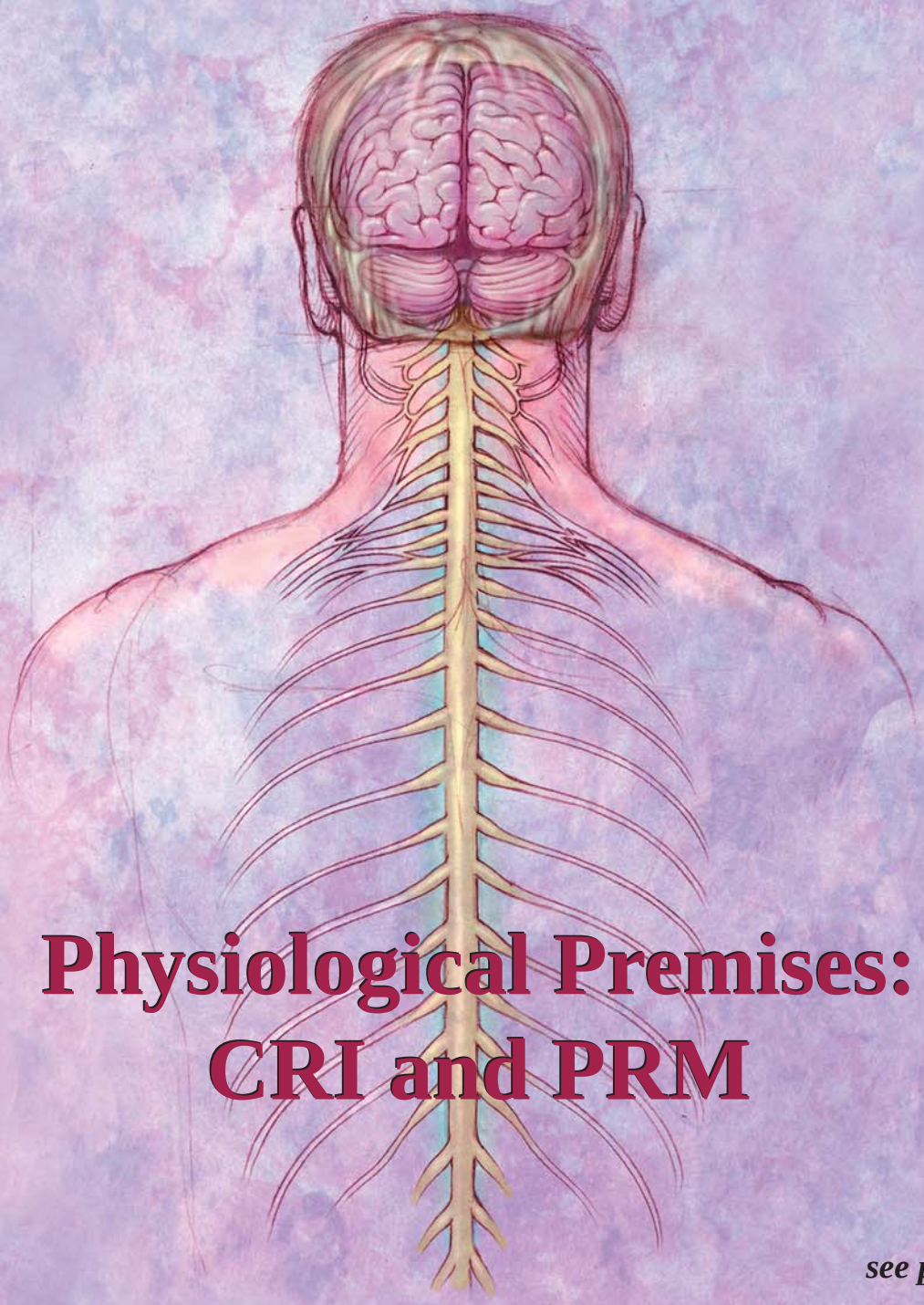
THE AAO

FORUM FOR OSTEOPATHIC THOUGHT

JOURNAL

A Publication of the American Academy of Osteopathy

TRADITION SHAPES THE FUTURE • VOLUME 13 NUMBER 2 SUMMER 2003



Physiological Premises: CRI and PRM

see page 21

Instructions to Authors

The American Academy of Osteopathy (AAO) Journal is a peer-reviewed publication for disseminating information on the science and art of osteopathic manipulative medicine. It is directed toward osteopathic physicians, students, interns and residents and particularly toward those physicians with a special interest in osteopathic manipulative treatment.

The AAO Journal welcomes contributions in the following categories:

Original Contributions
Clinical or applied research, or basic science research related to clinical practice.

Case Reports
Unusual clinical presentations, newly recognized situations or rarely reported features.

Clinical Practice
Articles about practical applications for general practitioners or specialists.

Special Communications
Items related to the art of practice, such as poems, essays and stories.

Letters to the Editor
Comments on articles published in *The AAO Journal* or new information on clinical topics. Letters must be signed by the author(s). No letters will be published anonymously, or under pseudonyms or pen names.

Professional News of promotions, awards, appointments and other similar professional activities.

Book Reviews
Reviews of publications related to osteopathic manipulative medicine and to manipulative medicine in general.

Note
Contributions are accepted from members of the AOA, faculty members in osteopathic medical colleges, osteopathic residents and interns and students of osteopathic colleges. Contributions by others are accepted on an individual basis.

Submission
Submit all papers to Anthony G. Chila, DO, FAAO, Editor-in-Chief, Ohio University, College of Osteopathic Medicine (OUCOM), Grosvenor Hall, Athens, OH 45701.

Editorial Review
Papers submitted to *The AAO Journal* may be submitted for review by the Editorial Board. Notification of acceptance or rejection usually is given within three months after receipt of the paper; publication follows as soon as possible thereafter, depending upon the backlog of papers. Some papers may be rejected because of duplication of subject matter or the need to establish priorities on the use of limited space.

Requirements for manuscript submission:

Manuscript
1. Type all text, references and tabular material using upper and lower case, double-spaced with one-inch margins. Number all pages consecutively.

2. Submit original plus three copies. Retain one copy for your files.

3. Check that all references, tables and figures are cited in the text and in numerical order.

4. Include a cover letter that gives the author's full name and address, telephone number, institution from which work initiated and academic title or position.

5. Manuscripts must be published with the correct name(s) of the author(s). No manuscripts will be published anonymously, or under pseudonyms or pen names.

6. For human or animal experimental investigations, include proof that the project was approved by an appropriate institutional review board, or when no such board is in place, that the manner in which informed consent was obtained from human subjects.

7. Describe the basic study design; define all statistical methods used; list measurement instruments, methods, and tools used for independent and dependent variables.

8. In the "Materials and Methods" section, identify all interventions that are used which do not comply with approved or standard usage.

Computer Disks
We encourage and welcome computer disks containing the material submitted in hard copy form. Though we prefer Macintosh 3-1/2" disks, MS-DOS formats using either 3-1/2" or 5-1/4" discs are equally acceptable.

Abstract
Provide a 150-word abstract that summarizes the main points of the paper and it's conclusions.

Illustrations
1. Be sure that illustrations submitted are clearly labeled.

2. Photos should be submitted as 5" x 7" glossy black and white prints with high contrast. On the back of each, clearly indicate the top of the photo. Use a photocopy to indicate the placement of arrows and other markers on the photos. If color is necessary, submit clearly labeled 35 mm slides with the tops marked on the frames. All illustrations will be returned to the authors of published manuscripts.

3. Include a caption for each figure.

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References
1. References are required for all material derived from the work of others. Cite all references in numerical order in the text. If there are references used as general source material, but from which no specific information was taken, list them in alphabetical order following the numbered journals.

2. For journals, include the names of all authors, complete title of the article, name of the journal, volume number, date and inclusive page numbers. For books, include the name(s) of the editor(s), name and location of publisher and year of publication. Give page numbers for exact quotations.

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American® Academy of Osteopathy

3500 DePauw Boulevard
Suite 1080
Indianapolis, IN 46268
(317) 879-1881
FAX (317) 879-0563

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THE AAO JOURNAL
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A PEER-REVIEWED JOURNAL

TRADITION SHAPES THE FUTURE • VOLUME 13 NUMBER 2 SUMMER 2003

The Mission of the American Academy of Osteopathy is to teach, advocate, advance, explore, and research the science and art of osteopathic medicine, emphasizing osteopathic principles, palpatory diagnosis and osteopathic manipulative treatment in total health care.

In this Issue:

AAO Calendar of Events

July 2003

1 AOBNMM Case Histories are due for November Exam

13-14 AAO Board of Trustees meeting in Indianapolis

15-17 AOA Board of Trustees meeting in Chicago

18-20 AOA House of Delegates meeting in Chicago

18-20 OMT for Common Organic and Clinical Problems
MSUCOM, East Lansing, MI

August 2003

1 FAAO application deadline

1-3 Manual Medicine/Manipulation for Physicians:
Upper Back, Neck and Upper Extremities
CCOM, Downers Grove, IL

8-10 AAO Education Committee meeting in Indy

21-24 OMT Update
Walt Disney World®, Lake Buena Vista, FL

September 2003

1 FAAO candidates' deadline for 2nd draft of scientific thesis

19-21 Unlocking the Cranial Sutures I: Development and Release
San Francisco, CA

October 2003

1 AOBNMM Apr '04 Application Deadline

11 One-day Course: OMT in Geriatrics
New Orleans, LA

12-16 AOA Convention; New Orleans, LA

25-26 Dr. Fulford's Basic Percussion Course

November 2003

7-9 Prolotherapy - Below the Diaphragm
UNECOM, Biddeford, ME

15-16 AOBNMM Examinations in Indy

December 2003

1 AOBNMM Apr '04 candidates' deadline for case histories

5-7 Visceral Manipulation/Urogenital
NSUCOM, Ft. Lauderdale, FL

2004 on Review

JANUARY
Greenman's Exercise Prescription
Midwestern University/Arizona College of Osteopathic Medicine
Glendale, Arizona

FEBRUARY 14-17
Osteopathic Treatment of Headache
Honoluu, Hawaii

MARCH 15-17
Visceral Manipulation: GI/Abdominal
MARCH 18-21
2004 Annual Convocation
Colorado Springs, Colorado

APRIL
Dr. Fulford's Advanced Percussion Technique
Midwestern University/Chicago College of Osteopathic Medicine
Downers Grove, Illinois

APRIL 30 - MAY 2
Prolotherapy: Above the Diaphragm
University of New England College of Osteopathic Medicine
Biddeford, Maine

JUNE 4-6
Jones Strain - Counterstrain
The Radisson Hotel, Downtown
Indianapolis, Indiana

JULY 23-25
Still Technique
West Virginia School of Osteopathic Medicine
Lewisburg, West Virginia

AUGUST 19-22
14th Annual OMT Update
Contemporary Hotel at Walt Disney World®
Buena Vista, Florida

SEPTEMBER 30 - OCTOBER 5
Visceral Manipulation: Emotional Diagnosis/Treatment
Visceral Manipulation: Unlocking the Cranial Sutures II
San Diego, California

NOVEMBER 6
Modifying Delivery of OMT in an Allopathic Environment
NOVEMBER 7-11
AOA / AAO Convention
San Francisco, California
NOVEMBER 12-14
Prolotherapy: Below the Diaphragm
University of New England College of Osteopathic Medicine
Biddeford, Maine

DECEMBER 4-5
Facilitated Positional Release
NOVA Southeastern University College of Osteopathic Medicine
Ft. Lauderdale, Florida

View from the Pyramids

2003-2008

In 1992, 1998 and most recently on March 18, 2003 at Ottawa, Canada, the American Academy of Osteopathy leadership have conducted strategic planning sessions. Until last year, strategic planning has been conducted by a Long Range Planning Committee, the functions of which began in 1985. At that time, nearly 20 years ago, the AAO leadership recognized that without such activity, the goals and objectives of the organization had no basis for stability, initiative and growth. The Board of Trustees, having dissolved the former Long Range Planning Committee, have now assumed the strategic planning function for the organization. As the cycle of renewal continues, the successful outcomes of the 1992 and 1998 sessions should bode well for the goals set in 2003.

The 2003 strategic planning session recommended modification of the Mission Statement of the AAO and established 6 Goals. Obtaining listing for the *AAO JOURNAL (AAOJ)* in *Index Medicus* remains on the list of objectives within the new 5-years plan. Let us look at some of the steps that have been taken to accomplish this.

Since 2000, the masthead of the *AAOJ* has been reconfigured to reflect the traditional and future intentions of this publication. Peer Review has become the standard for publication. Student writing is encouraged and accepted for publication, with two requirements: In assigning first author status, the student physician is designated as an osteopathic medical student (OMS); A practicing physician (preceptor, faculty member, etc.) must agree to be second author, thus insuring peer review. Clinical practice has been reflected in published case histories of student physicians, interns and residents, practicing physicians. Scientific Papers/Theses of Fellows of the American Academy of Osteopathy have been published. The AAO involvement in Memorial Lectures (Scott and Northup) has been reflected in publication of these addresses. Book and Journal Reviews and comments have been published. Letters to the Editor which address the intentions of the *AAOJ* have been accepted. Signal occasions (designation of UNTHS-COM as the osteopathic profession's first research center) have produced an issue driven solely by the faculty of the institution.

What should we be doing during the next five years (or before) to reach our goal? MORE OF THE SAME, AND MORE OF IT! It is well understood that the success of a publication is determined by identifying and establishing its particular niche in the broader arena of associated publications. If we earnestly apply ourselves to the criteria specified for our goal, we will eventually reach it. This is the time in which active solicitation is made for submission of original contributions by new authors as well as continuing submission by previously published authors. In so doing, the *AAOJ* can clearly become a major vehicle in assisting the American Academy of Osteopathy to realize in particular four of the new Goals:

- To maintain, advance and advocate the AAO as a resource of educational excellence on osteopathy.

- To develop programs and activities which foster growth and development of the membership.

- To facilitate programs promoting collaborative efforts that further OPP/OMT research and training.

- To serve the osteopathic medical profession as an advocate, resource and guide in policy making and standard setting.

Let us hear from you NOW!

Anthony G. Chila D.O., FAAO

Contributors

Moskalenko Y, Frymann V, Kravchenko T, Weinstein G: Physiological Background Of The Cranial Rhythmic Impulse And The Primary Respiratory Mechanism. This extensive paper is the result of collaborative activity involving the Sechenov Institute, Russian Academy of Sciences; Russian School of Osteopathic Medicine, St. Petersburg, Russia; and The Osteopathic Center for Children, San Diego, CA (USA). The authors analyze the fundamental premises of the Primary Respiratory Mechanism based on modern physiological positions. In the process, they undertake the evaluation of the efficacy of osteopathic treatment in the cranial field. Readers will appreciate the elaboration of points of history of cerebrovascular studies placed in the context of the Still-Sutherland contribution to this area of physiologic knowledge. **(p. 21)**

Pasquarello, GJ: Osteopathic Manipulative Treatment and Jaw Pain. In this case presentation the author applies principles of osteopathy in the cranial field to management of an unusual clinical situation. A comprehensive evaluation is presented which seeks to optimize the patient's body physiology and focus on health rather than a disease process.

Submitted in partial fulfillment of requirements for Fellowship in the American Academy of Osteopathy. Doctor Pasquarello was conferred status as Fellow of the American Academy of Osteopathy in 2002. **(p. 34)**

Regular Features

Dig On.

In recent years, the degree ***DOCTOR OF OSTEOPATHY*** has undergone a name change to ***DOCTOR OF OSTEOPATHIC MEDICINE.*** EE Tucker reviewed the root origin of the original descriptor ***OSTEOPATHY*** in 1904. The careful study and rereading of the process and extent of Tucker's etymologic effort might well have offered pause for thought about the relative values of a noun or an adjective in explaining the intention of the profession. **(p. 12)**

From the Archives.

The movement of fluid was heavily emphasized by William G. Sutherland, DO. In this selection, the topics covered reflect the evolution of his thought through the years 1947 and 1948. These include: Applications of Technique; Technique Of Directing The Potency Of The Cerebrospinal Fluid; Primary Respiratory Mechanism And its Relation to the Circulatory Activity of the Cerebrospinal Fluid; Compression Of The Bulb; Reciprocal Tension Membranes; The Relation of Intracranial Membranes to Venous Flow and Cerebrospinal Fluid Fluctuation; Incitant Cerebrospinal Fluid Technique; Lateral Fluctuation Of The Cerebrospinal Fluid. The sources for this selection also illustrate the involvement of the Doctors Lippincott in assisting Doctor Sutherland's explanatory and teaching effort. **(p. 13)**

Elsewhere in Print.

