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CASE OF UNUSUALLY LARGE FRONTAL SINUS.

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During the routine of hospital work we discovered an unusually large frontal sinus, or rather, sinuses. We delved into the literature on this subject, and although rather limited we gathered some very valuable and interesting material. We were especially interested in the comparative frequency of absence of one or both frontals and the average size of these sinuses in man. Many of us have undoubtedly diagnosed frontal sinusitis and even seriously considered operation and have been surprised when the skiagraph showed total absence of the sinus. We know that in a few instances serious mistakes have occurred. A. Logan Turner says: "One or both frontal sinuses may be absent. When we say the frontal sinus is absent, we mean there is no cavity extending into the vertical portion of the frontal bone. This does not, however, exclude the possibility that a small frontal air space exists between the two laminae of the orbital plate. The frequency of this happening differs in different races." He examined 578 skulls in the anatomic museum of the University of Edinburgh. Two hundred and forty were Europeans as follows: Scottish, 124; English, 16; Irish, 20; French, 37; German, 13; Russian and Polish, 8; Swiss, 7; Greek, 6; Turkish, 3; Austrian, 2; Danish, 1; Flemish, 1; Italian, 1, and Spanish, 1. The largest pair seen in the Scotch were right 47 by 42 and left 51 x 53 mm. The smallest pair right 20 x 18 and left 16 by 13 mm. The average size of both cavities was 29.8 by 26.6 mm., the right sinus slightly larger than the left. Calculations based on examination of several hundreds of frontal sinuses represent a standard sinus as being 31.6 mm. in height by 25.8 mm. in breadth. As to presence and absence in 124 Scotch skulls: Both sinuses were present in 76.6 per cent;

both sinuses were absent in 12.1 per cent; right sinus absent in 4.8 per cent, left sinus absent in 6.4 per cent, making one or both absent in 23.2 per cent. The average size of frontal sinuses in 240 European crania was 33.5 by 28.7 mm., the largest being German. As to presence and absence in 240 European crania, one or both were absent in 17 per cent; of these, 7.5 per cent represents total absence. He finds the average depth of the frontals in 71 skulls to be 5.2 mm., the variation being from 2 to 16 mm., 16 mm. being exceptional. The sinuses were more frequently absent in female crania.

J. Parsons Schaeffer says: "The anatomy varies greatly in size, shape and type. Right and left are generally asymmetrical, and either or both may be present in duplicate or triplicate. He has seen four frontal sinuses on one side—each with an independent communication with the cavum nasi. Agenesis of the frontal sinus is most unusual in his studies. He thinks errors have been made in supposing it to be absent where there was no pneumatization of the frontal or vertical portion of the frontal bone, and that the frontal sinus in some cases never does invade the vertical portion of the frontal bone but develops wholly in the horizontal portion and is of the orbital type. In this class of sinuses any ordinary procedure to expose the frontal would oftentimes fail to reveal it. He describes a common type of duplicate frontal sinus, the simple sinus pneumatizing both the horizontal and vertical portions of the frontal bone. He thinks sometimes the sinuses remain so small as to be mistaken for agenesis and describes a dissection when the frontal sinuses were represented by two small cells well down toward the root of the nose, and their combined capacity was only 1 cc. He says the skiagram is valuable but not infallible in determining presence or absence of, and extent of the frontal sinus in the region of the forehead. When they are supernumerary, skiagraphy may be in error. Rhinoscopic examination is an invaluable supplement. One gathers from his experience that the frontal sinuses are rarely absent and that duplication and triplication are common; that if absent in the vertical position, it is usually present in the horizontal position of the frontal bone, hugging the ethmoid labyrinth and extending far into the roof of the orbit, both dorsally and laterally. He admits that the ethmoid

cells may develop far into the frontal region and in many cases might be classed as frontal sinuses, and that when there are two large sinuses on the same side of the frontal region it is hard to say whether they are both frontal sinuses or extensively developed ethmoid cells.

