

The Cranial Bowl*

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Eight years ago this spring Dr. R. C. McCaughan and the Editor published a series of papers entitled, "Osteopathic Research Imperative." In the third of these papers, in March, 1936, we quoted Dr. Della B. Caldwell as urging the investigation and evaluation of various discoveries made, and methods used, by osteopathic physicians, including the diagnosis and treatment of cranial conditions as taught by Dr. W. G. Sutherland.

For many years previous to that, Dr. Sutherland had been studying skulls, in fact since his early days in osteopathic college. He examined them dead and dry, on the dissection table, and in his patients, young and old. More recently he has been appearing with greater frequency on convention programs, where the bare outlines of his methods were brought to the attention of increasing numbers of osteopathic physicians, since no convention sessions are long enough to cover the ground. And he has been giving individual instruction to those greatly interested, so that cranial technic is now being practiced by more and more doctors, from coast to coast.

Like any other specialty in osteopathy, cranial technic is not to be learned from casual observation, or even from study of an article or two in a magazine. Therefore, there has been hesitation about putting anything about it in print. The presentation which Dr. Sutherland made at the Eastern Osteopathic Association meeting last spring was such as he has made at various other places. It calls for many draw-

ings, and for the examination of the skull, and the various bones which make it up, most of which do not lend themselves well to representation on a flat surface. The illustrations reproduced herewith are not intended to clarify the text adequately, but they do exemplify the drawings used freely by Dr. Sutherland in his presentations. It is hoped that the text will excite interest in many who are not familiar with the principles underlying this aspect of osteopathic diagnosis and treatment, and that to some who already are somewhat familiar with it, it will serve as a review.

It is by no means to be understood that this is the first appearance in print of material relating to the effects, the diagnosis, or the treatment of cranial lesions. Dr. Sutherland brought out a book in 1939, "The Cranial Bowl," which is no longer in print. In that book there were references not only to the earlier editorial mention of his work in THE JOURNAL but also to his articles in THE NORTHWEST BULLETIN and THE WESTERN OSTEOPATH.

Dr. Charlotte Weaver has for years lectured and written on the cranial vertebrae. She had articles on the subject in THE JOURNAL for March, April, May and June, 1936. This series was followed by a symposium by Drs. Charles L. Naylor, Earle E. Sanborn, Edward T. White, N. A. Ulrich and Charlotte Weaver, running in THE JOURNAL from November, 1937, to March, 1938. In THE JOURNAL for June, 1942, Dr. Perrin T. Wilson had an article in which he referred to Dr. Sutherland's work and told of his own application of a modification of it.—Editor.

Our subject is, "The Cranial Bowl," but that is not a detached unit, any more than is any other part of our complicated body machine. In my interpretation we take into consideration a mechanism which includes the brain, the intracranial membranes, the cerebrospinal fluid, and the articular mobility of the cranial bones; and also the spinal cord, the intraspinal membranes, again the cerebrospinal fluid, and the articular mobility of the sacrum between the ilia.

The cranial thought belongs to Doctor Andrew Taylor Still, founder of osteopathy. The Old Doctor frequently referred to the "osteopathic squirrel," in a hole in a tree. He had a grip on the squirrel's tail, and we had to go on and pull it out. The cranial thought is simply a part of the process of getting the "body of the squirrel" out. The thought provides an avenue for "digging on," through scientific research.

We remember Dr. Still's dictum: "An osteopath reasons from his knowledge of anatomy. He compares the work of the abnormal body with that of the normal body." In this avenue of scientific research one must primarily possess a *knowledge* of the cranial structure, within and without. It is as true here as in any part of the body that, as Dr. Still said again: "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."