Harvey E, Burton AK, Moffett JK, Breen A in collaboration the UK BEAM trial team. **Spinal manipulation for low-back pain: a treatment package agreed by the UK chiropractic, osteopathy and physiotherapy associations.** A spinal manipulation study package has been developed for use in the UK Back pain Exercise And Manipulation (UK BEAM) trial. The package was developed for the treatment of simple mechanical low-back pain. Agreement and acceptance has been by the three professions performing this treatment in the UK. A common core of manipulative practice has been defined. Sufficient flexibility in both assessment and treatment is felt to be representative of the three professions. This package is the result of a successful attempt to overcome interdisciplinary barriers. It is intended to facilitate the scientific testing of 'manipulation' as practiced in the UK or elsewhere. **(p. 39)**

Component Societies' CME Calendar

and other Osteopathic Affiliated Organizations

May 2-4
Intermediate Face Course
Course Director: Doug Vick, DO
Philadelphia, PA
Hours: 16 Category 1A (anticipated)
Prerequisites: 2 Basic Courses one being SCTF, and 3 years Clinical Practice
Contact: Judy Staser
817/926-7705

May 3-4
Using the Powers Within the Patient's Body (Sutherland's techniques for the trunk and extremities)
A Still Sutherland Study Group
Contact: Andrew Goldman, DO
860/364-5990

May 14-17
Osteopathic Contributions to the Health Perception: The Art and Science of Osteopathy as it applies to the use of optometric lenses, visual dysfunctions, and perceptual strains.
Course Director: Joseph Field, DO
Kennebunkport, ME
Hours: 32 Category 1A (anticipated)
Prerequisites: 2 SCTF approved basic courses in Osteopathy in the Cranial Field
Contact: Joseph Field, DO
207/967-3311

May 30 - June 3
Osteopathy in the Cranial Field
Course Director: Andrew Goldman, DO
Philadelphia, PA
Hours: 40 Category 1A (anticipated)
Contact: Judy Staser
817/926-7705

June 9-10
*Addressing Medical Issues Conference: *OIG Compliance, *Stark Rules, *HIPPA Regulations, *Center for Medicare and Medicaid.*
Pinellas County Osteo Medical Society
Las Vegas, NV
Hours: 12 Category 1A (anticipated)
Contact: Kenneth E. Webster, EdD
717/581-9069

June 14-18
Basic Course
The Cranial Academy
Founders Inn
Virginia Beach, VA
Hours: 40 Category 1A (anticipated)
Contact: The Cranial Academy
317 594-0411

June 19-22
Annual Conference
The Cranial Academy
Founders Inn
Virginia Beach, VA
Hours: 40 Category 1A (anticipated)
Contact: The Cranial Academy
317/594-0411

October 4
Outcome-Based Osteopathy
Arizona Academy of Osteopathy
Poco Diablo Resort
Sedona, AZ
Hours: 8 Category 1A (anticipated)
Contact: William Devine, DO
623/572-3350

October 10-13
Research Symposium/SCTF Continuing Studies Program
Indian Lakes Resort
Bloomingdale, IL
The Cranial Academy
Contact: The Cranial Academy
317/594-0411

AOA Convention 2003 AAO Program

"Integration of Care: From the specialist to the primary care physician"
Edward K. Goering, D.O.
Program Chairperson

October 13-15

Topics:

Temporomandibular Joint Dysfunction: An ENT Perspective

Treatment of the Temporomandibular Joint: A Practical Solution

Northup Memorial Lecture

Female Pelvic Floor Anatomy: A Laparascopic Review

Treatment of the Female Pelvic Floor

Scoliosis and OMM

Evaluating Structural Effects of Manual Medicine

Carpal Tunnel Syndrome & OMM

Low Back Pain & OMM

Male Sexual Dysfunction

Osteopathic Approach to Male Sexual Dysfunction

Workshop on Treatment of Male Sexual Dysfunction

Osteopathic Considerations in End of Life Care

Cultural Differences in End of Life Care

Role of the Hospice in End of Life Care

End of Life Care – A Personal Reflection

Orthopedic and Osteopathic Evaluation and Treatment of the Knee

Neuromuscular Evaluation and Treatment of the Knee Utilizing Strain/Counterstrain

Hands-on Workshop on Treatment of the Knee

Letters to the Editor

Understanding the Combined Motions of the C3/C4 Vertebral Unit: A further look at Fryette's model of cervical biomechanics

To the Editor,

Capobianco and co-workers[1] have highlighted the need for research into the clinical and academic applications of Fryette's mechanics of the cervical spine. Their study, however, suffers from a major flaw, the use of motion palpation to determine a segmental motion restriction or segmental position.

Many authors have demonstrated that segmental motion palpation lacks inter- and intraexaminer reliability and is therefore of little assistance diagnostically. Those studies demonstrating favourable results often have methodological flaw.[2] Therefore, the use of motion palpation by Capobianco and co-workers[1] to determine coupled motion in the cervical spine cannot be seen to be valid.

It may have been more prudent to establish the reliability of the motion palpation tests employed initially, rather than as the final experiment. If motion palpation was in fact demonstrated to be reliable, then it must be asked whether the researchers could be in no doubt that the perceived motion of C3/4 truly represented C3/4 coupled motion. It is entirely possible that there are other factors involved (ie. polysegmental muscles).

Repeated passive movement is an interesting topic and one that should be explored to determine whether it does in fact make a difference to palpatory findings. From the results of experiment 3, one would have to suggest that repeated movement *may* play a role in the poor interexeminer reliability, however, as the authors rightly point out, there may in fact be other factors at work

It is difficult to perform pure rotation or pure sidebending without some form of technological aide to ensure that whilst testing motion in one plane, there is no motion occurring in any other plane. With this in mind, the variability in passive movements performed by different examiners through all three planes (ie. saggital, frontal/coronal, transverse) may play a role in both the poor inter- and intraexaminer reliability. If repetitive passive motion testing does in fact alter the original motion finding, it would mean that as soon as one motion is tested for, other motions would be altered, therefore, there is little chance that this study would be able to refute Fryette's 2nd law.

The results of experiments 2 & 3 serve to confirm what is already in the literature in relation to the reliability of motion based palpation, that is, interexaminer reliability is fair to poor and intraexaminer reliability is fair. The overall conclusion by the authors is that Fryette's 2nd law may not be applicable to the cervical spine at the level of C3/C4. By using an unreliable and invalid diagnostic tool (ie. motion palpation), it is difficult to draw any real conclusions from this research.

Fryette's mechanics of the typical cervical spine is certainly an area where more research is warranted and the authors are to be commended for exploring this aspect of the biomechanical basis of osteopathy.

Brett Vaughan BSc, MHlthSc
Osteopath
Private Practice
Melbourne, Australia

References

1. Capobianco JD, Protopapas MG, Rivera-Martinez S. Understanding the combined motions of the C3/C4 vertebral unit: a further look at Fryette's model of cervical biomechanics. *The Journal of the American Academy of Osteopathy*. 2002. 12:3:15-30

2. Troyanovich S, Harrison DD, Harrison DE. Motion palpation: it's time to accept the evidence (Commentary). *Journal of Manipulative and Physiological Therapeutics*. 1998. 21:8:568-571

Address Coorespondence to:
Brett Vaughan
107 Sherbourne road
Montmorency VIC 3094
Australia

Phone: +61 3 9432 2212
Fax: +61 3 9432 5977
E-mail: brettv@axs.com.au

Reply to Letter to the Editor:

In his letter, Mr. Brett Vaughn questions the use of motion-based palpation for the purpose of determining the combined motions of the cervical spine. As will be discussed below, the authors carefully implemented methods to ensure the data collected would be unbiased, blinded and of a high level of confidence as this was the first undertaking of an in-vivo, large-scale analysis of Fryette's model of segmental motion.

Firstly, core osteopathic principles and practice, from A.T. Still to the present, utilize palpation for diagnosis. The concept of laying on of the hands to feel health and disharmony (somatic dysfunction) is a universal osteopathic precept. Because palpation is fundamental to the osteopathic medical sciences we felt that it should be the mode of diagnosis for our research.

Secondly, and most disturbingly from an intellectual point of view, Mr. Vaughn has stated that our research is not valid because of flaws in other less controlled studies. A complete reading of our research will reveal several factors that we have addressed. To summarize:[1]

1. The subjects were living, not skeleton's. Fryette's original hypothesis was that rotation and sidebending at a segmental level occur ipsilaterally. This was a restatement of Halladay and Lovett's writings.[2,3] Our study did not presume to address the first law of motion which is a correlate of functional and structural scoliosis.

2. The examiners for this study were at the pinnacle of the earned and credentialing process for osteopathic manipulative medicine.

3. Two hundred eighty nine subjects participated in our study.

4. At any given examination, the examiners assessed only one component of motion of the C3/C4 cervical vertebral unit (either rotation or sidebending or flexion/extension). Another blinded examiner independently diagnosed the other components. The diagnoses obtained on any given subject were combined for statistical analysis, not at the time of the examination, but at a later date. This method of diagnosis and analysis gave an unbiased assessment of segmental motion.

5. Interexaminer concordance was good. The initial agreement level dropped off after several examinations, which lead us to conclude that repeated dynamic palpation may be akin to actual treatment and could potentially alter the original diagnosis (refer to experiment three). The implication for testing on an academic level may be this: Examiner's should consider not grading their students on a diagnosis which has been repeatedly examined with palpation.

6. Our data suggests that Fryette's second axiom of spinal motion occurs approximately 1/3 of the time in the mid-cervical spine. In fact, rotation and sidebending were found to occur predominately in opposite directions in the C3/C4 cervical vertebral unit.

7. Our findings in Experiment one were reproduced in Experiment two.

8. Conclusions: Sidebending and rotation for the middle cervical spine may occur in ipsilateral as well contralateral directions. The osteopathic physician should diagnose what they find without preconceived notions of what they should find.

In addition to the above, published biomechanical and kinematic studies have demonstrated that sidebending and rotation occurs in opposite directions in the upper cervical spine inclusive of C2/C3.[4,5] These studies question the validity of Fryette's laws of biomechanics for the cervical spine. No study has validated Fryette's second law of spinal motion. Our study aimed at taking these studies a step further with a palpatory model. The results we obtained are in agreement with the studies that preceded it.

There have been many interexaminer reliability studies which have shown poor rater concordance with segmental motion testing. However, recent studies have demonstrated that with standardization of the examining methods rater concordance may be enhanced and acceptable reliability achieved.[6,7] The results of these studies suggest that motion based palpation is indeed reliable and that it is the testing protocols which have undermined the interexaminer reliability results. It should be noted that the research studies we are referencing were published years after the commentary Mr. Vaughn quotes in his letter.

In our study, the examiners were all osteopathic physicians highly qualified diagnosticians with greater than 10 years clinical experience. In addition, all of these examiners had experience teaching motion-based palpation at U.S. colleges of osteopathic medicine. These qualifications alone would argue in favor of a high level of confidence to the diagnoses documented by each examiner. Further, the examination procedures were agreed upon prior to the experimental sessions. This ensured minimal discrepancies in the testing protocol. Perhaps most importantly, our examiners' were blinded from the results of the other physicians. No single examiner was allowed to make diagnosis of both rotation and sidebending. Each of the components was determined by separate physicians. Moreover, as seen in our experiment 3, despite the possible changes which may have occurred during the multiple sequential palpation, the level of agreement among examiners remained high. This supports the results and conclusions stemming from our experiment 2 as the same raters in experiment 3 also participated in experiment 2.

Pure rotation or pure sidebending does not necessarily occur exclusive of one or the other in the cervical spine as both motions occur concomitantly.[4,5] Assurance that pure rotation or pure sidebending is tested cannot be achieved even with technological assistance. What type of technology can be used in lieu of the skilled palpation of a physician? Conversely it is possible to measure and quantify rotation or sidebending separately at a given position if one motion is more prominent than the other.[4,8] This is one of the reasons we used in our study the most qualified diagnosticians to ensure that the testing procedures were well calibrated and reproducible. Most interestingly, Mr. Vaughn never disagreed with our methodology, statistical analysis or study design. The author's do sympathize, however, with those who are uncomfortable when the first chips of the existing paradigm begin to fly in the face of a brand new scientific challenge. We believe that this discussion ➔

has addressed the questions raised by Mr. Vaughn and that results and conclusions of our study remain valid and intact.

John D. Capobianco, DO, FAAO
Sonia Rivera-Martinez, DO

1. Capobianco JD, Protopapas MG, Rivera-Martinez S. Understanding the combined motions of the C3/C4 vertebral unit: A further look at Fryette's model of Cervical Biomechanics. The AAO Journal 2002; 12(3):15-30
2. Lovett RW: Lateral Curvature of the Spine and Round Shoulders, Philadelphia, PA: P. Blakiston's Son & Co. 1907, p. 35
3. Halladay HV, Walmsley AG, Ed. Applied Anatomy of the Spine, Kirksville, MO: J.F. Janisch 1920, p. 25
4. Mimura M, Moriya H, Watanabe T, Takahashi K, Yamagata M, Tamaki T. Three-dimensional motion analysis of the cervical spine with special reference to the axial rotation. Spine 1989; 14(11): 1135-1139
5. Bogduk N, Mercer S. Biomechanics of the cervical spine. I: Normal kinematics. Clinical Biomechanics 2000; 15:633-648
6. Marcotte J, Normand MC, Black P. The kinematics of motion palpation and its effect on the reliability of for cervical spine rotation. Journal of Manipulative and Physiological Therapies 2002; 25(7)
7. Degenhardt BF, Snider KT, Johnson JC, Snider EJ. Retention of Interexaminer Reliability in Palpatory Evaluation of the Lumbar Spine. JAOA 2002; 102(8):439
8. Penning L, Wilmink JT. Rotation of the Cervical Spine: A CT Study in Normal Subjects. Spine 1987; 12(8):732-738

Dear Editor

Please allow me to submit this enclosed article on "Osteopathic Management of Herpes Zoster and the Prevention of Post Herpetic Neuralgia". To my knowledge, no one has written any information on the feasibility of using manipulation for the treatment of shingles. For quite some time, I have been wanting to express myself on the subject as I think many of the younger manipulative-minded DOs might benefit from my experience and success in treating this potentially very troublesome condition.

Osteopathic Manipulative Management of Herpes Zoster (Shingles} and the Prevention of Post Herpetic Neuralgia

Over 38 years of practice approximately 450 patients with herpes zoster were treated with manipulative therapy and not a single patient developed post herpetic neuralgia, which is the prime reason for writing this.

Herpes zoster, also known as "shingles" is a viral infection caused by the same virus that caused chicken pox (Varicella), which has been dormant within the body for several years but has become reactivated in the form of burning type pain, vesicle formation and itching. About 20% of those individuals who have had Varicella will develop shingles some time in their lifetime and the overall incidence is about 10% of the population, especially those over 50 years of age, though it can occur at any age.

Most patients with shingles will tolerate the itching, the blistering and the pain with the customary usage of anti viral agents, cortisone, pain medications and antidepressants, but the fear of both patient and physician is that the patient will develop post herpetic neuralgia, the severe and annoying pain from the shingles that persists for years without any known method of relief except reliance on strong pain medications.

Most articles on the subject state that herpes zoster is due to a breakdown of the immune system, due to stress or some underlying disease such as several of the malignancies, lymphoma, leukemia and the like. Indeed this is most probably correct, but utilizing my osteopathic thinking, I ask these two questions, "Why does the virus seek out one or more specific (sensory) nerves"? and " Why does the virus not cause widespread dissemination and eruption all over the body of the affected individual"? There has to be a reason why only a few sensory nerves are involved.

My osteopathic education convinced me years ago to look for evidence of somatic dysfunction in the area of the nerves involved, as such a change would cause a disturbance in the nutrition and oxygenation of the involved nerves via the sympathetic nervous system. The sympathetic nervous system controls and regulates the blood flow to the entire body as well as to sensory nerves of which we speak. The sympathetic nervous system when over stimulated by the effects of a somatic dysfunction will cause a vasomotor shut down to all tissues involved including the sensory nerves. Nerves can be compromised very quickly, and the longer that the nerve suffers from insufficient nutrition and oxygenation, the longer it will take for that nerve to heal itself and become regenerated. Any tissue devoid of oxygen will result in pain and the nerve itself is no exception. In the case of post herpetic neuralgia the nerve has been unable to readapt to normalcy.

Even though my osteopathic practice spanned the years prior to the use of antiviral agents for the treatment of herpes zoster, I would still hesitate to rely solely on a prescription drug to accomplish what I have been able to do with manipulation. There is only an expectation that the antiviral agents will help, no guarantee. Being aware that the somatic dysfunctions were present in the area of the shingles, I treated them appropriately. Never once in the 450 cases did a patient ever develop "post herpetic neuralgia" This can be attributed to the fact that the somatic dysfunction was released, the sympathetic pathways were normalized and the nerve tissue received its normal blood supply.

Over the years of my practice, I encountered about twelve patients who had "shingles" for years prior to their initial visit to my office, but I had no success in helping these patients with manipulative therapy.

Having the experience of treating

so many herpes zoster patients, I found it interesting that in about one third of the cases I was able to diagnose the problem before there was any vesicule formation. Many of my patients would come to the office because of pain in the back, and when they described it as a "burning type pain" following a dermatome, that gave me a clue as to the diagnosis. Furthermore, when these patients arrived before the onset of blistering and vesicular eruption, and were treated with manipulation, they had much less pain, vesicular eruption, scarring and the duration of the shingles greatly shortened.

This presentation is not written with the idea that manipulative therapy is a panacea for all patients with shingles, as I will freely admit that my experience with cases involving "immune compromised" patients with malignancies is limited. As a practicing physician however, I would opt to use all modalities needed to help the patient, particularly the antiviral agents, as they may help, but I would also study the problem of shingles from an osteopathic viewpoint.

