

the tumour diminishes in proportion to the freedom with which the current of blood enters the aneurism. No variation in the pulse of the affected limb would indicate that the current was uninterrupted, and would lead to the conclusion either that no aneurism existed, or if it existed that the cavity was closed. And yet, as will appear in the course of this paper, aneurisms may exist, and the distal arteries pulsate with undiminished force.

We shall in a future paper consider the diagnosis of aneurisms from malignant growths, from pulsating tumours of bone, from enlarged thyroid, etc. etc.

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ART. V.—*A Contribution to the Anatomy of the Jugular Foramen.*

By THOMAS DWIGHT, JR., M.D., of Boston, Professor of Anatomy at the Medical School of Maine. (With three wood-cuts.)

THE objects of this paper are: 1st, to call attention to the great and, as far as the writer knows, undescribed variations of the jugular fossa, that part of the temporal bone which, together with the occipital, forms the *foramen lacerum posterius*; 2d, to consider the differences which the fossa, the foramen, and the neighbouring foramina present on the two sides of the same skull; and, 3d, the effect of these differences on the cranial circulation.

A. The size and shape of the jugular foramen depend to a certain extent on the formation of the jugular eminence and notch of the occipital bone, but far more on that of the notch of the temporal bone, while the lower aspect of the opening, and the jugular fossa for the enlargement of the internal jugular vein, depend almost entirely on the latter. The fossa is liable to great variations, and presents all the appearances intermediate between two extreme types, one of which is very common, and is the form usually described in text-books, while the other, though far rarer, is not rare enough to be called abnormal. It is astonishing that no mention of this latter form should be found in any of the modern systematic treatises on anatomy. In the seventh edition of Quain, we are told that "a smooth, rounded, and deep depression, the *jugular fossa*, lies internal to the styloid process, it is close to the posterior margin of the bone, and completes, with the jugular notch of the occipital bone, the *foramen lacerum posterius*." In many cases it is neither smooth, rounded, nor deep. There is no satisfactory description of it in Sappey, Cruveilhier, nor Luschka, nor, what is more surprising, in the admirable description of the bone in Henle's *Knochenlehre*.

The jugular fossa is situated on the inferior surface of the petrous portion, or, more correctly according to Henle, on the posterior external

surface.<sup>1</sup> The most frequent form consists of a thimble-shaped depression pointing upward, outward, and a little backward. (Fig. 1, *a*.) The rim of the thimble is usually well-defined, except behind, where it is lost in the border of a rough surface (*b*) which joins the end of the jugular eminence of the occiput; but sometimes the rim is wanting on the outer side so that the lower part of the wall of the fossa is formed on that side by the tympanic plate. A blunt crest (*c*)<sup>2</sup> separates the fossa from the *aqueductus cochleæ* and runs into the *processus infrajugularis* (*d*), a prominence on the posterior border of the petrous portion which assists to divide the foramen into an anterior and a posterior portion for the passage of the nerves and veins respectively.

Fig. 1.

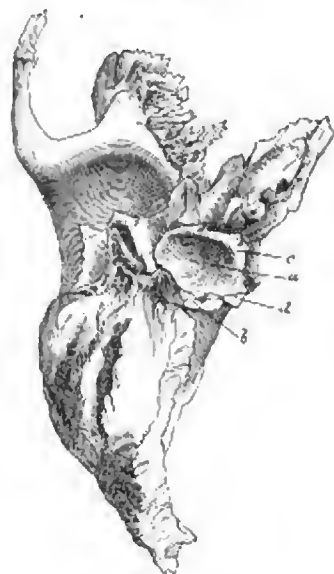


Fig. 2.



From this slightly amplified description of the most common form we pass to that of the least frequent, which is extremely puzzling to the student if he follows, as he should, the book on the bone. There is no thimble-shaped depression whatever, but merely an entering angle formed by two rough surfaces which meet in a groove running forward and outward. The posterior of these surfaces (Fig. 2, *b*) is for the junction with the jugular eminence, and is much larger than in the other type. The anterior one (*a*), nearly vertical, and slightly and irregularly concave,

<sup>1</sup> When the bone is *in situ* the highest part of the petrous portion is the ridge separating the surfaces commonly called superior and internal, excepting the point where the former surface is forced up by the superior semicircular canal.

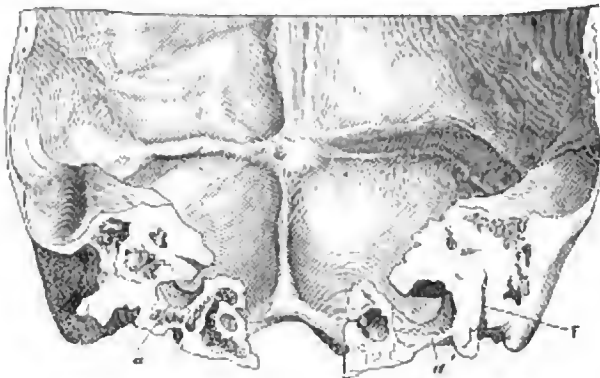
<sup>2</sup> Henle, *Knochenlehre*, s. 158.

represents the diminutive fossa. The inner and lower angle of the surface is prolonged into the infrajugular process (*d*), and its anterior edge (*c*) is very thick, taking the place of the blunt crest behind the aqueduct. In this form, one might imagine that the occipital surface behind, and the crest in front, had become enlarged at the expense of the fossa, of which nothing but the anterior wall remains. When the bones are joined to the occipital the effect is very striking; the foramen is reduced to a narrow slit, partially divided into a larger anterior and a smaller posterior one, by the very prominent infrajugular process.

