should be administered:
   A. Within 20 seconds of seizure onset
   B. Within 30 seconds of seizure onset
   C. > 30 seconds of seizure onset
   D. As soon as the seizure is over

   Correct Answer: A
9. The accuracy of ictal SPECT is highest with:
   A. Visual analysis of ictal scan alone
   B. Visual analysis of ictal and interictal scans
   C. Voxel based co-registration techniques such as Subtraction ictal SPECT co-registered to MRI
   D. Co-registration of ictal SPECT to CT

   Correct Answer: C

Reference

10. When performing Tc-99m-HMPAO perfusion of the brain:
   A. The timing of injection can be up to 20 minutes after the seizure
   B. All glucose products should be withheld for 6 hours prior to injection.
   C. It is critical to have EEG monitoring to identify seizure onset for ictal injection.
   D. Post-injection imaging must be performed immediately following injection of the tracer.

   Correct Answer: C

Rationale
Answer __a__ is incorrect. Explanation: Injection of tracer should be times within 20 seconds of seizure onset to capture the ictal perfusion.

Answer __b__ is incorrect. Explanation: There is no need to restrict glucose for perfusion imaging. This statement applies to FDG PET imaging.

Answer __d__ is incorrect. Explanation: Following the injection, imaging can be performed up to 2 hours in the department.

References

11. FDG PET is used to identify a seizure focus, especially in the absence of a structural lesion:
   A. Tracer should be injected during an active seizure (ictal).
   B. EEG monitoring is not helpful and may hinder the interpretation.
   C. It is helpful to administer a glucose solution to aid uptake.
   D. The seizure focus will be hypometabolic on inter-ictal imaging.

   Correct Answer: D
Rationale
Answer ___a___ is incorrect. Explanation: Typically, FDG PET imaging is performed inter-ictally because of the high baseline metabolic activity of the normal cortex.

Answer ___b___ is incorrect. Explanation: EEG monitoring should be performed 15 min prior to and following the injection of tracer to ensure inter-ictal period or to document seizure activity if it occurs.

Answer ___c___ is incorrect. Explanation: Glucose should be withheld to have adequate uptake in the brain parenchyma.

References

Dose Reduction and Image Optimization in Pediatric Nuclear Medicine
*Ted Treves, MD*

12. When was the latest version of the North American Consensus Guidelines for Nuclear Medicine Pediatric Administered Activities published?
   A. 2001
   B. 2015
   C. 2000
   D. 2016

   **Correct Answer: D**

Reference

13. What are methods for the Reduction/Optimization of Pediatric Administered Activities in Nuclear Medicine?
   A. Follow the North American Guidelines
   B. Use of Advanced Image Processing (i.e. OSEM 3D)
   C. Customize protocols
   D. All of the above

   **Correct Answer: D**

References

Protocols for Pediatric SPECT/CT
Marguerite T. Parisi, MD, MS

14. Which of the following will result in decreased patient dose when performing hybrid imaging with either SPECT-CT?
   A. Increasing kVp
   B. Decreasing pitch
   C. Use of automatic patient centering for CT
   D. Faster rotation of detector heads.

   Correct Answer: C

Rationale
C is the correct answer. Numerous articles have demonstrated the importance of proper patient positioning within the CT gantry. Both tube current and measured dose ratios increase as off-center positioning increased. Off-center patient positioning can increase patient dose by as much as 140% (mean 33%).

A and B are false. To reduce patient dose, one can either decrease kVp, decrease mAs, increase pitch or a combination of all of these factors.

D is false. Faster rotation of the detector heads will not lead to more detected counts at any time point and therefore will not improve sensitivity nor lead to potential dose savings.

References

15. Regarding low back pain in children and adolescents, which of the following is true?
   A. Low back pain occurs in about 10% of children and adolescents
   B. The incidence of low back pain decreases with age
   C. A structural abnormality is found in as many as 60% of children and adolescents
   D. One of the most common etiologies is spondylolysis.

   Correct Answer: D
Rationale
Correct answer: D. Spondylolysis is one of the more common structural causes of low back pain.

A is incorrect. Low back pain occurs in approximately 40% of children and adolescents as some point before adulthood.

B is incorrect. The incidence of low back pain in children and adolescents increases with age and becomes similar to that of adults by adolescence.

C is incorrect. A structural abnormality is identified in between 12% and 26% of cases.

References

Personalized Oncogenomics in Pediatrics: BC Program
Rebecca Deyell, MD

16. Which of the following best reflects our current understanding of the genomics of pediatric cancers?
   A. Pediatric cancers have a higher mutation burden overall compared to adult cancers
   B. Transcriptome data is routinely used in pediatrics to guide targeted therapy
   C. Pediatric cancers frequently have oncogenic fusions
   D. Germline analysis contributes little to our understanding of pediatric cancers

   Correct Answer: C

Reference

17. In order to obtain required tumour content of >55% required for whole genome and transcriptome sequencing, which type of procedure should be avoided?
   A. Excisional biopsy
   B. IR-guided core biopsy
   C. Fine needle aspiration biopsy
   D. Bite or punch biopsy

   Correct Answer: C

Reference