AN OSTEOPATHIC APPROACH TO GASTROENTEROLOGY
(WITH FOCUS ON NAFLD / NASH)

IOMS 2023 Winter Scientific Seminar

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CONFLICT OF INTEREST

- *I have no conflicts of interest with any parties for this presentation.*

OBJECTIVES

- *At the conclusion of this session, the participant will be able to:*

- 1. Discuss how a clinical approach using osteopathic principles may benefit patients with gastrointestinal disorders.
- 2. Locate the anatomic regions that commonly contain somatic dysfunction related to the liver.
- 3. Explain how lifestyle factors contribute to both the development and treatment of NAFLD.
- 4. Describe and demonstrate how the treatment of somatic dysfunction may alter the pathophysiology of NAFLD.

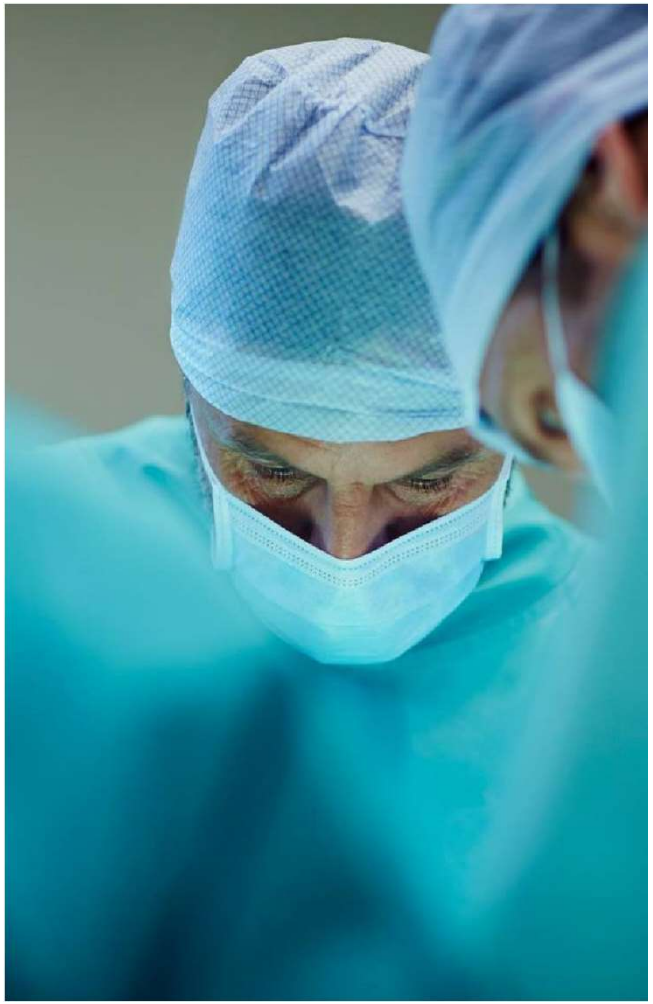
AGENDA

Topic one: Clinical Approach

Topic two: Anatomic relationships

Topic three: Lifestyle factors

Topic four: Somatic dysfunction



INTRODUCTION

The Osteopathic approach to Gastroenterology is based upon the body's unique structural and functional relationships.

It includes the role of the MSK system, the body's inherent capacity to heal, and the importance of including the patient's mind, emotions and spirituality in their care.

TOPIC ONE: OSTEOPATHIC CLINICAL APPROACH

OSTEOPATHIC APPROACH

- The approach is patient-oriented not disease-oriented.
- The patient is viewed from a holistic viewpoint including components of body, mind spirit.
- Using a thorough understanding of Anatomy, the role of the musculoskeletal system is considered in relationship to the visceral, cognitive, and emotional factors.
- The approach considers how to support the hosts internal homeostasis, internal ability to heal, and the patients innate ability to overcome injury, illness, and disease.
- Lastly, the approach looks to help the patient achieve improved day-to-day functioning, through patient empowerment, empathy, and encouragement.

TAKING THE HISTORY

- When evaluating a patient with nonalcoholic fatty liver disease (NAFLD), it is essential to obtain a detailed history:
- Metabolic risk factors: Identifying patients with metabolic syndrome is crucial, as it is strongly associated with NAFLD. Metabolic syndrome consists of obesity, type 2 diabetes mellitus or hyperinsulinemia, hypertension, and dyslipidemia.
- Alcohol consumption: The diagnosis of NAFLD should not be made in patients with a history of significant alcohol consumption. The acceptable level of daily alcohol consumption is less than 2 drinks a day in men <65 and 1 drink a day in women; or men > 65.
- Medications: It is essential to review the patient's medications, as some drugs can cause liver damage or contribute to fatty liver. Elevated LFT's may preclude the use of statins and Tylenol.

TAKING THE HISTORY

- Other considerations:

- Symptoms: NAFLD is often asymptomatic, but some patients may report fatigue, abdominal right upper quadrant fullness or pain, or pruritus. The diagnosis is usually made incidentally during routine lab tests or imaging studies.
- Medical Conditions: Polycystic ovary disease, lipodystrophies, mitochondrial diseases, Weber-Christian disease, and Wilson disease.
- Nutrition: Both nutritional overload states (e.g., total parenteral nutrition) and malnutrition (e.g., Kwashiorkor and celiac disease) are also associated with NAFLD.
- Family history: A family history of liver disease or metabolic syndrome may increase the risk of NAFLD.

LIFESTYLE FACTORS TO EVALUATE (HALLSWORTH, NGC)

- Excessive Caloric Intake
- Metabolic Syndrome: (54% of NAFLD patients)
- High blood pressure
- High blood sugar
- High body weight
- High cholesterol levels (53% of NAFLD patients)
- Type 2 Diabetes
- Obesity
- High Levels of Triglycerides
- Lower levels of HDL-cholesterol
- Insulin Resistance
- Unhealthy Diet

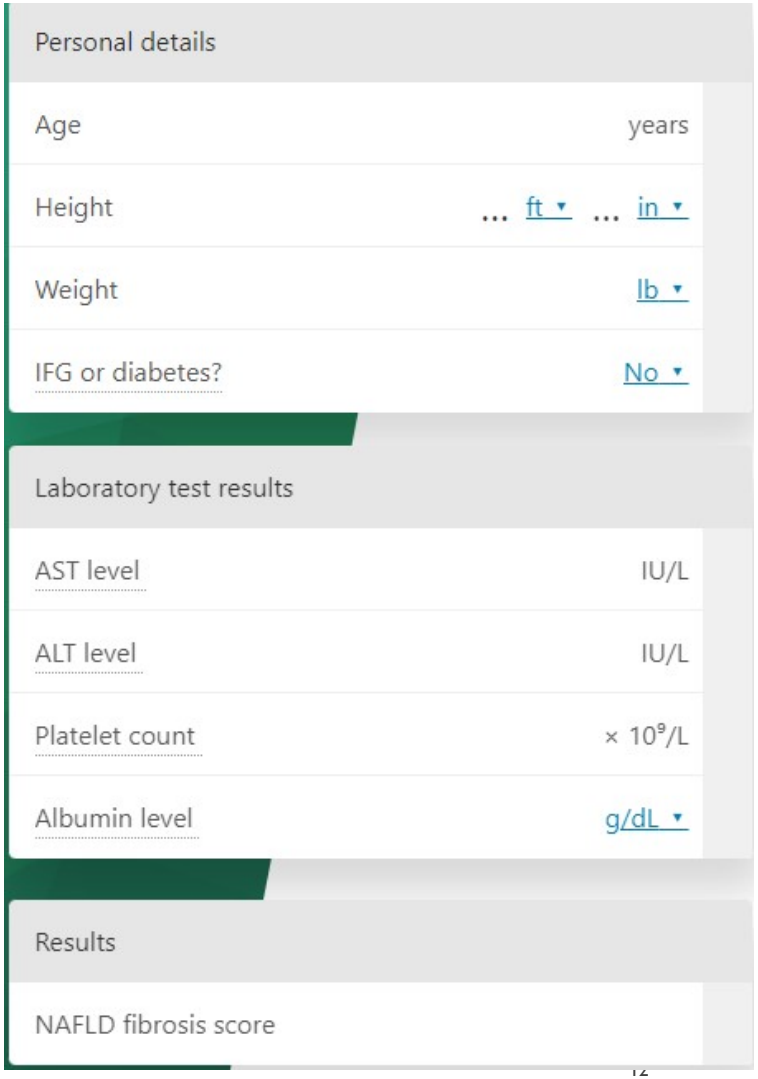
PHYSICAL EXAM:

- Clinicians should perform a thorough exam and look for stigmata of chronic liver disease.
  - Jaundice
  - Ascites
  - Palmar erythema
  - Spider hemangiomas
  - Gynecomastia
  - Encephalopathy
  - Dupuytren's contractures
  - Testicular atrophy
  - Other features: These can include pruritus (itching), hair loss, leuconychia (white nails), and asterixis (a flapping tremor of the hand)

DIAGNOSTIC TESTS

- Liver function tests: (ALT / AST) is usually mildly elevated at two to five times the upper level of normal, with ALT greater than AST in a 2:1 ratio.
- Fasting blood sugar
- Lipid profile
- Imaging procedures (e.g., abdominal ultrasound, MRI, or CT scan)
- Non-invasive tests for predicting the severity of fibrosis in NAFLD patients.
- AST to Platelet Ratio Index (APRI) score
- Fibrosis-4 (Fib-4) calculator
- NAFLD fibrosis score (NFS)

https://www.omnicalculator.com/health/nafld-fibrosis-score



Fibrosis-4 (FIB-4) Calculator

Share

The Fibrosis-4 score helps to estimate the amount of scarring in the liver. Enter the required values to calculate the FIB-4 value. It will appear in the oval on the far right (highlighted in yellow).

$$\text{FIB-4} = \frac{\text{Age } (\textit{years}) \times \text{AST Level } (\textit{U/L})}{\text{Platelet Count } (\textit{10}^9/\textit{L}) \times \sqrt{\text{ALT } (\textit{U/L})}} =$$

Interpretation:

Using a lower cutoff value of 1.45, a FIB-4 score <1.45 had a negative predictive value of 90% for advanced fibrosis (Ishak fibrosis score 4-6 which includes early bridging fibrosis to cirrhosis). In contrast, a FIB-4 >3.25 would have a 97% specificity and a positive predictive value of 65% for advanced fibrosis. In the patient cohort in which this formula was first validated, at least 70% patients had values <1.45 or >3.25. Authors argued that these individuals could potentially have avoided liver biopsy with an overall accuracy of 86%.