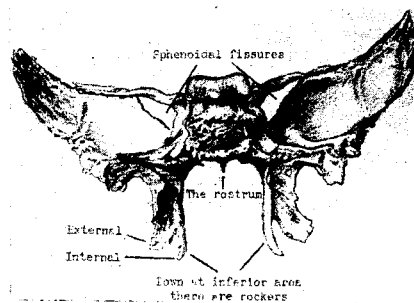
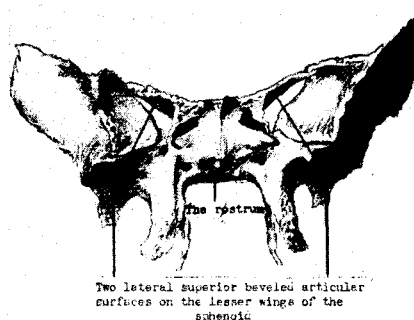
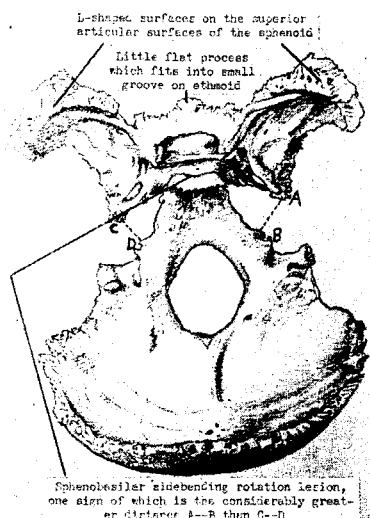
His anatomical-physiological knowledge was the keynote of his diagnosis and his corrective adjust-

ments. The cranium is an intricate mechanism, and requires especial study of its complicated articular surfaces. For the perfection of skill required in cranial diagnosis and technic, it is necessary, primarily, to possess a perfect anatomical-physiological mental picture.

As a preliminary to further study, attention is called to these illustrations. Observe the L-shape of the superior articular surface of the greater wing of the sphenoid bone. The two of these, one for each greater wing, articulate with L-shaped articular surfaces beneath the frontal bone. At birth there are two frontal bones, and in some adults the sagittal suture continues down to the ethmoidal notch. Inasmuch as there are two ossification centers, we may reason on the basis of *two* frontal bones; the sphenoid being suspended from the two as the sacrum is suspended, by the L-shaped articular surfaces, between, or beneath, the ilia. Both bones, the sphenoid and the sacrum, have anterior and posterior rotation articular mobility, as well as sidebending movement.

Now observe the little flat process upon the middle of the anterior superior area of the body of the sphenoid. This fits into a small groove upon the middle of the posterior superior area of the ethmoid. It provides the mechanical arrangement for movement of the ethmoid when the sphenoid moves downward. Immediately lateral to this process, on the superior articular surface of the lesser wings of the sphenoid, are two lateral beveled articular surfaces, articulating beneath the two frontal bones, lateral to the ethmoidal notch. These provide a mechanical arrangement for

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the accommodation of articular mobility between the lesser wings of the sphenoid and the frontal bones.

One need not look farther than these two indications, found upon the articular surfaces of the sphenoid, for a truth signifying that a Master Mechanic designed the bones of the cranium for articular mobility. There are many other indications throughout the cranial bones signifying that truth, which also may be found in the anatomical laboratories of our osteopathic colleges as proof to our anatomists, providing they "dig" for it. The proof of the assertion of cranial articular mobility is right there on the articular surfaces, and it does not require even a mechanical mind to recognize the mechanical principle.

Here at the lower middle anterior area of the sphenoid is a beak-like process, called the rostrum. Doubtless the term was given by some anatomist because of its resemblance to the beak of a bird, which corresponds to the bird-like form of the sphenoid with its greater and lesser wings.

Next we consider the vomer. It has a cup-like articular surface, a provision designed to fit over the beak, or rostrum. It provides a movement like that afforded by a universal joint. From that articulation the vomer extends forward over the roof of the maxillae and palate bones, which also have mobility.

Down here at this inferior area we have rockers, which are known as the internal and external pterygoid processes. They are convex in shape, and hang beneath the bird-like, or boat-like form, from the bottom of the sphenoid. When the sphenoid rocks forward these rockers rotate downward and backward. They articulate with the concave articular surfaces of the little palate bones.

Let us study this concave articular surface on the palate bone in all its details, and articular surfaces connecting the maxillae with the palate bones. It almost calls for a magnifying glass to study the orbital surface that sticks up within the orbital cavity.

Dr. Still said: "It is the little things that are the big ones in the science of osteopathy." That tiny orbital surface has a big task to perform in the cranial mechanism. The little palate bone provides an opportunity for osteopathic specialization in the field of eye, ear, nose and throat.

The sphenopalatine ganglion lies between the palate bone and the body of the sphenoid. Articular fixations commonly occur which crowd the palate bone backward onto the ganglion, thus disturbing its functioning. The ganglion sends nerve fibers to the lacrymal gland, the turbinates, the nasal and postnasal areas, and to the mouth of the eustachian tube.

The sphenoid does not articulate with the maxillae, but does with the palate bones. The palate bones fit in between the sphenoid and maxillae, and function as "speed-reducers" to retard the movement between the sphenoid and maxillae. The sphenoid also articulates with another equalizer in connection with the movement of the sphenoid and maxillae. This is the malar, which articulates with the greater wing of the sphenoid *within the orbital cavity*. As the sphenoid rocks forward, the greater wing swings the malar outward and widens the orbital cavity. As the anterior end of the sphenoid ascends, the greater wing draws the malar inward, and narrows the orbital cavity. The malar also articulates with the maxillary bone. Hence the movement of the sphenoid, through its equalizer the malar bone, moves the maxillary. The functioning widens and narrows the sphenomaxillary fissure within the orbital cavity. This fact is taken into consideration in the diagnosis of sphenobasilar lesions, through observation at a glance. Wide or narrow orbital cavities provide clues, which later may be verified by the skilled art of osteopathic palpation.

The orbital surface of the palate bone is located immediately back of the maxillary, at the beginning of the sphenomaxillary fissure. The infraorbital nerve passes over that tiny orbital surface, just before it enters a groove in the maxillary to find its way to the infraorbital foramen. Were it not for that especially designed little orbital surface, the maxillary bone might saw or wear the infraorbital nerve in two. The orbital surface of the palate bone is an equalizer that removes the tension from the nerve.

The orbital cavity is not like the solid osseous acetabulum of the ilium, but is formed by the articulation of the frontal bone, the orbital surface of the ethmoid, the lacrymal, the maxillary, the orbital surface of the palate, the malar, and the greater and lesser wings of the sphenoid. It is a cavity designed by a Master Mechanic for mobility.

In addition, the Wise Mechanic placed the origin of the extrinsic muscles of the eyeball around the optic foramen, on the lesser wing of the sphenoid, with the exception of one, which He placed a little farther forward, arising from the maxilla. As the sphenoid comes forward the eyeball comes forward also; and as the sphenoid moves backward, the eyeball moves backward. In addition to the infra-orbital fissure we observe another, the supra-orbital fissure, which is formed by the greater and lesser wings of the sphenoid. The cavernous sinus leads from this fissure, carrying its volume of venous blood that flows to the exit at the jugular foramen. The ophthalmic veins lead into this cavernous sinus.

In the case of glaucoma, one may reason that the accumulation of fluid points to a condition somewhere back along the intracranial membranous wall of the cavernous sinus, or in the walls of the petrosal sinus, to a membranous restriction affecting the venous return, and back of that the possibility of a cranial lesion as an etiological factor.

The superior maxillary bones hang by their nasal processes from the frontal bones, lateral to the ethmoidal notch. There is a gap between the nasal processes that is capped by the nasal bones. Now we may imagine the sagittal suture as continuing down to the ethmoidal notch, or ending between the nasal processes of the maxillary bones. The ethmoid lies beneath the nasal processes. It has processes known as the superior and middle turbinates. A lesion fixation of the nasal processes of the maxillae would crowd the turbinate bones. These fixations are quite common. Here again is an opportunity for one who would become an osteopathic specialist in eye, ear, nose and throat. Let one who doubts the opportunity stand before a mirror, place a finger in contact with the roof of his mouth, at the junction of the palate bones with the maxillae, inhale and exhale deeply, and watch the incisor teeth separate and come together alternately. One's own skilled osteopathic fingers will guide him to this opportunity, providing there is no fixation in the maxillae.

Now let us drop back to the posterior articular surface of the greater wing of the sphenoid. The upper half of its articular surface is beveled externally, and it articulates with an internal articular surface upon the upper anterior half of the squamous portion of the temporal bone. At the halfway point lies a tiny niche, which articulates with a tiny projection upon the squamous portion. As we observe the lower half, we note that its articular surface has changed to an internal bevel, and that it articulates with an externally beveled articular surface upon the lower half of the squamous portion. These surfaces are designed especially for articular mobility.

Posterior to the squamous portion of the temporal bone we find serrations running across the articular surface. These articulate with similar serrations that run across the articular surface of the posterior-inferior angle of the parietal bone. These provide for a lateral movement between these bones, the temporal and parietal, inward and outward.

At the inferior articular surface, which might be called a lateral articular surface, we find the surface convex. It articulates with a concave articular surface within the condylar area of the occipital bone, in such a way that while the convex surface of the temporal moves in one direction, the concave surface of the condylar area moves in the other.

Just a little farther forward on the condylar portion of the occipital is a small fulcrum, which articulates with a groove beneath the petrous portion of the temporal. This fulcrum is immediately posterior to the jugular foramen.

The basilar portion, anterior to the jugular foramen, has a lateral ridge on its articular surface. This ridge articulates within a longitudinal groove on the petrous portion of the temporal. Now it is important to observe the peculiar shape of the temporal bone, that of a disced wheel, such a condition as sometimes occurs in the wheels of automobiles and causes them to wobble.

The temporal bone was especially designed to wobble, in order to accommodate the internal and external rotation of the petrous portions which, in my opinion, takes place with respiratory movements. When the mastoid portion is outward, the mastoid process will be inward; and while the mastoid portion is inward, the mastoid process will be outward. This feature of the wobbling of the temporal bone provides the means of diagnosing, by palpation, a sphenobasilar lesion, the mastoid portion being prominent in one type, and depressed in another.

The cartilaginous portion of the eustachian tube it attached to the petrous portion. It is my belief that the petrous portion rotates externally during the period of inhalation, that the cartilaginous portion rotates externally also; and the mouth of the eustachian tube opens. Likewise I believe that in exhalation the petrous portion rotates internally, that the cartilaginous portion rotates internally also, and that this causes the mouth of the eustachian tube to close. In case of a lesion fixation in the movement of the petrous portion, the movement of the cartilaginous portion would be in the same fixation, and the mouth of the eustachian tube would be either wide open or closed. Here is another opportunity to specialize osteopathically in eye, ear, nose and throat conditions.

The temporal bone, like the sphenoid, does not articulate with the maxillary. It articulates with one of the same equalizers, the malar bone, and the malar bone with the maxillary. This articulation is by way of the zygomatic process of the temporal. The articular surface is semioblique and overlaps the malar, providing an up-and-down movement, as the petrous portion rotates internally and externally. One may take a disarticulated temporal bone and demonstrate the wobbling wheel motion, by moving the zygomatic process upward and downward.

The bones at the base of the skull have their origin in *cartilage*, while the bones of the vault have their origin in *membrane*. Articular mobility occurs at the basilar area, in the bones having their origin in cartilage. The cranial structure is a *cranial bowl*, and we could not have articular mobility at the basilar area without compensation by the bones of the vault, that are formed in membrane. Here we have another mechanical design by a Master Mechanic, who understood His handiwork.

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The Elder Nationalist movement provides in the most basic way the background for understanding the failure of the national movement in India. The movement is, in its basic sense, the quest of Indians for economic freedom, while that of the second movement is political freedom. It is because the demand of the party has been that of the second rather than of the first that the national movement has been changing from a mass-based, while the emphasis on the national change is the external. This signifies that the national movement is the product of the economic and social development for independence by national leaders of the form of the state. The movement along the second course are with special emphasis to the first and second. This movement is a movement for economic and social development, and the national movement of the second course, that of the first and second, and the national movement. The national movement is the first of the party's as the national movement of the second course.

Therefore, to launch a project can be defined only partially in terms of a suitable mix. The game begins over such obstacles and continues so long as the player is not overcome by the limits and constraints of the situation. The effects upon the technology and upon the firm in the second half of the twentieth-century Japan, where the limits were, like ours, the place of the membership with each other, a series of changes leading to the player, the entrepreneur, the individual, and, for the internal control of the firm, a search which focuses on the entire place where he is moved by corporate technology, and on the other hand, the conceptual, the firm, the social, and the individual, significant, to be a member of the firm of the technology.

