Intra-abdominal Vascular Compression Syndromes

Looking closely at causes for autonomic dysfunction, there are quite a number of areas where compression of the arteries, veins and the accompanying autonomic nerves can occur. The most common appear to be in the legs, at the origin of the Adductor Canal, some 12 cm above the femoral condyle of the knee, and the Popliteal Compression Syndrome and the Thoracic Outlet Syndrome. These are dealt with in separate articles. I recommend further reading of Professor Scholbach's paper on Vascular Compression Syndromes, to explore the other syndromes not described in this article. [(2)]

Within the abdomen the most important I have found while looking at Autonomic Dysfunction are the Median Arcuate, Nutcracker, Pelvic Congestion and May-Thurner Syndromes. There is increasing evidence that even Left Renal Vein compression under the Superior Mesenteric Artery, present in various postures, produces autonomic change by signalling of the baroreceptors or direct compression of the branches of the vagus nerve that surround the area. There is also iliac vein compression periodically noted, and retrograde flow of the Left Internal Iliac Vein. It is likely the mechanism is the same when the nerves of the pelvis are examined for compression areas.

increasing number of Median Arcuate Syndromes where the coeliac plexus is being jammed by the median arcuate ligament at the bottom of the diaphragm compressing, or pinching the coeliac plexus nerves over the coeliac artery have been found in the POTS research, and from this, it is being seen in a number of patients with dysautonomia.

These 4 main syndromes are notable for the vascular congestion they produce, and as yet it is impossible to determine whether the autonomic and inflammatory instability associated with them is embolic, with the accompanying inflammatory reactions, purely inflammatory from the venous congestion, or autonomic activation as above. Most likely, it is a combination of all. These hypotheses are dealt with in "Inflammation and Autonomic Dysfunction."

Nutcracker Syndrome

The Nutcracker phenomenon is an entrapment of the left renal vein between the aorta and the superior mesenteric artery. The syndrome is when there is compression plus haematuria and left flank pain. Seen frequently in young girls, young and slender women, pregnant women, people with soft connective tissue and overweight people. Within this angle between the aorta and the superior mesenteric artery runs the left renal vein (see image below: "left renal vein") and the duodenum.

The blood flow in the left renal vein becomes disturbed, accelerated and pulsating. The obstruction of the left renal vein blocks the outflow from the left kidney. Its blood is then forced into tributaries that normally bring blood from their organs towards the left renal vein. This sets these organs under pressure, they swell, their vessels become engorged and the walls of these vessels react with an inflammation. These so called collateral vessels enlarge and go baggy, become varicose veins, which are painful.

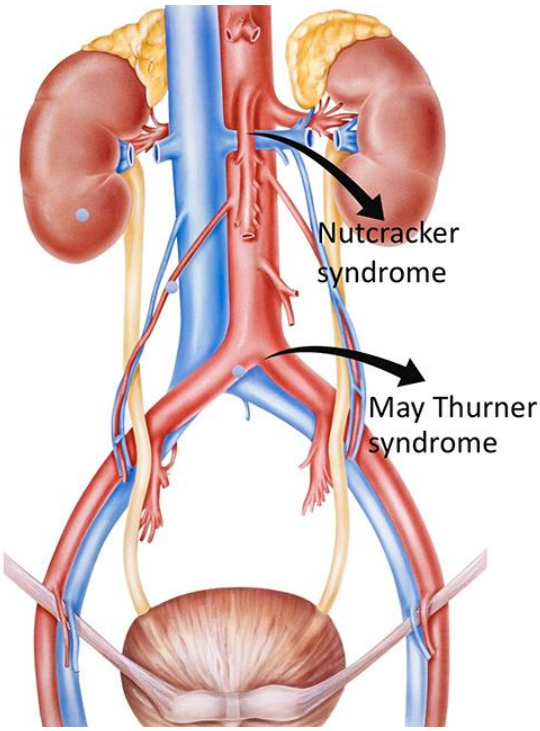
Common accompaniments include abdominal pain and headaches, with symptoms often worse with exercise. Pain is often exacerbated by sitting, standing, walking or riding in vehicles. Males often develop varicocoeles.

