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A RARE FORM OF OCCIPITO-ATLANTAL
ARTICULATION. ✓

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ABNORMAL conditions in the manner of articulation of the atlas with occipital bone are not uncommonly met with, and have been described in large numbers. The most frequent condition which is encountered is the bony union of the atlas with the occiput. This may be confined to ankylosis of the articular facets of the atlas to the occipital condyles, or part or all of one or both arches of the atlas may be involved, or the jugular processes of the occiput may be unusually long and join in bony union or articulate with one or both transverse processes of the atlas. These or similar abnormal conditions have been described by Lawrence,¹ Toynebee,² Hussey,³ Boxhammer,⁴ Turner,⁵ Schniffer,⁶

¹ Lancet, London, 1827, vol. xi, p. 31.

² Abnormal Articulation of the Occiput with the Atlas, Transactions Pathological Society, London, 1848-49, vol. ii, p. 93.

³ Ankylosis of Atlas and Occiput, *ibid.*, 1856-57, vol. viii, p. 314.

⁴ Die angeborenen synostosen an der enden der beweglichen Wirbelsäule, Zeitschrift für rationelle Medicin, iii, Reike, Bd. 15, p. 1.

⁵ St. Bartholomew Hospital Reports, London, 1867, vol. iii, p. 368.

⁶ Ueber die Architectur des Schädelgrundes in der Norm bei assimilation des Atlas, Virchow's Archiv, vol. lxxiv, p. 320.

Grawitz,⁷ Zoja,⁸ Allen,⁹ MacAllister,¹⁰ and Slade.¹¹ The paper by Dr. Slade contains a careful review of the subject and describes eight cases. The paper by Professor MacAlister is perhaps the most valuable and contains very full references to the literature.

It is outside my purpose to discuss the causes of abnormal occipito-atlantal articulation or their frequency, and they are common enough, but rather to describe a peculiar form of articulation in which several points of interest are involved. But first a word in regard to the skeleton itself. It is one of many purchased by the Field Columbian Museum from Sr. Montez, of Peru, who found it along with others in a rock-tomb at Huaracundo, a small village near Cuzco, Peru. When received into the museum it had on the original wrappings of fibre rope and had never been opened. It was a good example of the mummy packs which come from that region, and may be considered as belonging to the Inca branch of the great Kechua stock. It may not be without interest to note in passing that these same Huaracundo rock-tombs have been very fertile in their yield of anatomical anomalies. Thus, of three mummy packs from the Montez collection from that region, one contained a skull in which the atlas was fused with the occiput, in the second the skull had been most skilfully and successfully trepanned in two places, while the third serves as the basis of this paper. Again, in a small collection of crania made by the writer in that locality in 1892, one was trepanned,

⁷ Beitrag zur Lehre von der basilaren Impression des Schädels, Virchow's Archiv, vol. lxxx, p. 463.

⁸ Intorno all' Atlante, Mem. inst. Lomb. di sc. e lett., 1881, 3, s., V., p. 269.

⁹ On the Varieties of the Atlas in the Human Subject, Journal of Anatomy and Physiology, vol. xiv.

¹⁰ Notes on the Development and Variations of the Atlas, *ibid.*, 1893.

¹¹ Abnormal Attachment of the Atlas to the Base of the Skull, Boston Medical and Surgical Journal, cxxxiii, p. 57.

another had the atlas joined to the occiput, while four others showed the effect of disease by the presence in each skull of a large circular hole.

Turning now to the skull which directly concerns us, we may begin with the occipital bone. On the right side (see Fig. 1) the jugular process extends downwards and slightly backwards into a prolongation which measures 23 millimetres in length, and 17 millimetres in its greatest diameter. The process is somewhat compressed in a slightly oblique antero-posterior



FIG. 1.

direction. On the anterior surface, toward its lower extremity, is a nearly circular articular facet which measures 10 millimetres in diameter. The facet is concave from side to side. On the atlas (see Fig. 2) there is a corresponding facet on the posterior border of the right transverse process, which is unusually deep at this point. The facet is concave from above downwards and is rougher than that of the paramastoid process.