Robert T. Kellam, DO
8503 Caracas Avenue
Orlando, FL 32825-7905
Phone: 407-275-0802
E-mail: timkeldo@aol.com

OMT for Common Organic and Clinical Problems

July 18-20, 2003

East Lansing, MI

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Exposition of Still's Thought: The Word "Osteopathy"

In recent years, the degree granted by osteopathic colleges has undergone a name change, now frequently conferred as ***DOCTOR OF OSTEOPATHIC MEDICINE.*** Andrew Taylor Still's original descriptor ***OSTEOPATHY*** was discussed by E.E. Tucker in 1904 (1). In his search for clarification, Tucker consulted with a professor of ancient languages at Buchtel College, Akron, Ohio. In the popular mind of the time, osteopathy was held to be contrasted with allopathy and homeopathy, the names being considered analogous. Osteopathy was regarded as being derived from two Greek words meaning "bone" and "pain or disease", literally, "bone disease or bone pain". Professor Rockwell informed Tucker that the word *pathos* needed to be contrasted with the word *ethos* in order to grasp the real meaning of the word osteopathy. In Greek, *pathos* is derived from the root path, meaning "sensitive to" or "responding to". *Pathos* describes an incoming impression, while *ethos* describes an outgoing impression. A correct understanding of the original Greek words composing osteopathy would then be "bone influence" or "sensitive to bones". In the sense of the meaning described, allopathy would be correctly defined as "influenced by the opposite" (*allos* = "another" or "opposite"; *pathos* = "sensitive to" or "responding to"). Similarly, homeopathy would be correctly defined as "influenced by the same" (*homeo* = "alike" or "the same"; *pathos* = "sensitive to" or "responding to"). Osteopathy, then, differs from allopathy and homeopathy in that it does not describe a procedure, or a theory of medication, or point of view in studying diseases, but a fact of diagnosis. After establishing this differentiation, Tucker further states:

"The bones are not used to produce health, but bones are effective in producing disease. The bones represent the mechanism and resisting framework of the body and bear the brunt of all its shocks. The bony framework, the bony structure being in many instances delicate and intricate, is subject to lesions which are not always either easy of detection or correction, but which do occur. And that they do occur, and that they are closely related to the nervous system, and thereby become potent factors in producing diseases, is a fact and not a theory. Facts are matters not subject for debate, but for testimony and investigation, and as such, these facts challenge investigation of the whole field of medical research.

Osteopathic therapeutics proceed logically on such diagnosis, removing mechanical difficulties and straightening out mechanical strains. Of these mechanical troubles, conditions in the osseous system form the largest part. Thus in osteopathy, the body is treated, not the disease; and in its treatment, a condition and not a theory is confronted. In this it presents a contrast with the other practices, allopathy and homeopathy, in which the practitioner treats the disease and only nurses the body – although in many cases he recognized the inutility of treating the disease, and in that case treats "not pneumonia, but a patient with pneumonia". In all cases, disease is regarded as entirely foreign to and preying upon the tissues of the body, whose character is entirely unknown – so unknown that the idea of its origin in germs has taken immediate hold, and has been advanced for every disease described.

The word *pathos* implies an influence from without, and with that connotation may be correctly used in the name of the science of osteopathy, in which disease found to be a condition of the body wherein its normal forces are disturbed by forces from without. It is a matter of actual experience that the trouble can be so traced to its external origin.

No name was ever more accurate or fitting for the thing represented than is osteopathy for the science it represents".

Tucker's exposition of the meaning of the word ***OSTEOPATHY*** does much to elaborate the meaning of a statement made by Still in 1897 (2): "To know all of a bone in its entirety would close both ends of an eternity".

1. Tucker, EE: The word "osteopathy". *The Journal of Osteopathy,* May 1904; 194-196.
2. Still, AT: *Autobiography of Andrew T. Still,* published by the author; Kirksville, MO, 1897; 179, 282.

From the Archives

A Manual of Cranial Technique

Prepared by Rebecca Conrow Lippincott, DO and Howard A. Lippincott, DO
Approved by William G. Sutherland, DO, Author of *The Cranial Bowl*

Preface to the Second Edition of A Manual of Cranial Technique

This text was originally compiled by the authors in 1943 from material supplied by Dr. William G. Sutherland and from his treatise, *The Cranial Bowl*, which was published in 1939. The Academy of Applied Osteopathy, an affiliate of the American Osteopathic Association, sponsored the first printing of *The Manual*, which was distributed by a cranial committee of the Academy, consisting of Doctors Rebecca C. Lippincott, Kenneth E. Little, and Richard B. Gordon, chairman. After the organization of the Osteopathic Cranial Association in affiliation with the Academy of Applied Osteopathy the distribution was continued by the O.C.A. Upon exhaustion of the original edition this reprint was accomplished by the Osteopathic Cranial Association through its Publication Committee. The book is primarily designed for the use of those who have studied under Dr. Sutherland and is not intended as a complete exposition of his cranial concept.

Further material given out by Dr. Sutherland and a fuller understanding of cranial osteopathy make it possible to add to the original text and advisable to make some deletions.

Rebecca C. Lippincott, DO
Howard A. Lippincott, DO
Authors

Foreword

Dr. William G. Sutherland, originator of the cranial concept and author of *The Cranial Bowl*, frequently opens his course in cranial osteopathy with the following quotations from Doctor Andrew Taylor Still:

> "An osteopath reasons from his knowledge of anatomy. He compares the work of the abnormal body with the normal body."
>
> "The osteopath has his own symptomatology."
>
> "We must know the position and purpose of each bone, and be thoroughly acquainted with each of its articulations. We must have a perfect image of the normal articulations that we wish to adjust."

To these quotations, Dr. Sutherland adds: "The reciprocal tension membranes are continuously under tension during both inhalation and exhalation. They are like a tense wire stretched between two upright poles. One may pull on one pole and the tense wire pulls the other pole in the same direction, and vice versa. The technician through his finger tips is continually seeing, thinking, feeling, guiding – to the point of articular release."

Acknowledgments

T.L. Northup, DO, for encouragement and suggestions gained through his years of experience as Secretary and Treasurer of the Academy of Applied Osteopathy, formerly known as Osteopathic Manipulative Therapeutics and Clinical Research Association.

Mary Alice Hoover, DO, and Mrs. William G. Sutherland for assistance in editing and proofreading.

Ralph W. Rice, DO, for photographs illustrating technique.

Applications of Technique

Intracranial pressure and power, which include the brain and the fluctuation of the cerebrospinal fluid, are very strong. They exert the pull on the "falx" and the "tent" to normalize the position of the cranial bones.

Apply and release all pressures slowly and gradually.

➔

QUESTION: For correction, when do we use direct action and when do we exaggerate the lesion?

ANSWER: (By W.G.S.) "Direct action is contraindicated wherever it is possible to exaggerate the lesion."

DIRECT ACTION IS USED IN:

1. Cant Hook technique for Spheno-Frontal L-shaped area.
2. Parietal Spread.
3. "V" Technique for releasing fixation of the temporal when the petrous portion is in external rotation.
4. Parieto-Occipital (Traumatic).

Possibly others –

QUESTION: Should care be exercised in application of technique? Can too much force be harmful?

ANSWER: "The Cranium is a very delicate structure. It should be handled with the greatest possible care, based on a thorough understanding of its mechanics. The motive power is created by the use of natural forces within the body, with the patient's cooperation. Thus, a technique that is gentle and without force is used in normalizing the position of the cranial structure."

Technique of Directing the Potency of the Cerebrospinal Fluid

Not until the years 1947 and 1948, did Dr. Sutherland describe and explain this technique for the diagnosis and correction of cranial membranous articular strains or lesions. He wisely withheld it until his followers were ready to comprehend it through experience with and understanding of his cranial concept. The method makes use of the unexplainable, but nonetheless actual, inherent capacity of the cerebrospinal fluid to perform the work assigned to it. The ease and effectiveness of cranial osteopathy is increased immeasurably by this technique.

A fluctuating movement or transference of energy within the skull by means of the cerebrospinal fluid is initiated by applying a gentle pressure upon the cranium. A point of application is selected on the opposite side and at as great a distance from the area to be affected as is convenient. The pressure is directed toward that area, regardless of the bony or soft tissue structures, which intervene. Only a few ounces of pressure will suffice and the best results follow a decrease, rather than an increase, in the amount of pressure used during the operation. Usually after only a few seconds an intermittent wavering motion and a tendency to expansion of the bony wall is felt by the palpating fingers indicating that the energy is being transmitted to the desired point.

When used in the diagnosis of lesions the energy is directed toward an articulation. Normal structure responds with a perceptible resilience, quite different from the distinct wavering or beating sensation felt in case there is limited motion or fixation of the articulation.

In applying the technique for the correction of lesions the involved structures are held at the point of balanced membranous tension and articular release, usually in exaggeration of the lesion position, while the energy is directed toward the articulation. The potency of the fluid energy is increased by dorsiflexion of the patient's foot on the side opposite the lesion, or both feet in case the lesion is in the midsagittal plane. Frequently a definite release at the site of lesion is palpable and following the reduction the fluctuating pressure against the osseous structures subsides.

In acute traumatic lesions and in children before the sutures have developed the adult type of articular surfaces it is advisable to use the "direct action: method of holding the structures in a position toward their normal relationship. Sometimes simple disengagement or tendency to separation of the articular surfaces is adequate for correction by the cerebrospinal fluid technique. Molding of distorted bones is accomplished by using light pressure toward a restoration of the normal shape of the bone, the plastic change being made by the fluid cooperation.

This technique is powerful and specific. It supplements and to a degree replaces respiratory cooperation by using the inherent capacities of the cerebrospinal fluid.

Primary Respiratory Mechanism and it's Relation to the Circulatory Activity of the Cerebrospinal Fluid

The primary respiratory mechanism, to which the diaphragmatic respiratory mechanism is secondary, includes the brain, the intracranial membranes, the cerebrospinal fluid and the articular mobility of the cranial bones. It also includes the spinal cord, the intraspinal membranes, the same cerebrospinal fluid and the articular *mobility* of the *sacrum between* the *ilia.* (Note, particularly, the articular mobility of the sacrum *between* the ilia, which is *involuntary* mobility – and *not* mobility of the ilia *upon* the sacrum, which is a *postural* mobility.)

There are no muscles of attachment from the sacrum to the ilia. Neither are there muscles of attachment from bone to bone to operate the cranial articulations. The cranial structure as well as the sacrum is involuntary in activity and does not require muscular agencies of profusion.

During the primary respiratory functioning, the brain, using powerful energy from within itself, operates through an expansion and contraction of the cerebral and cerebellar hemispheres. This is, of course, minimal. During *inhalation* these cerebral

hemispheres, like the wings of a bird, swing upward, the third ventricle dilates and *lifts the pituitary body,* which strong dural membranes anchor to the sella turcica. This lifting of the sella turcica, or slight raising of the saddle, tips the anterior end of the sphenoid bone downward into a "nose dive".

At the same period the reciprocal tension membrane consisting of the falx cerebri and the tentorium cerebelli, acting somewhat as a check ligament allows the ethmoid to drop downward and lifts the petrous portions of the temporal bones into external rotation and the spheno-basilar articulation into the position of flexion. Also, at the same period, the spinal cord is drawn upward and through the operating of the intraspinal membrane the sacrum is drawn upward and posterior between the ilia.

Note: The intraspinal membranes are hung from above at the foramen magnum and the upper two or three cervical vertebrae and have only one attachment below– at the sacrum.

During the period of exhalation some of the activities are as follows: The cerebral hemispheres, like wings, fold and the third ventricle contracts, which allows the pituitary body to drop the sella turcica down thus tipping the anterior end of the sphenoid upward. At the same time the reciprocal tension membrane, acting somewhat like a check ligament, lifts the ethmoid upward and allows the sphenobasilar junction to drop downward into the position of extension. This allows the petrous portions of the temporal bones to drop downward into internal rotation. During this period the spinal cord moves downward, and the intraspinal membrane drops the sacrum anteriorly between the ilia.

According to Hilton in his text *Rest and Pain*, "the brain rests upon water beds of cerebrospinal fluid. It seems not only to rest but to rock its cranial articular cradle through the fluctuation of the cerebrospinal fluid."

Dr. Still stated, "The rule of the artery is supreme." Cranial theory adds, "The cerebrospinal fluid is in *command*" – being primary to arterial, venous and lymphatic activity. A complete picture of the intracranial and intraspinal membranes and of the large body of cerebrospinal fluid is essential. It is through the agency of these membranes, acting as check ligaments during respiration that the fluctuation of the cerebrospinal fluid is brought about.

The cerebrospinal fluid is under pressure and constant activity, both within the ventricles and spinal cord and surrounding the brain and spinal cord. It is the very center of body activity. It fluctuates, during the cycles of respiration (according to Best and Taylor). It is an interchange with the arterial blood at the choroid plexuses. It empties into the venous system.

In the roof of the fourth ventricle there are three openings – a medial and two lateral – by means of which the ventricle communicates with the subarachnoid spaces permitting circulation of cerebrospinal fluid from one to the other. This anatomical fact is used together with compression of the bulb, a description of which follows, to bring systemic ailments under direct control by sending the cerebrospinal fluid fluctuating up into the ventricles, down into the spinal canal and out into the subarachnoid spaces surrounding the brain and spinal cord.

(a) OCCIPITAL SPRING

POSITION: Patient supine-operator at head. Thenar eminences are placed on lateral angles of the occipital bone.

MOTION: Fingers interlaced for F.D.P. and F.L.P. tension, which is maintained throughout deep expiration held to involuntary inspiration.

NOTE: This springs the edges inward and flexes the structure of the occiput where it under rides the parietals. Pressure is light at first, gradually increases on subsequent expirations until involuntary jerk is obtained and "motor is idling." The diaphragm ➔

Compression of the Bulb
The articular surface of the superior portion of the mastoid angle of the occipital bone is beveled so that the occiput circumducts upward and forward under the parietals while the lateral portion moves up and forward between mastoid portions of the temporal bones.

has slowed down to the short motion of a pump and all fluids are changed.

(b) OCCIPITAL SPREAD

POSITION: Patient supine-operator at head. Thenar eminences placed over mastoid angles of parietal bones; fingers locked over the occipital protuberance.

MOTION: Maintain compression of the mastoid angles during complete exhalation until the involuntary jerk and inspiration.

NOTE: This spreads the outer edges of the occipital bone over the lateral sinuses.

(c) OCCIPITAL FLATTENING

POSITION: Patient supine-operator at head. Thenar eminences are placed on lateral angles of occipital bone.

MOTION: Pressure is exerted on occipital protuberance by the fingers to spread the edges outward flattening the bulb anteroposteriorly.

(d) SACRAL COOPERATION

(1) POSITION: Patient supine-operator at head. Sacrum of patient is held in position of expiration by a pad placed under the base, while cranium is held in position of inspiration as follows: The parietal angles are held by vault lift with contact over posterior-inferior angles and surfaces while thumbs are hooked over the sagittal suture.

MOTION: Operator *maintains this position* while patient breathes *normally*. (This is not associated with any additional respiratory effort on part of patient and operator must not exaggerate any motion of head.)

(2) POSITION. Patient supine – operator at head. Sacrum of patient is held in position of inspiration by a pad placed under the apex. Cranium is held in position of expiration by holding the posterior inferior parietal angles inward.

MOTION: Operator maintains position of expiration (extension) on cranium while the patient breathes normally.

(3) Head may be held in position of inspiration by flexing sphenobasilar to point of articular release.

(4) Head may be held in position of expiration by extending sphenobasilar to point of articular release.

Note: Pad under sacrum must always maintain it in opposite position; i.e., head in position of inspiration (flexion) while sacrum is in position of expiration or vice versa.

(5) If unable to compress the bulb, rock sacrum between ilia in time with respiratory period. Sacral cooperation technique brings the respiratory periods to point where "the motor is idling" or time of inspiration and expiration is nearly equal-membranes acting as check ligaments.

WARNING: Pad under apex of sacrum affects the lumbar curve and may cause pains if kept there too long.

(e) POSTURAL COOPERATION

POSITION: Patient supine-operator at head, assistant at feet. If no assistant is available have patient use own muscle force.

(1) Assistant holds the feet in plantar flexion with toes in, rotating the thighs internally. The patient attempts to press the lumbar spine against the table obliterating the lumbar curve. Operator holds the cranium in the position of extension during several respirations.

(2) Assistant holds the feet in dorsiflexion and external rotation. The patient flattens the lumbar spine against the table as described above. Operator holds the cranium in the position of flexion during several respirations.

ACTION AND IMPORTANCE OF COMPRESSION OF THE BULB

Compression of the bulb:

(1) Tenses the tentorium cerebelli thereby causing alternate compression and release of the fourth ventricle. This stimulates the vital centers, which are located on or near its floor.

(2) Incites a fluctuant wave in the cerebrospinal fluid.

(3) Changes the circulation to the brain and spinal cord.

(4) Changes all body fluids.

CEREBROSPINAL FLUID

(Must *never* be overlooked)

Low back conditions produce profound disturbances in the circulation of the cerebrospinal fluid.

Pelvic lesions frequently cause reflex disturbances in the head due to restricted movement of the cerebrospinal fluid.

SACROILIAC LESIONS IN RELATION TO CRANIAL LESIONS

Each will cause the other and adjustment of the cranium will aid in maintaining free motion of the sacrum.

Reciprocal Tension Membranes

From *Cranial Bowl* – Page 45

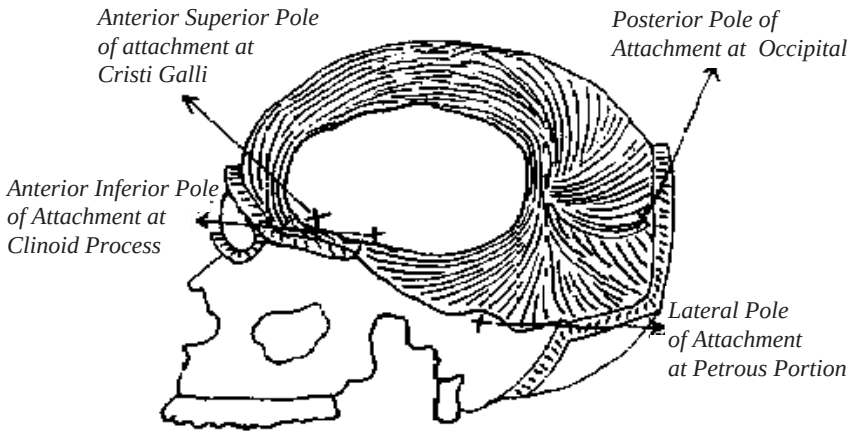
In describing spinal lesions, the author prefers the term: ligamentous articular strains; and for cranial lesions: membranous articular strains. The spinal lesion includes the ligaments as well as the articulations; and the cranial lesion includes the intracranial membranes as well as the articulations. The ligaments, in their

Illustrating the flexor profundus digitorum and flexor longus pollicis muscles, utilized as leverage in the application of cranial technic.

regulation of movement in the spinal articulations act as check agents to voluntary muscular action, and might be called reciprocal tension ligaments. The cranial articulations are involuntary in their mobility, and have no intermediate muscular agency for operation. However, they possess a special intracranial membranous tissue that acts not only as an intermediate agency, but functions also as a reciprocal tension agent that limits the normal range of their articular mobility. This special tissue consists of the falx cerebri and tentorium cerebelli, which causes movement of the articulations and at the same time, regulates or limits the normal, range of articular mobility. This tissue agent functions somewhat like that of the tension spring of the balance wheel of a watch; the tension spring regulating or limiting the to and fro movement of the balance wheel. Hence, the term r*eciprocal tension membrane* is chosen to describe the functioning of the intracranial membranous tissue with the cranial articulations.

