

The Cranial Letter

THE OSTEOPATHIC CRANIAL ACADEMY, INC.

A Component Society of the American Academy of Osteopathy



Quarter 2 | 2026



OCA2026 Annual Conference

Indianapolis, IN
June 4-7, 2026

Development of the Cranium and Face:
Newborn to Adulthood

Dr. Tasha Turzo, DO, FCA
Conference Director

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The Cranial Letter

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Jan. 15, Apr. 15, Jul. 15, Oct. 15

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Quarter 2 2026

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Mission

To teach, advocate and advance osteopathy, including osteopathy in the cranial field, as envisioned by Andrew Taylor Still, MD, and William Garner Sutherland, DO.

Vision

To promote mastery in the practice of osteopathy in the cranial field
To support a vibrant professional environment so that osteopathy can flourish
To establish osteopathy, including osteopathy in the cranial field, as a recognized cornerstone of complete patient care

President's Message



Julie Mai, DO

Dear OCA Members,

I hope this message finds you enjoying the warmer days of spring. 2026 is moving quickly, and we are already approaching summer with nearly half the year behind us. May all the projects and endeavors you are pursuing this year thrive, and may you continue to grow through your experiences.

The OCA's partnership with Oak Ridge Association Management Company continues to go strong. Our Executive Director, Amanda Bureau, CAE, CVA, MEd, stepped into her role seamlessly and has already implemented meaningful process improvements for the office, faculty, and membership. Many of you have connected with her by phone or email and experienced her prompt and helpful responses. We are truly grateful to Amanda and the entire Oak Ridge AMC team for their unwavering support as we smoothly navigate through this transition period.

Early bird registration for our 2026 Annual Conference, "Development of Cranium and Face: Newborn to Adulthood," directed by Tasha Turzo, DO, FCA, ends soon on May 6. Please register before rates increase, and take advantage of our discounted hotel rates, listed on our CME webpage. Dr. Turzo has assembled an outstanding lineup of speakers, and her promotional video on the OCA CME page is well worth watching. We hope to see you June 4–7 in vibrant downtown Indianapolis!

OCAF has generously provided a limited number of tuition assistance grants for students, interns/residents, and early-career physicians for the Annual Conference (first-come, first-served). Please apply via the CME page if you are interested.

Our March Pre-Convocation 40-hour Introductory Cranial Course at The Broadmoor in Colorado Springs was successfully completed with Amanda and Oak Ridge AMC in-person support. Many Convocation attendees visited the OCA's booth with membership renewal requests from past members, students expressing interest in future OCA Hybrid Intro courses, or just to say hello to our welcoming Executive Director.

Looking ahead, our intermediate course, "The Cranial Base," directed by Jose Camacho, DO, is scheduled for September 25–27 in Portland, Oregon. This hands-on program will sharpen your palpatory skills and precision in addressing restrictions across the cranium, cervical, and sacral regions. With a 1:4 faculty-to-participant ratio, you will receive personalized, in-depth guidance from our excellent faculty.

2026 is shaping up to be a very active year. The OCA has nearly completed the 2025 Financial Review and remains on track to file the 990 nonprofit tax return by the May 15 deadline without an extension. I am excited to see what the rest of the year brings and am grateful to share this journey with all of you.

Serving in Gratitude,

Julie Mai DO
OCA President

Pre-Convo Hybrid Intro Course Highlights

The hybrid version of OCA's 40-hour Introduction to Osteopathy in the Cranial Field evolved out of necessity during the challenges of the COVID pandemic and has continued as a valued program format. This format combines virtual instruction, both synchronous and asynchronous, with 3-day in-person teaching. The recorded lecture modules allow participants to learn at their own pace, supplemented with weekly faculty-led discussion sessions. The OCA appreciates Dr. Annette Hulse and Dr. Richard Smith for being instrumental in creating this mode of learning for our profession.

OCA completed another successful hybrid 40-hour Introductory course prior to the AAO Convocation in Colorado Springs this past March. Forty participants, consisting of medical students, residents, and physicians, took part. Two-thirds of the participants were recipients of either 50 percent or 100 percent Tuition Assistance, with much gratitude to the OCA Foundation for their generosity. Our OCA members served as faculty, table trainers, and discussion group leaders as they guided the next generation with extensive knowledge, honed skills, and deep passion.

Many thanks to Dr. Annette Hulse as the Course Director, for her abundant dedication in helping make the Pre Convocation Hybrid Intro Course a success.



Pre-Convo Hybrid Intro Course Highlights



Pre-Convo Hybrid Intro Course Highlights





OCA2026

Development of the Cranium and Face: Newborn to Adulthood

Conference Director: Tasha Turzo, DO, FCA
Assistant Conference Director: Josh Krembs, DO

The 2026 OCA Annual Conference will explore the anatomical structures and functional systems that shape the human face across the lifespan. We will examine how these functions influence dental occlusion, cranial motion, and overall craniofacial harmony. Attendees will also review the embryologic forces that drive growth and development from newborn through adulthood, gaining a deeper understanding of the dynamic changes that occur throughout each phase of life.

A focused study of intraoral function, dental occlusion, and their interdependent relationships with cranial motion will further enrich the learning experience. Hands-on labs will offer practical, clinically relevant skills to support effective evaluation and treatment of craniofacial dysfunctions.

