

questrum can be thoroughly irrigated, its decalcification is a matter of absolute certainty within a moderate number of days. The hydrochloric solution is a perfect antiseptic of itself, and during its use no other is required.

After the solution is completed there remains the gelatiniferous animal matter of the bone, which is identical with the material of decalcified bone drainage-tubes, and like them is rapidly absorbed in antisepticized cavities. I have commenced to investigate the possibility of dissolving it out at once with pepsin, but have not finished that part of the subject.

Billroth raises the objection that the acid will dissolve the living bone as rapidly as the dead, or even more so. So plain a point as this of course cannot fail to rise in everyone's mind, but I am sure that great man spoke from mere theory, and not from observation or experience. Whatever one might fear in this respect, I find as a matter of experience that the weak solutions which I have used do not decalcify living bone. Apparently the granulations covering the living osseous tissue protect it from contact with the acid, except in spots denuded by ulceration, and even there the circulation of the alkaline blood in the Haversian canals, and the constant exudation of alkaline serum from all raw living surfaces, bone included, protect it from the action of such weak acid dilutions as I have hitherto used. At any rate, it is a positive fact that the sequestra are dissolved, and the cavity heals, without any perceptible injury to the living bone.

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### THE INFLUENCE OF THE DURA MATER IN CAUSING PAIN, REFLEX AND OTHER PHENOMENA, WHEN INJURED OR DISEASED.

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The dura mater, the mother membrane of the body according to the ancients, is a much neglected and most important organ, for organ it must be regarded in the human anatomy. To the average student and general practitioner the dura is but a tough inelastic, fibrous membrane of unusual thickness, which plays the part of a scaffolding and support for the brain.

A careful study of this part, however, shows that it is not only the superstructure upon and in which the brain is built, but that it is an internal periosteum to the skull—a complex channel for the great venous currents through which course, not only the venous blood from the brain, but much from outside the skull,—likewise a soft, serous cover for the membranes of the convolutions and sheath for the cranial nerves. It has, furthermore, a small arterial supply, which is gathered from branches of both the exter-

nal and internal carotids, but is most peculiar in being a most sensitive organ with a greater combination of sensory motor and vasa motor reflexes than any other part of the body. The nerves of the dura come from the Casserian ganglion direct, and from the three great branches of the fifth pair. With these are combined branches of the facial and a number of sympathetic ganglia relating it to the spinal cord.

Van Helmont and others of his school regarded the dura mater as the seat of sensation. Marshall Hall (1841) was the first to announce that its irritation caused reflex actions. In 1872, Dr. John C. Dalton showed that convulsions or contractions followed irritation of the dura upon the same side. These observations have been confirmed by a large number of experimentalists, more particularly by Duret, who injected iodine and other chemical stimulants between the cranium and the dura and produced fracture of the skull at various points.

All these experiments were upon lower animals—presumably dogs. That the same condition exists in an exaggerated degree when the dura in the human subject is either diseased or injured, is recognized by Duret and others. This author, who has written most exhaustively upon the subject, intimates that so much confusion may arise between reflected sense and motion arising from irritation of the dura, as to puzzle the advocates of cerebral localization. He says: "Certain opponents (of cerebral localization) have adduced these facts to prove that the localized movements, which are determined by the application of the electrodes on the pretended motor centers of the cortex, were in reality due to irritation of these sensory conductors."

I herewith submit a sketch of a few cases which illustrate to some extent the function of the dura as an organ of sensation and reflected motor contractions, first premising my remarks by calling attention to the anatomical points of the scalp and cranium. The scalp is not normally acutely sensitive; its cutaneous sensibility is less than other parts of the skin, notwithstanding its sensory nerves are from external branches of the fifth pair of nerves. The skull-cap, when examined shows many openings, through which emissary veins pass from without inward, as can be plainly seen upon the dura by the numerous spots where these veins have been broken in tearing the fresh calvarium from the brain; through these openings in the skull frequently, but perhaps in abnormal conditions the extremities of the dural branches pass; it is from this, we have occasionally those dreadfully sensitive tumors of the scalp, or the more dreadful tumors of the dura, which Abercrombie, Louis, Wenzel Brothers, Cruveilhier and others, describe as commencing in the dura and making their way through the skull, lifting the scalp and finally breaking into fungoid masses of the most disgusting and painful kind upon the surface. These external dural nerves, if I may so name them, also account for the excessively sensitive spots which some persons have upon the scalp, when they must avoid the pressure of even a brush or comb, and arrange the hat for the particular spot. I doubt

not that a careful examination in such cases would reveal a sensitive tubercle or clubbed extremity of a nerve.