As we have sketched, the conventional theory, by not taking account of the frequency of the oscillations, does not take into account the order and value of the oscillations, as well as the number of the sign of oscillations over a single period. We showed that the spectrum of these oscillations is equivalent to a series changing the period of the wave. We know as already that oscillations with a constant frequency are not in the spectrum of the wave, and the oscillations with a constant frequency change the composition of the spectrum, making it denser.

growth. In addition, studies of the effect of the size of the initial population on the rate of growth have been reported through the effect of density on the mean length of the spawned eggs. It is suggested that the exponential model of the growth curve can be applied to the early life history of the carp and that the spawning time of the eggs has to be taken into consideration when the exponential model is used to describe the growth curve of the carp.

Further to the work done, we study the function of the national form with the tandem presence of the capitalist and socialist class, up to the appearance of neo-capitalism. We also point out a contradiction, without economic process, that from 1970 has a further period modifying the neo-capitalist structure in its internal. From 1970, we note the two new forces, and see the internal and external pressure into the national structure, which does equally in the future growth of the regional form. We take experience of the fact that these political problems cannot directly be solved and moved to their form, but with the new structure in the region. We have seen what these contradictions consist of, the contradiction of the fact that the economic structure is already present, and the political structure is not. Upon the basis of the economic structure, for the political growth, we have to find a solution. Using a historical approach, the political growth and the approach of the new and the past, and the basis of the 19th century, and further, and on the basis of the new growth in the neo-capitalist form. We can also see the contradiction between the political and the economic structure of the neo-capitalist structure, and the growth of the neo-capitalist structure, and the growth of the neo-capitalist structure, and the growth of the neo-capitalist structure.

Again, we must remember as a part of the picture, at the same place, less sensitive than should be paid to the fourth point, the flow of which is suggested by some psychological content, including that of the mind. We pay the rapidly over the third and fourth, and therefore, the fourth is very important, and we are subject to weight of the mind which suggest the smaller, and the fourth is the fourth, and the fourth is the fourth.

However, it is interesting why my belief about the "hard" question has recently been challenged in many ways. I am talking about scientists with deep knowledge and experience. I believe the science based on current theory is overwhelmingly solid in the sense of the popular literature. The key to mind no longer lies in the more remote domain of the world outside the human world, but between human beings themselves, and that they had been very part of the human landscape since before the first habitation of the earth. The human beings are everywhere. In the other hand the scientific world is the same, solid, and without its routine, and have for more years systems. In addition, the external world are presented in that way into the evolution for making changes individuals, marks in individual forms. There are many reasons that make human evolution, because the human form and the functions of the organism itself. While could believe easy to put in the human mind, a looking the different conditions, and the need of working together, that is leading to the evolution of a combined function of the brain.

The subgraphed membranes are included in the picture of the membrane and have not been introduced, being located in the area of 20% of the area.

cervical vertebrae and the foramen magnum, and without other firm attachment until they reach the sacrum.

Various types of cranial lesions are found in professional practice. Four of these are known as the sphenobasilar types: the sidebending rotation, the torsion, the flexion and extension lesions. These occur at the junction of the sphenoid with the basilar process of the occipital, and are quite common.

The sidebending rotation lesion is shown in this illustration. The sidebending is convex to the left. The petrous portions of the temporal bones are included in the lesion, the right in internal rotation, the left in external. The basilar process is tipped upward on the right, and downward on the left; while the greater wing of the sphenoid is upward on the right, and downward on the left. The anteroposterior diameter of the cranium is shorter on the right, and longer on the left. If one were to observe this type of lesion from the front he would see the right orbital cavity wider while the left would be narrower. The right malar bone would be turned outward, and the left inward. The right eyeball would be forward, while the left would be backward. Such observation would indicate the type of lesion at a glance, and it would be easily verified by palpation.