Severe orthostatic intolerance associated with left renal vein occlusion may occur.[(2)] Chronic fatigue associated with high left renal vein/ interior vena cava pressure gradients occur, with relief of fatigue in some patients following surgery to correct the obstruction.[(2)] Unfortunately surgery does not consistently

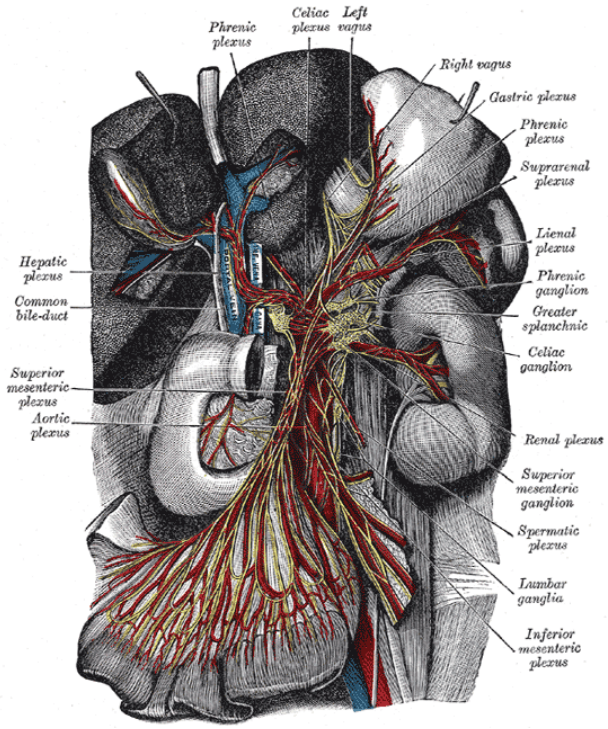
produce relief of symptoms, implicating the neural compression as being more important in symptom causation than the venous compression itself.

Pelvic Congestion Syndrome

In pelvic congestion, pain in the lower abdomen or in the left testicle results from the diversion of blood from the left kidney to the organs of the pelvis. This additional volume needs to be transported to the inferior vena cava, which runs at the right side of the spine. Within the pelvis a vast network of veins fills the space between the organs, mainly the uterus (prostate), rectum, urinary bladder and vagina. This network takes up the renal blood from the left kidney but may soon be overfilled. If so, symptoms may be present including abdominal pain, increased menstrual cramps, genital pain, pain during bowel movements, urinary discomfort, congestion in the genital region and vulval varicosities. Thrombosis of the deep veins of the left leg, mainly of the calf, and varices of the left leg may develop.[2]



Source: Dr Kurian Mylankal
http://www.vascularcareadelaide.com.au/vein-compression.html.(7)



Source: Wikipedia: Celiac Plexus:
By Henry Vandyke Carter - Henry Gray (1918) Anatomy of the Human Body (See "Book" section below)Bartleby.com: Gray's Anatomy, Plate 848, Public Domain, https://commons.wikimedia.org/w/index.php?curid=541708

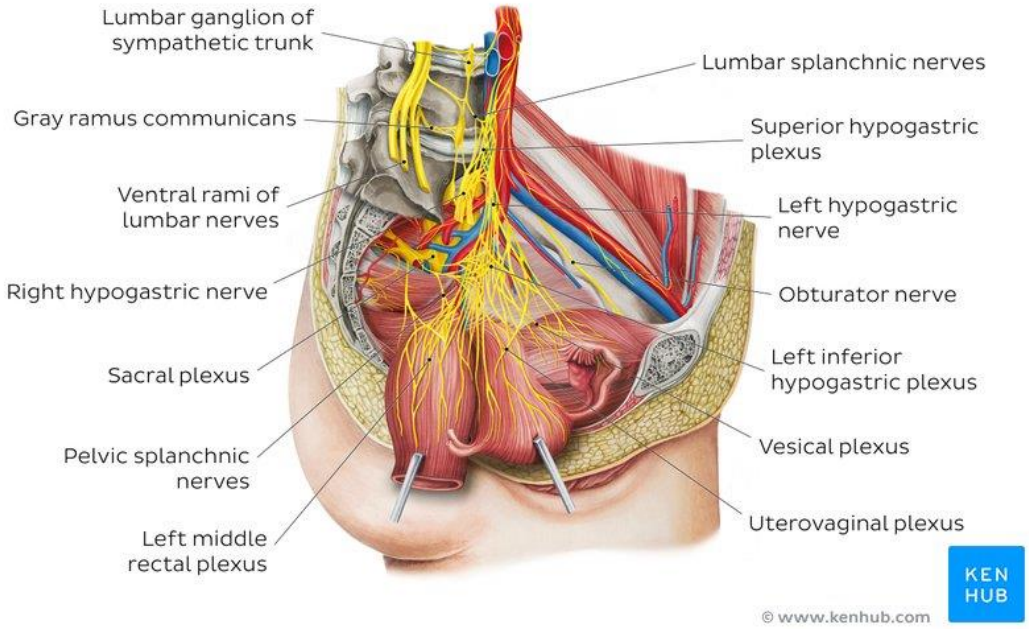
May-Thurner Syndrome

May-Thurner syndrome is increasingly recognized as a frequent source of leg swelling and a precipitating factor for venous thromboembolism due to an anatomical variant in which the right common iliac artery overlies and compresses the left common iliac vein against the lumbar spine. This variant has been shown to be present in over 20% of the population. (3)