Attention is called to the specific poles of attachment of the falx cerebri and the tentorium cerebelli that are especially adapted to maintain the normal range of movement of the basilar articulations. There is an anterior superior pole upon the crista galli of the ethmoid bone; and an anterior inferior pole upon the clinoid processes of the sphenoid bone; also lateral poles upon the petrous portions of the temporal bones; and posterior poles upon the occipital bone.

In respiration, during the period of inhalation, the anterior superior pole swings forward, while the anterior inferior pole swings backward and upward. At the same period the lateral poles move upward, while the posterior poles move forward. During the period of exhalation, a reverse movement occurs at the various poles of attachment. We might say that during the period of inhalation the reciprocal tension membrane allows the crista galli to drop downward, while it draws the clinoid processes of the sphenoid backward and upward, the petrous portions of the temporal bones upward, and the occipital forward. Then during the period of exhalation, the reciprocal tension membrane allows the clinoid processes of the sphenoid to drop downward and forward, the petrous portions of the temporals downward, and the occipital backward, while it draws the crista galli of the ethmoid upward.



Illustrating the falx cerebri and tenorium cerebelli as the reciprocal tension membrane.

The Relation of Intracranial Membranes to Venous Flow and Cerebrospinal Fluid Fluctuation

One of the most important intracranial and intraspinal pictures is that of the dural and arachnoid membranes; the dural wall carrying venous blood, and the arachnoid fluctuating the cerebrospinal fluid. We view the superior and inferior longitudinal sinuses formed by the falx cerebri, and see the venous blood moving along through the compensatory movement of the sagittal suture. We glance laterally to the superior longitudinal sinus and see the smaller veins leading →

from the brain and apparently emptying against the flow of the venous blood within the sinus. We say *apparently* against the flow of blood within the sinus, but in reality it happens to be another design by a Master Mechanic, to coordinate with the compensatory movement of the sagittal suture. So arranged that when the sagittal suture widens posteriorly, the mouths of the smaller veins empty laterally into the sinus; and when the sagittal suture narrows posteriorly the mouths of the smaller veins assume the forward direction. We then view the lateral sinuses along the occipital bone, and find that there are no sutures to activate the membranous walls of the tentorium cerebelli as an agency to propel the blood along, but these lateral sinuses pass over the posterior-inferior (mastoid) angles of the parietal bones, and these inferior angles move outward and inward in connection with the temporal bone during inhalation and exhalation. This movement draws the venous blood from the lateral sinuses of the occipital bone and carries it along by membranous activity to the exits at the jugular foramina.

In this picture we find that the main venous channels have walls decidedly different within the cranium than those in the rest of the body, and that they find their way out of the cranium through exits formed by the articulation of two bones; for example the jugular foramen. On the other hand, the arterial walls and the nerve supply are the same within the cranium as they are without. In addition the arterial walls are protected on their way into the cranium by passing through individual foramina in individual bones. Thus we may reason that membranous restriction disturbs the venous flow and the fluctuation of the cerebrospinal fluid. While cranial lesions may be primary, the intracranial membranes, including the dural and arachnoid, are the immediate disturbing factors leading to pathology of the brain.

Incitant Cerebrospinal Fluid Technique
(text pg. 71)

(a) POSITION: Patient supine-operator at head. Thenar eminences are placed on the mastoid portions of the temporal bones, with thumbs extending down along the mastoid processes and fingers locked together beneath the occiput to secure F.D.P. and F.L.P. muscle leverage.

MOTION: The mastoid processes are gently compressed inward and backward during inspiration to slightly exaggerate external rotation of petrous portion while the mastoid portions are gently compressed inward and backward during expiration to slightly exaggerate internal rotation of the petrous portion.

(b) POSITION: Patient supine-operator at head. Hands at sides of head, tips of mastoid processes between the distal phalanges of the index and middle fingers, the thumbs on the squamous portions of the temporals above the zygomata.

MOTION: During inspiration the index fingers gently press the mastoid processes inward and backward to slightly exaggerate external rotation of petrous portions. During expiration the middle fingers bring the tips of the mastoid processes forward and outward while the thumbs press inward and backward on the squamous portions-to slightly exaggerate internal rotation of the petrous portion. Continue until a change in circulation occurs. This may be determined by

(1) a sensation of warmth at the lower occipital and mastoid regions, or,

(2) a change in the diaphragmatic movement (idling the motor).

Both of which indicate activity in the lymph channels similar to that occurring apparently from application of the lymphatic pump method.

Lateral fluctuation of the Cerebrospinal Fluid

The vital functions of the body operate most effectively under the influence of the short, rhythmic fluctuation of the cerebrospinal fluid. It is then that the chemical interchange between that fluid and the blood is most freely accomplished, that the physiological centers in the medulla function most efficiently, that the various elements of the cerebrospinal fluid, chemical or otherwise, are distributed with greatest facility to their destinations in the tissues of the body. This quickened and regular rhythm of low amplitude in the fluctuation is compared by Dr. Sutherland to the ripples on a vessel of water, moving concentrically to a fulcrum when the vessel is subjected to a fine vibration. The effect upon the body is evidenced by a warmth coming from the skin, especially about the occiput, a velvety feel and a lacy appearance to the skin, short, even and effortless respirations, and an approach of the body rates and functions toward normal.

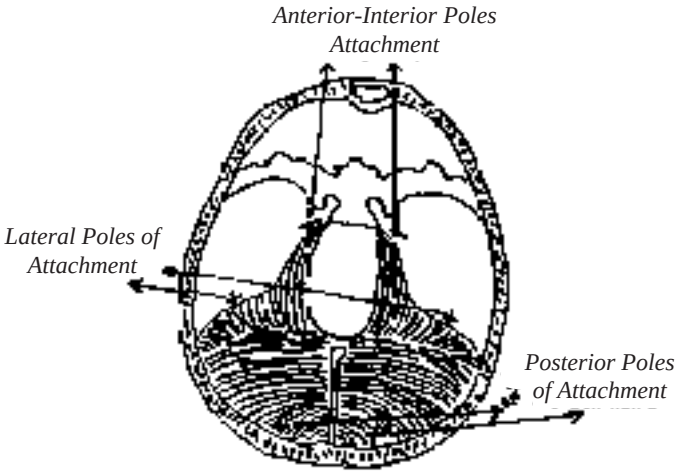
This result is produced in various ways. Reduction in the capacity of the fourth ventricle in the so-called bulb compression is one method. If there is reduced fluctuation of the cerebrospinal fluid as is present in the lowered or vagotonic states of the body the incitant technique is used until the amplitude and usually the rate are approximately normal, followed by compression of the bulb if necessary to produce the systemic reaction. In the cases characterized by over stimulation or sympathicotonia the excessive fluctuation is repressed by steadily holding the temporal bones, sphenobasilar, vault or sacrum to reduce their rate and amplitude in

primary respiratory motion, then using bulb compression if the short, rhythmic fluctuation does not follow spontaneously.

Lateral or side-to-side motion of the cerebrospinal fluid is another means of bringing the fluctuation down to the balanced rhythm close to the fulcrum. The technique is applied with the position similar to either (a) or (b) under incitant technique. The temporal bones are rocked in opposite directions, one in external and the other in internal rotation, alternating the position rhythmically. Before starting the motion it is well to determine by palpation whether there is already present any lateral fluctuation and, if so, the rate and amplitude. This is evidenced by the alternate or opposite rotation of the temporal bones just as the respiratory fluctuation causes them to swing bilaterally externally and then internally. If lateral fluctuation is determined to be present the technique is administered in harmony with the already established rhythm. If no lateral movement of the fluid is palpated one is established by alternately rocking the temporals at a rate of approximately one to one and a half seconds each direction. The rate will probably need to be changed to conform to that assumed by the cranial mechanism as the fluid starts fluctuating. By adding the lateral to the ever-present respiratory movement of the cerebrospinal fluid the fluctuation assumes the desired short, easy rhythm, and the system reaction is manifested by the skin changes and the breathing.

The technique is accomplished with the thenar eminences and thumbs placed in the grooves anterior to the mastoid portions and processes and posterior to the external auditory meatuses, these being the only contacts necessary upon the skull. The fingers are loosely interlaced posterior to the upper cervical spine. The middle fingers are rolled back and forth, one upon the other, providing the motion of the thumbs, which rocks the temporals. It is imperative not to press the temporals posteriorly, but to turn them like the cap on a fruit jar without pressure against one side of the threads. In the usual case the movement must be almost imperceptible. If a stimulating or incitant effect is desired the amplitude of the motion is very slightly greater than that ordinarily applied. If the motion is discontinued and then resumed, it should be in the rhythm already established. It is well to visualize a long pendulum, gently touched on each side alternately to start it swinging. Its natural rate and rhythm must be respected if its motion is to be continued without disturbance.

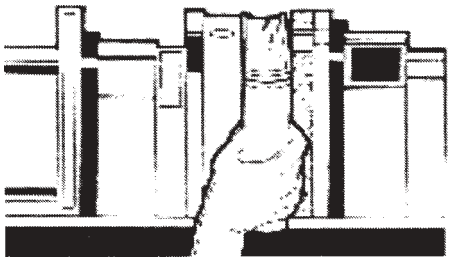
The technique is continued until the systemic response occurs, usually in a shorter time than that required in conventional "compression of the bulb."❐



Illustrating the tentorium cerebelli portion in lreation to the reciprocal tension membrane.

Correction:

In his 2002 Scott Memorial Lecture entitled "Social Capital and Osteopathic Medicine in Transition," Robert C. Ward, DO, FAAO mentioned that Kirksville College of Osteopathic Medicine "Dean (Gerald) Osborne, DO tells me that this is the first time the Scott Lecture has been given on the occasion of the White Coat Ceremony." (*The AAO Journal*, Winter 2002). However, several former Scott Memorial Lecturers subsequently advised the Academy that they too presented their remarks at KCOM's White Coat Ceremonies. Apparently, in some years the lecture was included as part of KCOM's Founders Day Program conducted each fall. The AAO now understands that the lecture will be featured only at the White Coat Ceremony in the future.



Physiological Background of the Cranial Rhythmic Impulse and The Primary Respiratory Mechanism

*Yury MOSKALENK0, ***Viola FRYMANN, **Tamara KRAVCHENK0, *Gustav WEINSTEIN
*Sechenov Institute of Evolutionary Physiology and Biochemistry, Russian Academy of Sciences;
**Russian School of Osteopathic Medicine, St. Petersburg, Russia;
and ***The Osteopathic Center for Children, San Diego, USA

Introduction

Osteopathy in the Cranial Field has gained a special position within the many dimensions of osteopathic medicine. The underlying causes of severe pathological disturbances are to be found in cerebrovascular insufficiency and impaired cerebrospinal fluid circulation. Throughout the early development of osteopathic medicine, Dr. Andrew Taylor Still, its founder, paid special attention to the cerebrovascular and cerebrospinal systems. The role of these systems was well known to him at the end of the XIX Century. He appreciated their respective dominance in body physiology.

Another enlightened pioneer, Dr. William G. Sutherland, who advanced osteopathy into the cranial field, recognized the significance of slow fluctuations arising within the cranium, which could be responsible for skull bone motion. Thus he defined the function named the Primary Respiratory Mechanism in the late 1930s (and published it in the Cranial Bowl text in 1938). The concept was further expanded by Harold Magoun in 1966.

Decades have passed since the formulation of these concepts. Cerebrovascular and Cerebrospinal physiology have made giant advances toward understanding of the functional and structural organization of the cerebrovascular control system and the mechanism of cerebrospinal fluid. These are critically important for understanding the mechanism of osteopathic technique in the cranial field, for evaluation of the fundamental basis of the Cranial Periodic Impulse and the Primary Respiratory Mechanism.

Already, there are new possibilities for objective monitoring of the Primary Respiratory Mechanism under development, in addition to new ways of intervention to investigate the system taking into account a principle concept of osteopathic medicine namely the dynamic unity of the patient. Functional tests of different forms were used ñ hypercapnic and hypoxic gas mixture inhalation, 30-50 seconds of voluntary apnea, the Valsalva and Stookey maneuvers.

The aim of this paper is the analysis of the fundamental background of the features of the Primary Respiratory Mechanism based on modern physiological positions. The objective monitoring of some indices reflecting its activity, as well as functional tests of a different nature provide the means for evaluating the efficacy of osteopathic treatment in the cranial field.

Key Words

The Primary Respiratory Mechanism; Volume/pressure relations of liquid media inside cranium; slow volume fluctuations of intracranial origin; Cranial rhythmic impulse.

1. Significant points of history of cerebrovascular studies.

Understanding of the concepts of Osteopathy in the Cranial Field should be based on knowledge of the structure and function of the cerebrovascular (CV) system and the cerebrospinal fluid (CSF) circulation, which was known at the time they were defined. Therefore the history of CV and CSF physiology is divided into two periods, the first before Andrew Taylor Still and the second – after Still and before William Sutherland.

The main elements of the structural organization of the CV system and its anatomy were described fully during XVIII-XIX Centuries. The starting point of functional studies was the work of Cotugno (1770), and later Magendie (1843) and Salate (1876), who found the liquid medium inside the cranium, the cerebrospinal fluid. It circulates within the cranium and can be considered as the "liquid suit" of the brain.

Investigations of CSF movement and its relation to the vascular system have opened a special avenue of CV physiology. Intensive study of this problem advanced during the late XIX and early XX Centuries when it was found that volumes and pres- ➔

sures of liquid media i.e. CV and CSF inside the craniospinal cavity are closely correlated. There are two channels of CSF circulation, first the circulation activated by secretion pressure from the brain ventricles to the brain surface and spinal cord; and second by irregular CSF movements initiated by local and regional blood volume changes and modulated by CSF pressure and the resistance of CSF pathways (Quincke 1872, Hill 1896). Mathematical simulations of these relations (Geigel 1905) were the most significant feature of these studies. All this data provides the foundation for Dr. Still's famous statement "While the rule of the artery is supreme the cerebrospinal fluid is in command".

Since the middle of the XIX Century, functional activity of the CV system has been studied by direct observation of the lumen of the vessels on the brain surface using simple lenses (Forbes, Cobb 1853). This principle is still applied but using a micro-TV instrument connected to a computer instead of lenses. The most important discovery of all in this period was made in 1890 when Roy and Sherrington established the presence of CV control processes. In 1928 Sepp described slow fluctuations of a number of CV and CSF system parameters: periodical fluctuations of vascular tone, CSF periodical movements and fluctuations of its pressure.

These data became known just before the description by Sutherland of the hypothesis, which he named the Primary Respiratory Mechanism (PRM). The PRM according to Sutherland includes a number of structural or anatomical elements namely brain, blood vessels, meninges, the cranial bones with their delicate articular design of sutures and the reciprocal tension membrane of dura mater. Within the cranium there is the source of the special physical forces, which initiate the cranial rhythmic impulse and skull bone motion.

At the second part of the XX Century a number of problems related to the PRM and the Cranial Rhythmic Impulse were solved by new technology for the study of CV and CSF circulation - the technique of implanting electrodes into human and animal brain (Moskalenko et al 1964; Cooper et al 1966; Fedulova et al 1971; Grechin and Borovikova 1982). These investigations clearly demonstrate for the healthy brain that slow fluctuations (4-18 cycles/min) of brain volume, oxygen availability in brain tissue and intracranial pressure have their special features. A resume of investigations of this period is the statement by Magoun (1966) concerning features of PRM: " The inherent motility of Brain and Spinal Cord, the Fluctuation of the CSF. The mobility of the intracranial and intraspinal membranes, the Articular Mobility of Cranial bones and the Involuntary Mobility of the Sacrum between ilia".

A quarter of a Century has passed and progress in CV physiology, including CV dynamics has been made. The next step toward understanding the fundamental basis of the functioning of the PRM is the analysis of

– volume/pressure relationships of arterial and venous blood and CSF inside the closed cranium, their meaning for the functioning of the process of the circulatory supply of brain metabolism, which in turn should be based on the study of craniospinal biophysical structure;

– principles of the "generating" of physical forces, which may be responsible for periodical CV and CSF volume/pressure fluctuations and skull bone mobility, which in turn should be based on certain control processes, which are special for the CV system.