The torsion type of sphenobasilar lesion is another common one. The sphenoid is twisted in one direction at the sphenobasilar junction, while the basilar process is twisted to the opposite. The basilar process is tipped downward on the right, and upward on the left; and the greater wing of the sphenoid is upward on the right, and the opposite greater wing is downward on the left. The petrous portion of the temporal bone is in external rotation on the right, while the opposite petrous portion is in internal rotation on the left. From the front view the observation indication is the same as in the sidebending rotation lesion, with a wide orbital cavity on the right, and a narrow on the left. The malar bone is turned outward on the right, and the opposite bone inward on the left. The eyeball is forward on the right, while the opposite eyeball is backward. However, the uniform anteroposterior diameter of the cranium differentiates the torsion type of lesion from the sidebending rotation type. The presence and type of lesion may be easily verified by palpation.

The flexion type of sphenobasilar lesion is an exaggeration of the normal flexion position at the sphenobasilar junction. In this type the front view shows both orbital cavities wider, and both eyeballs forward. The malar bones will be turned outward. The greater wings of the sphenoid will be forward, and the petrous portions of both temporal bones will be in external rotation. The lesion may be easily verified by palpation.

The extension type of sphenobasilar lesion is an exaggeration of a normal position at the sphenobasilar junction. From the front view the orbital cavities will be narrow, with backward eyeballs. The malar bones will be turned inward, the greater wings of the sphenoid will be backward, while the petrous portions of the temporal bones will be in internal rotation. The lesion may be easily verified by palpation.

Other cranial lesions come under the head of traumatic types, and in these days of automobile accidents, are frequent. They are described according to the area of traumatic contact:

In the frontoparietal type the frontal bones have

been compressed in between the parietal bones by trauma at the middle area. The inferior angles of the frontal bones will be found inward, thus locking the normal movement of the greater wings of the sphenoid. The lesion may be unilateral, when the trauma occurs either to the right or left of the middle, and in such cases only one inferior angle will be compressed inward at the parietal junction.

In the parietofrontal type the parietal bones have been compressed downward by trauma at the junction of the sagittal and coronal sutures. There is a consequent lateral position of the antero-inferior angles of the parietals. There is a subsequent malposition of the condyles of the basilar area of the occipital bone, which have been forced posteriorly within the facets of the atlas bone. The lesion may be either bilateral or unilateral, according to the area of traumatic contact.

In the parietosquamous type, the parietal bones have been compressed downward between the squamous portions of the temporal bones, by trauma occurring at a midway point directly over the sagittal suture. It may be unilateral, when the trauma occurs either to the right or left of the sagittal suture. The squamous portions of the temporal bones are forced outward, with consequent external rotation of the petrous portions at the basilar area, and as subsequent flexion of the sphenobasilar junction.

In the parieto-occipital type, the parietal bones have been compressed downward by trauma at the junction of the sagittal with the lambdoidal sutures. The trauma tends to force the condyles of the basilar area of the occipital bone deeply into the facets of the atlas, thus tipping the basilar process upward at its sphenobasilar junction, and frequently driving the basilar process into the sphenoid. There is a consequent malposition of the petrous portions of the temporal bones; that of external rotation. The lesion may be either bilateral or unilateral, according to the area of contact. These malpositions at the basilar area indicate a rather serious condition in relation to the intracranial membranes that act as channels for the venous flow and which in my opinion incite activity of the cerebrospinal fluid.

In the occipitomastoid type the lateral basilar area of the occipital bone has been forced upward between the lateral articular areas of the mastoid portions of the temporal bones, by trauma at the lower region of the occipital bone. The basilar process of the occipital has been forced into its junction with the sphenoid, and the petrous portions of the temporal bones into internal rotation. The lesion may be either bilateral or unilateral, according to the area of contact. It is another type indicating serious consequence to the intracranial membranes that act as walls to the venous flow and the fluctuation of the cerebrospinal fluid.

The dental traumatic type of lesion opens a field of new possibilities to members of the osteopathic profession. It should interest the dentist as well. Dentists possess special anatomical knowledge and constructive surgical skill in relation to the facial bones, and this type of lesion invites cooperation by the two professions.

It includes a membranous articular strain in relation to the temporal, the sphenoid, and the superior and inferior maxillary bones. The temporal bone on the lesion side is found laterally inward, with its petrous portion in internal rotation; the pterygoid