Sources

Sterling RK, Lissen E, Clumeck N, et. al. Development of a simple noninvasive index to predict significant fibrosis patients with HIV/HCV co-infection. Hepatology 2006;43:1317-1325.

OSTEOPATHIC STRUCTURAL EXAM FINDINGS

- Lateral curvatures of the spine can be related to visceral disturbances, even mild cases.
- Asymmetry of anatomic landmarks generally indicates postural issues but may indicate visceral issues!
- Increased abdominal girth may indicate ascites.
- Increased lumbar lordosis commonly accompanies the increased abdominal girth.

https://www.scoliosissos.com/blog/lumbar-scoliosis-explained

https://www.sciencephoto.com/media/249985/view/ascites-side-view-of-distended-abdomen

OSTEOPATHIC PALPATORY FINDINGS

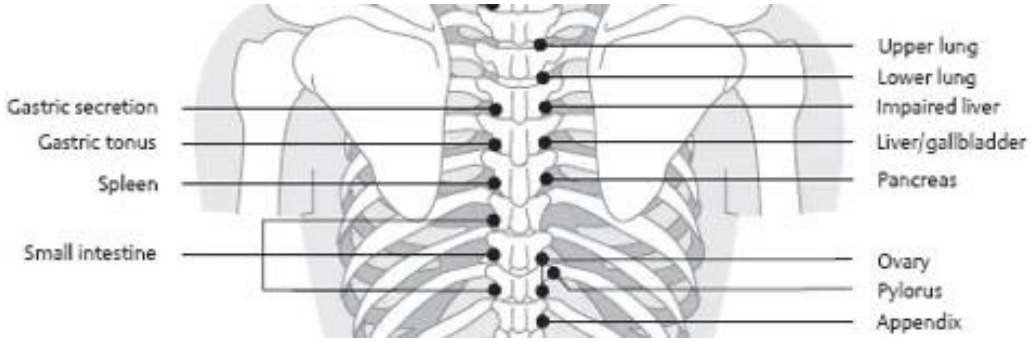
- *Does the patient have a somatic component to their chief complaint, injury or illness?*

- Tissue texture abnormalities are generally located between the T6 and T10 spinal segments on the right side typically over the rib angles
- Decreased motion during respiration of rib six through 10 on the right side
- Tenderness in the midline of the abdomen referable to the celiac ganglion
- Tissue texture abnormalities in the suboccipital region referable to irritation of the vagus nerve

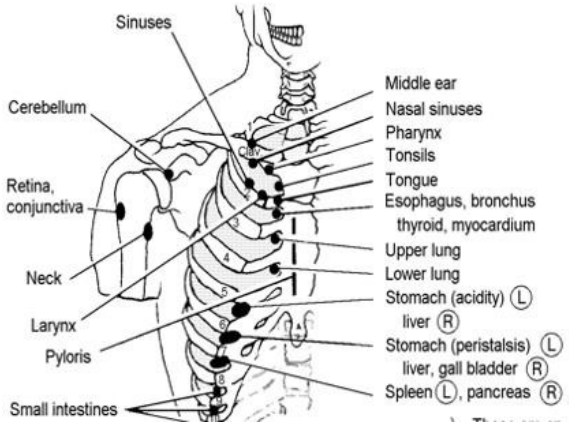
https://www.youtube.com/watch?app=desktop&v=CCKdKGKL88E

PALPATORY FINDINGS: CHAPMAN'S REFLEX POINTS

- Chapman's reflex points, also known as Chapman's points, are specific areas on the body that correspond to visceral dysfunctions or pathologies.
- They are characterized as small, discrete, and smooth palpable nodules, approximately 2 mm in diameter.
- The anterior Chapman's reflex points for the liver are located at the right fifth or sixth intercostal space.
- The posterior point is located at the right intertransverse spaces between the fifth and seventh thoracic vertebrae.



Perplexity AI



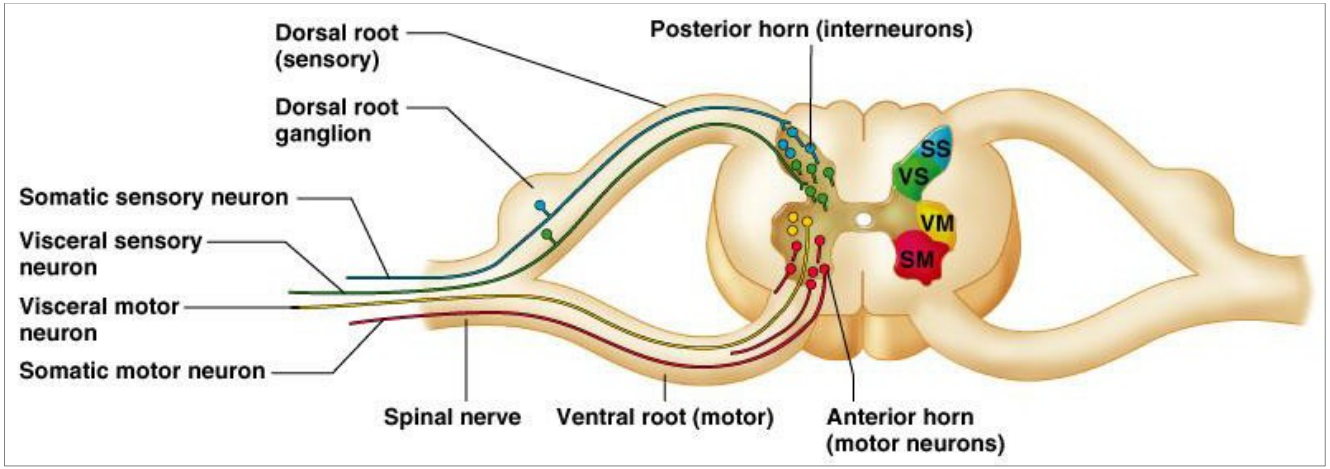
PALPATORY FINDINGS: SOMATIC DYSFUNCTION

- Somatic Dysfunction Definition: an impaired or altered function of related components of the somatic (body framework) system: skin, fascia, muscle, arthrodial, and related vascular, lymphatic, and neural elements.
- T.A.R.t. - Tissue Texture Abnormality
  - ☐ Definition: a palpable change in tissues from skin to periarticular structures that accompanies somatic dysfunction
  - ☐ Ability to sense TTA useful in identifying the presence of somatic dysfunction
  - ☐ Qualities of TTA are typically different for acute injuries vs. chronic conditions
- Visceral disease can cause tenderness and tissue texture changes, that are proportionate to the degree of visceral pathology, when the area of the associated dermatome or myotome is palpated.

CCOM /OMM class notes

PALPATORY FINDINGS: VISCEROSOMATIC REFLEX

- A viscerosomatic reflex are palpatory findings that are part of a neurophysiologic reflex indicating underlying visceral inflammation, distension or disease. They are used to assist the clinician in diagnostic and management decisions.
- A peripheral focus of irritation, in the case of a viscerosomatic reflex from the inflammation associated with
  visceral pathology, results in activation of nociceptive, general visceral afferent neurons.
- Ongoing afferent stimulation state of irritability (facilitation) of the internuncial neurons of that spinal segment.



PATHOPHYSIOLOGY OF NAFLD

- The pathophysiology of NAFLD and its progression are complex:

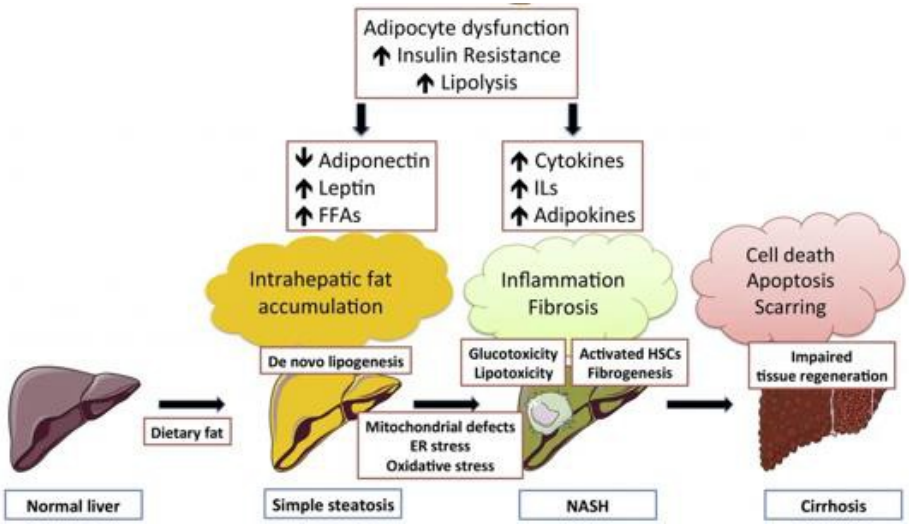
- Lipid accumulation
- Inflammatory Cytokines and Adipose Tissue Inflammation
- Insulin Resistance:
- Genetic Factors:
- Dietary Factors:
- Oxidative Stress:
- Gut Microbiome:
- Activation of the sympathetic nervous system

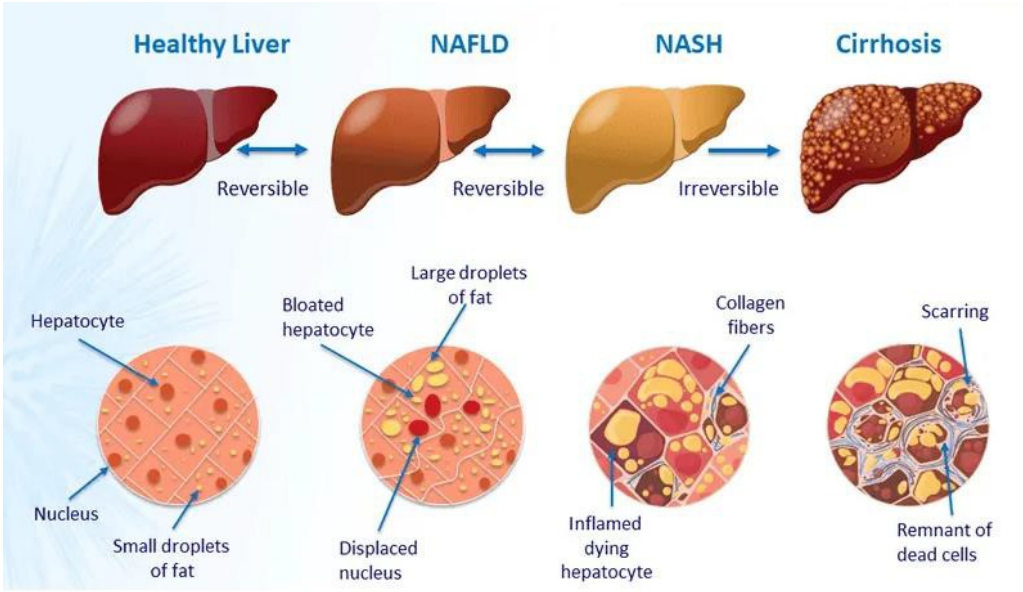
https://liverfoundation.org/liver-diseases/fatty-liver-disease/nonalcoholic-steatohepatitis-nash/nash-definition-prevalence/

PATHOPHYSIOLOGY OF NAFLD----NASH-----FIBROSIS-----CIRRHOSIS

- Simple Fatty Liver or Steatosis: (NAFLD) This is the initial stage of NAFLD where there is a build-up of fat in the liver cells. At this stage, there is no inflammation or scarring.
- Non-Alcoholic Steatohepatitis (NASH): This is a more serious form of NAFLD where the liver has become inflamed due to the continued accumulation of fat.
- Fibrosis: This stage occurs when persistent inflammation leads to the formation of scar tissue around the liver and nearby blood vessels.
- Cirrhosis: This is the most severe stage of NAFLD, occurring after years of inflammation. This damage is permanent and can lead to liver failure and liver cancer.
- Early detection and management of NAFLD can help prevent the disease from developing into cirrhosis.

PATHOPHYSIOLOGY OF NAFLD----NASH-----FIBROSIS-----CIRRHOSIS





https://cmeindia.in/non-alcoholic-fatty-liver-disease-emerging-concepts-in-pathogenesis/

NAFLD AND THE MICROBIOME

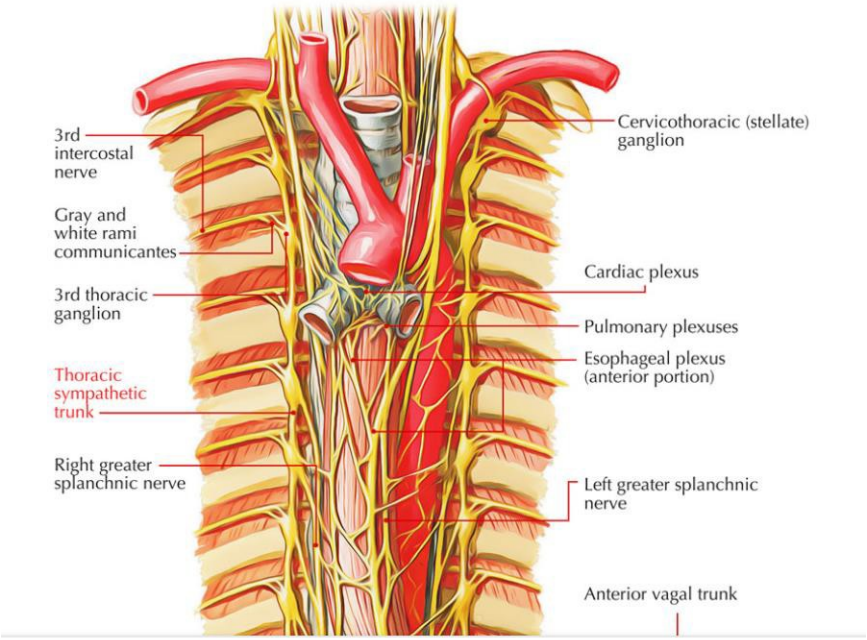
- Metabolic dysfunction-associated fatty liver disease (MAFLD) is a newly proposed term for non-alcoholic fatty liver disease (NAFLD) with the more advance stage termed metabolic dysfunction-associated steatosis liver disease (MASLD).
- Microbial metabolic pathways that were upregulated in MASLD-cirrhosis patients included those for fatty acid, phospholipid, and cholesterol-related biosynthesis.
- One meta-analysis consisting of 1252 patients showed that probiotic formulations largely containing Lactobacillus and Bifidobacterium strains improved markers of NAFLD. (Sharpton).

https://www.doctork.nyc/blog/2017/3/5/gut-microbiome

TOPIC TWO: ANATOMIC REGIONS AND THEIR SIGNIFICANCE

THORACIC & LUMBAR SPINE: SYMPATHETIC NERVOUS SYSTEM

- The sympathetic trunks are two ganglionated nerve trunks that extend the whole length of the vertebral column. In the neck, each trunk has 3 ganglia; in the thorax, 11 or 12; in the lumbar region, 4 or 5; and in the pelvis, 4 or 5.
- The principal neurotransmitter released by postganglionic sympathetic neurons is noradrenaline.
- Sympathetic fibers cause constriction of the blood vessels supplied to the skin and GI tract and dilatation of the blood vessels supplied to the skeletal muscle, brain and to the heart.
- In the viscera, they cause general vasoconstriction, bronchial and bronchiolar dilatation. They also enhance glandular secretions and inhibit the alimentary muscle contraction.
- In general, sympathetic nervous systems controls catabolism on glucose and lipids, while parasympathetic nervous system contributes to anabolism and promotes glycogen storage in the liver.



https://www.earthslab.com/anatomy/thoracic-sympathetic-trunks-course-relations-ganglia-and-its-branches/

SYMPATHETIC INNERVATION OF THE LIVER (JENSEN)

- The sympathetic innervation is postganglionic and originates in the celiac and superior mesenteric ganglia that receive preganglionic fibers from the intermediolateral column of the spinal cord (T7-T12)
- The hepatic nervous plexus, receives sympathetic fibers from the celiac plexus.
- The celiac plexus is a complex network of nerves located in the abdomen, near where the celiac trunk, superior mesenteric artery, and renal arteries branch from the abdominal aorta.
- The afferent fibers deliver information regarding osmolality, glucose level, and lipid level in the portal vein to the central nervous system (CNS).
- The efferent fibers are crucial in the regulation of metabolism, blood flow, and bile secretion.
- The sympathetic nervous system is involved in the regulation of hepatic fibrosis, regeneration, and circadian rhythm.

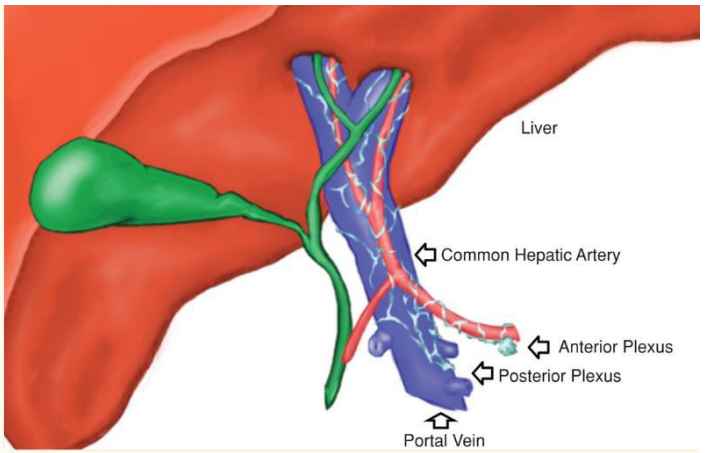


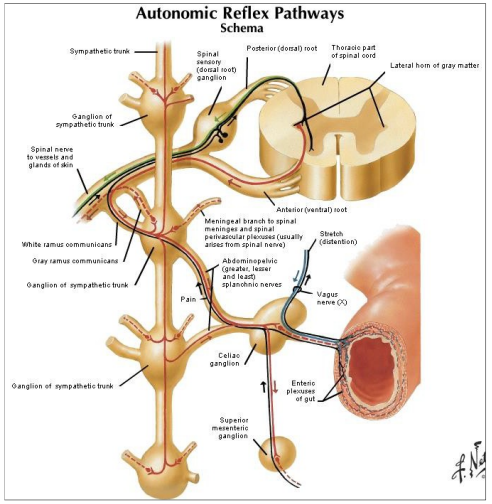
Figure 1

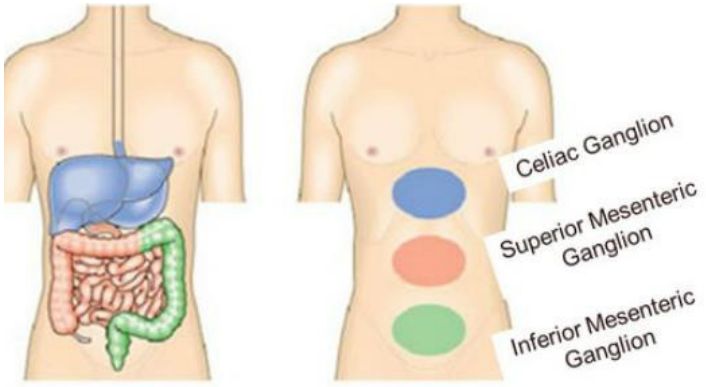
Gross anatomy of the hepatic nervous system

The anterior plexus forms around the common hepatic artery, and the posterior plexus forms around the portal vein. These plexuses follow these structures to enter the liver hilus with the accompanying portal structures and carry afferent and efferent fibers of both sympathetic and parasympathetic origin.

SYMPATHETIC GANGLIA: VISCEROSOMATIC'S

- The splanchnic nerves carry both visceral sympathetic and sensory fibers, except for the pelvic splanchnic nerves which carry parasympathetic fibers.
- The thoracic splanchnic nerves are divided into the greater, lesser, and least splanchnic nerves.
- The greater splanchnic nerves receive branches from T5-T9 thoracic sympathetic ganglia
- The lesser splanchnic nerves arise from T10-T11 thoracic sympathetic ganglia.
- The least splanchnic nerve forms from branches of T12 sympathetic ganglia.
- The celiac ganglia are the two largest ganglia in the autonomic nervous system and serve as an example of prevertebral ganglia. They provide efferent sympathetic input to gut parenchyma.
- Both the celiac and superior mesenteric ganglia play a significant role in the regulation of the digestive system. They are involved in controlling the contraction of the lower esophageal sphincter, decreasing motility in the stomach and intestines, reducing exocrine secretion and insulin secretion in the pancreas, and increasing glycogenolysis and gluconeogenesis in the liver.

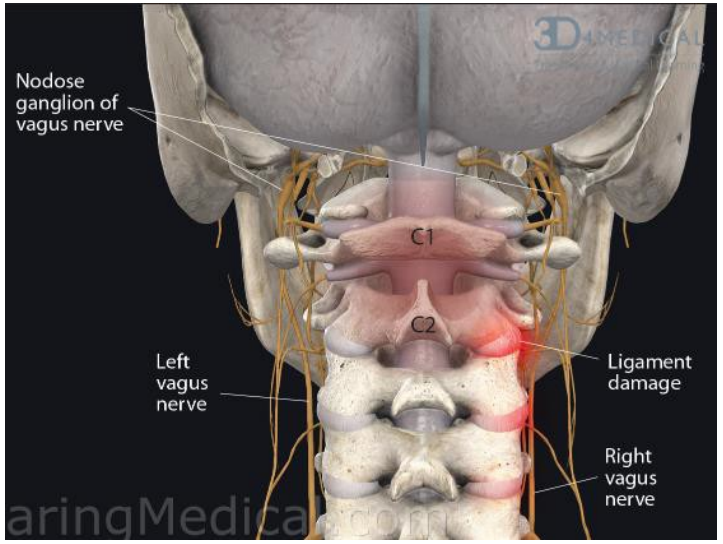




https://quizlet.com/256036679/omm-osteopathic-considerations-in-gastrointestinal-diseases-i-qettlinger-flash-cards/

CRANIAL AND SACRAL REGIONS: PARASYMPATHETIC NERVOUS SYSTEM

- The vagus nerve originates from the lateral aspect of the medulla and exits the cranium via the jugular foramen with the glossopharyngeal and spinal accessory nerves.
- The right vagus nerve forms the posterior vagal trunk passing through the thorax behind the esophagus through the esophageal hiatus into the abdomen.
- Parasympathetic nerves synapse on ganglia located at the hepatic hilus and within the hilar spaces.
- Somatic Dysfunction in this region has been shown to affect vagal tone. (Giles)



Ross Hauser, MD https://www.caringmedical.com/prolotherapy-news/vagus-nerve-compression-cervical-spine/

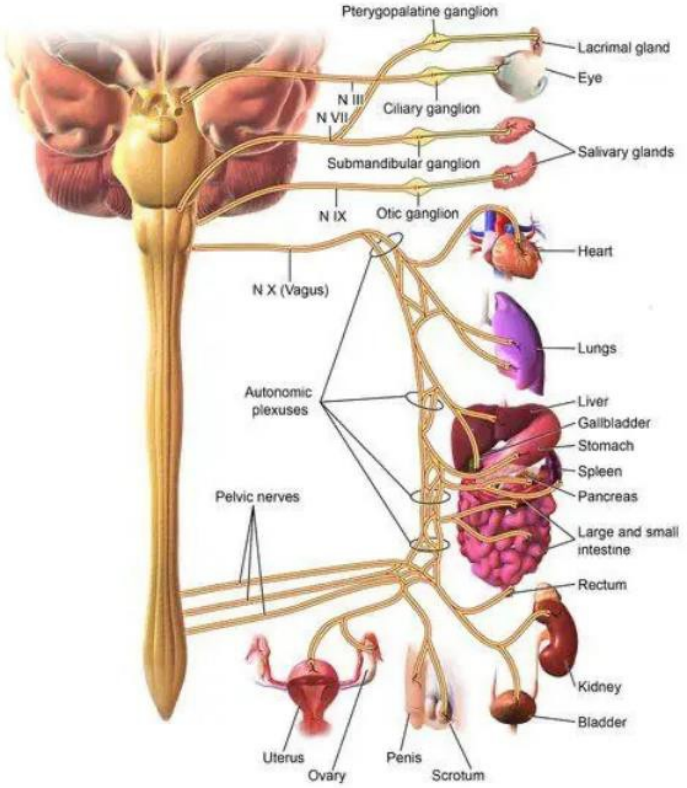
SUBOCCIPITAL REGION AND THE VAGUS NERVE (GILES)

- Decompression of the occipito-atlantal (O-A) junction, an OMT technique that focuses on treating an articular compression between the occiput and the atlas, may improve conditions relating to the path of the vagus as it exits the skull.
- Local inflammation, edema, muscle hypertonicity or spasm, or other somatic dysfunctions could cause either a chemical or compressive effect on the vagus, thereby affecting its optimum function.
- Data from the Giles study have demonstrated an effect of suboccipital decompression to moderately enhance parasympathetic control of heart rate and/or shift the sympathovagal balance to a more predominant vagal control.

https://ommfellows.files.wordpress.com/2008/11/headlec10-28-2008kts.pdf

CRANIAL AND SACRAL REGIONS: PARASYMPATHETIC NERVOUS SYSTEM (JENSEN)

- The anterior vagus trunk, which derives from the left vagus nerve, innervates the liver via the common hepatic branches. The common hepatic branches innervate not only the liver but also the bile duct, portal vein, gastric pylorus, proximal duodenum, and part of the pancreas.
- Branches of both the vagal and splanchnic nerves innervate the liver via the portal area.
- The vagus nerve is comprised of motor and sensory fibers, while the splanchnic nerves consist of both visceral efferent and afferent fibers, as well as sensory fibers.
- The parasympathetic nerves branch off the vagus nerve and are derived from the splanchnic and vagal nerves that surround the portal vein, hepatic artery, and bile duct.



https://neuropedia.net/

PARASYMPATHETIC INNERVATION OF THE LIVER (MIZUNO)

- The parasympathetic innervation plays a crucial role in the regulation of metabolism, blood flow, and bile secretion. It also has been associated with hepatic fibrosis, regeneration, and circadian rhythm.
- The afferent fibers of the parasympathetic nervous system sense levels of ions, glucose, free fatty acids, cytokines as well as hormones such as glucagon-like peptide-1 and cholecystokinin.
- Release of parasympathetic neurotransmitters such as acetylcholine or vasoactive intestinal peptide causes relaxation of the hepatic sinusoids.
- Systematic neural ablation studies have highlighted the importance of the hepatic autonomic innervation of the liver in both physiological and pathological processes., such as lipid homeostasis, inflammation and fibrosis. (Niijima)

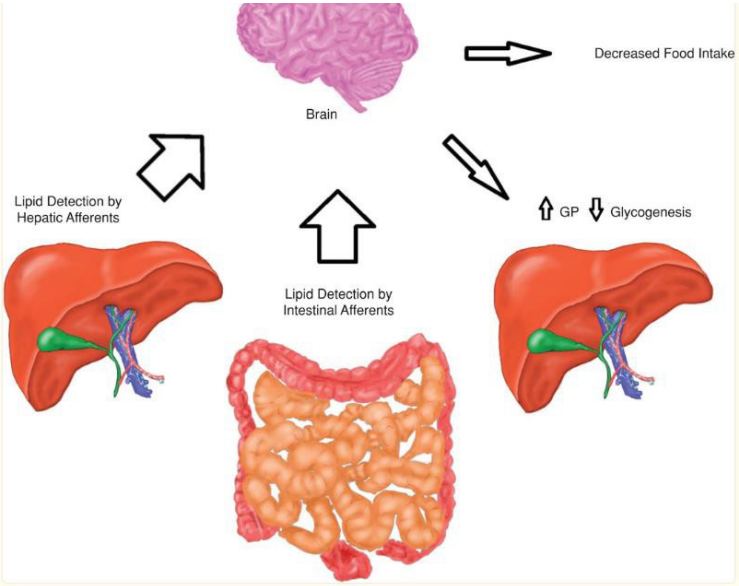
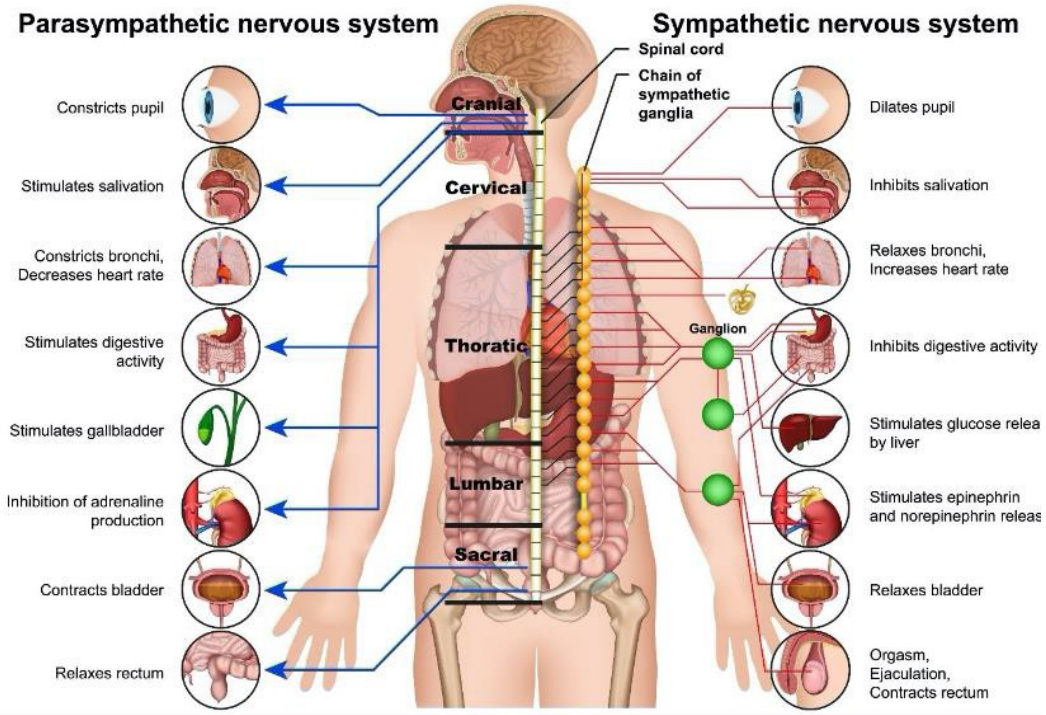


Figure 5

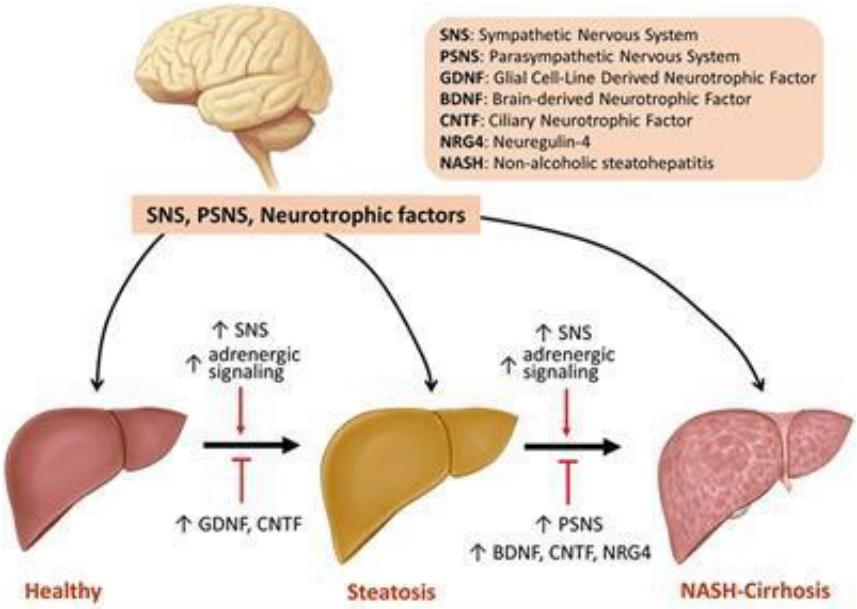
Lipid sensation by liver and gut

Lipid sensation by both the liver and the gut, leads to vagal afferent activation. The hypothalamus of the brain responds by signaling the liver to increase glucose production and decrease glycogenesis.

OBTAINING BALANCE OF THE SYMPATHETIC AND PARASYMPATHETIC NERVOUS SYSTEMS



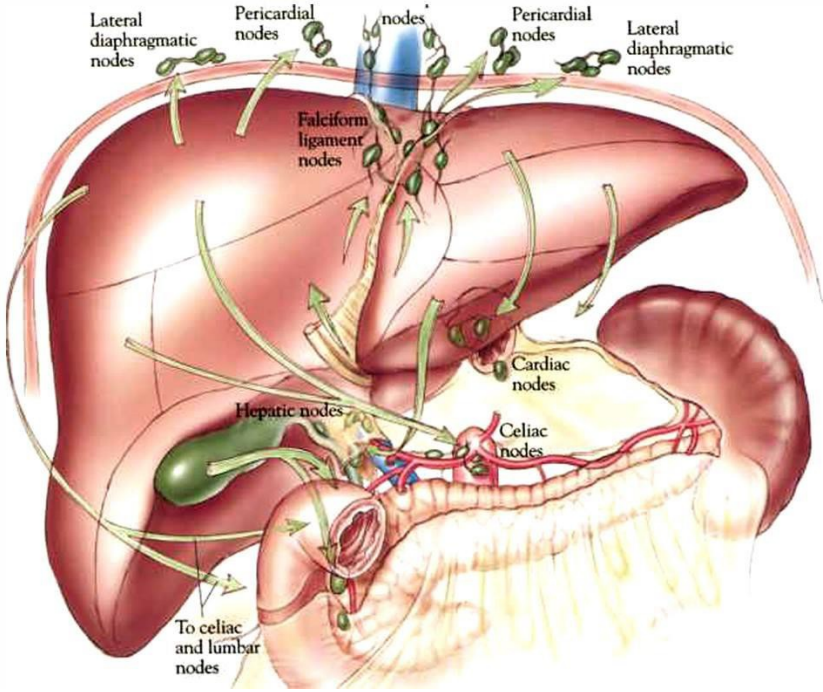
https://www.christopherreeve.org/todays-care/living-with-paralysis/health/secondary-conditions/autonomic-dysreflexia/



https://www.frontiersin.org/articles/10.3389/fmed.2020.00062/full

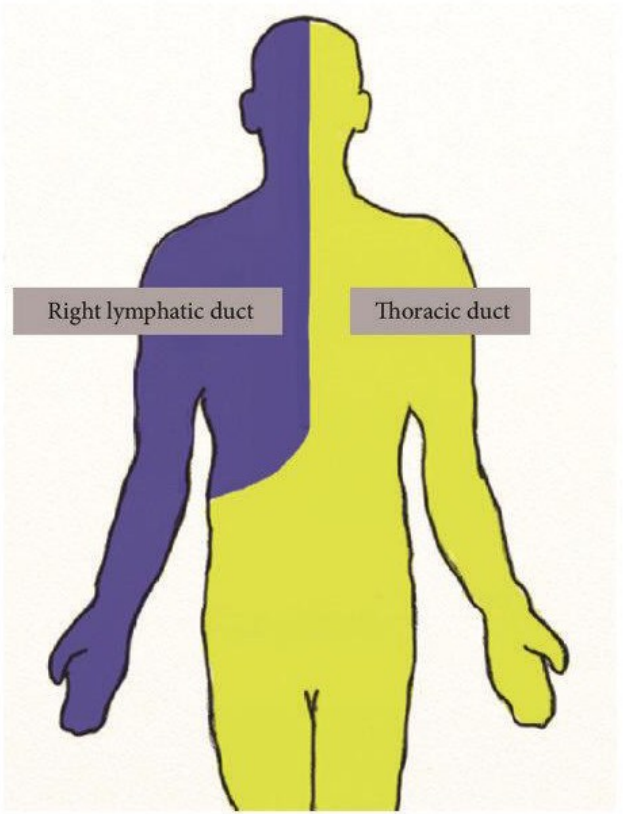
LYMPHATIC SYSTEM

- The lymphatic drainage of the liver is divided into deep and superficial systems.
- The deep system consists of hepatic lymph vessels that follow the hepatic portal veins, which drain to the celiac nodes. These drain to the cisterna chyli (if present) and on into the thoracic duct.
- In patients with chronic liver disease, lymphatic vessel abundance increases and is associated with areas of fibrosis and immune cell infiltration. The density of lymphatic vessels is significantly increased in cirrhotic livers.
- The lymphatic system plays a critical role in the pathogenesis of chronic liver disease, contributing to inflammation, immune cell trafficking, and potentially drug delivery.



ANATOMY- LYMPHATIC DRAINAGE

- Right Lymphatic duct-drains right side of head, neck, upper extremity, chest, heart, lungs
- Thoracic duct (left)-drains left arm, neck, thorax, upper abdomen,
  both sides of lower abdomen, and both lower extremities
- Cisterna chyli- distal saccular dilation of thoracic duct, lies anterior right side of the L1-2 vertebrae near renal vessels, posterior to right crus of diaphragm, and next to abdominal aorta
- L1-2 somatic dysfunction that can be associated with psoas hypertonicity or somatic dysfunction of the diaphragm can affect drainage through
  cisterna chyli.

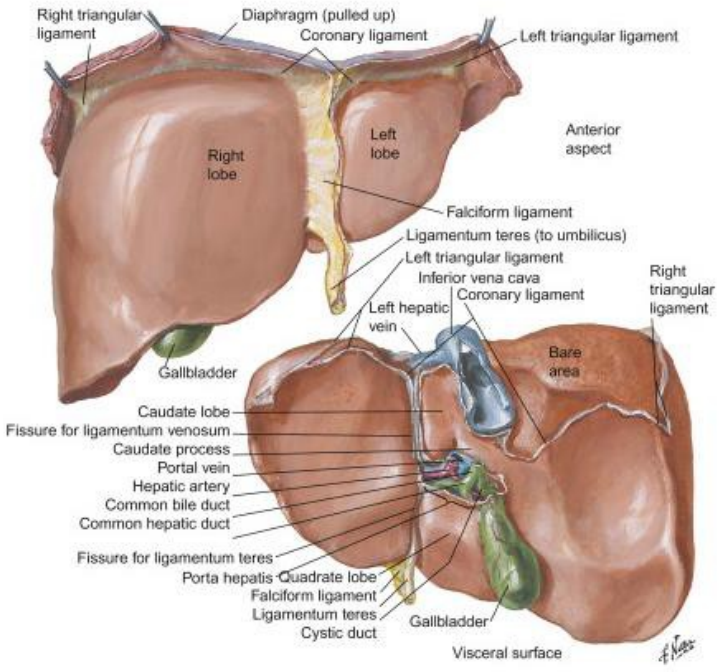


ABDOMINAL WALL GANGLIA & VISCEROSOMATIC REFLEXES

- Celiac ganglion:
  - Two large irregularly shaped masses of nerve tissue in the upper abdomen.
  - Sympathetic innervation to the lower esophageal sphincter stomach, upper small intestine, liver, and pancreas.
  - The greater splanchnic nerve, which arises from thoracic ganglia 5 through 9, synapses in the celiac ganglion.
  - The celiac ganglion is part of both the sympathetic and parasympathetic divisions of the autonomic nervous system. It receives parasympathetic input from the vagus nerve (CN X) and sympathetic input from the greater splanchnic nerve.

ABDOMINAL DIAPHRAGM – LIVER CONNECTION

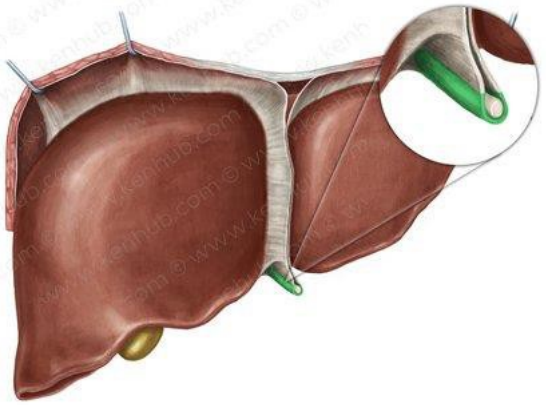
- The diaphragm is a domed, musculotendinous partition consisting of a continuous flat sheet of muscle surrounding a central tendon.
- It attaches to the posterior aspect of the xiphoid process, the internal surfaces of the inferior six costal cartilages, and the via the medial and lateral arcuate ligaments, the three most superior lumbar vertebrae
- The diaphragm contracts during inspiration, descending into the abdominal cavity, which results in an increase in intrathoracic volume and a decrease in intrathoracic pressure.
- The diaphragm and the liver are connected by several ligaments, which are double-layered folds of peritoneum. The coronary ligament, for instance, attaches the superior surface of the liver to the inferior surface of the diaphragm.

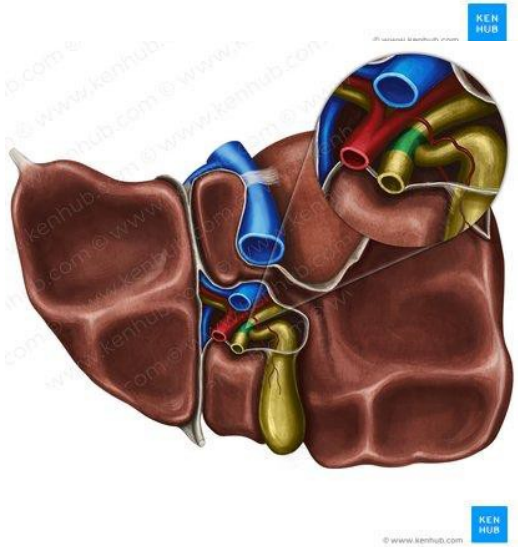


https://www.sciencedirect.com/topics/immunology-and-microbiology/liver-hilus

LIVER

- The liver has two main surfaces: the diaphragmatic and the visceral.
- The liver is divided into a larger right lobe and a smaller left lobe by the falciform ligament. However, from a surgical perspective, the liver is divided into right and left lobes of almost equal size by a major fissure.
- The liver is attached to surrounding structures by several ligaments formed by a double layer of peritoneum.
  - Falciform ligament, which attaches the anterior surface of the liver to the anterior abdominal wall.
  - Coronary ligament, which attaches the superior surface of the liver to the inferior surface of the diaphragm.
  - The round ligament of the liver, also known as the ligamentum teres hepatis, is a fibrous cord that is a remnant of the left umbilical vein from embryonic development. It connects the liver to the umbilicus and is found within the free margin of the falciform ligament.





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ENTERIC NERVOUS SYSTEM

- The enteric nervous system (ENS) is a semi-autonomous part of the nervous system that governs the function of the gastrointestinal tract.
- It is often referred to as the "second brain" due to its ability to operate independently of the brain and spinal cord, although it does receive innervation from the vagus nerve and prevertebral ganglia.
- The ENS is organized into two main ganglia: the myenteric (Auerbach's) plexus and the submucosal (Meissner's) plexus. The myenteric plexus is primarily involved in controlling gastrointestinal motility, while the submucosal plexus regulates intestinal secretion, blood flow, and absorption.
- The ENS includes efferent neurons, afferent neurons, and interneurons, making it capable of carrying reflexes and acting as an integrating center in the absence of central nervous system input.
- More than 90% of the body's serotonin and about 50% of the body's dopamine are found in the gut.
- The Liver does not have an ENS but does influence eating behavior via the “liver-brain axis”.

TOPIC THREE: TREATMENT OF LIFESTYLE FACTORS

Subtitle

OVERALL GOALS

- Lifestyle modifications play a crucial role in managing non-alcoholic fatty liver disease (NAFLD). Here are some key strategies:
- Weight Management: Gradual weight loss, about ½ – 2 pounds per week, is recommended. For people with NAFLD, losing about 10% of current body weight has been shown to reduce inflammation.
- Healthy Eating:A balanced diet is crucial.The Mediterranean diet, which is rich in fruits, vegetables, whole grains, and healthy fats, is often recommended for NAFLD patients.
- Reduced Alcohol Consumption: Limit to 1 drink per day
- Physical Activity: Regular exercise is beneficial for overall health and can help manage NAFLD. It can help with weight loss and improve liver function.
- Avoid Late Night Eating: Eating dinner within 2 hours of going to bed has been associated with NAFLD.
- Quit Smoking: Smoking has been significantly associated with NAFLD development.

WEIGHT MANAGEMENT: INTERMITTENT FASTING

- Intermittent fasting (IF) is a dietary strategy that involves alternating periods of abstention from calorie consumption with periods of unrestricted food intake. The physiological effects of intermittent fasting are multifaceted. (wang)
- Weight loss by reducing calorie intake and boosting metabolism
- Lower insulin levels
- Higher Hgh Levels
- Increased amounts of norepinephrine.

Atkins.com

WEIGHT MANAGEMENT: INTERMITTENT FASTING

- Studies suggest that IF is safe and efficacious for weight loss in patients with NAFLD, and it may improve liver function.
- Protocols can lead to more than 5% weight loss, reduced hepatic steatosis, and improved lipid profiles in patients with NAFLD, appearing superior to standard dietary and weight loss advice.
- Ramadan Fasting: The fasting during Ramadan, which involves complete fasting between dawn and dusk, has been associated with weight loss, reduced insulin resistance, and improved liver biochemistry specifically in patients with NAFLD.
- Cardioprotective and Immunomodulatory Effects: IF may also have weight-independent benefits through the cardioprotective and immunomodulatory effects of circulating mediators such as ketone bodies and polyunsaturated fatty acids, which increase with fasting
- Improvements in Liver Function: Fasting may lead to improvements in liver function, potentially indicating a reduction in liver fat.
- Prolonged fasting can cause significant hormonal changes, including increased concentrations of norepinephrine, epinephrine, dopamine, and cortisol in urine and serum

HEART HEALTH = LIVER HEALTH: THE MEDITERRANEAN DIET

- The Mediterranean diet has been shown to improve heart disease. Research indicates that adhering to a Mediterranean-style diet can reduce the risk of heart attacks and other cardiovascular events.
- The Mediterranean diet is abundant in minimally processed plant-based foods, rich in monounsaturated fat from olive oil, but lower in saturated fat, meats, and dairy products.
- The diet consists of daily consumption of vegetables, fruits, whole grains, and healthy fats, weekly intake of FISH, poultry, beans, and eggs, moderate portions of dairy products, and limited intake of red meat. It also includes the use of Olive Oil as the primary source of added fat, and fish rich in omega-3 fatty acids.
- In addition to the heart benefits, the Mediterranean diet has been shown to reduce the risk of other chronic diseases such as cancer, diabetes, dementia, and obesity.

https://www.themediterraneandish.com/what-to-eat-on-the-mediterranean-diet/

EXERCISE RECOMMENDATIONS

- All adults should achieve 30-60 minutes of exercise on most days of the week.
- Losing 3% to 5% of body weight can have benefits but losing 10% or more is typically recommended.
- In select individuals, High-Intensity Interval Training (HIIT) is known for burning significant calories and fat. It also increases a person's resting metabolic rate.
- HIIT has been shown to decrease the risk for cardiovascular diseases and can even reverse some symptoms of stable coronary artery disease
- Blood Sugar Regulation: HIIT can improve insulin sensitivity, allowing glucose to enter the cells more efficiently. This can help lower blood sugar levels and reduce the risk of insulin resistance, a key factor in type 2 diabetes and NAFLD.

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TOPIC FOUR: HOW TREATMENT OF SOMATIC DYSFUNCTION MAY ALTER THE PATHOPHYSIOLOGY OF NAFLD

Subtitle

SOMATIC DYSFUNCTION

- Somatic dysfunction is impaired functioning of the somatic (body framework) system, which can include the musculoskeletal, nervous, visceral, and lymphatic systems, and is characterized by positional asymmetry, restricted range of motion, tissue texture abnormalities, and/or tenderness.
- The diagnosis of somatic dysfunction is based on the diagnostic acronym TART.
- T= Tissue Texture Change
- A= Positional Asymmetry
- R: Restriction of motion
- T:Tenderness
- Somatic dysfunction and especially viscerosomatic reflexes are palpatory evidence of disturbed physiologic function.
- Somatic dysfunction can create facilitated / sensitized regions of the related spinal cord, and abnormal autonomic function to the supplied viscera. (somatovisceral reflexes)
- Organs with distention, inflammation, or disease can create facilitated / sensitized regions of the related spinal cord, and abnormal nerve function to the related Dermatomal, Myotomal, or Sclerotomal somatic structures.