2. Relationships between volumes and pressures of blood and CSF inside the cranium.

Experimental and clinical observations demonstrate (Figure 1) that relations between main parameters specific for CV and CSF systems are complex. They have connections between different elements of the cranial cavity and the central blood circulatory system. The scheme represents the Biophysical Structure (BPhS) of the CV system and provides understanding of the relations between the single elements. From Figure 1 it follows that the BPhS of the CV system includes several groups of parameters. The principal one is complex - cerebral blood flow, cerebrovascular resistance, brain blood volume and intracranial pressure, which create a functional unit. The first two belong predominantly to the CV system while the latter to the CSF system. It is important to emphasize that all complex parameters are independent interacting only indirectly. Thus it is impossible by observing one parameter to study another. It follows from Figure 1 that although all complex parameters are formed by the same primary factors this influence for every parameter is specific and correlation between them is determined by a particular combination of primary factors - pressures and volumes. For example, in one combination of primary factors, if arterial volume increases, cerebral blood flow (CBF) increases together with increase of intracranial pressure (ICP), but if venous volume inside the cranium increases or outflow of CSF to spinal cavity is obstructed, increase of ICP will be accompanied by a decrease of CBF.

BPhS is responsible for a number of important features of the functioning of the CV system and established some rules of its study:

— Close correlation between volume of blood vessels and intracranial pressure, on the one hand, and pecu-

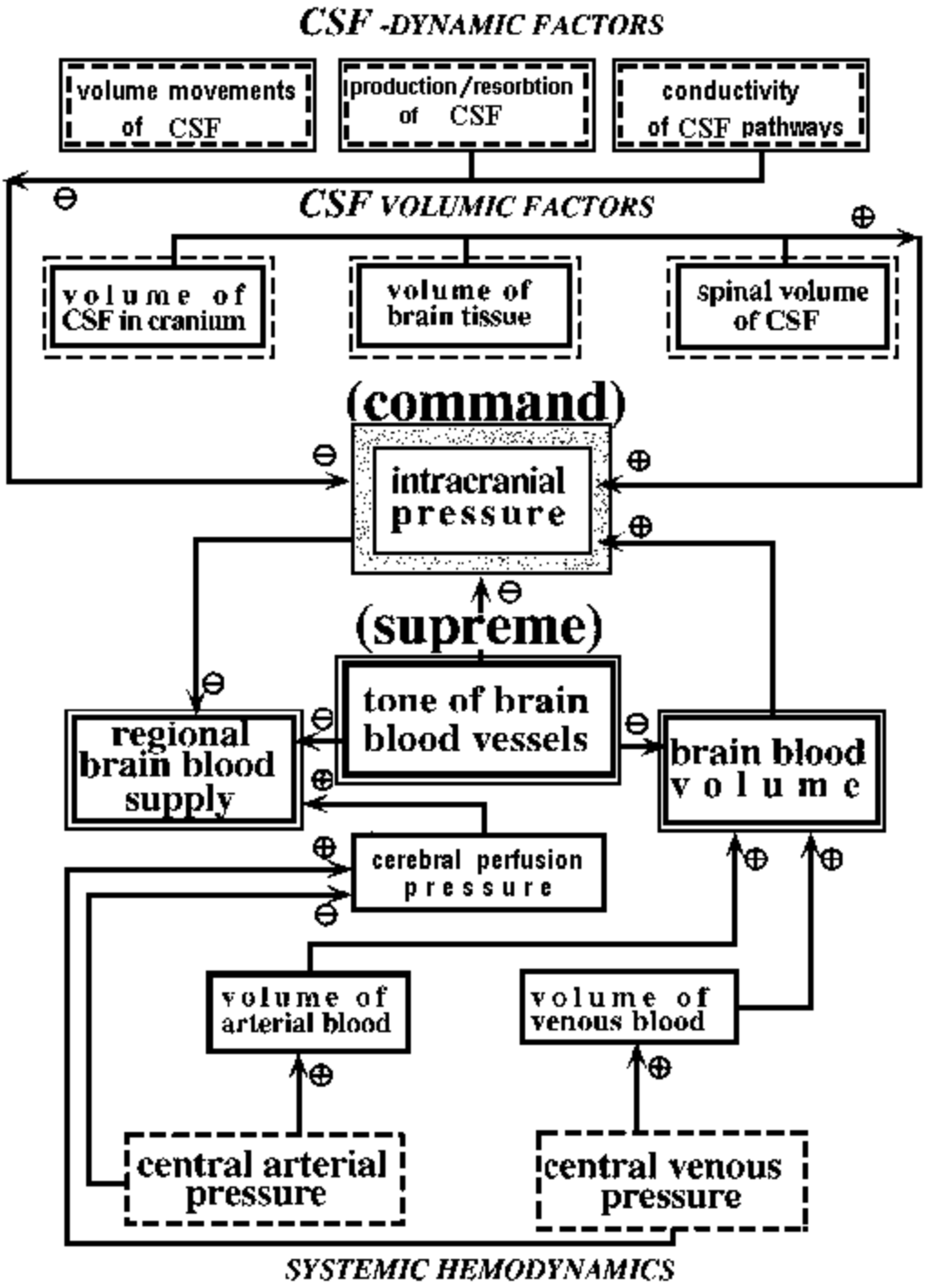


Figure 1: *Biophysical structure of the cerebrovascular system. Schematic representation of functional relations between pressures and volumes of liquid media, cerebrovascular tone, central hemodynamics inside craniospinal cavity. (+) - direct influence, (-) - inverse influence between blocks of the scheme.*

liarities of localization of major arteries at the base of the skull, while, on the other hand, major veins in the vault on the top of the skull determine important mechanisms of utilization of energy of arterial pulsation to facilitate outflow of venous blood from the skull. When the arterial pulse wave reaches the skull it initiates the increase of blood pressure and volume on the base of the skull and replacement of a particular volume of CSF to the veins that have been compressed. Some portion of blood is coming out of the skull. Direct evidence of the presence of such a mechanism has been collected over the years. For example, by direct observation it has been established (Zibulsky 1885) that venous outflow from a dog's head is pulsating while in parenchymal brain vessels blood flow has no pulsations. The most recent evidence has been obtained by MRI computer tomography (Grietz et at 1992, Enzmann and Pelc, 1992, Poncelet et at 1992), which demonstrates pulsating movements of the brain inside the closed cranial cavity. Note that the amplitude of movement of intracranial media corresponds to the amplitude of skull bone motion perceived by computer MRI and X-ray image analysis (Moskalenko et at 1999). The rhythmic external, internal rotation of the parietal bones of the vault stimulates motion of venous blood through the sinuses that also support this mechanism.

Distribution of the energy during the cardiac cycle provides for adequate cerebral circulation: averaged level of arterial pressure (i.e. DC component) is responsible for blood supply of brain tissue while pulsating arterial pressure (i.e. AC component) is responsible for venous outflow from the skull. Therefore there are two separate ways for arterial pressure energy transmission inside the cranium. Calculations, with the help of a mathematical model, show that owing to this mechanism about 30% of stroke impulse energy delivered to the cranium could be saved (Moskalenko et at 1980). This statement demonstrates that regional brain blood supply is determined not only by hemodynamic factors but also by CSF mobility. Therefore, if resistivity of CSF pathways increases, the regional CBF will decrease, and this may be the explanation of some kinds of neurological deficit. Such a situation might be one of the consequences of brain injury. In this case the appropriate osteopathic techniques could increase the CSF circulation in the injured brain region, promote increased regional CBF and thus diminish neurological problems.

— The important consequence of BPhS and peculiarities of brain blood vessels namely the permeability of small brain blood vessels for water is that during arterial hypertension brain edema could take place if the CV control system does not stabilize cerebral blood flow at a new adequate level (Moskalenko 1988). This means that in this situation it is impossible to both support the initial high brain blood supply and normal brain tissue hydration at the same time. Therefore some decrease of cerebral blood flow in cases of arterial hypertension must occur as a compensatory reaction to support the brain volume.

— Peculiarities of BPhS give the reason for the statement that this system consists of two components. This means that the system includes structural elements, which are characterized by different time-response parameters. The first structural element is cerebral blood vessels and the second - regional CSF volume/pressure relations. Time responses of volume/pressure relation of cerebrovascular system are sufficiently shorter as compared with CSF regional volume/pressure relations due to limitation of volume conductivity of CSF pathways. For the study of functioning of the CV system it is necessary to record at least two independent parameters, characterizing both intracranial volume processes and ICP, which are responsible for CSF movements.

3. Periodical fluctuations of cerebrovascular parameters.

Numerous investigations demonstrate that all indices characterizing functioning of the CV and CSF systems are fluctuating continuously with various periodities.

A. The most pronounced and most regular are fluctuations, initiated by heartbeats. Patterns of pulse fluctuations, or their wave shape are represented as a complicated curve, similar to a central arterial pulse, but varying their form from beat to beat, depending on the phase of respiration, movement of the patient, and others. They are also dissimilar for the different recorded parameters. Therefore their recording, study, comparison and analysis should be made when the patient is quiet and lying comfortably in a horizontal position. Taking into account that the arterial pulse is an "external signal" to the CV and CSF systems, it could be considered as a special "functional test". This is a very important statement for the study of any functional system because it is impossible to provide any valid result unless the system is fully quiet. Therefore analysis of pulsation of CV and CSF parameters could evaluate some peculiarities of its functioning. Taking into account that latency of control processes in the CV system is not shorter than 1.5-3.0 sec (average 2.3 sec - Moskalenko et al 1996) during the pulse cycle only the passive (as a physical composition) properties of the system under investigation could be studied.

B. Together with pulsation, respi-

ratory fluctuations are also pronounced initiated by the chest movements of breathing. This type of fluctuation as determined from BPhS analysis is derived from two forces (Moskalenko et al 1980). First, the decrease of pulmonary pressure and consequent decrease in blood pressure in the upper body venous system during inspiration. As a result blood volume inside the cranial cavity decreases and ICP decreases, too. Second, at the same time there is increase in visceral pressure below the diaphragm, compression of veins, which have no valves, and replacement of some portion of blood to the spinal cavity. ICP will therefore increase during inspiration. Thus during pulmonary respiration two opposite forces, which, determine brain blood volume and ICP, are operating. Depending on individual characteristics one of these forces could prevail over the other since some individuals use thoracic respiration versus others who use diaphragmatic respiration. The parameters inside the cranium may vary with the respiratory type.

C. Beside pulse and respiratory fluctuations, CV and CSF parameters are characterized by slow fluctuations with variable periodicity (2-16 cycles/min) and unstable amplitude. First, these fluctuations were observed as slow variations of the vascular lumen of surface cerebral blood vessels, slow replacement of CSF and fluctuations of ICP. Later, similar fluctuations of oxygen availability in brain tissue (Cooper et at 1966) and cerebral blood volume (Moskalenko et at 1969) were recorded in human brain. Recently, slow fluctuations in cytochrome "aa3 activity were revealed (Vern et at 1997).

It was found also, that together with fluctuations of CV parameters, similar slow fluctuations are special for the central blood circulatory system. This means that slow fluctuations of CV parameters could have two different origins - one intracranial and the other extracranial. For central circulation, slow fluctuations are of three groups:

A – waves with period 2-20/min, named "plateau waves" are characteristic of pathology.
B – waves with period 1-2 cycles/min.
C – waves fluctuations of central arterial pressure namely Traube-Hering waves.

For determination of the real origin of slow fluctuations of CV parameters the correlation principle of analysis has been used (Moskalenko et at 1980). Although, at that time computer analysis of fluctuations was not easily accomplished, it was found that slow fluctuations of arterial pressure did not correlate with slow fluctuations of brain blood volume and with oxygen availability inside brain tissue. Slow fluctuation of cerebral blood flow however does closely correlate with local fluctuations of brain blood volume and oxygen availability in brain tissue. More precise investigation of the origin of fluctuations of CV and CSF parameters could be done by spectral analysis. This type of analysis is based on the fact that any fluctuation with complicated forms of waves could be presented as a number of simple sinusoid fluctuations of different frequencies derived from the analyzed fluctuations. Determination of the origin of the slow fluctuations of CV and CSF parameters can be provided by comparison of the spectral component of fluctuations, unique for physiological systems of intracranial and extracranial nature. In other words, the initial forces are localized inside cranium. The special advantage of spectral analysis is the principle of amplitude normalization that is to represent the maximal amplitude of each process as a reference unit; by this way it is possible to compare fluctuations of principally different processes. Recent applications of spectral analysis have shown (Moskalenko 2000, Moskalenko et at 2001) that slow fluctuations are composed of extracranial fluctuations of arterial pressure and respiratory chest movements, and of intracranial fluctuations namely redistribution of CSF volumes inside skull.

It has been shown that slow fluctuations of systemic circulation are characterized by spectral components 2-4 cycles/min; they were described in the XIX Century (for ref see Koepchen 1984) as Traube-Hering-Mayer waves (or B and C waves). Spectral components reflecting intracranial fluctuations are represented by 5-15 cycle/min, and they are close to a separate spectral component, which represents respiratory movements. Therefore, it is possible definitely to conclude that there are slow fluctuations 5-15 cycles/min, which are initiated inside the cranium (Moskalenko et at 2001). These data were confirmed recently (Zhang et at 2000).

4. Physiological basis of slow fluctuations of cerebrovascular and CSF parameters.

The physiological background for understanding the of origin of the intracranial slow fluctuations, and thus of the PRM, should follow from the modern interpretation of the general principles of the physiological mechanism responsible for adequate blood and metabolite supply of the brain under different living situations. This ➔

mechanism is characterized by two functional goals: one is to support the metabolic supply of brain tissue and the other is to support the water balance of brain tissue. Both of these goals are realized by the same executive mechanism - the brain and parenchymal blood vessels. Therefore, CV control processes have been based on a multi-link control system, including a neurogenic link with several types of efferent innervation, a myogenic link based on sensitivity of the vascular wall to stretch forces, and a humoral link based on sensitivity of the vascular wall to hormones. (Moskalenko et at 1988).

Synergistic functioning of these control links supports both metabolic supply and water balance of brain tissue. The mechanism of "generation" of slow fluctuations of CV and CSF parameters is based on the fact that control links supporting metabolic supply and water balance of brain tissue are characterized by different time constants because one of the conclusions of the theory of complicated control systems is the declaration that any system having two or more control links with different time constants should produce some fluctuations This explanation was accepted for the understanding of the mechanism of the slow fluctuations of central arterial pressure (Koepchen 1984, Miyakawa et al 1984). This should be fully accepted for the CV system because numerous experiments have shown (Moskalenko et al 1989, Moskalenko et al 1996) that latency for metabolic supply, e.g. for oxygen delivery to brain cells, is rather short – 1-3s, but for support for water balance of brain tissue is longer – 8-12s.

Thus one may conclude that slow fluctuations of CV system related with the CSF parameters are maintaining the metabolic supply of brain tissue and support of its water balance by interaction of these control links. This conclusion supports the concept that the slow fluctuations of intracranial origin, manifesting as the cranial rhythmic impulse are generally independent from the other bodily rhythms (Magoun 1966) but may be responsive to external or internal pathological influences. It is therefore possible to conclude that the fundamental basis of the PRM; its frequency and amplitude, reflect peculiarities of functioning of the CV control system, as well as CSF mobility. If frequency of PRM decreases while amplitude increases - it means that brain tissue metabolism increases

5. Fundamental basis of cranial rhythmic impulse and skull bones motions.

Questions connected with understanding the fundamental principles of the Cranial Rhythmic Impulse (CRI) and the PRM are based on the evaluation of physical forces that could be responsible for skull bone motion. First, what type of motion is most relevant? There are three types of structural deformation - stretch deformation, deformation of rotation, and curve deformation. Taking into account the physical properties of living bone it is impossible for any kind of these deformations, to occur. The physical forces that would be required are not physiologically present. Only one explanation is feasible. Skull bone motion may be considered as comparative changes of the position of bones at their sutures. In other words, mobility of skull bones is localized in sutures. This statement is supported by many published investigations (Frymann 1971, Adams et al 1992). During the last decade, using various methods a rhythmic periodicity of skull bone motion of 6-15 cycles/min has been clearly demonstrated (Chaitow 1999, Moskalenko 2000). In order to fully appreciate this evidence however, it is necessary to evaluate the physical forces that could exist within the closed cranium. There are three sources that will be considered. The first is the CV System, which initiates periodical fluctuations of ICP. This statement is supported by direct observations of patients under intracranial angiography investigations. For this purpose subjects were given an injection of 20 ml X-ray contrast solution into the internal carotid artery. (Only subjects without pathology were included in this study). Measurements made in rest state indicated mobility with an amplitude of 0.2 - 0.4 mm immediately after the injection movement increased up to 1.0 mm in 1.5 seconds. Calculations, using a simple model, demonstrate that the reason for this movement was the increase of ICP due to increase of arterial volume in the cranium (Moskalenko et al 1999). Thus it is clear that slow fluctuations of brain arterial blood volume are due to CV control processes and could initiate skull bone mobility.

In connection with these suggestions it is necessary to mention one recent publication, which declares that the PRM is absent and is some artifact, connected with personal sensitivity of physicians (Herniou 1998), because, as it follows from the author's data (no references), amplitude of skull bone mobility is very small, much less than could compare with the above-mentioned data.

Unfortunately, it is difficult to analyse results of the calculations presented in that paper, and compare them with other results, because the author gives only final results of some calculations without either initial data or method of calculations. Is the initial subject under investigation a living structure or a cadaver? However, it is possible to mention, that out of their theoretical analysis and presentation the skull and CSF as a bio-mechanical couple, appear to be most

questionable. The author declares that velocity of CSF is about 5 cm/min! – but this value is difficult to accept, because data obtained even 40 years ago described linear flow, which is much higher, according to numerous measurements using radioactive markers (Vassilevsky, Naumenko 1959). Additionally, the author of the paper did not take into account numerous MRI data (Grietz et al 1992) demonstrating pulsating movements of CSF. However, the author gives interesting and valuable data, concerning microstructure of living skull sutures.