To learn more about the conference and to register, go to: <https://cranialacademy.org/events/cme/>, or the QR code to register for the Conference.

Register today!



OCA Foundation Tuition Assistance

The Osteopathic Cranial Academy Foundation (OCAF) generously offered a grant for Tuition Assistance for the 2026 OCA Annual Conference. OCA is deeply appreciative of the contributions of OCAF.

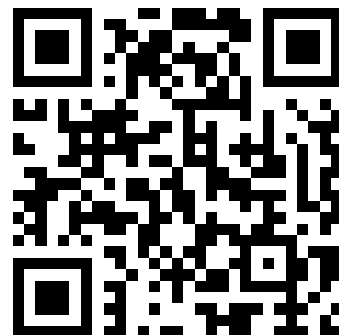
Thanks to OCAF's support, a limited number of eligible Annual Conference registrants can receive \$399 in Tuition Assistance.

Tuition Assistance will be granted on a first-come, first-served basis. Membership in OCA is not required, but priority will be given to current OCA members. A limited number of Tuition Assistance is available. Assistance is available for individuals who are:

1. Students
2. Residents
3. Early-career physicians



Apply for Assistance



Meet the Faculty



Tasha Turzo DO FCA
Conference Director



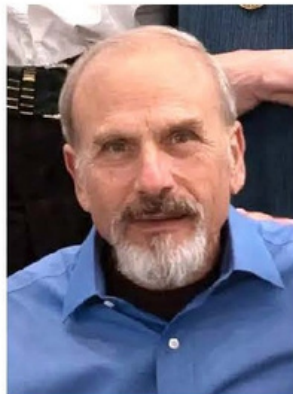
Joshua Krembs DO
Conference Assistant Director



Paul Dart MD FCA
2026 Sutherland Memorial Lecturer



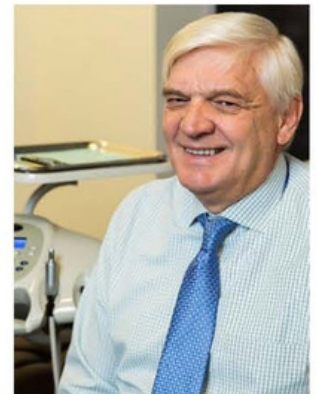
Allison Adams DMD



Elliot Blackman DO FCA



Alex Bronson DMD



James Bronson DDS



Stefan Hagopian DO FAAO



Traci Jones DO



Stephen Kiesel DO



Julie Mai DO

CME Schedule

The Annual Conference features a dynamic line-up of lectures, small group discussions, and hands-on labs. Attendees may earn up to 21.5 AOA Category 1-A credits.

Find the complete schedule, including meals and networking functions, at <https://cranialacademy.org/events/cme/>



Thursday, June 4th

3:15 PM	P	Opening: Gravity, Breath, and Sensation	Krembs, DO
3:30 PM	L	Welcome-Intro to/Overview of Conference	Mai, DO/Turzo, DO
4:00 PM	L	The Fabulous Face	Turzo, DO
5:00 PM	S	Small Group Discussion	Faculty
5:15 PM	L	The Dental Osteopathic Approach	Adams, DMD

Friday, June 5th

9:00 AM	L	Embryology of the Face	Kisiel, DO
9:30 AM	P	Biodynamic Treatment of the Infant's Face	Kisiel, DO
10:00 AM	L	Occipital Condylar Compression & Crowded Teeth Syndrome	Jones, DO
10:30 AM	S	Small Group Discussion	Faculty
10:45 AM	L	Facial Growth: 0-3 year old, Parts 1 & 2	Jones, DO
11:45 AM	P	Assessing Facial Functions	Jones, DO
1:45 PM	L	Cranial Motion and the Dental Occlusion	Turzo, DO
2:15 PM	P	Cranial Assessment of the Dental Occlusion	Turzo, DO
3:15 PM	S	Small Group Discussion	Faculty
3:30 PM	L	Cranio-Facial Vasculature and Flow Parts 1 & 2	Krembs, DO
4:30 PM	P	Assessing Blood Flow and Vascular Tone	Krembs, DO

Saturday, June 6th

9:00 AM	L	The Mandible	Blackman, DO
9:30 AM	P	Lab: Treating the Mandible	Blackman, DO
10:00 AM	S	Small Group Discussion	Faculty
10:15 AM	L	Joints of the Head: SBS and TMJ	Turzo, DO
11:00 AM	P	Dental/Osteopathic Evaluation; TMD Assessment	Turzo, DO
1:15 AM	L	TMD and Chronic Illnesses	Turzo, DO
2:00 PM	L	Sutherland Memorial Lecture	Dart, MD
3:00 PM	P	Sutherland Memorial Lecture Lab	Dart, MD
3:45 PM	S	Small Group Discussion	Faculty
4:00 PM	L	Treating the Cranial Base After Head Injury	Hagopian, DO
4:45 PM	P	Lab: Treating the Cranial Base After Head Injury	Hagopian, DO

Sunday, June 7th

9:00 AM	L	The Dynamics of an ALF Approach Part 1	A. Bronson, DDS
9:30 AM	L	The Dynamics of an ALF Approach Part 2	A. Bronson, DDS
10:00 AM	L	Osteopathic Assessment of Dental Appliances	Turzo, DO
10:30 AM	S	Small Group Discussion	Faculty
10:45 AM	L	Introduction to 2027 Conference	Foley, DO
11:00 AM	L	Sleep Anatomy	Mai, DO
11:30 AM	L	The Power and Potency of Photobiomodulation Part 1	J. Bronson, DDS
12:00 PM	L	The Power and Potency of Photobiomodulation Part 2	J. Bronson, DDS
12:30 PM	L	Panel Discussion	Faculty

L = Lecture P = Practical Lab S = Small Group Discussion

Find the complete schedule at <https://cranialacademy.org/events/cme/>

The ALF Approach

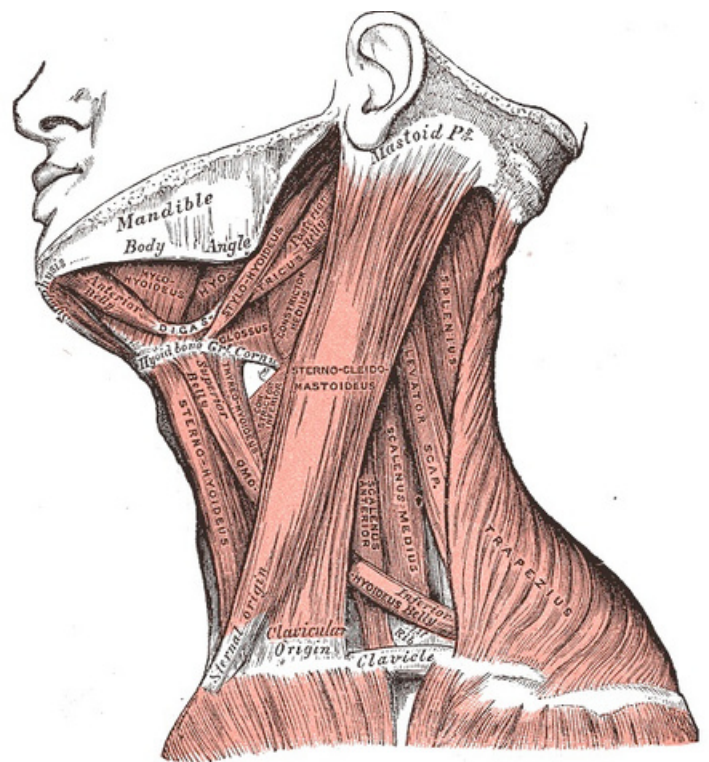
Excerpted by kind permission of Tasha Turzo, D.O., from Turzo, 2023, The ALF Approach, pp.216-217
<https://www.drashaturzo.com/book>

"It's interesting to note that a continuous over-contraction of the SCM, which attaches to the temporal bone, will position the temporal bone in a more internally rotated position, with the mastoid process more anterior and inferior, placing the glenoid fossa in a more lateral plane than the other temporal fossa. In order to maintain a balance to the vestibular and postural neuromuscular integrated system, the muscles of the mandible and cervical balancing system will have to compensate for the over-contracted SCM in order to maintain an upright posture stance. The overactive SCM can also compromise the motion of the temporal bone. This affects not only optimal glymphatic brain drain but also potentially compression of the other vital cranial nerves vessels entering and exiting the skull within the jugular foramen, which contains the vagus, glossopharyngeal, and accessory nerves...."

"An interesting clinical finding reported by Stanley Rosenberg, PhD, is that tension in the right sternocleidomastoid (SCM) muscle is associated with a deformation of the cranium described as a "flat back of the head." This change in shape of the cranium is called plagiocephaly, which is a flattening in any part of the infants skull created by prolonged pressure. This asymmetrical pressure could have been experienced in utero during growth, during the birthing process, or prolonged time on the baby's back misshaping the occiput (back of the baby's skull). Dr. Rosenberg found that in every client diagnosed with ADHD, or a diagnosis on the autism spectrum, the right SCM was tight and was associated with a flat occiput on the same side.

Research published in the Journal of Pediatrics reported that the plagiocephaly expressed as flattening at the back of the skull was present in a higher percentage of the children with autism and ADHD compared to normally functioning children."

"Another potential consequence of torticollis and overactivation of the SCM muscle is compression on the deep cervical lymph nodes, which are a chain of lymphatic tissue lying just beneath the SCM muscle. The majority of the lymphatics from the brain drain into these cervical lymph nodes,...."



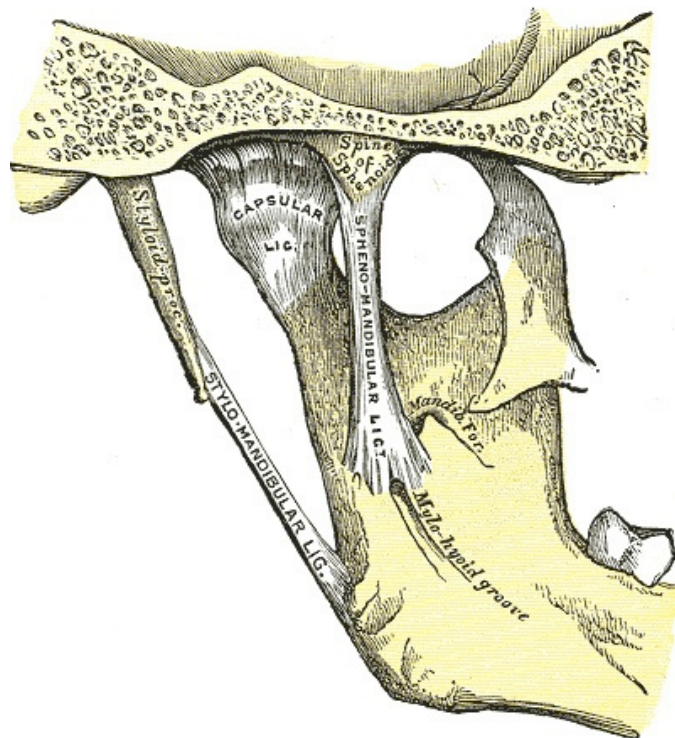
Sutherland: The Cranial Bowl

Excerpted from William Garner Sutherland, D.O., *The Cranial Bowl*, Cranial Academy, 1939, p. 100
<https://members.cranialacademy.org/Sys/Store/Products/347916>

"I contend that articular fixations of the sphenoid and temporal bones cause malalignments of the glenoid fossae; with consequent abnormal movement of the mandible of the inferior maxillary, like that of a wobbling wheel of a car due to malalignment of an axle. The phenomenon of overbiting is cited as an example.

"The fixations occurring in the articulations of the sphenoid and temporal bones, as I find frequently in cranial practice, causes a stretching of the membrane embedding the Gasserian ganglion [Trigeminal ganglion]; thus giving rise to nerve impulses that affect the branches of the fifth nerve, resulting in tie douloureux.

"I would add: Dr. Still's effective mandibular technic, through traction upon the sphenomandibular and temporomandibular ligaments, reduces the articular fixations of the sphenoid and temporal bones."



A.T. Still, Osteopathy: Research & Practice

Excerpted from Osteopathy: Research & Practice, 1910, v2. edition: Chapter: Neuralgia; paragraphs 336-337
<https://books.google.com/books?id=DjeRry9YnAgC>

Editor's Note: The mandible/TMJ/facial neuralgia technique of Dr. Still is cited in Dr. Sutherland's (The Cranial Bowl, 1939, p.99, with the enunciation: "In temporomandibular technic, the author would hesitate to offer any other than that given to the profession by the Founder of Osteopathy, Dr. Andrew Taylor Still; especially that in relation to tic douloureux."

Readers are reminded that Dr. Still wrote these passages over a century ago, when publishing, illustration, and clinico-anatomical resources were very sparse, compared to recently. The excerpt is intended to convey brief outline of historical technique, and foundational study for Dr. Sutherland and others.

"636 Tic Douloureux or Facial Neuralgia.

In all cases that I have examined and treated, I have proven to my satisfaction that this suffering is caused by a shutoff of the facial nerve and blood supply on that side of the face in which this periodic misery appears. This shut-off is made by a strained or dislocated inferior maxilla. I place my hand behind and on the angle of my patient's under jaw with a firm hold, then ask the patient to open his mouth. At this time I place my other hand on his chin and bring it forward and down with a firm rotary motion which movement when done properly returns the inferior maxilla to its normal position. It has possibly been thrown out when having a tooth extracted, or by other strains or jars, which have slipped that and often some of the bones of the neck from their normal articulations and have produced a shut-off of the normal nerve and blood supply to the trifacial nerve. I now wrap a handkerchief around my thumb and place it in the mouth as far back on the jaw as the wisdom teeth. I place my other hand on the side of the head, then with my thumb I press the jaw down giving it a little transverse motion.

"637 In every case of tic douloureux which I have had for thirty-five years, I have succeeded in giving entire relief with one or two exceptions, and those were patients who had undergone surgical operations having some of the nerves cut away. I am satisfied the cause of tic douloureux is pressure of the under jaw and upper bones of the neck on the trifacial nerve thus cutting off its supply at that point; and I have given relief to many patients whose trifacial nerves had been operated on by the knife of the surgeon, which operation I know to be wholly unnecessary in ally case of tic douloureux. I have given the relief but the distortion or appearance of the face continued as the surgeon left it. I think all cases of tic douloureux can be successfully treated and cured by a skilled osteopath. "

Neural Orchestration of Mandibular Development

Excerpted from Menghan Zhang et. al., Int Dent J 2025 Dec 12;76(1):109317. <https://pmc.ncbi.nlm.nih.gov/articles/PMC12757485/>

"Unlike long bones or other craniofacial bones, the mandible forms through both intramembranous and endochondral ossification, enabling three-dimensional and highly adaptive growth (Figure 1B and 1C). Intramembranous ossification predominates, occurring in the mandibular body, alveolar process and major portions of the ramus, where neural crest-derived mesenchymal cells differentiate directly into osteoblasts without a cartilage intermediate.

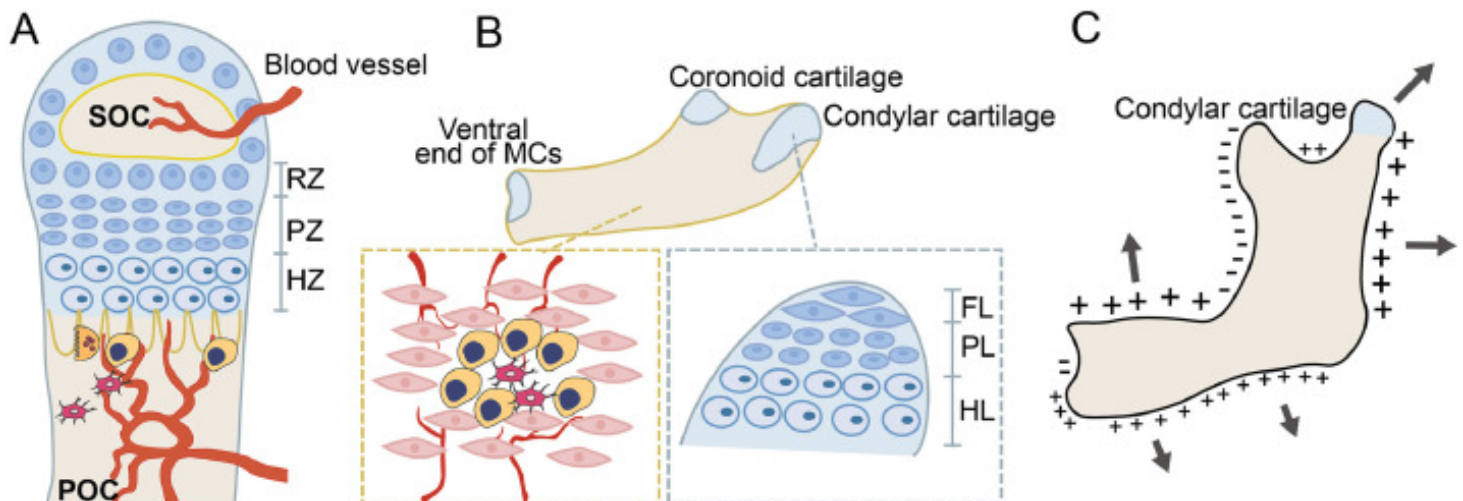
"As a quintessential product of intramembranous ossification, the alveolar process represents an anatomically unique and functionally significant structure exclusive to the mandible. The alveolar bone proper, a thin layer of compact bone lining the tooth socket, is commonly referred to as bundle bone due

to the direct insertion of Sharpey's fibres from the periodontal ligamentThe predominance of intramembranous ossification facilitates rapid functional adaptation to mechanical stimuli such as masticatory forces and tooth eruption.

"Endochondral ossification in the mandible is restricted to specific regions including the condyle and coronoid process, with transient contributions reported in the angular region.

"In humans, during the fourth embryonic week (E4w), CNCCs[Cranial Neural Crest Cells] migrate into the PA1 [first pharyngeal arch] and form ectomesenchyme. Concurrently, the trigeminal nerve (cranial nerve V) invades the arch alongside vasculogenesis and persists throughout subsequent development

Figure 1



Osteopathic Treatment For Ear Disorders

Historical Excerpt: Riley D. Moore, D.O., The Osteopathic Physician, January 1914, vol XXV, #1, p.2

Editor's Note: This early 20th century excerpt describes cranio-cervical & TMJ technique for ear disorders, with a different perspective than Dr. Sutherland's. The excerpt includes clear interest in comparative anatomy, recognition of relation of the TMJ to ear and function, and nuances about how D.O.'s of the era conveyed approaches to colleagues.

"The close relationship of the circulation and nerve supplies of the structure of the ear and those around the temporo-mandibular joint soon becomes apparent when the anatomy of these parts is studied. It is also of interest to call attention to the fact that the articulare and quadrate bones, which, in amphibians and reptiles, form part of the mandibular articulation, are in man found to have wandered into the tympanum where they are known as the malleus and incus respectively while the stapedius and tensor tympani muscles are but migrated slips of the larger muscular mass which controls the movements of the jaw. As a nerve which originally supplies a part never forsakes it, regardless of its wanderings or changes of function, the relationship between the auditory and masticatory organs is given new importance.

"My technique may be of interest to those of you who are not satisfied with your own in the treatment of ear disorders. Part of it does not differ materially from that used by some others of the profession, but I will give it as I have found it to be very satisfactory. To force the jaw forward, I do not use that manipulation devised by some osteopathic imp of Satan, i.e., to put the patient on his back lace your thumbs on his superior maxillae and your fingers behind the ascending rami of the jaw and command your victim to open his mouth. Any manipulation to correct a subluxated jaw is painful enough, but that one is inexcusably so.

I sit across the head of the table with the patient on his back, his head resting on my thigh and, if it is a subluxation of the left, I hold the patient's head tight against my abdomen with my left hand while I place my right palm over the chin, the tips of my fingers behind the jaw snug up under the ear and fit the hand over the whole left side of the mandible.

By distributing your pressure in this manner, you cause no pain except in the stretched tissues and none from pressure with the tips of your fingers. Now ask your patient to relax the jaw muscles and if he cannot do this have him open his mouth. With the palm on the chin force the jaw down and the mouth open while with the rest of the hand you pull the jaw forward, downward and toward you. Too much lateral pressure causes severe pain in the opposite temporo-mandibular articulation.

I then grasp the pinna in the region of the anti-tragus between my thumb and fore-finger, and as close to the head as possible. Pulling directly outward from the patient's head I get traction on the cartilaginous portion of the meatus. Then I rotate the parts slightly, still keeping up the traction. This has a marked influence on the local circulation.

