Comparing Degree of Left Iliac Vein Compression between Computed Tomography and Intravascular Ultrasound

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Objective:
To determine the measurement accuracy of left iliac vein compression by the right iliac artery as seen on intravenous ultrasound and retrospectively compared to prior enhanced computed tomography.

Introduction:
Deep vein thrombosis (DVT) evaluation is a common reason for an imaging study to be ordered on a patient and has many causes. Left iliac vein compression by the right iliac artery, also known as iliac vein compression syndrome or May-Thurner Syndrome, is an anatomic variant that is not often thought of in the differential for deep venous thrombosis but has been documented in over 20% of the population.1-2 While this anatomic variant is more common than one would think, not all patients with the variant are symptomatic3, therefore it is important to correlate with patient history. Patient with clinical history of DVT as well as history of chronic edema, pain and venous stasis should be evaluated for this syndrome.

Lower extremity ultrasound is the most common imaging modality ordered to evaluate for DVT but is inadequate in assessing the compressibility of the left iliac vein due to its inability to visualize above the inguinal ligament. Compression of the left iliac vein can easily be seen on computed tomography. Intravascular ultrasound (IVUS) is becoming a common imaging modality utilized by interventional radiology. IVUS provides a 360° intraluminal view of the vessel and can visualize adjacent structures that may be affecting the diameter.

Intravascular ultrasound logically would be the more accurate exam compared to computed tomography in detecting left iliac vein compression. The purpose of this exam is to evaluate patients that have had both imaging modality ordered to evaluate for DVT but is inconsistent over time. According to McDermott and Oliveira, the mean change in the degree of compression of the left common iliac vein in the same patient between two sequential CTs was 23.1%.

Methods & Materials:
Retrospective institutional review analyzing interventional cases involving intravascular ultrasound that demonstrated compression of the left iliac vein by the right iliac artery from January 1, 2014 through January 31, 2016. Cases that were analyzed had contrast enhanced computed tomography of the abdomen and pelvis available for comparison. The intravascular images were obtained utilizing Volcano intravascular ultrasound. The short-axis AP diameter of the iliac vein on CT was measured between the vertebrae and the right iliac artery on axial sequence. On intravascular ultrasound, the measurement utilized was obtained intraoperatively as the right iliac artery crossed the left iliac vein. Exclusion criteria included left iliac venous stent, unavailable CT and thrombus within the left iliac vein.

A total of 51 cases met the study criteria and 29 cases were excluded. The included patients were comprised of 21 females and 9 males with age range from 28 to 75 and a mean age of 53.3 years. The discrepancies between the diameters were calculated and the mean was obtained.

Results:
Of the 30 cases included in the analysis, all of the computed tomography diameter measurements were greater than the associated diameters obtained by intravascular ultrasound (Graph 1). The discrepancy between AP diameters ranged from 0.6 mm to 6.6 mm with a calculated mean of 3.03 mm (Graph 2).

Conclusion:
The results indicate a strong correlation between compressed left iliac vein diameter on IVUS and CT with IVUS consistently measuring smaller compared to CT. The differences in diameter ranged from 0.6mm to 6.6mm. The discrepancies could be due to a variety of factors. For example, the CT images were evaluated in the axial plane while the iliac vein typically runs in an oblique course which could result in overestimating the diameter on CT. IVUS runs along the long axis of the vessel, therefore vessel orientation is inconsequential. Another important consideration is that the left common iliac vein size can change from exam to exam depending on factors such as Valsalva maneuver, hydration status and cardiac output. 5

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Allowing for the above limitations, IVUS is more accurate for assessing left iliac vein compression by the right iliac artery compared to CT and there is evidence that there is a correlation between the measurements. If patient presents with signs concerning for chronic venous disease including DVT, evaluating current or past CT of iliac in the differential and help lead the clinician toward a more chronic and fixable cause of the patient’s symptoms. Further prospective research can be performed including a standardization for obtaining the CT as well as possible reformatted images in the plane of the vein to compare to IVUS.

References: