Osteopathic Manipulative Approach to the Sympathetic Nervous System

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There are two sympathetic chains in the human body, one on each side of the spine.

- Where is top of the sympathetic chain?
  - Anatomically, where does the superior portion end?

- Where is the bottom of the sympathetic chain?
  - Anatomically, where does it end and what is the name of the structure at the end?
The top of the sympathetic chain is the Superior Cervical Ganglion which lies at C2-3

The bottom of both chains is on the anterior coccyx, where they combine in a structure named...

Ward ed. Foundations for Osteopathic Medicine
The Ganglion Impar

Ward ed. *Foundations for Osteopathic Medicine*

Sobotta *Human Anatomy*
If the chain extends from C2 to the coccyx, why are viscero-somatic reflexes only observed T1-L2?
• The sympathetic pre-ganglionic neurons that feed into the sympathetic chain ganglia, have their cell bodies in the spinal cord at the levels T1 - L2.

• Any osteopathic treatment that corrects spinal dysfunctions (e.g. HVLA, counterstrain, etc.) will positively affect the sympathetic nervous system by reducing the segmental increased sympathetic tone (the facilitated segment).
Influence of touch on SNS

• Sympathetic nerve activity can only be measured directly through difficult and invasive techniques

• SNS activity is usually measured indirectly by measuring the physiologic responses that result
  – Heart rate
  – Pulse waves
  – Sweat gland activity
  – Galvanic skin response
  – Thermography
Sympathetic response to touch

General sympathetic activity is easily monitored by cardiovascular indices:

- When dogs are touched, they routinely show decreases in heart rate and blood pressure
- In extreme cases the pulse has been seen to drop from 180 bpm to 29 bpm
- Systolic BP has been seen to drop 50%
- Similar responses have been seen in horses
• The same sympathetic response is seen in humans.

• In intensive care unit, when a nurse held the hand and comforted trauma patients, heart rate was seen to drop by as much as 30 bpm.

• This happened even in patients who were unconscious or comatose and had multiple injuries.

• This indicates that the human brain is quite sensitive to touch, and responds physiologically.

Measuring SNS Activity

• Pulse plethysmography (recorded from the finger) can indicate the relative activity of the SNS

• As SNS activity decreases, Y height, and X/Y height increases

Measuring SNS Activity

• This study looked at sympathetic response to touch and gentle suboccipital manipulation

• Baseline Plethysmography reading
With simple touch (placebo manipulation), we see a significant reduction of SNS activity, evidenced by increases in increased pulse height and X/Y ratio.
Measuring SNS Activity

With manipulation, (gentle suboccipital traction), we see a marked decrease in SNS activity (increased X/Y ratio).
Measuring SNS Activity

- In subjects who rated the manipulation as neutral or comfortable, this SNS reduction was most pronounced.

- In subjects that rated the manipulation as *uncomfortable*, the decrease in SNS activity was significantly less.

- So, in these SNS manipulations, the goal is to influence the physiology, but if the manipulation is uncomfortable, or causes pain, the effects are largely negated.
Measuring SNS Activity

- The cranial technique of occipital compression (CV-4) was also shown to lower SNS activity.

- In this study, Muscle Sympathetic Nervous System (MSNA) activity was monitored using standard micro-neurographic technique.

- During occipital compression, after a 'stillpoint' was reached, there was a significant change in MSNA activity.

- Therefore, the cranial technique of occipital compression (CV-4) influences SNS activity.

In a recent study using heart rate variability, it was conclusively demonstrated that **cervical myofascial release** shifts sympathovagal balance from the **sympathetic** to **parasympathetic** nervous system.

The autonomic nervous system shows an oscillation of activity.

For example, this is seen in:

- Hippus in the iris of the eye (sympathetic)
- R-R wave variability of the heart (vagal-parasympathetic)
- Traube-Hering-Mayer Waves - in peripheral arterioles (sympathetic)
• As peripheral arterioles vaso-dilate and vaso-constrict, there is a swelling and receding of the tissues.

• This is due to the smooth muscle of the arterioles, under sympathetic control; named Traube-Hering-Mayer (THM waves)

• This was first observed around the late 1800’s.

• The previous study tracing showed the THM phenomena:

Secondary (THM) wave
• THM waves typically occur at a rate of 10-12 waves/minute

• This is the same rate as described by persons palpating the cranial rhythm

• It has been theorized that the cranial rhythm is actually THM waves.