Placing the patient on a stool, I stand to his right and holding his head firmly against me with my left hand, I insert the right thumb, protected by a clean cloth, well back on the molar teeth and grasping the jaw between my thumb and finger, I pull it downward and forward with considerable force while the patient holds the jaw muscles as relaxed as possible. This is done on both sides of the jaw. Be sure to remove false teeth and do not make traction on teeth which are supported on pegs. Have the patient then open and close the mouth several times against resistance. Thoroughly manipulate throat and post cervical tissues to gain complete relaxation of these.

[instructions continue with atlas and O-A treatment...]

The Remarkable Sensitivity of Human Touch and Its Implications for Osteopathic Medicine

Eric J. Dolgin, DO, FCA

Abstract

Human touch is a high-resolution sensory system capable of nanometer-scale texture detection, micrometer-scale motion discrimination, and millinewton force sensitivity. Osteopathic medicine, particularly cranial practice, relies on the detection of subtle biomechanical and autonomic phenomena.

This integrated review synthesizes tactile neuroscience, mechanoreceptor physiology, cranial suture histology, micromotion measurement research, reliability science, and classical osteopathic neurophysiology to provide a comprehensive overview of the scientific basis for osteopathic palpatory diagnosis. Evidence supports persistent adult sutural patency, measurable cranial micromotion, and the theoretical detectability of these phenomena within known sensory thresholds.

The paper argues that the physiology of human touch is, in principle, more than adequate to support many osteopathic palpatory findings, while identifying areas where claims may outstrip demonstrated sensory capabilities. Reliability limitations are interpreted primarily as challenges of calibration, operational definition, and training rather than anatomical impossibility. Insights from Irvin M. Korr's work on segmental facilitation and proprioceptors further explain the neural mechanisms underlying palpable somatic dysfunction.

The paper concludes by considering how tactile neuroscience and classical osteopathic neurophysiology can improve training and inter-rater reliability, incorporating recent studies (2022–2025) on tactile perception, cranial rhythm correlates, palpation reliability, and biofield-related phenomena.

Introduction

Since Andrew Taylor Still articulated the principles of Osteopathy in the late nineteenth century, touch has been central to osteopathic diagnosis and treatment.

The hands are used to assess tissue quality, joint mobility, tissue tension, rhythmic tissue motion, and thermal asymmetry. Osteopathic manipulative medicine (OMM) relies on the practitioner's ability to perceive subtle mechanical signals and respond with calibrated force and direction. This clinical tradition has developed largely independent of the neuroscience of touch. Osteopathic educators teach "palpatory literacy"—the cultivated ability to attend to and interpret tactile signals—through apprenticeship and guided practice, with minimal reference to the known psychophysics of mechanoreception.

This paper attempts to bridge that gap. Using findings from the scientific literature on human touch sensitivity, we ask: what are the physical signals that osteopathic practitioners claim to detect, and are these signals within the demonstrated perceptual capacity of the human sensory system? Recent advances, such as high-resolution haptic displays matching fingertip acuity and bio-inspired tactile sensors for texture discrimination, further support the integration of tactile science into osteopathic practice.

The Mechanoreceptor Substrate

Since Andrew Taylor Still articulated the principles of Osteopathy in the late nineteenth century, touch has been central to osteopathic diagnosis and treatment. The hands assess tissue quality, joint mobility, tissue tension, rhythmic tissue motion, and thermal asymmetry. Osteopathic manipulative medicine (OMM) relies on perceiving subtle mechanical signals and responding with calibrated force and direction. This clinical tradition developed largely independent of tactile neuroscience, though it aligns closely with foundational neurophysiological research by Irvin M. Korr, Ph.D., on the neural basis of somatic dysfunction.

This paper bridges that gap. Using findings from tactile neuroscience and Korr's classic studies, we ask: what physical signals do osteopathic practitioners

The Remarkable Sensitivity of Human Touch, cont.

claim to detect, and are they within human perceptual capacity? Recent advances in haptic displays and bio-inspired sensors further support integrating tactile science into osteopathic practice.

The high density of these receptors, especially Meissner corpuscles and Merkel discs, explains the fingertip’s superior sensitivity compared to the palm or forearm. The two-point discrimination threshold at the fingertip is approximately 2–3 mm. Pacinian corpuscles can detect vibration amplitudes as low as 0.01–0.1 μm. Recent neuromorphic tactile sensors mimicking these receptors have achieved real-time multimodal detection, enhancing texture discrimination in robotic applications.

Receptor Type	Location	Receptive Field	Frequency Sensitivity	Primary Function
Meissner Corpuscles (RA1)	Dermal Ridges	Small (~3-5 mm²)	Low (2-50 Hz)	Slip and Texture Detection
Pacinian Corpuscles (RA2)	Deep Dermis/Subcutaneous	Large, Diffuse	High (40-500 Hz)	Vibration, Tool Use
Merkel Discs (SA1)	Epidermal Ridges	Small (~11 mm²)	Sustained Pressure	Fine Spatial Detail, Edges
Ruffini Endings (SA2)	Dermis	Large, Elongated	Sustained Stretch	Skin Stretch, Finger Position

Spatial and Textural Resolution

Human fingertips can discriminate surface features at the nanometer scale. Participants reliably detect wrinkle amplitudes as small as 13 nm, an effect amplified by fingerprint ridges acting as a spatial filter. This complements classical spatial acuity measures, such as the grating orientation threshold (~0.9–1.2 mm groove width).