A. W. Meyer states that he thinks the entire absence of the frontal sinuses is probably not so rare as Schaeffer implies and doubts whether their absence is as common as Boege reports. Boege published an excellent summary of the literature and found bilateral absence of the frontal sinus in 4 per cent of 203 skulls examined.

Austin reports the case of a woman, 29 years of age, who suffered with pain over and behind the left eyeball for eight years, with discharge of pus from the left nostril for two years and recent swelling of upper eyelid. Examination showed pus came from region of left infundibulum and anterior ethmoid cells. He removed part of the middle turbinate and obtained temporary relief. The week before, he had operated upon another case similar to this and found a frontal sinus full of pus, so he cut down on this also. What he took for the anterior wall of the sinus seemed rather thick, and then to his surprise dura mater came into view. He explored the bone on both sides of the first opening, with the same result. The wound closed, healing by first intention. A subsequent skiagram showed absence of the frontal sinuses and, as he himself says, "A skiagram after operation was like shutting the stable door after the horse had bolted."

Goldsmith says that the complete absence of one or both frontal sinuses and frontonasal ducts is not unusual and exhibited the sectioned skull of a Canadian Indian to strengthen his contention.

Shambaugh claims that the absence of one or both is not unusual. He has about a dozen preparations showing absence of one or both and thinks the variation is as a rule bilateral. He never saw a large frontal sinus on one side and absence on the opposite side, but occasionally finds a small frontal on one side and absence on the other side. In contrast with these he has preparations showing an unusually larger sinus and considers them of practical interest because they are especially likely to become the seat of severe infections and if

operated upon externally are liable to cause a very disfiguring scar. We can at least gather from this that to operate upon the frontal sinus without a skiagram in addition to transillumination may sometimes prove a serious matter and involves a responsibility not to be lightly assumed. Even then there are times when it is very difficult to be certain about the exact conditions present. The skiagram may at times not enable us to distinguish between a large high anterior ethmoid cell and absence of the frontal sinus. It is at times well to introduce a probe and make the skiagram with the instrument in situ. Two good views should always be obtained, a postero-anterior and a lateral, and these should be at hand when the operation is being performed so that divisions and septa with blind pockets are not overlooked.

The patient whose sinuses are herewith reported came to us with oculomotor paresis, both internal and external, of the left eye, which proved to be specific. The photographs demonstrate the enormous size that the frontal sinuses at times attain. Should it be necessary to operate upon a sinus of such size externally the patient should be previously informed of the deformity that would in all probability result. These sinuses show not only a very unusually high vertical portion but a very deep horizontal extension over the orbit, and one can easily see how severely adjacent structures might be affected in case of their infection.

Anticipating the fact that the accompanying photographs may provide material for discussion, we wish to give a brief outline of the method used in making the radiographs.

The posteroanterior view was made with the patient in the prone position face downward, nose and forehead resting on the plate, the tube being centered over the median line about one inch above the occiput at a distance of twenty-four inches, using a head clamp and compression. The lateral view was made with the patient lying on his left side, the tube being centered over the orbit at a distance of twenty-one inches, again using the head clamp and compression. In this view the upper brim of the orbits are shown to be slightly out of alignment, a fact which we surmise to be due to the shape of the head, making it difficult to get a perfect alignment under compression. Subsequent radiographs made of other

cases, using the same method with regard to distance, direction and position of the patient, have failed to reveal any magnifying of the parts taken when compared with the original, therefore we have no hesitancy in saying that the following measurements are true in all detail. The vertical portion of the sinuses, as shown in the lateral view, measures $3\frac{3}{4}$ inches or approximately 95 mm. The depth over the orbit measures $2\frac{1}{4}$ inches or 57 mm. The width from the median line measures $2\frac{3}{8}$ inches or 60 mm. on the right side and $2\frac{1}{4}$ inches or 57 mm. on the left.

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Fig. 1. Lateral view.

Fig. 2. Anterior view.