Reprinted by permission from "OSTEOPATHIC ANNALS" - July, 1983

Craniosacral Function in Brain Dysfunction

By JOHN E. UPLEDGER, DO

INTRODUCTION

Since 1975, the Department of Biomechanics at Michigan State University College of Osteopathic Medicine has been involved in research of the craniosacral system and its influence upon brain function or dysfunction, as the case may be. The research has been directed at relevant basic anatomicophysiologic mechanisms and their clinical applications and significance.

The concept of a craniosacral system[1] was first publicly discussed by William G. Sutherland in the 1930s. Sutherland suggested the hypothesis that cranial vault bones move rhythmically to accomodate pressure fluctuations in the CSF of normal adult humans. To formulate this hypothesis, he had to reject the premise that sutural ossification occurs in normal adult humans. As did Galileo's discoveries of gravitational law and Semmelweiss's discoveries of the causes of childbirth fever, Sutherland's rejection of anatomic dogma placed him in a posture of anti-science. He developed a system of diagnosis and treatment aimed at mobilizing cranial sutures which were determined to be abnormally restricted to physiologic motion. Results were, and continue to be, clinically efficacious when the techniques developed by Sutherland are correctly employed. Numerous technical modifications have been made more recently.

PROCEDURE

Cranial suture specimens were taken from adult primates and living adult humans. Histologic study of these specimens failed to demonstrate the supposed ossification described in traditional anatomy texts; rather, the microarchitecture demonstrated a general lack of intrasutural ossification, the presence of collagen and elastic fibers, as well as a generous supply of vascular structures, nerve plexuses, and free nerve endings.[2,3] These intrasutural findings suggested the potential for minute motion between the osseous borders of the suture, as well as the potential for pathologic intrasutural ischemia and stimulus from pressure on these intrasutural free nerve endings and fibers. Hypothetically, the stimulus may be pathologic, or it may represent a rhythmical stimulus input that supports the development and function of the CNS.

Clinical Application

A standard craniosacral examination protocol was developed. Reliability among the raters was tested in a double-blind study using a sample of 25 nursery school children, which verified the reproducibility of craniosacral examination findings. Each of the children was ex-

John E. Upledger, DO, FAAO, is chief of staff, Unity Center for Health, Education and Research, West Palm Beach, Fla. Dr Upledger is a former researcher in the Department of Biomechanics, Michigan State University College of Osteopathic Medicine, East Lansing, Mich.

amined by two physicians trained in craniosacral techniques. The results indicated that the cranial vault motions, which were evaluated by physical examination, were perceptible and that the two physicians agreed on their findings in a great number (86 percent) of cases.

Clinical experience suggests that dysfunction of this hypothetical craniosacral system was related to brain dysfunction in children. A single-blind study was carried out using the same standard examination protocol on 203 public school children.[5] The quantified craniosacral examination findings were subjected to statistical analysis according to the behavioral and academic problems present in the sample of children examined. The results suggested, at a probability level of less than 0.0001, that the children with the most severe and noticeable brain function problems were rated as the most abnormal on the craniosacral examination.

Mechanoelectric and Circumferential Measurements

With Zvi Karni, a visiting professor from Technion Institute in Haifa, Israel, mechanical and electrical measurements were recorded from distal parts of the body during craniosacral treatment for a variety of problems.[6] The results support the concept that subjective and clinical changes in the function of the craniosacral system are accompanied by changes in levels of body electric potential and in respiratory activity. We also noted a change in extremity circumference. The circumferential change was recorded with highly sensitive strain gauges, and was, in fact, rhythmical and corresponding in rate to the cranial rhythm as perceived concurrently on the subject's head.

This finding led to a visiting professorship awarded to the author by the Technion Institute during the summer of 1979. The purpose of the visit was to initiate continued investigation of this phenomenon. The recording of a rhythmic circumferential change, which corresponds in rate to the perceived craniosacral rhythm, has been duplicated by Joseph Mizrahi, working with Karni at the Leuwenstein Neurological Institute in Ra'ana, Israel. Mizrahi and Karni continue their work at present; their findings are not yet published.