For roughness perception, the brain uses dual coding: spatial variation of pressure for coarse textures (>200 μm) and vibrotactile signals (Pacinian system) for finer textures during sliding.

Tactile Resolution Metric	Threshold	Underlying Receptor(s)
Nano-texture Discrimination	~13 nm amplitude	Meissner (RA1), Pacinian (RA2)
Grating Orientation Threshold	~0.9-1.2 mm	Merkel (SA1)
Two-Point Discrimination	~2-3 mm	Merkel (SA1)
Data from Skedung et al. 2013 [6]		

The Remarkable Sensitivity of Human Touch, cont.

Motion, Force, and Thermal Detection

Thermal sensitivity contributes to material perception and can signal underlying physiological changes, such as local blood flow alterations.

Sensory Modality	Detection Threshold	Primary Receptor(s)
Motion Velocity	~0.4-1 mm/s	Meissner (RA1)
Slip Detection	Micrometer-scale displacement	Meissner (RA1)
Force Discrimination	~7-10% Weber Fraction	Merkel (SA1), Ruffini (SA2)
Thermal Discrimination	~0.02-0.07°C	Thermoreceptors

Adult Cranial Sutures and Structural Plausibility

A foundational concept in cranial osteopathy is micromotion at the cranial sutures. Histological and morphological research documents persistent connective tissue and incomplete synostosis in adult cranial sutures well into advanced age, refuting claims of universal early-adult fusion[12]. Studies of skulls from ages 56–101 show variable patency, with the lambdoid suture often remaining more open. The frontozygomatic suture demonstrates incomplete fusion even at age 95. These findings establish structural plausibility for subtle cranial bone motion in adults.

Measured Cranial Micromotion and the Cranial Rhythmic Impulse (CRI)

Animal models demonstrate cranial bone mobility, with parietal displacement of 200–300 μm in response to CSF volume changes. In humans, high-resolution sensors have identified a “third rhythm” distinct from cardiac and respiratory cycles, with frequencies in the range typically reported for the CRI (approximately 6–12 cycles per minute) and amplitudes on the order of tens to hundreds of micrometers—well within the detection range of Pacinian corpuscles for vibration and Merkel/Ruffini endings for sustained pressure changes.

Recent objective validation significantly strengthens this picture. Pelz et al. (2023), publishing in Scientific Reports (Nature Publishing Group), directly compared expert manual CRI palpation against simultaneous objective physiological recordings during cranial vault hold in 25 participants. Palpated CRI frequencies (0.05–0.08 Hz) correlated highly with autonomic nervous system activity in forehead skin blood flow measured by photoplethysmography (PPG), with a 1:1 frequency ratio in 77% of participants and a 2:1 harmonic ratio in 23%. Critically, wavelet analysis revealed integer harmonic concordance in over 98% of palpated intervals, and phase analyses suggested synchronization between the objective microvascular signal and the palpated CRI in a subset of participants. This constitutes the first direct, instrumented validation of subjective cranial palpation against objective physiological measurement published in a peer-reviewed Nature-family journal [22]. The physiological correlate identified — autonomic nervous system activity in the intermediate frequency band of skin microcirculation — provides a plausible mechanism linking the practitioner’s palpatory experience to a measurable biological signal, and lends weight to the interpretation that inter-rater reliability failures reflect calibration challenges rather than absence of signal.

The Remarkable Sensitivity of Human Touch, cont.

Reliability and Training Implications

Blinded studies report inter-examiner reliability for CRI detection with kappa (κ) values of 0.10–0.40 (slight to fair) and intra-examiner reliability of 0.40–0.65 (fair to moderate). Tissue texture abnormality shows similar inter-examiner fair-range agreement. These scores reflect challenges in standardization, operational definitions, and calibration rather than the absence of a detectable signal. Higher intra-examiner consistency suggests individual practitioners can develop reliable internal standards. Improved training—incorporating graded tactile exercises, attentional practices, and objective feedback (e.g., PPG or motion sensors)—could enhance inter-rater reliability.

Implications for Osteopathic Palpation: The TART Criteria

The TART criteria (Tissue texture change, Asymmetry, Restriction of motion, Tenderness) map well onto human sensory capabilities, with Korr's neurophysiological framework providing a mechanistic "why" for the palpable signals.

Tissue Texture Change

Changes in skin moisture (friction), subcutaneous compliance, and temperature are detectable via Meissner corpuscles (slip/drag), compliance discrimination (~15%), and thermoreceptors. Korr's model of segmental facilitation explains the underlying physiology: sustained aberrant input leads to exaggerated sympathetic outflow and trophic influences, producing persistent alterations in vasomotor tone, sweat gland activity, and tissue compliance—precisely the texture abnormalities palpated in somatic dysfunction. These autonomic-mediated changes create signals well within tactile thresholds.

Asymmetry

Bilateral comparison via interhemispheric integration; spatial asymmetries of several millimeters exceed grating thresholds (~0.9 mm). The challenge is primarily defining consistent reference frames amid normal variation.

