***CHILDREN’S NATIONAL HEALTH SYSTEM***

***DEPARTMENT OF RADIOLOGY***

***ULTRASOUND PROTOCOL***

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**Issue Date: 5/24/2015 Policy: Celiac Artery Doppler/MALS**

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1. **Indications for a pediatric celiac artery doppler study include but are not limited to:**
2. Suspected median arcuate ligament syndrome (MALS) or celiac artery compression.
3. Chronic abdominal pain associated with eating
4. POTS – postural orthostatic tachycardia syndrome or other cardiac conditions
5. Unexplained gastrointestinal symptoms, or weight loss
6. Abdominal bruit
7. **Patient Prep:**
8. Similar to abdominal US prep, patient should fast (water is allowed) 6 hours
9. Avoid chewing gum before the exam because it allows for swallowing excess gas.
10. **Protocol:**
11. **If this is the first exam, then CA Doppler is scheduled as complete abdomen ultrasound with Doppler.** If the patient already has a recent (within 6 months) abdomen ultrasound exam, then schedule as limited abdomen Doppler exam.
12. Explain the procedure to the patient. Ensure that the patient understands how long it will take (ideally 25 to 30 min) and why it is important to hold breath as directed.
13. Transducer – Curved 1-5 MHz Curved 9 MHz. In case of thin built patients, a linear 9 MHz transducer may be used.
14. Obtain midline grayscale and color sagittal image of aorta (Ao) showing celiac artery (CA) and superior mesenteric artery (SMA) origins.
15. Document the CA origin in sagittal plane to assess presence of hook or J-shape. Look for aliasing and turbulence in proximal CA. Look for juxtaostial narrowing of CA and post-stenotic dilatation.
16. Save a grayscale sagittal cine clip of the deflection angle i.e. save a 3 second long static cine clip showing the excursion/movement of the CA during normal respiration.
17. Measure baseline resting peak systolic velocity (PSV cm/s) in the Ao, CA and SMA. Angle of insonation should be less than 60 degrees.
18. In supine position sagittal plane, measure CA PSV in deep inspiration and then in expiration (3 sample sets) using angle-correction at a point in the proximal artery just beyond its origin. Also measure Ao PSV.
19. In upright position, again measure PSV in inspiration and expiration, in both the CA and Ao.

Points to remember-

1. In an abnormal exam, the PSV increases in expiration and normalizes in upright position.
2. CA PSV >200 is abnormal and expiratory PSV >350 is consistent with MALS.
3. CA:Ao PSV ratio greater than 3:1 is suggestive of MALS.
4. Deflection angle >50 (change of CA axis during expiration) is also positive for MALS.
5. **References:**
6. <http://account.svunet.org/files/positions/Mesenteric2013.pdf>
7. <http://www.medultrason.ro/assets/Magazines/Medultrason-2012-vol14-no2/12-Ozel.pdf>
8. <http://www.researchgate.net/profile/Hannes_Gruber/publication/221683686_Ultrasound_of_the_median_arcuate_ligament_syndrome_a_new_approach_to_diagnosis/links/02e7e51f25123c04e5000000.pdf>
9. <http://www.lebenskuenstlerin.at/chronischkrank/dunbarfallgeschichte.pdf>
10. http://radiopaedia.org/cases/median-arcuate-ligament-syndrome-1