GOALS OF OMT FOR NAFLD PATIENTS

- Osteopathic Manipulative Treatment (OMT): the therapeutic application of manually guided forces by an osteopathic physician to improve physiologic function and homeostasis that have been altered by somatic dysfunction.
- OMT isn't only used for *Low Back Pain*!!
- OMT can potentially help to:
  1. Improve function and remove irritation to the vagus nerve.
  2. Reduce sympathetic reflex mechanisms caused by vertebral and rib cage somatic dysfunction.
  3. Improve balance of sympathetic and parasympathetic nervous systems.
  4. Remove fascial adhesions between the liver and the diaphragm and the abdominal wall.
  5. Improve passive congestion of the liver and remove myofascial adhesions.
  6. *Improve lymphatic drainage of the abdominal organs by increasing negative intrathoracic pressure,* ➔ *Mobilizes lymph!*

CERVICAL REGION:

IMPROVE FUNCTION AND REMOVE IRRITATION TO THE VAGUS NERVE

- The cervical region does contain the superior, middle and inferior ganglia that are sympathetic, however outflow is still from T1-4 for the head and neck. They may be influenced by osteopathic treatment of local SD.
- Irritability of the vagus nerve has long been postulated due to upper cervical somatic dysfunction.
- The entire sub-occipital region C0-C2 has palpable TART changes in patients with vagal mediated conditions and treat of associated SD in this area seems to be of benefit.
- The phrenic nerve may be influenced by somatic dysfunction between C3-5, and it is thought that diaphragmatic function could be enhanced by treatment in this region.

CERVICAL REGION

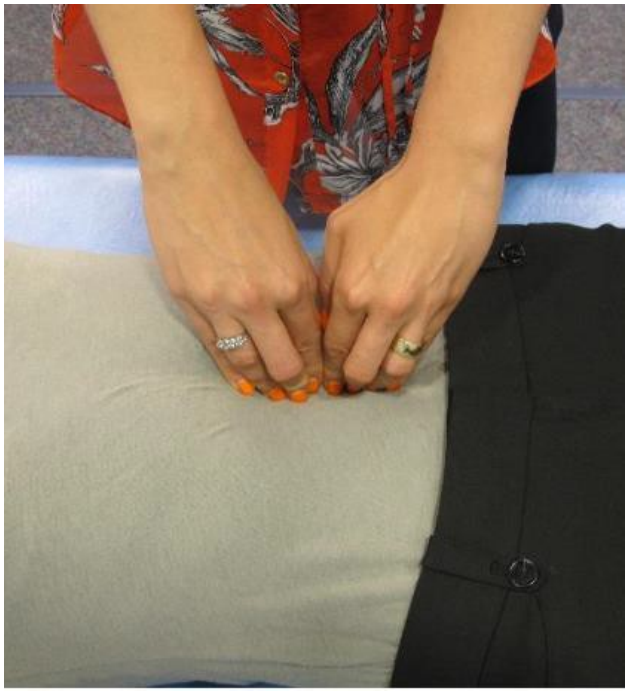
IMPROVE FUNCTION AND REMOVE IRRITATION TO THE VAGUS NERVE

- Somatic dysfunction, particularly in the upper cervical spine, can alter vagal tone. This is because the vagus nerve is closely linked with the spine and upper neck, and any alteration in the position or movement of the spine can interrupt the information flow to and from the vagus nerve.
- Research has shown that upper cervical manipulative treatments can directly influence vagal nerve function, improving heart rate variability (HRV) and overall nervous system function.
- A study has shown that occipitoatlantal decompression, a treatment often used for somatic dysfunction, can slow conduction velocity through the atrioventricular node in healthy participants, suggesting a potential impact on vagal tone.

ABDOMINAL REGION

IMPROVE BALANCE OF SYMPATHETIC AND PARASYMPATHETIC NERVOUS SYSTEMS

- Treatment of the abdominal region is important to remove fascial restrictions and any obstruction to the vagus nerve, splanchnic nerves, and the celiac ganglia.
- Patients with GI conditions have palpable tension and tenderness in the circular regions of the anterior abdominal wall.
- These palpatory findings are correlated with underlying GI disturbances.
- Direct inhibition of the tissues with a progressive approach over time helps to resolve these.



THORACIC REGION, DIAPHRAGM, AND RIBS

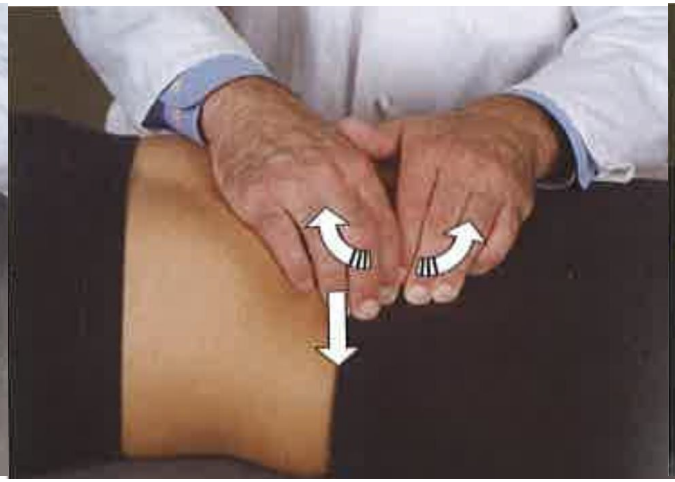
IMPROVE LYMPHATIC DRAINAGE OF THE ABDOMINAL ORGANS

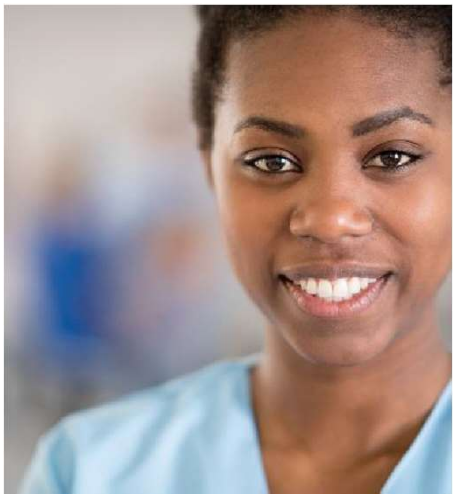
- A goal of "doming the diaphragm" treatment is to improve the "2-chambered pump" between the abdomen and the chest, to facilitate lymphatic drainage of the viscera and move lymph to the central circulation.
- These tissues are tense and tender in patients who have difficulty with abdominal breathing and those with GERD, hiatal hernias and in high stress conditions.
- Treatment of the Thoracic inlet, Rib cage, Abdominal diaphragm, Thoracolumbar junction and Iliopsoas are all important to open pathways and optimize lymphatic circulation.

LYMPHATICS

IMPROVE LYMPHATIC DRAINAGE OF THE ABDOMINAL ORGANS

- Treatment of the lymphatics involves "opening the drain“ and removing barriers to lymphatic flow. This will optimize the pumps' function.
- Stimulation of the enteric nervous system and mobilizing lymphatic fluids.
- Applying pump techniques to return lymph to the central circulation






SUMMARY

- NAFLD is a commonly seen in patients with metabolic syndrome and if treatment is delayed, can progress to inflammation, fibrosus and permanent cirrhosis.
- The management of NAFLD primarily focuses on weight loss through a healthy diet, portion control, and exercise. Losing 3% to 5% of body weight can have benefits but losing 10% or more is typically recommended.
- Osteopathic physicians can play a key role in helping patients reverse the process by uniquely addressing the pathophysiology through applying the principles of structure and function.

THANK YOU!!

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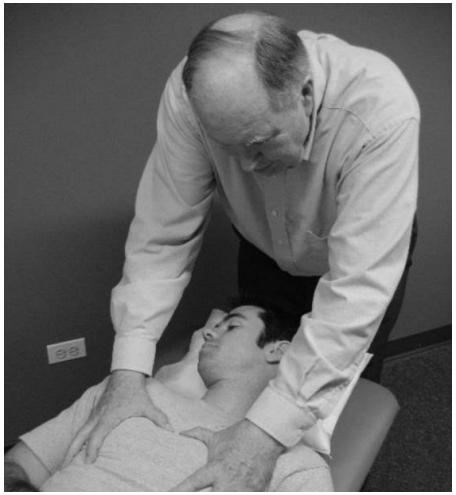
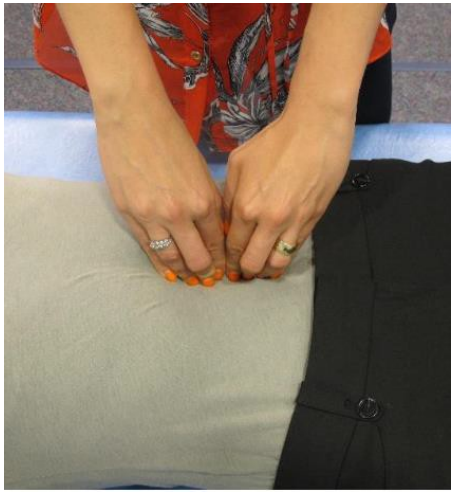
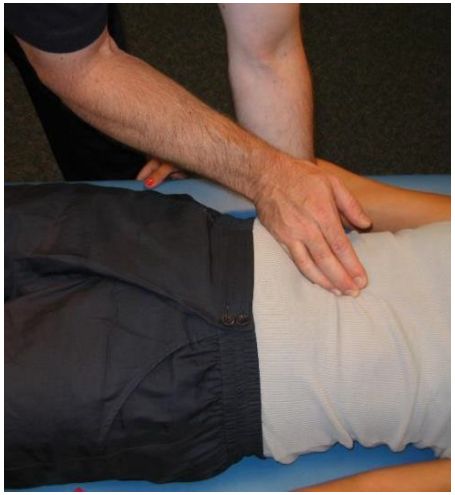




TREATMENT OF SOMATIC DYSFUNCTION: WORKSHOP

SUBOCCIPITAL RELEASE :VAGUS/ PARASYMPATHETIC

Improve parasympathetic function and remove irritation to the vagus nerve

- Place fingertips under patient's occiput at inferior nuchal line
- Let patient's head & neck fall over your extended fingers
- Apply slight anterior/superior stretch

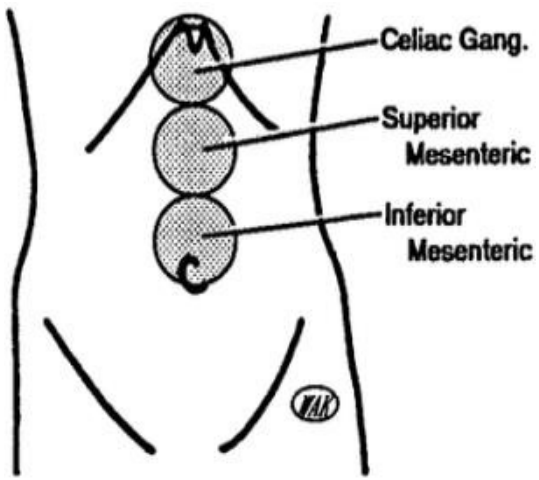
THORACIC/LUMBAR WALK-AROUND: MUSCLE ENERGY/ ART

REDUCE SYMPATHETIC REFLEX MECHANISMS CAUSED BY VERTEBRAL AND RIB CAGE SOMATIC DYSFUNCTION.