The second possibility of skull bone motion is based on reciprocal tension of brain membranes (Greenman 1989, Magoun 1966). It is significant that the membranes are firmly attached to the skull bones and are characterized by thick inelastic connective tissue structure. But it is not recognized up to the present time as a source of motivating forces, which could be responsible for periodical skull bone motion. However, without any doubt, it is possible to suggest, that these membranes play a significant role as a passive modulator, which determines directions and comparative changes in the position of particular bones. The third possibility is based on the fact, that glial cells could change their volume under different conditions (Roitback 1993). For acceptance of this position it is necessary to establish "volume-pressure" dependence for glial cells, to find time constants of this process and to establish the connection of glial cells volume changes with ICP and control processes of the CV system.

Therefore taking into account the data collected up to the present time the first statement appears to be the most feasible concerning the nature of the PRM. Periodical fluctuations of vascular tone are called "vasomotion". Understanding the PRM should reflect, first, the nature of the initial forces, fluctuations of vascular tone which are determined by peculiarities of CV control processes; second, the possibility for CSF replacement inside the cranium and between cranial and spinal cavities. Following from this fundamental basis of the PRM its activity can be described by the complex of objective parameters, as well as from the results of spectrum analysis, which is the most adequate method for the analysis of slow fluctuations with changeable frequency and amplitude.

6. Principles of the study of PRM and CRI.

The study of PRM and CRI include the next important positions:

1. Methods for recording parameters and collecting data, which could be used for presentation of quantitative indices characterized by PRM and CRI.
2. Methods for analyzing collected data in order to express them in a comparable and acceptable form for physicians.
3. Methods for investigations of studied system should be based on the application of some functional tests. This could make some peculiarities of the activity of PRM and CRI visible which are "silent" and not revealed at the rest conditions.

It follows from analysis of the BPhS, that it is necessary to provide simultaneous recording of at least two different parameters for the study of functioning of the PRM and CRI that is necessary to provide simultaneous recording of at least two different parameters. For this purpose, as it was shown earlier (Moskalenko 1999, Moskalenko 2000), the most acceptable would be the combination of simultaneous recordings of Bio-Impedance (B-Imp) and transcranial dopplerography (TCD), because these methods are based on different physical principles and, therefore, reflect different aspects of the functioning of CV and CSF systems. Indeed, B-Imp records the change of electrical conductivity between plate electrodes, placed on the human head, for high frequency (50-70 kHz) electrical current. Because electrical conductivity of blood and CSF are different (for blood it is about half that for CSF), their comparative volume changes will change the electrical conductivity between electrodes. This method is used in clinical practice for cerebrovascular examination (Jenkner 1987, Moskalenko, Weinstein 1983, and others). TCD method is based on Doppler's effect – that is change of frequency of ultrahigh sound in moving media – e.g. moving blood inside vessel. For investigation and monitoring purposes it is necessary to investigate the same brain region. For this purpose, the fronto-mastoid position of B-Imp electrodes and focusing of TCD probe on segment MI of middle cerebral artery (MCA) (close to the circle of Willis) must be used on the same brain hemisphere.

There are two principles of analysis of simultaneous recording of B-Imp and TCD. One is used during short time intervals when no control processes in the investigated system could exist. This could be suggested as a passive one. The second principle of analysis is based on statistical calculations, therefore rather long-time recording intervals have been taken, when active properties of the system were revealed and analyzed.

The most appropriate way for the first principle is to analyse B-Imp and TCD recordings during the single cardiac cicle. This period is significantly shorter than any control process in the CV system. Therefore only passive relations representing the Blood/CSF volume replacements could be evaluated. In such situation TCD changes will be proportional to ICP changes, ➔

because pulsatile changes of linear velocity of blood flow in MCA initiate volume pulse fluctuations of its major branches, and regional ICP will increase. Therefore, simultaneous recordings of B-Imp and TCD during pulse cycle will represent indirectly relations between changes of ICP and CSF volume inside investigated region of cranium - the first is the initiating force and the second is result of its action. For the most correct interpretation of pulse, TCD and B-Imp pulse patterns they must be taken in the expiratory phase, because venous brain volume depends on secondary respiration and could modulate the interrelations between TCD and B-Imp pulsatile peaks. This is important for the first principle of data analysis. For the second principle of data analysis it is important to derive from the slow fluctuations of intracranial origin of TCD and B-Imp their secondary respiratory components. That is why the respiratory movements of the chest should be continuously recorded. Thus, it is possible to predict, that TCD changes will be ahead to B-Imp changes, because CSF volume could change only if CSF moves inside investigated region, but for this some time is required due to limitation of conductivity of CSF pathways.

For the second principle of analysis of simultaneously recorded TCD and B-Imp the most appropriate way is to analyse continuous recordings of these parameters during 45-60s. This would permit the application of the spectral (or Fourier) type of analysis for evaluation of slow fluctuations of intracranial origin (Figure 2), which represent the activity of PRM and CRI.

For the study of CV and CSF systems it is important to apply some functional tests which should be directed to particular aspects of the functioning of the system under in-

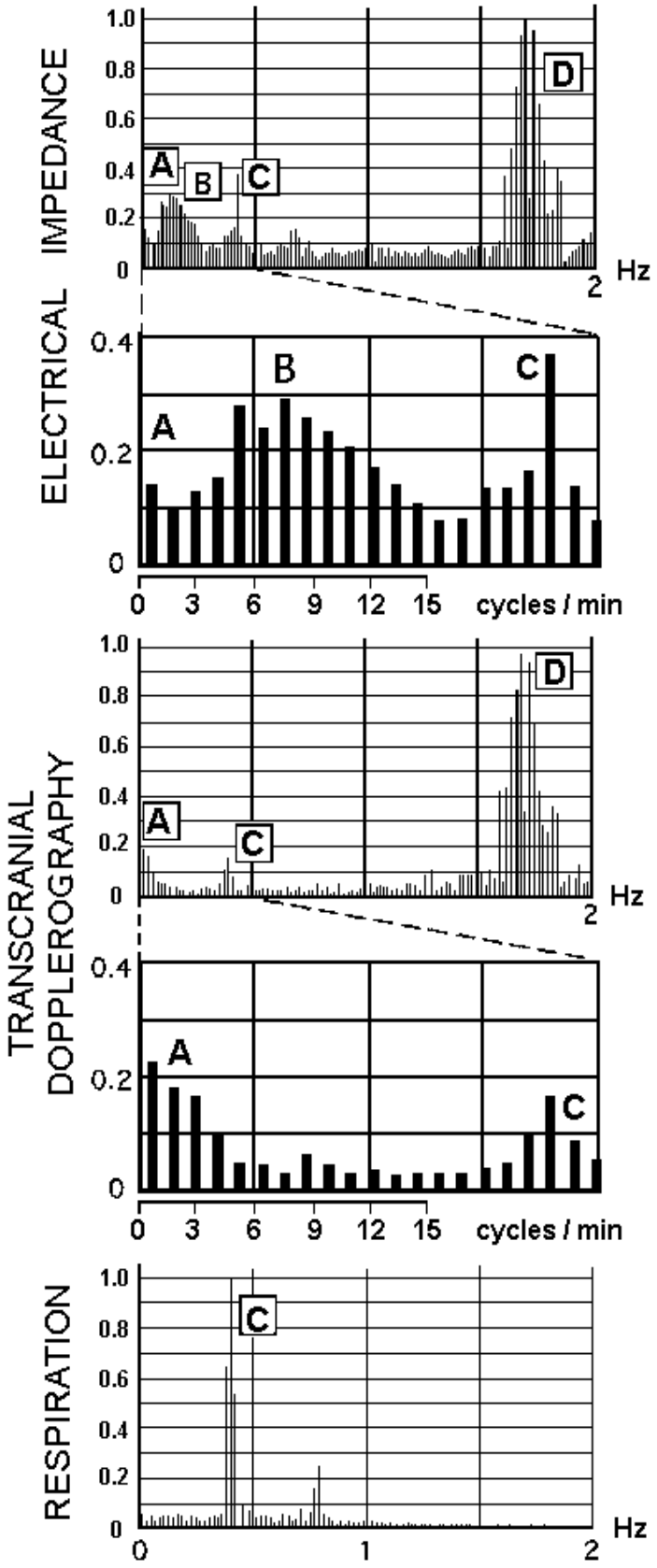


Figure 2: *Low frequency parts of spectral components of simultaneously recorded of B-imp, TCD and chest respiratory movements evaluate slow fluctuations of intracranial origin (B) from similar fluctuations of extracranial origin (A), respiration (C) and heart activity (D).*

vestigation. Physiological and clinical experience of the study of the functioning CV and CSF systems shows that for these purposes the following functional tests are the most acceptable:

— The role of brain arteries could be evaluated under the application of functional tests that change their tone. This is 60-90 second gas mixture inhalation 7.5% $C0_2$ in air, which actively dilates cerebral arteries (Lassen 1978). However, increase $C0_2$ in air also stimulates brain respiratory center. Nearly the same effect is noted for respiratory arrest. Reverse effect gives a voluntary hyperventilation functional test. Inhalation of low oxygen (6%02) gas mixture acts primarily on brain arteria

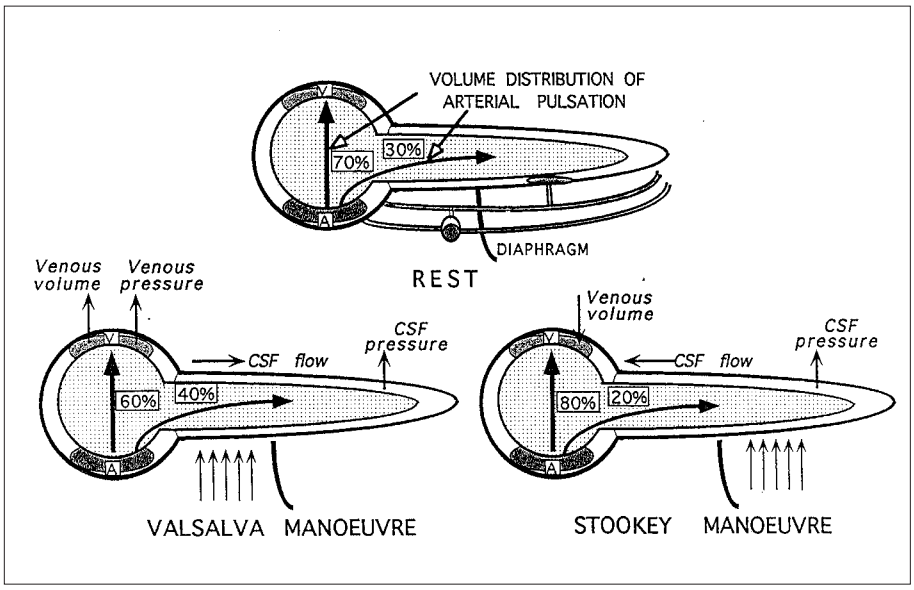


Figure 3: *Redistribution of arterial pulsatile volume during cardial cycle within the craniospinal cavity under the influence of Valsalva and Stookey maneuvers.*

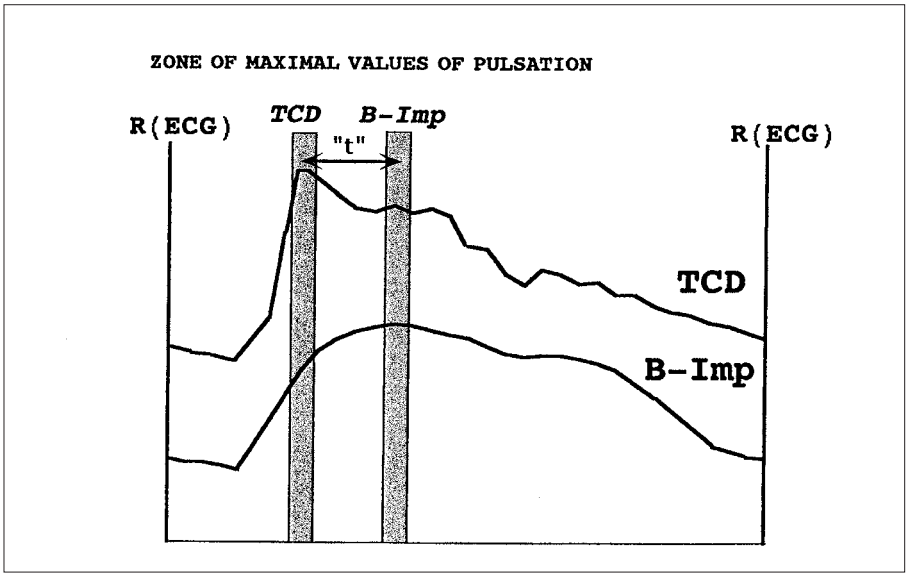


Figure 4: *Averaged representation of 15 pulse cycles of TCD and B-Imp obtained in healthy persons. "t" is the time shift between peaks of the two pulsations.*

— The application of the Queckenstedt manoeuvre with the head inferiorly tilted 30 degrees provides a direct influence on brain veins.

– A special group of functional tests is directed to the CSF system. They are the Stookey manoeuvre, which consists of moderate pressure to the abdomen, and the Valsalva manoeuvre - the voluntary strain and increase of intrathoracic pressure. They both evoke CSF replacements but in opposite directions (Figure 3).

The application of these functional tests is important for analysing of informational meaning of slow fluctuations of intracranial CV and CSF parameters, which represent the activity of PRM and CRI.

The comparison of patterns of pulse curves of these parameters have shown that is taking place because maximal peaks of the pulse waves of B-Imp and TCD are not synchronous and the difference between peaks is characterized by some time shift "t" (Figure 4). Therefore time shift between peaks of TCD and B-Imp is determined by the replacement of some portion of CSF out from (or into) zone of B-Imp electrodes. Thus this time interval represents the mobility of CSF inside the cranium during the pulse cycle. At this period no active processes could operate.

Investigations under different conditions have shown that "t" reflects CSF mobility. Indeed, it becomes smaller during increase of brain blood volume by any way due to diminishing possibilities for CSF movements - during inspiration phase or 7.5% $C0_2$ inhalation, tilting head-down or Stookey manoeuvres. Measurements during expiration phase have shown that "t" variations for healthy adult persons are limited by 10-20%. However for the post brain -injury patients the "t"- time interval was found to diminish up to 30-50%, and similar, but less changes were obtained in healthy

➔

persons during some functional tests. This can be revealed the most clearly if time scale is normalized by ECG "R-R" interval (Figure 5). This means that such patients are characterized by diminishing CSF mobility. After appropriately administered osteopathic treatment this time interval usually increases indicating an increase in CSF mobility. Some athletes were characterized by increased 'T' time intervals, which indicate their compensatory capabilities are higher, as compared to the average "Man on the street".

In addition to patterns of analysis of TCD and B-Imp records, sufficient information can provide the phase type of analysis by presentation of data in an "X-Y" scale (Figure 6). This reveals any disproportions in dynamics of compared curves. Both start at the same point. The loop indicates that tracings "increase" and "decrease" on the curve in an "X-Y" scale without repeating each other. Square of the loop which indicates the disagreement of TCD and B-Imp or, in other words, replacement of CSF are significantly less in the patient with consequences of brain injury (intracranial hypertension) and significantly greater in athletes, intensively trained as divers.

It is important that there is visible correlation between changes of disproportion of TCD and B-Imp during the pulse cycle and cerebrovascular tone, as well as changes of conditions for CSF replacement. For example, when cerebral blood volume increased after 7% $C0_2$ inhalation, or ICP increased in response to the Stookey manoeuvre, the square of loop on "X-Y" graph and the 'T' interval became smaller, but both increase if brain blood volume decreases in response to hyperventilation or decrease of ICP.

The application of the second type of data analysis for samples of 45-60 seconds continuous recordings is the most successful if they are performed without any interference. For this it is necessary for the patient to lie motionless in the supine position. The recordings were made before and after some manipulation (application of osteopathic techniques and functional tests). Special attention has been paid to the B-Imp recording because, as was mentioned earlier, this parameter reflects particularly slow fluctuations of intracranial origin. To exclude possible mistakes by involving slow fluctuations of extracranial origin, the other recordings such as respiratory movements of chest, were recorded simultaneously.