All other forms appear to be intermediate; we may consider them as successively greater deviations from the former type. In the first grades the inner edge of the thimble disappears; then it becomes more shallow, till finally it is a mere concavity sloping outward and forward. As the fossa grows less, the anterior and posterior walls thicken as just described. It is the posterior or venous part of the foramen which suffers, the anterior undergoes little change.

Apart from variations in form, the foramen and the fossa may vary greatly in size. The depth and diameter of the fossa are equally uncertain. It is not too much to say that in two skulls of equal size the fossæ of one may have four times the capacity of those of the other, though made on the same plan. The foramina may vary as much as the fossæ and independently of them, though, as a rule, the size of the one is in direct ratio to that of the other. Both foramina of a skull may be decidedly above or below the average, but, as the next part shows, one is usually larger than the other.

Fig. 3.



B. The difference between the foramina of the two sides does not result solely from the quasi-accidental asymmetry of corresponding parts, but, as a rule, from a peculiar arrangement of the venous channels. The difference of the relations is well shown by vertical sections. Fig. 3 represents such a section through the head of a young subject, in which

there is a striking disparity between the foramina. The cut is made rather obliquely; on the right it is  $\frac{1}{16}$ th of an inch in front of the stylo-mastoid foramen, while on the left it strikes the posterior wall of the canal (*f*) leading to it, yet such is the asymmetry of the skull, that while on the left the jugular foramen (*a*) is fully opened, the section on the right is just behind its orifice, and shows the lateral sinus (*a'*) turning over the jugular eminence.

To ascertain whether there is any fixed relation between the size of the opening, the shape of the fossa, and the size of the anterior and posterior condyloid foramina, the writer has examined very carefully the skulls in the museum of the Boston Society of Natural History, and those in the private collection of his friend Dr. J. Collins Warren. After the rejection of some more or less mutilated specimens there remained 159 ancient and modern, representing races from nearly all quarters of the globe. The first step was to study the variations in size of the jugular foramina of the two sides of the same skull. (The posterior or venous portion is, as already intimated, the important part as influencing the size of the opening.) This foramen was larger on the right in 104 cases, on the left in 38, and those of the two sides were equal in 17. Of the 142 cases in which one foramen was larger than the other, the fossa was more capacious on the same side as the larger foramen in 93 cases, on the opposite side in 19, and those of the two sides were equal in 30. In the same 142 skulls the posterior condyloid foramen was larger on the same side as the larger jugular foramen in 53, on the other side in 37, and they were equal or absent in 52.<sup>1</sup> In the same series the anterior condyloid foramen was larger on the same side as the jugular in 16 skulls, on the other in 11, and the two were equal in 115. It should be mentioned that the differences between the anterior condyloids were, with one or two exceptions, extremely slight. There does not appear to be any definite relation between their size and that of the posterior condyloids. The above figures are obtained by adding together the results of the examination of the two main classes: those in which the jugular foramen was larger on the right and left respectively. In the 17 skulls in which they were even, the neighbouring parts, though not quite alike, presented nothing worthy of description. To sum up roughly, we may say that of 159 skulls about two-thirds had the jugular foramen larger on the right side, about one-fourth on the left, and about one-ninth had the two equal; further, that about two-thirds of those having the foramina unequal, had the larger fossa on the same side as the larger foramen, while less than one-seventh of them had it on the opposite side; and lastly, that the posterior (and in a less degree the anterior) condyloid foramen was much more frequently larger on the same side as the jugular foramen than on the other.

<sup>1</sup> When but one posterior condyloid was present it was held to be larger than its fellow.

C. The application of what precedes to the cranial circulation is very simple. It is clear that, as a rule, the greater part of the blood tends to seek an exit on one side. It has long been known that one jugular vein is commonly larger than the other, and it is shown that the jugular fossa of that side is generally shaped so as to lodge a larger dilatation.

Fig. 3 shows the correspondence in size of the lateral sinus, the foramen, and the fossa of the same side. It appears also that the condyloid foramina, both of which transmit veins, show no compensatory disposition, but on the contrary are usually larger on the same side as the larger jugular foramen.

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ART. VI.—*Case of Painful Neuroma of the Skin.* By LOUIS A. DUHRING, M.D., Clinical Lecturer upon Diseases of the Skin in the University of Pennsylvania, and Physician to the Dispensary for Skin Diseases, Philadelphia. (With a wood-cut.)

UNDER the name of painful neuroma of the skin, I propose to describe the following case which has been under my observation for the past six years, and was kindly placed at my disposal by my friend Dr. F. F. Maury, in whose ward at the Philadelphia Hospital the man is at present.

David W., aged 70; Irish, boiler-maker, but of late his trouble has incapacitated him for any kind of labour. His previous health has been excellent and none of his family or relatives ever presented any disease similar to that from which he is suffering. About ten years ago he first noticed the presence of a few, small, round nodules, situated in the skin of the left shoulder, attended with decided itching, but without pain. These nodules soon multiplied and increased in size. For four years they continued to appear in numbers, and by the end of this time the arm and shoulder were well studded with them. For the past five years their increase in number has been slower, but new ones have continued to appear up to the present time. Some of the older nodules have grown somewhat in size during the past five years. He is quite positive that it was not until three years after the first elevations were noticed, that there was any pain in or about them. Such are the important points in connection with the early history of this case. Since I first saw the patient, six years ago, there has been but little change in the appearance of the growth, with the exception that new scattered tubercles have developed at various points.

The disease is now characterized by the presence of numerous small, rounded, hard nodules, occupying the left scapular region, shoulder, and outer surface of the arm, as far down as the elbow, as is seen in the accompanying illustration. They are incorporated with the skin and subcutaneous tissue; vary in size from that of a pin's head to that of a large pea, and at certain points are situated closely together. They are elevated from one to four or five lines above the level of the surrounding healthy skin, and present a marked tubercular, knotty appearance. They are