Our results were reported at the Combined International Conference of Biological Engineers and Biophysicists in Jerusalem in 1979.[7] During this conference, we had the privilege of meeting with E.A. Bunt, a neurosurgeon working in Johannesburg, South Africa. Bunt reported that, using serial tomograms that recorded the cross-sectional area of the lateral and third ventricles of the brain, he had observed a rhythmic dilatation (six cycles per minute) of this cross-sectional ventricular area. Bunt named this observed phenomenon the *Third Wave*. The Third Wave occurrence seems to correspond to the craniosacral rhythm and suggests that the same physiologic activity is present inside the brain, as well as through the tissues of the extradural body (the latter was recorded on the strain gauges). Bunt reported his work at the conference and presented slides to illustrate rhythmic changes in the brain's ventricular system.

CLINICAL FINDINGS

Also during the summer of 1979, patients were examined at the Leuwenstein Neurological Institute in Israel. These examinations were made with special focus on the craniosacral system of patients suffering from various and severe neuropathologies. The diagnoses were unknown to us at the time of examination. Examinations were made in the presence of Professor Nachansohn, Director of the Institute, Karni, and two other Leuwenstein Institute physicians.

The following conditions were demonstrated to the satisfaction of all present.

1. The rate of craniosacral rhythm was reduced to 3 or 4 cycles per minute (normal is 6 to 12 cycles per minute) all over the body in four cases of long-standing coma from accidental prolonged anoxia. Also, the subjectively evaluated amplitude of the craniosacral rhythm was reduced in these cases.

2. The rate of craniosacral rhythm was increased above normal, all over the body, to 16

to 25 cycles per minute in two cases of long-standing coma from drug overdose. The amplitude of craniosacral motion was low.

3. In one case of poliomyelitis the craniosacral rhythm was 24 cycles per minute in the affected parts, both lower extremities. The craniosacral rhythm was determined to be within normal limits on all other parts of the body, including the head.

4. In one case of Guillain-Barré syndrome, the craniosacral rhythm was abnormally low in rate and amplitude, but was consistent in all parts of the body, except the legs, where it was 25 cycles per minute.

5. In seven cases of spinal cord injury, five of which ended in secondary paraplegia and two in quadriplegia, the craniosacral rhythm on the head was generally of normal rate. The amplitude seemed moderately reduced above the spinal cord lesion. The craniosacral rhythm was elevated to between 18 and 26 cycles per minute below the lesion. This determination of increased craniosacral rate was made on the paravertebral tissues and the affected extremities. The level of spinal cord lesion was accurately localized by determining the level at which the craniosacral rhythm change occurred in the paravertebral tissues.

6. In one case of long-standing coma from cerebral hemorrhage with hemiplegia on the right, the craniosacral rhythm was 24 cycles per minute in the paralyzed limbs and 8 cycles per minute on the unaffected side. Examination of the patient's head produced no definite conclusions except that the craniosacral motion was disorganized and lacked symmetry.

CLINICAL THERAPY

Successful clinical correction of a wide variety of craniosacral system dysfunctions was achieved, between 1976 and 1980, in approximately 50 children with brain dysfunctions. About 80 percent of these children have shown noticeable improvement in areas of academic achievement, classroom and home behavior, frequency of seizure occurrence, and in spastic cerebral palsy conditions. The observed behavior and functional improvements were reported by independent observers, such as teachers, psychologists, physiotherapists, parents, and children themselves. This study is not a controlled research protocol but a series of accumulated case histories.

For the first six months of the years 1978, 1979, and 1980, we were privileged to work at the Genessee Intermediate School District Center for Autism in Flint, Mich. The work included data collection from blood analysis, hair analysis, as well as general, neuromusculoskeletal, and craniosacral physical examination. Outstanding among the findings were frequent and severe multiple dysfunctions of the craniosacral system. In the 1979 and 1980 work at the Center for Autism, manipulative therapy and craniosacral system treatment were instituted in addition to the behavior modification techniques that were used by the school faculty. As an exploratory pilot study the results seemed promising: behavioral and emotional growth appeared greater in the craniosacrally treated group of children (26 children treated, 27 untreated); and school absenteeism because of illness was significantly greater in the untreated group.