For evaluation of slow fluctuations of intracranial origin the spectral principle of analysis in range of 0.05-0.3 Hz (3-18 cycle/min) has been used. These frequencies include slow fluctuations of intracranial origin, which are representing the activity of the PRM. For unification of amplitude indices, spectral components representing slow fluctuations were compared with pulse amplitude, which is

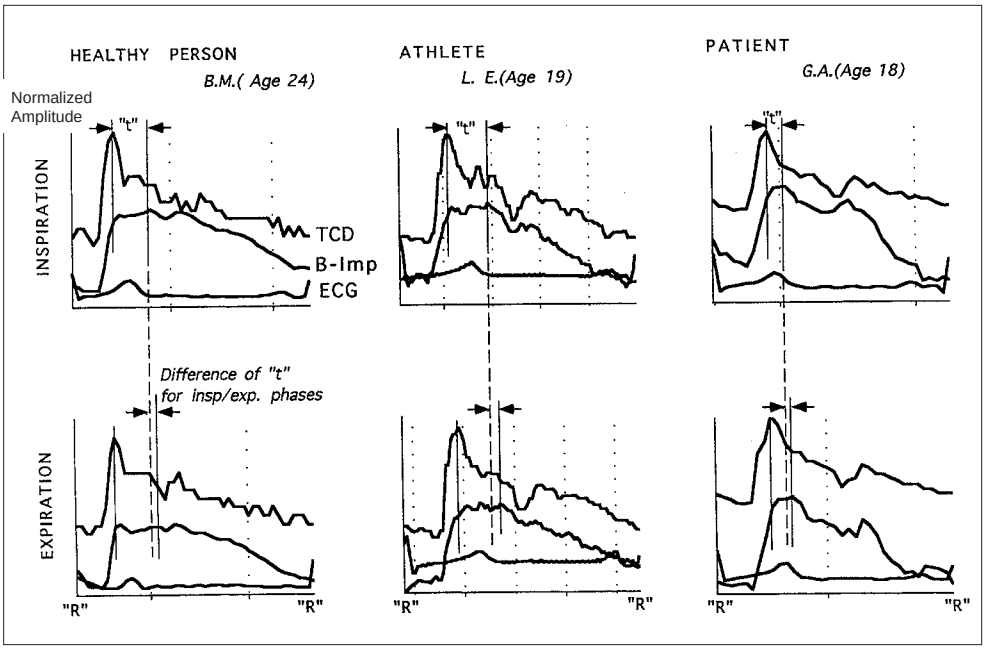


Figure 5: *The difference of "t" between inspiratory and expiratory phases of the secondary respiration in a Healthy person, Athlete trained in diving and Patient after head injury.*

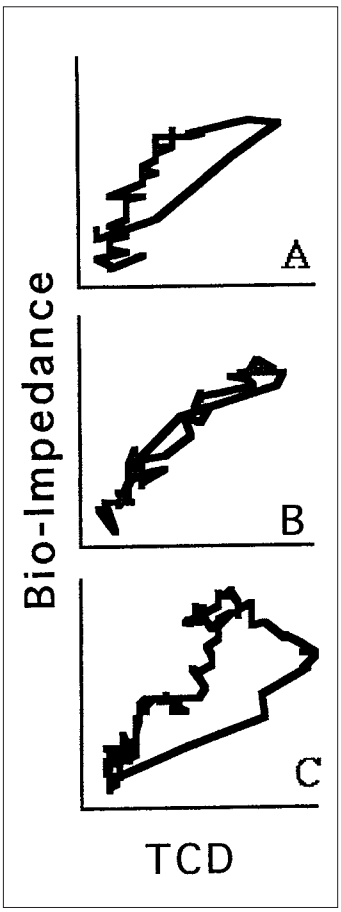


Figure 6: *Phase diagrams of B-Imp and TCD in:*
A - Healthy person;
B - Patient after head injury;
C - Athlete

the most pronounced and has been taken as a reference 1.0. In other words, amplitudes of spectral components were expressed as normalized units. It has been shown that under above described conditions for healthy adult persons the average amplitude of slow fluctuations representing PRM and CRI is 0.4+-0.15 normalized units. Frequency ranges are from 5-14 cycles per minute. It is necessary to consider that in these ranges secondary or pulmonary respiratory components may occur. Usually, secondary respiration is characterized by frequencies 15-24 cycle/min. It is important to emphasize that no correlation was found between averaged (group of 10 patients) changes of frequency and amplitude of PRM and changes of frequency of secondary respiration or heart rate deviations during different function tests namely inhalation of gas mixtures with 7.5%$C0_2$ or 6%0_2 (Figure 7). No correlation was found also between changes of frequency of PRM after voluntary respiratory arrest for 30s before and after application of osteopathic technique venous sinus drainage (Figure 8). These data suggest that PRM and secondary respiration have no direct connection, but their clinical independence is quite significant. All of the above mentioned data showed that the informational meaning of changes of parameters of PRM could indicate the changes of activity of CV control processes, if frequency distribution of spectral lines are changed, or, if only amplitude indices of PRM are changed - this means, that conditions of CSF dynamic were changed. These suggestions demonstrate the meaning of monitoring of parameters of PRM as a way for evaluating efficacy of osteopathic treatment.

Thus, results of investigations of slow frequency fluctuations of intracranial origin show, that the phenomenon named by Dr. Sutherland as the "Primary Respiratory Mechanism " is an independent parameter of the functioning of the CV and CSF systems. It reflects indirectly the activity of CV control processes connected with activity of systems, responsible for brain metabolic supply (chemical homeostasis of brain tissue) and maintenance of water balance of brain tissue (physical homeostasis of brain tissue). These include "external" (secondary) respiration, heart activity and control of basic vascular tone, the control centers of which are localized in the brain. They have a functional influence on PRM activity. Therefore indices characterizing activity of PRM are connected with external respiration and heart activity, but these connections are only of a resilient response but not routine functional nature, without permanent and definite correlations.

This data leads to the conclusion that simultaneous recordings of TCD and B-Imp can give valuable infor- ➔

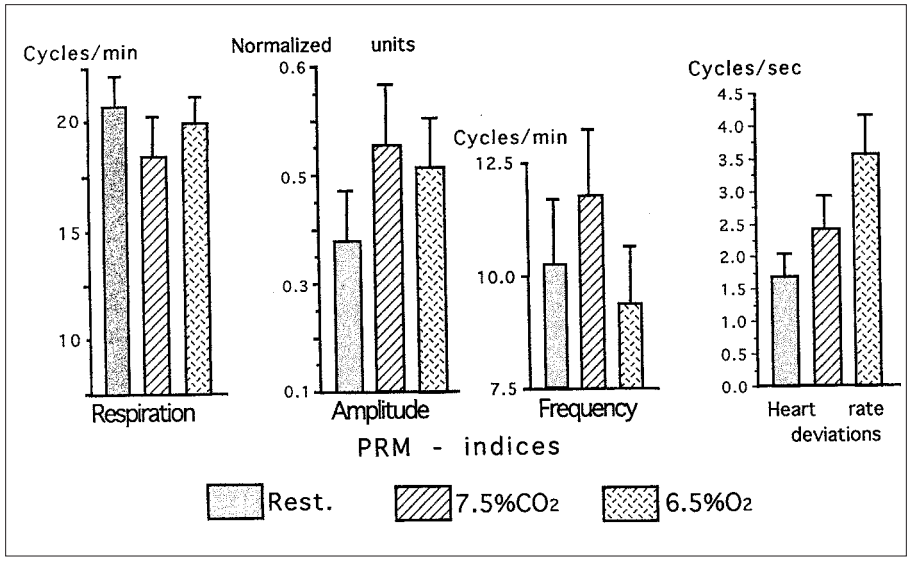


Figure 7: *Amplitude and frequency characteristics of PRM, secondary respiration and heart rate deviations in group of healthy persons (n=12) in different situations: Rest, Inhalation of hypercapnic (7.5%CO2) and hypoxic (6.5% 02) gas mixtures.*

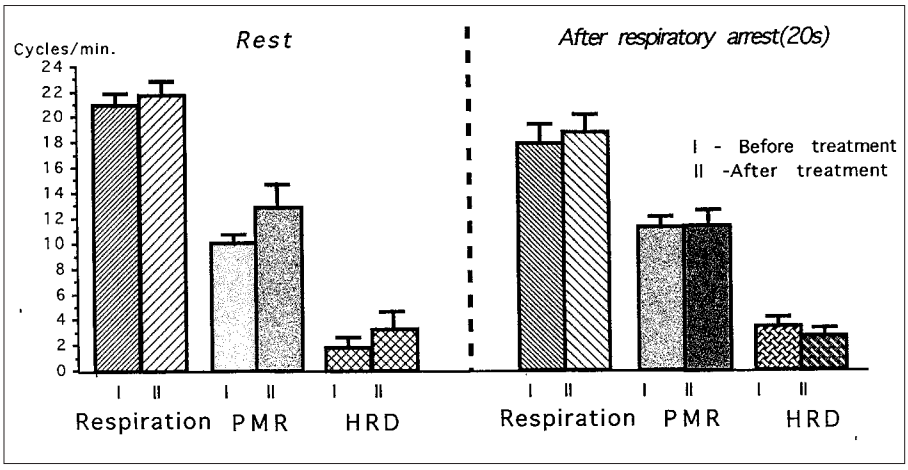


Figure 8: *The changes of frequency characteristics of PRM, secondary respiration and heart rate deviations in patients after head trauma (n=10) under influence of osteopathic manipulative techniques I - before treatment, 11 - after treatment.*

mation concerning CSF mobility. It also permits monitoring of the efficacy of the osteopathic manipulative treatment.

Conclusions

The presented data demonstrate that CV and CSF systems are characterized by a complicated biophysical structure, which determines the relationship between pressures and volumes of liquid media - blood and CSF inside the closed cranial cavity. Due to special biophysical structure, control processes in the CV system are directed to the complex functional goal, to provide chemical support (metabolites supply) and physical support (water balance of brain tissue) and homeostasis of brain tissue. As a consequence of CV control processes, slow fluctuations of CV and CSF parameters occur. These fluctuations are the most probable cause for periodic skull bone movements.

1. Structure of PRM:

Dr. Sutherland suggests that the PRM includes brain, CSF, intracranial and intraspinal membranes, articular mechanism of the cranial bones. ***Modern interpretation:*** These elements consist of the special biophysical structures of the craniospinal cavities, which determine interaction between volume and pressure of liquid media - blood and CSF inside the cranium and the craniospinal cavity.

2. Dynamic relations of PRM:

Dr. Sutherland suggests that skull bone mobility is related to and controlled by reciprocal tension function of the dural membranes, determined by special structural relations. ***Modern representation:*** Changes of distances between fixed points in particular skull bones are determined by CSF periodic fluctuations. The presence of reciprocal components in skull bone motions is determined by the modulatory role of membranes.

3. Functioning of PRM:

Dr. Sutherland suggests that the brain is the "motor", and might be visualized as cerebral convolutions. ***Modern representation:*** Slow periodic fluctuations of the parameters of the brain circulatory system, namely brain blood volume and CSF pressure, are the consequence of relation of control links with different time-constants, and support brain metabolic supply and water balance of brain tissue. They are responsible for motion of brain tissue and skull bone motions. These fluctuations are functionally connected with other processes, which maintain the chemical and physical homeostasis of brain tissue.

Acknowledgement

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References

1. Adams T., Heisel R.S., Smith V.C., Briner B.J. (1992). Parietal bone mobility in the anesthetized cat. J.Amer.Osteopath.Ass. V.92. No.5. P.599.
2. Chaitow L. (1999). Cranial manipulation. Theory and practice. Osseus and soft tissue approaches. Churchill-Livingstone, London. 293 p.
3. Cooper R., Crow H.J., Walter G., Winter A. (1966). Regional control of cerebral vascular reactivity and oxygen inhuman supply in man. Brain Res. V.3. No.2. P.174-191.
4. Enzman D.R. and Pelc N.J. (1992). Brain motion: Movement with phase-contrast MR imaging. Radiology. V. 185. No.3. P.653-660.
5. Fedulova I.P. (197 1). Some statistical characreristics of slow oscillations of the blood flow and oxygen tension in the brain. Sechenov J.Physiol.J.(USSR). V.57. No.4. P.584-590
6. Forbes H.S., Cobb S.S. (1938). Motor control of cerebral vessels. Brain. V.60. P.153-177.
7. Frymann V. (1971). A study of the rhythmic motions of the living cranium. J. Amer. Osteopath.Ass. V.70. P.928-945.
8. Geigel R. (1905). Die Rolle des Liquor cerebrospinalis bei der Circulation im Schaedel. Pflug. Arch. B.109. S.337-354.
9. Grechin V.B., Borovikova V.N. (1982). Slow non-electrical processes in the study of functional state of the human brain. Nauka Press, Leningrad.
10. Greenman P. (1989). Principles of manual medicine. Williams and Wilkins.
11. Grietz D. et al (1992). Pulsatile brain movements and associated hydrodynamics studied by magnetic resonance phase imaging, the Monro-Kellie doctrine revisited. Radiology. V. 34. P. 370-380.,~
12. Herniou J.-C. (1998). Le Mechanisme Respiratoire Primaire n'existe pas. Aesculape. No. 10. P.1820.
13. Hill L. (1896). The physiology and pathology of the cerebral circulation. An experimental research. London.
14. Jenkner F.L. (1986). Clinical rheoencephalography. A non-invasive method for automatic evaluation of cerebral hemodynamics. Wien: Springer. (I 87p.)
15. Koepchen H.P. (1984). History of studies and concepts of blood pressure waves. In: Mechanisms of blood pressure waves (Eds. Miyakawa K. et al) Berlin: Springer-Veriag, P-3 - 23.
16. Lassen N.A. (1978). Brain blood circulation (Ch. 12). In:Peripheral circulation. (Ed. P.Johnson). JWiley & Sons Pubt., New York.
17. Magendie F. (1843). Untersuchungen uber die Himund Ruckenmarkflussigkeit. Paris.
18. Magoun H.I. (1966). Osteopathy in the cranial field. Ed. 2. Journal Printing Co. Kirksville, MO. 164p.
19. Miyakawa K.,Takeuchi T., Shimuzu T. et at (1984). Mechanism of blood pressure waves of the third order. In: Mechanisms of blood pressure waves (Eds.Miyakawa K. et at) Berlin: Springer-Verlag. P.85-97.
20. Moskalenko Yu.E. (1999). Mechanismes physiologiques des fluctuations lentes intra-craniennes. Europ.J. Osteopath. Med. No. 11-12. P. 161-174.
21. Moskalenko Yu.E. (2000). Physiological mechanisms of slow fluctuations inside cranium (Parts I and II). OSTEO (La revue des osteopathes. France) 2000, No.50. P.4-15, and No.51 P.4-1 1.
22. Moskalenko Yu.E. (2000). Principles of objective representations of results of osteopathic treatment in cranial field. ApoStill (Lejoumal de I'Academie d'Osteopathie de France). No.7. P.22-30
23. Moskalenko Yu.E., Beketov A.I., Orlov R.S. (1988). Regulation of the cerebral circulation: Physical and chemical ways of investigation. Nauka Press, Leningrad.
24. Moskalenko Yu.E., Cooper H., Crow H., Walter W.G. (1964). Variation in blood volume and oxygen availability in the human brain H Nature. 1964. V.202. No.4928. P. 159-161.

25. Moskalenko Yu.E., Demchenko I.T., Cooper R. (1969). The dynamics of spontaneous fluctuations of blood flow and oxygen tension in the brain. Sechenov J.Physiol. (USSR). V.55. No.7. P.809-815.
26. Moskalenko Yu.E.,Dowling J.,Rovainen C. et at (1996). LCBF changes in rat somatosensory cortex during whisker stimulation monitored by dynamic H2 clearance. Int.J.Psychophysiol. V.21. No.l. P.45-59.
27. Moskalenko Yu.E., FrymannV., Weinstein G.B., Kravchenko T.I. etal (2001). Slowperiodical fluctuations inside human cranium: Phenomenology, origination, informational meaning. Human Physiology. V.27. No.2. P.1-9.
28. Moskalenko Yu.E., Kravchenko T.I., Gaidar B.V., Weinstein G.B. et at (1999). Periodic mobility of cranial bones in humans. Human Physiology. V.25. No. 1. P.51-5 8.
29. Moskalenko Yu.E., Weinstein G.B. (1983). Rheoencephalography: Biophysical background, informativity, application limits. Human Physiology. V.9. No.5. P.707-721
30. Moskalenko Yu.E., Weinstein G.B., Demchenko I.T. et at (1980). Biophysical aspects of cerebral circulation. Pergamon Press: Oxford.
31. Moskalenko Yu.E., Weinstein G.B., Kravchenko T.I. et al (2000). Informativity of the simultaneous registration of cerebral blood volume and velocity indices in evaluation of intracranial hemo-liquoro-dynamics. Proceed of Int.Conf. “Modern methods in diagnostics and treatment of nervous diseases”. St.Petersburg. P.313-316.
32. Moskalenko Yu.E., Woolsey T., Rovainen C., Weinstein G.B. et al (1998). Blood flow dynamics in different layers of the somatosensory region of the cerebral cortex in the rat during mechanical stimulation of the vibrissae. Neuroscience and Bechaviour Physiology. V.28. NoA P.459-467.
33. Poncelet B.P. et al (1992). Brain parenchima motion: Measurement with cine echo-planar MRImaging. Radiology. V.185. No.3. P.645-651.
34. Quinke H.I. (1872). Zur Physiologie der Cerebrospinal Flussigkeit. Arch. Anat. und Physiol.(Leipzig). S.153-177.
35. Roy C. S., Sherrington C. S. (1890). On the regulation of the blood supply of the brain. J. Physiol. (London). V. 11. P. 8 5 - 10 8.
36. Roitback A.I. (1993). Glia and its role in nervous activity. Nauka Press: St.Petersburg.
37. Salathe A. (1876). Recherches sur le mechanism de la circulation dans la cavitee cephalorachidienne. Travaux. du Lab. de M.Marey. Vol.H. P. 345-370.
38. Sepp E.K. (1928). Die Dynarnik der Blutzirkulation im Gehim. Berlin.
39. Still A.T. (1899). Phylosophy of osteopathy. Published by author. Kiksville, MO.
40. Sutherland W.G. (1939). The cranial bowl. A tretise relating to cranial mobility, cranial articular lesions and cranial technic. Ed. 1. Free Press Co. Mankato, MN.
41. Vasilevsky N.N., Naumenko A.I. (1959). Cerebral blood flow and CSF movements. Medicina Press: Leningrad.
42. Vern B., Leheta B., Vern J. et al (1997). Interhemispheric synchrony of slow oscillations of cortical; blood volume and cytochrome aa3 redox statein unanesthetized rabbits. Brain Res. V.775. P.233-239.
43. Zhang R., Zucken-nan J.H., Levine B.D. (2000). Spontaneous fluctuations in cerebral blood flow: insights from extended-duration recordings in humans. Am.J.Physiol. V.278. No.6. P.H1848-HI855.
44. Zibulsky N. (1885). Investigation of blood flow with the phototachometer. (Thesis Dr.Med.). St.Petersburg.