Restriction of Motion

End-feel and stiffness changes are force and displacement discrimination tasks well within 7–10% force thresholds and sub-millimeter sensitivity. Instrumented studies confirm measurable stiffness differences in dysfunctional segments.

Regarding force/displacement discrimination, Korr's 1975 paper on proprioceptors and somatic dysfunction links gamma-loop gain changes in muscle spindles to altered muscle tone and end-feel, accounting for many motion characteristics of the osteopathic lesion. "Turning down the gain" via manipulation aligns with common OMT effects.

Electromagnetic Field Perception and Possible Relevance to Biofield Sensing

The existence of the human biofield is not a fringe assertion. In 1994, an ad hoc committee convened at the NIH Office of Alternative Medicine formally defined the biofield as "a massless field, not necessarily electromagnetic, that surrounds and permeates living bodies and affects the body," and the term was subsequently accepted as an official Medical Subject Heading (MeSH term) at the National Library of Medicine [27]. The electroencephalogram and electrocardiogram — instruments in routine clinical use — are themselves biofield measurement devices. The biofield is not exotic; clinical medicine already depends upon it.

The sensory infrastructure relevant to biofield detection extends beyond the classical mechanoreceptors. Anatomist Frank Willard has highlighted the glycocalyx — the negatively charged carbohydrate coat covering virtually every cell — as a body-wide sensory network with mechanical transduction properties. Recent cellular biophysics research confirms that the glycocalyx configuration critically affects mechanotransductive events at the cell-microenvironment interface [28]. In the fascial planes and connective tissue that osteopathic practitioners work within, this glycocalyx-covered extracellular matrix creates a distributed sensory network transmitting mechanical and electromagnetic signals across tissue layers.

The Remarkable Sensitivity of Human Touch, cont.

Merkel cells, long considered purely mechanoreceptive, have now been confirmed as thermosensitive, expressing TRPM8 cold-sensing channels [29].

Combined with their expression of PIEZO2 mechanogated ion channels — confirmed as the primary mechanotransduction channel for discriminative touch and proprioception in humans [30] — Merkel cell complexes represent a multimodal receptor system integrating mechanical, thermal, and potentially electromagnetic inputs simultaneously. The fascial matrix itself, composed predominantly of collagen, exhibits well-documented piezoelectric properties: mechanical deformation generates electrical signals within collagen fibers, while structured water within the extracellular matrix acts as a medium for signal propagation. These properties mean the practitioner's hand enters into a dynamic bioelectrical conversation with the patient's tissue that exceeds simple mechanical contact. The question of whether training improves biofield detection has been directly tested. Schwartz et al. (2004), in a peer-reviewed study, enrolled 27 physicians, psychologists, and nurses in a five-day bioenergy awareness training program. Using a blinded hand biofield detection test, detection accuracy increased from 50.8% (chance level) to 55.5% post-training ($p < 0.05$), with high-absorption participants reaching 58.3% accuracy [31]. A follow-up study by Nelson and Schwartz (2005) with 165 subjects found overall biofield awareness accuracy of 57.7%, significantly above chance ($p < 0.0000001$), with individual differences in detection correlated with self-awareness and sensitivity to others [32].

These findings are modest but consistent: above-chance detection that is trainable and modulated by attentional capacity — precisely the pattern expected from a low-amplitude, learnable sensory skill. Objective measurements also document detectable physical emissions from trained practitioners' hands: Zimmerman (1985/1990) using SQUID magnetometry recorded pulsating biomagnetic fields sweeping

0.3–30 Hz from Therapeutic Touch practitioners' hands [23], and Connor and Schwartz (2007) documented significant increases in extremely low-frequency (ELF) magnetic field fluctuations from Reiki practitioners during intentional healing states, with larger increases in more experienced practitioners.

In Osteopathy in the Cranial Field, reported sensations of warmth, pulsation, or subtle tissue resistance are best understood as sophisticated multi-modal integration: mechanical cues (micromotion, tissue compliance, skin drag), thermal gradients, autonomic signals, and bioelectrical interactions at the fascial and glycocalyx level, amplified by trained attention. The convergence of NIH institutional recognition, emerging cellular biophysics, measurable ELF emissions from practitioners' hands, and above-chance blinded detection studies collectively justify treating biofield palpation as a legitimate area for continued empirical investigation rather than dismissal. Any explanatory model must remain anchored in known sensory physiology while remaining open to the mounting evidence that trained hands may detect a richer signal than classical mechanoreceptor models alone predict.

The Remarkable Sensitivity of Human Touch, cont.

Conclusion

The evidence from tactile neuroscience and Irvin M. Korr's foundational neurophysiology provides a robust scientific foundation for osteopathic palpatory practices. The human hand detects signals at scales relevant to somatic dysfunction, while cranial micromotion is anatomically plausible and measurable, with autonomic correlates (e.g., microvascular oscillations) within perceptual thresholds.

Korr's concepts of the facilitated segment and proprioceptor involvement elegantly link neural hyperactivity to the persistent biomechanical and autonomic changes that practitioners sense. Primary limitations relate to standardization and training rather than sensory impossibility. Integrating tactile psychophysics with Korr's models—through deliberate practice, attentional training, and objective feedback—can enhance reliability and palpatory literacy. This evidence-informed approach honors osteopathy's art while advancing its scientific grounding, preparing practitioners to skillfully perceive and treat the body's subtle signals.

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