Left iliac vein compression from the right common iliac artery, against the posterior fifth lumbar vertebral body, is estimated to comprise 49% to 62% of cases of left lower extremity venous disease. There is some degree of iliac vein compression present as a normal anatomic variant in otherwise healthy patients (>50% compression) in up to 25% of patients.(4) Retrograde flow is sometimes noted in the internal iliac vein.

Symptoms include left-sided abdominal pain radiating into the left thigh, left-sided flank pain. Left leg swelling and increased tendency to varicose veins and thrombosis left leg. (2)

Once again, patients with this compression suffer similar autonomic symptoms, again asking the question of venous microtrauma and microemboli, baroreceptor signalling or simple vagal activation through the coeliac plexus, just as appears likely in the renal vein compression. Once again, it is likely to be a combination of all three.



Source: https://www.kenhub.com/en/library/anatomy/neurovascular-supply-of-the-pelvis

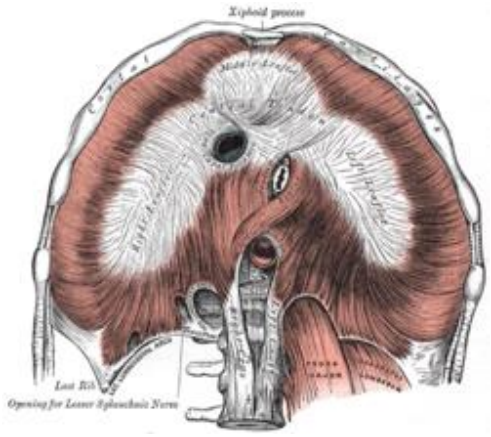
Median Arcuate Syndrome

Median Arcuate Syndrome is caused by compression of the coeliac ganglion (solar plexus), a web of nerves in the upper abdomen located immediately below the diaphragm. Arching over the aorta is the arcuate ligament. Movement of the diaphragm while breathing may irritate the coeliac ganglion leading to pain and autonomic symptoms.(2)

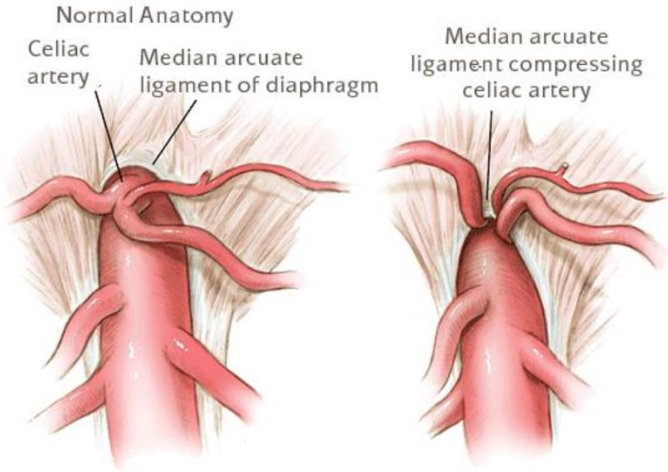
Symptoms may include, and not always associated with intake of food, are clearly related to autonomic dysfunction:

- Abdominal pain below the sternum which sometimes radiates like a belt or even into the chest
- Loss of appetite
- Rapid fullness while eating
- Weight loss
- Syncope and pre-syncope
- Sweating
- Tachycardia
- Short-lived bouts of diarrhoea.(2)

The Coeliac Artery (or Coeliac Axis or Coeliac Trunk) is a major artery in the abdominal cavity supplying the foregut. Arising from the Aorta, it branches into the Left Gastric Artery, Splenic Artery and Common Hepatic Artery. When visualized on ultrasound, which would show displacement and variable narrowing of the Coeliac Axis, it is an indirect sign of compression of the over-riding Coeliac Ganglion.



Source: Wikipedia: Median Arcuate Syndrome [6]



Source: University of Chicago MALS Program (4) http://www.ucmals.com/uploads/1/6/6/7/16670080/1847895_orig.jpg

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