Address Correspondence to:
Prof. Yuri Moskalenko, DO(Hon.) D.Sci)
Sechenov Institute for Evolution Physiology
Russian Academy of Sciences
M. Thorez. Prosp. 44,
Sankt-Petersburg 194223
Fax: 011 7 812 552 3260

Case History

OMT Relieves Jaw Pain

George Pasquarello, DO, FAAO

HPI: KP is a 13-year-old white female (y.o.w.f.) referred for evaluation of jaw pain. A specialist in Boston is following her for idiopathic condylosis, which was diagnosed several years ago. The extent of the condylosis involves TMJ discs torn and folded with anterior displacement, erosion of the condylar heads and osteophytic spurring within the TMJ bilaterally.

She is presently on a course of treatment that will be taking several steps toward eventual surgery, which will involve removal of both discs and mandibular advancement. During the course of her treatment she will have her wisdom teeth extracted and be fitted for braces. The duration of this preparation and eventual surgery is planned to be about 2-3 years.

She presents today with complaint of increased jaw pain for the last 2 weeks after being struck in the jaw while playing softball. She was struck just to the right of midline with a softball that was hit toward her. She complains of jaw pain particularly with opening and closing, neck pain, headaches and clicking in the jaw. Her pediatrician referred her here in hopes that osteopathic manipulative treatment would be able to treat her acute symptoms and that perhaps it may help her for long term treatment as well.

Past Medical History:

Idiopathic Condylosis. Seizure disorder

Past Surgical History:

Adenoidectomy. Bilateral Myringotomy tubes. ALLERGIES: NKDA

Medications:

Lodine 400 mg b.i.d.

Social History:

Denies use of alcohol, tobacco or illicit drugs. She is presently a student, very active in sports including soccer' softball and swimming.

Family History:

Mother 38, alive and well. Father 39, alive and well.

O: General:

This is a pleasant 13 y.o.w.f. who appears her stated age, she's in no apparent distress, is pleasant and cooperative throughout the exam.

P-78 BP- 110/72 R- 16 T-97.9°F

HEENT: NCAT. PERLA. EOMI. Fundi are without fluid or erythema. Neck is supple without nodes, bruits or thyromegaly. TMJ has crepitus bilaterally during opening and closing. Fullness is noted at anterior portion of TMJ bilaterally. Mandible has mild deviation to the left on opening following the same path on closing.

NEURO: CN 2-12 are grossly intact without focal sensory or motor deficit. DTR's are +2/4 in the bilateral upper and lower extremities. Strength is +5/5 in the bilateral upper and lower extremities. Dermatomes C5-T2 are intact bilaterally; L2-S1 are intact bilaterally.

Structural Exam:

Cranial Evaluation:

Reveals decreased cranial motion throughout. The right temporal is externally rotated and there is compression of the right TMJ joint. Marked tender point is noted at the right lateral C1, right anterior C1 on mandibular ramus, right serratus posterior superior. OA ESlRr, C3 ERSr.

T1 FRS1. Ribs 2-4 are restricted during inhalation on the right. SI is restricted on the left with a positive seated flexion test on the left; piriformis is tight on left. L1 FRSl, L5 ERSr.

A: Idiopathic Condylosis. Exacerbation of jaw pain from recent trauma. Hx of seizure disorder. Somatic dysfunction of cranial, cervical, thoracic, ribs, lumbar and sacrum.

Course of Treatment:

KP was treated on her initial visit primarily with balanced ligamentous, balanced membranous and counterstrain techniques. On her return visit she did notice some improvement in her pain symptoms

though the crepitus and opening and closing restrictions persisted.

For the first several weeks KP was treated once per week until her acute symptoms had significantly been relieved.

Approximately 8 months after treatment began KP had all four wisdom teeth removed. She was seen the day of her wisdom tooth surgery and treated with OMT using balanced ligamentous treatment to cranial and cervical somatic dysfunction. She was treated once a week for the next 4 weeks. She recovered very well with only mild exacerbation of jaw pain and headaches.

Over the course of the next several years KP has been treated once every 4-6 weeks. During the course of this time she's had varying levels of improvement though always continuing to move in a positive direction with decreased jaw pain, improved motion, decreased headaches and no episodes of seizures.

Treatment has focused on counterstrain points around the upper cervical spine and TMJ as well as intra-oral treatment of the pterygoids bilaterally and the base of the tongue. A variety of treatment approaches were used in improving motion throughout the cervical, thoracic and lumbar spine including articulatory, myofascial release and HVLA techniques.

Osteopathic manipulative treatment continues to be used as a part of her total care and has resulted in improvement in her symptoms of pain and crepitus as well as headaches. She's also noted improvement in objective findings during the course of her exam.

Discussion:

KP presented with a challenging problem of true anatomic degenerative process in the TMJ joints bilaterally. While she was referred initially for an acute exacerbation of symptoms she, her mother and her pediatrician were interested in adding osteopathic manipulative treatment as a part of her overall care.

As her symptoms have improved in the last few years with regular treatment her specialist in Boston has determined that she will not need braces, nor will she need mandibular advancement. It is unclear as to whether any TMJ surgery at all will be necessary. Her most recent visit with her specialist in Boston was approximately 5 months ago at which time the previously planned course of treatment was significantly altered and she was advised to continue with her treatment here.

She will be following up there in 6 months to determine whether further imaging studies to reevaluate the TMJ will be necessary.

Today KP is seen approximately once every 4-6 weeks, she has occasional episodes of headaches and mild jaw pain though overall has shown significant improvement from her initial visits. She remains very active in sports including softball, soccer and track and has continued to be free of seizures for the last several years.

This case represents the use of osteopathic manipulative treatment initially to treat an acute exacerbation of a degenerative process that resulted in it becoming the primary course of treatment for this patient. The goal of optimizing physiology throughout the body and focusing on health instead of the disease process that presented itself will often.❐

Address Correspondence to:
George J. Pasquarello, DO
100 Foden Road, Suite 203 E.
South Portland, ME 04106
E-Mail address:
gpasquarello@une.edu

13th Annual OMT Update

"Application of Osteopathic Concepts in Clinical Medicine
plus Preparation for Certifying Boards

August 21-24, 2003
Buena Vista, Florida

Ann L. Habenicht, DO, FAAO
Program Chairperson

The program anticipates being approved for 22.5 hours of AOA Category 1-A CME credit pending approval by the AOA CCME.

Course Objectives: Level III

This Academy program was designed to meet the needs of the physician desiring the following:

- OMT Review - hands-on experience and troubleshooting
- Integration of OMT in treatment of various cases
- Preparation for OMT practical portions of certifying boards
- Preparation for AOBNMM (American Osteopathic Board of Neuromusculoskeletal Medicine) certifying boards
- Information on CODING for manipulative procedures
- Good review with relaxation and family time

Program Time Table:

Thursday, August 21 ..... 5:00 pm - 10:00 pm
Friday, August 22 ..... 7:00 am – 1:30 pm
Saturday, August 23 ..... 7:00 am – 1:30 pm
Sunday, August 24 ..... 7:00 am – 1:30 pm
(Each day includes (2) 15 minute breaks)

Course Location:

Disney's Contemporary Resort

Hotel Information:

Disney's Contemporary Resort
Lake Buena Vista, FL
1-407-824-3869 (Reservation line)
Reservation Deadline: July 21, 2003

Room Rate: $149.00 single/double
$25.00 per person each additional
(Identify yourself as attending
American Academy of Osteopathy's Conference)

Testimonials

• Faculty is great, excellent course, well organized, "I will be back". Can't wait to take another course.
• I always learn several new ideas and approaches at every AAO course I attend, even though I have been in practice for several years.
• Excellent Review! I appreciate how useful the handouts are to teach and improve the OMT skills of my house staff and medical students

Registration Form

13th Annual OMT Update

August 21-24, 2003

Full Name _____

Nickname for Badge _____

Street Address _____

_____

City _____ State _____ Zip_____

Office phone # _____ Fax #: _____

E-mail: _____

AOA # _____ College/Yr Graduated _____

I need AAFP credit ❒ I require a vegetarian meal ❒

(AAO makes every attempt to provide meals that will meet participant's needs. However, we cannot guarantee to satisfy all requests.)

	Registration Rate	
	On or Before 7/21/03	After 7/21/03
AAO Member	$630	$730
Intern/Resident	$530	$630
AAO Non-Member	$1,000	$1,100

AAO accepts Visa or Mastercard

Credit Card # _____

Cardholder's Name _____

Date of Expiration _____

Signature _____

Prolotherapy: Below the Diaphragm

November 7-9, 2003
Biddeford, Maine

Mark S. Cantieri, DO, FAAO
Program Chair

The program anticipates being approved for 20 hours of AOA Category 1-A CME credit pending approval by the AOA CCME.

Additional Faculty: Thomas Ravin, MD
George Pasquarello, DO, FAAO

Course Description:

This is a course designed to instruct participants in the physiology of wound repair using cadavers and prosections. Participants will review the anatomical relationships of tendon and ligament structures and gain insight into the referred pain patterns of tendons and ligaments. Also, participants will learn diagnostic and injection techniques for tendon and ligament instability. The course will also include a lecture on coding and billing.

Learning Objectives:

At the end of each session, participants should:

- Readily evaluate for joint instability
- Readily diagnose tendon instability
- Know how to inject unstable tendons and joints

Program Time Table:

Friday, November 7 ..... 8:00 am – 5:00 pm
Saturday, November 8 ..... 8:00 am – 5:00 pm
Sunday, November 9 ..... 8:00 am – 12:00 noon
(Friday & Saturday include (2) 15 minute breaks and a (1) hour lunch; Sunday includes a 30 minute break.)

Course Location:

University of New England/
College of Osteopathic Medicine
11 Hills Beach Road, Biddeford, ME

Hotel Information:

You will be sent a list of local hotels along with your registration confirmation.

Testimonials

- *Excellent course!*
- *Well-balanced*
- *Hands-on, none better!*
- *Organizers should be very proud of their accomplishment.*

Registration Form

Prolotherapy Therapy / Below the Diaphragm

November 7-9, 2003

Full Name _____

Nickname for Badge _____

Street Address _____

_____

City _____ State _____ Zip _____

Office phone # _____ Fax #: _____

E-Mail _____

AOA # _____ College/Yr Graduated _____

I require a vegetarian meal ❒

(AAO makes every attempt to provide snacks/meals that will meet participant's needs. However, we cannot guarantee to satisfy all requests.)

Registration Rates

	On or Before 10/7/03	After 10/7/03
AAO Member	$1,200	$1,500
AAO Non-Member	$1,500	$1,700

(Non-members – see membership application on page 14)
Sorry, no discounts

AAO accepts Visa or Mastercard

Credit Card # _____

Cardholder's Name _____

Date of Expiration _____

Signature _____

Book Review

Reviewer: Anthony G. Chila, DO, FAAO

Ligamentous Articular Strain

Conrad A. Speece, DO and William Thomas Crow, DO; Illustrated by Steven L. Simmons, DO

pp. 183, incl. Index. Eastland Press, Incorporated: PO Box 99749, Seattle, WA 98199 USA. Copyright 2001. ($35.00 plus $4.95 UPS shipping and handling).

This highly recommended volume dedicates itself to a group of manipulative techniques utilized by William G. Sutherland, DO for treatment of the body aside from the central core of the craniosacral system. The volume is the outcome of more than thirty years' activity by the **Dallas Osteopathic Study Group (DOSG).** Originally tutored by the late Rollin E. Becker, DO, the work of this group provides a continuum of Sutherland thought and teaching as influenced by the philosophy, science and art of Andrew Taylor Still. The Preface, written by Anne L. Wales, DO, DSc(Hon) offers an additional link in the Sutherland chain. Compact organization of the text allows the reader to focus on three aspects of thought:

- **Section I:** Origins and general principles of Ligamentous Articular Strain techniques; joint physiology; fluid dynamics; the role of the fascia; the concept of vectors of injury.
- **Section II:** Detailed techniques for treating various areas of the body, with the exception of the cranium.
- **Section III:** The body as a functional unit.

In 1982, the original cranial osteopathy focus of the **DOSG** changed to an intensive study of the Sutherland techniques described in detail by Howard A. Lippincott, DO (Academy of Applied Osteopathy Yearbook, 1949, pp 1-24). The subsequent years of study of the group led to modification of the original techniques toward ergonomic efficiency requiring little or no patient cooperation. An example of the authors' very readable style of writing illustrates this, and is accompanied by an excellent, easily visualized illustration (p. 65):

> **Hip**
>
> ***Centering the Femur in the Acetabulum***
>
> TECHNIQUE: Lateral recumbent indirect ligamentous articular release.
>
> SYMPTOMS/DIAGNOSIS: Hip pain, often due to a force transferred up from the lower extremity, or a fall directly on the hip.
>
> PATIENT: Lateral recumbent position with the hips and knees flexed. The affected hip is on top.
>
> PHYSICIAN: Standing, facing the table behind the hip to be treated.
>
> PROCEDURE: Stabilize the ilium with palm of your superior hand. With the greater trochanter centered in the palm of your inferior hand, generate a force directly down the neck of the femur to center the femoral head in the acetabulum. This involves a compression between your hands directed medially and slightly superiorly on the femur. Maintain this balanced force until the injury softens, and the tide begins to flow through the hip joint.

Spinal Manipulation for Low-Back Pain: A treatment package agreed by the UK Chiropractic, Osteopathy and Physiotherapy Professional Associations.

Harvey E, Burton AK, Moffett JK, Breen A in collaboration with the UK BEAM trial team.
Manual Therapy (2003) 8(1), 46-51

SUMMARY. Trials of manipulative treatment have been compromised by, amongst other things, different definitions of the therapeutic procedures involved. This paper describes a spinal manipulation package agreed by the UK professional bodies that represent chiropractors, osteopaths and physiotherapists. It was devised for use in the UK Back Pain Exercise And Manipulation (UK BEAM) trial – a national study of physical treatments in primary care funded by the Medical Research Council and the National Health Service Research and Development Programme. Although systematic reviews have reported some beneficial effects of spinal manipulation for low-back pain, due to the limited methodological quality of primary studies and difficulties in defining manipulation, important questions have remained unanswered. The UK BEAM trial was designed to answer some of those questions. Early in the design of the trial, it was acknowledged that the spinal manipulation treatment regimes provided by practitioners from the three professions shared more similarities than differences. Because the trial design specifically precluded comparison of the effect between the professions, it was necessary to devise a homogenous package representative of, and acceptable to, all three. The resulting package is 'pragmatic', in that it represents what happens to most people undergoing manipulation, and 'explanatory' in that it excludes discipline-specific variations and other ancillary treatments.

The authors proceed from the recognition that guidelines for the management of low-back pain have been produced in at least 11 countries. Utilization of the same body of scientific evidence generally produces recommendation for early access to physical treatments and encouragement to return to normal activities as soon as possible. Differences are noted, however, with respect to recommendations on manipulation. Discrepancies are thought to be related to interpretation of evidence and in the manner of definition of chronicity.

In the UK, Acts of Parliament have formally recognized chiropractic and osteopathy in establishing systems of regulation analogous to those of the General Medical Council. It should be of interest to US readers to note the comment that similarities between chiropractors and osteopaths are probably much greater than differences. This observation appears to recognize a broad common type of manipulation underlying both treatment approaches. Passive mobilization techniques are utilized by the majority of physiotherapists practicing hands-on therapy in the UK. Specialist physiotherapists utilize a range of techniques probably similar to chiropractors and osteopaths. The use of high-velocity thrust techniques is much less frequent. Despite a plethora of techniques and terminologies, this project recognizes three general areas: Techniques directed primarily at soft tissue structures; Techniques intended to articulate joints through physiological ranges of movement; Techniques involving high-velocity, low-amplitude thrust to create cavitation of a synovial joint. It is noted that the three professions have traditionally seen themselves as separate entities with little common philosophical ground. It may be more realistic to note that within-profession differences can be greater than between-profession differences. The attempt to reconcile variances in defining the nature and manner of 'manipulation' being studied has led to the package employed in this study: Definition in advance of the permitted range of techniques; the timing of delivery; The accompanying advice. This effort offers a template for use in the context of further pragmatic trials, whether in the UK or elsewhere. Full results of this trial are pending.

American Academy of Osteopathy
3500 DePauw Boulevard, Suite 1080
Indianapolis, IN 46268

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Downers Grove, Illinois
October 25-26, 2003

Course Description: Level III

Based on the life work of Robert C. Fulford, DO in osteopathy, life energy, vibration, and the use of the percussion vibrator, the basic course explores these concepts. In-depth application of the energy concepts as Dr. Fulford used in his practices are included.

Learning Objectives:

At the end of this session, participants should be able:

- To develop an understanding of Dr. Fulford's diagnosis and treatment methods and its foundation in osteopathy.
- Utilize the percussion vibrator on any area of the body for any age patient
- To apply the basic concepts taught to make treatments more effective.

Program Time Table:

Saturday, October 25, 2003 ..... 8:00 am – 5:30 pm
Sunday, October 26, 2003 ..... 8:00 am – 3:30 pm
(each day includes (2) 15 minute breaks and a (1) hour lunch)

The program anticipates being approved for 14 hours of AOA Category 1-A CME credit pending approval by the AOA CCME

Suggested Hotel Site:

Marriott Suites, 1500 Opus Drive, Downers Grove, IL 60515
Reservation line: 630/852-1500
(5 minutes from course site)

Course Location:

Midwestern University,
Chicago College of Osteopathic Medicine
555 31st St., Downers Grove, IL 60515

For more information, contact:
American Academy of Osteopathy
Attn: Christine Harlan, Membership/Meetings coordinator
Phone: 317/879-1881
E-mail: charlan@academyofosteopathy.org