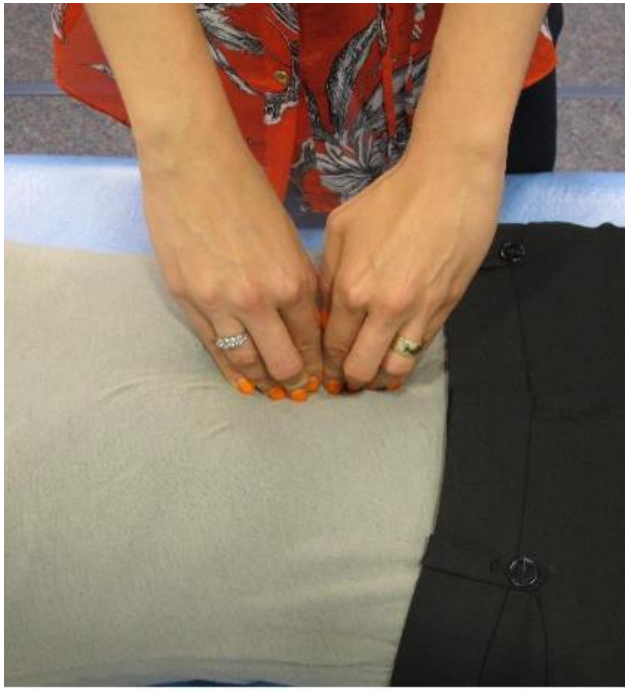
- Patient sits at end of table
- Place thenar eminence on posterior component (rotated segment)
- Flex/extend to specific level of dysfunction
- Rotate & Sidebend patient direct (into barrier)
- Have patient turn against you for 5 sec, then relax
- Maintain barrier and walk around the patient to engage further barrier
- Repeat 3-5 times

COLLATERAL GANGLION TECHNIQUE

Improve balance of sympathetic and parasympathetic nervous systems through inhibitory pressure of the collateral ganglia.



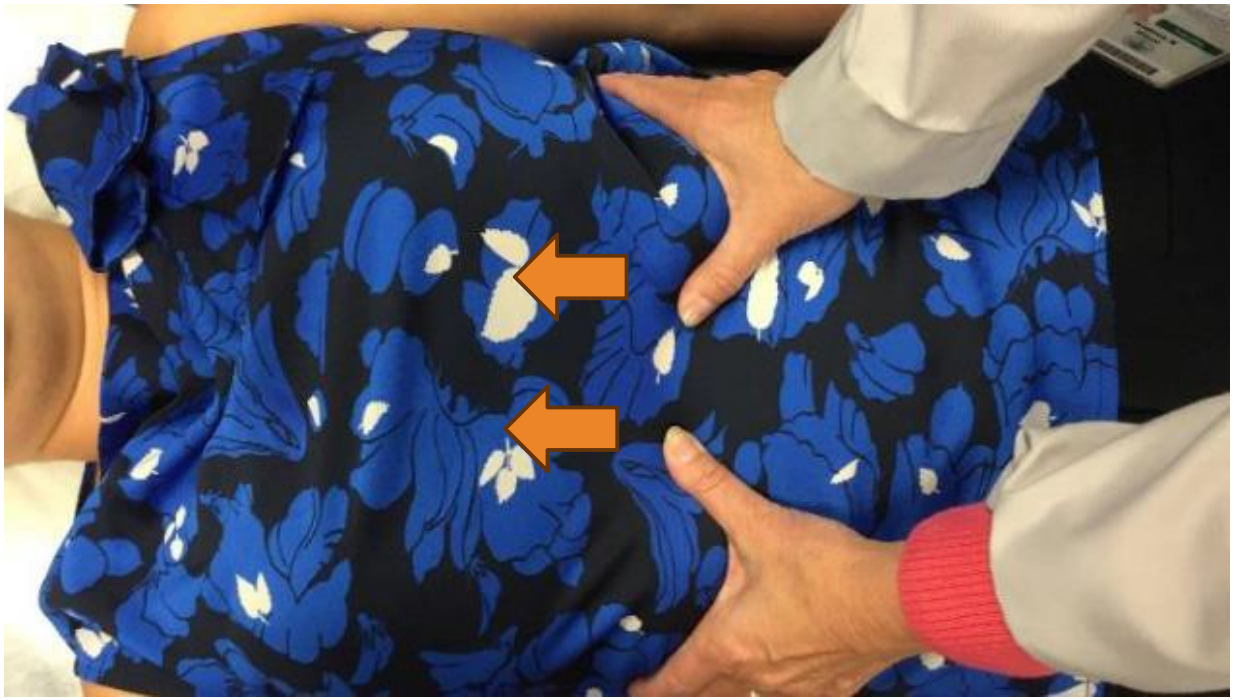
Location of Collateral Sympathetic Ganglia



- Place fingers along midline between umbilicus & xiphoid
- Extend fingers
- Assess for inhibition of individual ganglia
- Apply downward inhibitory pressure

DOMING THE DIAPHRAGM – PT SUPINE

Removes fascial adhesions between the liver and the diaphragm and the abdominal wall.



- Place thumbs/thenar eminence inferior to patient's lower costal margins
- Have patient take deep breaths; on exhalation, follow the diaphragm with your thumbs moving posterior and cephalad
- Maintain the pressure on the abdomen during inhalation, continue to follow diaphragm motion in exhalation

LYMPHATIC DRAINAGE OF LIVER – PATIENT SUPINE

Improve lymphatic drainage and congestion of the liver.

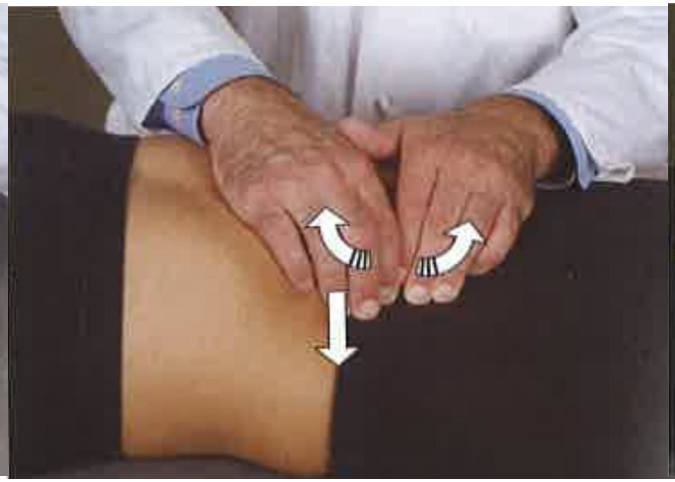
- L hand under lower ribs, R hand just inferior to costal margin
- Identify inferior portion of liver with R hand
- As patient exhales, induce **vibratory motion** with R hand on liver edge
- Repeat 3-4x, engaging further under costal margin each time

MESENTERIC LIFT

Improve passive congestion of the liver, and GI tract, remove myofascial adhesions, improving circulation. May affect the enteric nervous system.

Small Intestine

Ascending colon

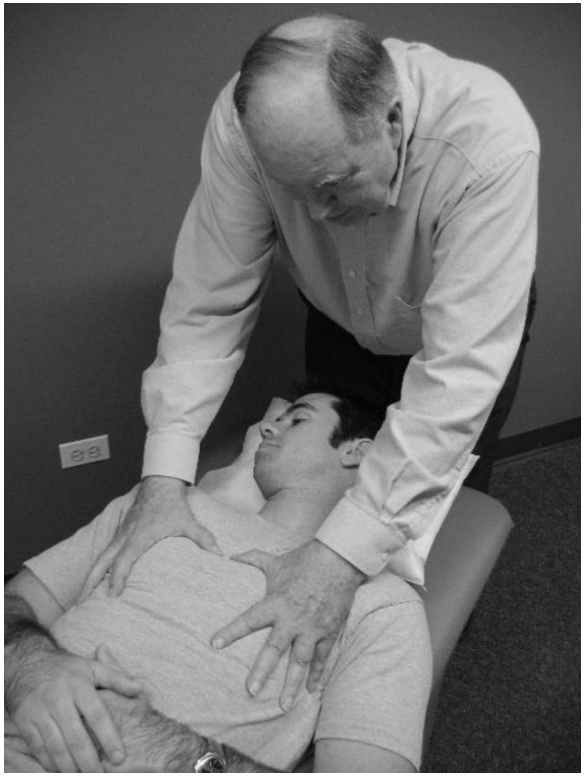


Descending Colon

LYMPHATIC PUMP TECHNIQUE OF MILLER

IMPROVE LYMPHATIC DRAINAGE OF THE ABDOMINAL ORGANS BY INCREASING NEGATIVE INTRATHORACIC PRESSURE ➔MOBILIZES LYMPH

- Place hands on patient's thoracic wall
- Have patient inhale and exhale with head turned to one side and mouth open
- Apply compression force, following exhalation & resisting inhalation
- Maintain compression force at end of exhalation; continue to resist inhalation
- One-third of the way through 4th or 5th inhalation, briskly remove hands, releasing pressure from chest



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