*Case 1.* M. C. was admitted to the Indiana Hospital for the Insane in March, 1882. He was irritable, homicidal and suicidal; suffered great pain in the head—at one time so excruciating that he ran at the window-bars (an iron grating) with all his force, lacerating the scalp in many places. During the war he had been cut along the center of the right parietal by an exploding shell, ploughing a groove into that bone; into this the scalp had healed into a firm adhesive cicatrix. With the intention of trephining in this case, a triangular flap was made leaving the scar in the center. It was not possible to dissect the scalp up from the old wound, but required a chisel to separate the dense aponeurosis; the old groove was likewise thoroughly scraped. Finding no evidence of a fracture and that the direction of the flying fragment was not likely to have caused one on the inner table, further procedure was dispensed with. The wound healed in a few days with the result better than could have been expected. The pain was gone and the patient while not yet fully recovered, is comfortable, works out of doors in the garden or on the farm, is more social and is considered a "trustee" on the hospital grounds.

*Case 2.* J. N., some eight years ago was near a boiler when it exploded; was struck by a fragment on the right parietal near its junction with its fellow and the coronal suture. After a period of unconsciousness, he recovered so far as to pursue his vocation, that of a farmer. Two years ago he had constant pain in the right side, also several epileptic convulsions followed by slight facial paralysis of the left side, and nearly constant twitching of the right face, neck, arm and hand.

In trephining this case, June 26, I found thickened and adherent dura, which was broken up with difficulty causing at the time increased muscular contractions; but when I had cut a slit through the greatly thickened membrane and explored the convolution beneath, even to passing a probe through the cortex of motor centers, no convulsive action was excited; there was an escape of perhaps two drachms of fluid, and more after the operation, but the patient remains to this date free from pain, convulsions or paralysis.

In six other cases in which I have trephined in insanity from traumatic causes, a like result, varying in degree as the location varied, was noticed.

It is my opinion from the foregoing observations upon the anatomical relations of the dura mater to the skull, that:

*First,* It is frequently the seat of disease or irritation produced by pressure, causing nearly all intracranial head-aches and neuralgias.

*Second,* That disease or injury of the dura through its relations with the vasa-motor nerves largely commands the blood supply of the cerebral centers, thereby affecting psychical, motor and reflex functions.

*Third,* That reflex contractions produced by irritation of the dura mater are usually upon the same

side of the irritation, but when the irritation is great, symptoms may be manifest upon both sides.

*Fourth,* Great inter-cranial pain in the cerebral regions is not an index of disease of those hemispheres, but of the dura mater.

### THREE CASES OF SYMPATHETIC OPHTHALMITIS ARRESTED BY EARLY ENUCLEATION OF THE INJURED EYE.

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A few years ago a writer in the *Archives of Ophthalmology* (vol. xi, p. 209) asserted that it could be definitely settled "that the enucleation of the injured eye does not arrest or shorten the course of sympathetic inflammation." But we need only to begin to look into the literature or to ask the views of several oculists to convince ourselves that the greatest difference of opinion still exists in regard to the propriety of removing the injured eyeball after sympathetic inflammation has started in the other eye. Mauthner, for instance, takes the ground that under these circumstances the operation is not only useless, but in certain forms of sympathetic inflammation positively harmful; while Wecker, on the contrary, declares these views are not borne out by clinical facts, and insists that the operation should be performed in the early stage of sympathetic ophthalmitis.

When men entertain and express such opposite opinions on a question it certainly cannot be said to be definitely settled; on the contrary, it seems to be still open to a great deal of discussion, and to call for further clinical observations before a definite decision can be arrived at.

But to discuss this subject understandingly, it is necessary that our arguments and the clinical facts to sustain them, rest upon the same platform; in other words, it is necessary that we understand each other in reference to what we regard as the early stage of sympathetic ophthalmitis. For our views in regard to this malady have recently been undergoing a material transformation; and the term, "the early stage of sympathetic inflammation," may have a different meaning in observations based upon the old views from what it means in observations made under the latest theory.

As long as the theory prevailed that the sympathetic inflammation was transmitted by reflex irritation through the ciliary nerves, we naturally looked for the first evidence of sympathetic disturbance in that part of the eyeball upon which the ciliary nerves exert their greatest influence. Tenderness of the ciliary region and inflammatory disturbance of the iris were regarded as among the earliest symptoms of sympathetic affection, while cases in which the first evidence of sympathetic disturbance was discovered around the optic papilla, were considered and reported as occasional and rare exceptions. But since Dr. Arlt (*Archives of Ophthalmology*, Vol. V, 1876,) has shown the uncommon frequency of inflam-