• This was confirmed by Dr. Nelson, et al, from Chicago:

Measuring SNS Activity

• A laser flowmetry unit was used to measure relative blood flow velocity that changed as peripheral arterioles dilate and constrict.

• An osteopath palpated the cranial rhythm and called out the beginning of every phase, this was marked with an event marker.
In several subjects, the phases of the cranial rhythm matched the THM waves perfectly.
• This study showed that the cranial rhythm is actually correlated with a measurable physiologic phenomenon.

• But not all subjects showed a clear THM wave rhythm. Some just showed a chaotic rhythm.
However, some subjects without a clear THM rhythm received gentle suboccipital and cranial treatment. Some of these subjects had a return of a strong THM wave rhythm after the treatment.

Because the THM wave is predominately due to SNS activity, we see that SNS activity can be monitored through palpation, and affected through manipulation.
A few words about this lab

• These techniques involve a lot of holding and palpating, while waiting for subtle physiologic changes to occur.

• In other words, this is a quiet, somewhat boring lab unless you pay close attention to the breathing, tissue response, and palpatory experience

• These techniques are usually not treatments by themselves alone, but are usually added onto an osteopathic treatment session.
Technique 1: Balancing The Sympathetics

• This technique historically was called inhibition of the osteopathic centers.

• It involves gentle pressure on strategic positions along the sympathetic chain ganglia:
  – C2 & Coccyx - the top and bottom of sympathetic chain
  – T4 & L4 - where the majority of sympathetic fibers exit to supply the upper & lower extremities
  – T9 - More sympathetic fibers leave T9 than any other level, this innervates the celiac ganglion (the solar plexus)
C2-3 - Superior cervical ganglion

T4 - upper extremity

T9 - Celiac Plexus

L4 - Lower extremity

Coccyx - Ganglion Impar
1: Balancing the sympathetics

• One operator can apply steady pressure to the top and bottom of the sympathetic chain

• Hold for 2-3 minutes

• Watch the patient’s respiration. Often one will observe a change in the pattern, resulting in a better, more coordinated respiration.

Perform Supine for the Hospitalized Patient
1: Balancing the sympathetics

- Any two or three centers may be contacted, but always alternate sides, right to left or left to right.

- Always hold for 3-5 minutes and observe the respiration.
1: Balancing the sympathetics

- If 3 or more centers are chosen, alternate left and right sides as illustrated.

- Always hold and observe.

- In addition to observing respiration, feel for minute changes, pulsing, changes in muscle tone under your fingers.
1: Balancing the sympathetics

- Two persons can cover all five centers
- Always alternate left and right sides as shown.
- Observe, observe, observe
- The patient usually finds this quite relaxing
- This is especially useful in distraught, hysterical, or mentally disturbed patients
2: Treating Mesenteric Ganglia

- Divide the distance between the xyphoid and umbilicus into three regions.

- These regions represent the three ganglia, as shown.

- Palpate each region and compare tissue texture, stiffness.

- Choose the one region with the most tissue changes.

Kuchera, Kuchera. Osteopathic considerations in systemic dysfunction.
2: Treating Mesenteric Ganglia

- Place your fingertips along the midline
- Gently let your fingers sink in as you test motion clockwise & counter clockwise
- Follow in the direction of ease until a softening, or release occurs
- Recheck

May have the patient bend hips and knees to soften abdomen
3: Suboccipital release

- With patient supine, balance subocciput on finger pads
- Instead of pressure, or traction, just allow patient’s neck to relax over finger pads
- Try to make the treatment as comfortable as possible for the patient - get the patient’s feedback on comfort level
- Maintain this hold silently for several minutes and pay attention to tissue changes.
4: Occipital compression

- Patient supine, place patient’s occiput on thenar eminences - with hand over hand, fingers crossed

- The action is a gentle squeeze of the fingers against each other to influence thenar eminence pressure.

4: Occipital compression

- If you detect a rhythm, you can accentuate the rhythm, or resist the expansion phase of the rhythm, otherwise, compress at a slow 10 cycle/minute rate.

- If you detect a rhythm, continue compression until you reach a still-point (ceasing of the rhythm), and hold until the rhythm returns.
finis

(you can wake-up your partner now)