Two human cadavers and seven primates were dissected to study the intracranial dural membranes. These dissections were performed without disturbing dural membrane geometry, by removing only a window of bone from the parietal bones bilaterally or unilaterally. All osseous attachments for both falces and the tentorium cerebelli were kept structurally intact. The brain was removed by blunt digital dissection to preserve, as nearly as possible, the *in situ* condition of the dural membranes. Photographic studies of the membranes suggest that fiber orientation patterns are not symmetric (Figures 1 to 4). These fiber orientation patterns are probably responsive to asymmetric principal tensions placed upon them.

CRANIOSACRAL DYSFUNCTIONS

These findings concur with our clinical impressions. It is probable that specific membrane tension patterns place constraints on cranial bone compliance motions; they then correlate to specific brain dysfunction syndromes. Some examples of these clinical conditions follow.

Autism

A bilateral medial constraint seems imposed by the tentorium cerebelli upon the lateral aspects of the occiput, across the occipitomastoid sutures, upon the mastoid processes of the temporal bones, across the auditory canals, and extending anteriorly above the temporomandibular joints. Also, a severe anteroposterior constraint involves the falx cerebri and the entire cranial base. Release of these membranous tensions by successful manipulative treatment usually engenders significant improvement in many autistic behavioral traits.

Dyslexia

A medial constraint is imposed by the dural membrane system across the occipitomastoid suture and temporal mastoid process of the temporal bone. This condition is usually on the right side but may be bilateral. Correction of this constraint frequently produces dramatic improvement in reading skills. In one case, a 16-year-old boy reading at a third-grade level advanced to an eighth-grade level within four weeks. Several children have advanced three or four grade levels within a few months.

Hyperkinesis

A minute anterior displacement of the occiput upon the atlas, maintained by the extracranial soft tissue, as well as the infratentional dural membrane and the falx cerebelli is a frequent finding. Release of this displacement often produces dramatic relief from abnormal hyperkinetic behavior. Similar objective findings and favorable results have been observed in two cases of abnormal fear, which had been considered to be emotional in origin.

Spastic Cerebral Palsy

A centralward depression of the coronal suture, which seems to be maintained by dural membrane constraint, is the most frequent finding in craniosacral examination of spastic cerebral palsy patients. Successful release has produced dramatic improvement in spastic hemiplegia and seizure patterns. To date, a wide range of spasticity-reduction results have been achieved in cerebral-palsied children. Minimal responses have been observed on a few occasions and, in three cases, a dramatic end to spastic hemiplegia with initiation of near normal function of the involved body parts. These observed results suggest further work is in order in the classification of cerebral palsy patients.

CONCLUSIONS

From our report, it seems apparent that in a significant number of cases the craniosacral system may have a powerful influence on brain function. This area of study is relatively new and virgin territory. It is, however, mandatory that the exploration be continued. So many idiopathic brain dysfunction cases exist, and it seems only reasonable that a significant number of the idiopathologies might be secondary to the malfunction of a physiologic system that, heretofore, has been largely disregarded or unknown to medical science. This system, the craniosacral system, has great influence over the physiologic environment in which the human brain develops and functions. Apparently, many problems of brain function can be improved by enhancing the "internal milieu" of the CNS. Presently, we have little appreciation of the real and maximum achievable potential for brain dysfunctioning patients.

Treatment of the craniosacral system is one of the few therapeutic modalities which, when properly applied, even in the research stages of its development, seems to have negligible, if any, risk. This finding suggests an excellent risk-to-benefit ratio. The potential benefit for a brain dysfunctioning patient may be a normal or near-normal life. If craniosacral treatment is correctly applied, the worst that can happen is nothing; the best is achievement of potential.