A reference to Fig. 3 shows that when the atlas is in place on the condyles it is perforce twisted slightly out of its normal position. There has been, as has already been said, a slight backward tendency in the growth of the process, but while it has been enough to escape the superior surface of the transverse process and to avoid fusion with the atlas, it has not been sufficient to permit of the atlas retaining its normal position. As a result, the atlas makes an angle of about 20° to the sagittal plane of the foramen magnum. A compensa-

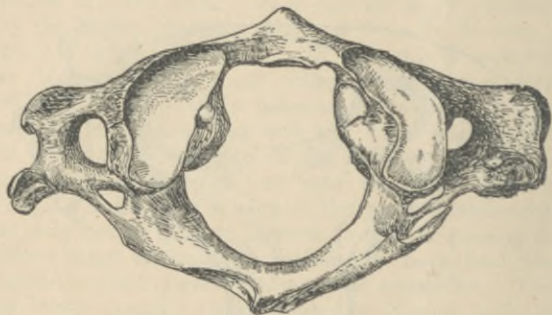


FIG. 2.

tory change, however, has taken place in the odontatlantal articulation, which permitted the head to be directed forwards and to be sustained in something like its original equilibrium at the same time. Referring to Fig. 2 again, it may be noticed that in the atlas a new articular surface for the odontoid process has been formed on the right antero-inferior surface of the lateral mass, occupying the position normally occupied by the tubercle for the transverse ligament. The effect of this new condition can also be plainly made out on

the odontoid process, where extended around on the right side is an articular surface which corresponds to the lateral articular surface on the axis.

It may not be without interest to call attention also to the fact that the left transverse process is bifid, a condition not often met with. It can also be seen in Fig. 2 that the groove for the vertebral artery on the

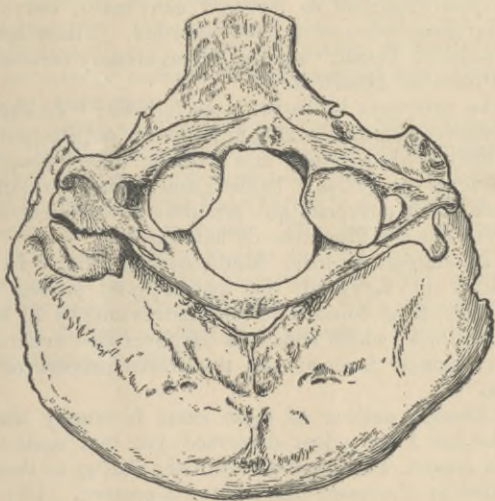


FIG. 3.

left side is almost bridged over by a spiculum of bone which begins near the middle of the posterior arch, and terminates half-way between the posterior border of the superior articular process, and the anomalous facet on the transverse process. There is also a small spine which begins along with the one just mentioned

and is directed towards a similar process from the middle posterior surface of the superior articular process. These two spines probably would ultimately have united and formed a canal for the vertebral artery. There is also on each side just posterior to the vertebral foramen a rather large well-defined *supernumerary* foramen.

In regard to the form of atlanto-occipital articulation just described so far as I can learn, only two similar cases have ever been recorded. These are to be found in Testut,¹² and the paper, already mentioned, of Professor MacAlister.

The reference in Testut is as follows: "Je l'ai vue (l'apophyse paramastoïdienne) dans un cas atteindre 22 millimètres de longueur et s'articuler avec l'apophyse transverse de l'atlas à l'aide d'une facette ovale à grand axe transversal qui mesurait 10 millimètres de largeur sur 8 millimètres de hauteur."

The statement from MacAlister is this: "In the skull of an Egyptian this par-occipital process is a thick styliform column, 22 millimetres long by 11 millimetres thick, which ends in a flat facet that articulates with a similar facet on the transverse process of the atlas."

Although neither of these cases is exactly similar to the one I have just described, yet in a male skull from Ancon, Peru, a condition very similar to that described by Professor MacAlister is present. Unfortunately we possess only the skull, so it is impossible to determine what was the nature of the atlas. But the left jugular or paramastoid process has extended downwards and backwards, and measures 10 millimetres in length and 15 millimetres in diameter. It terminates in an irregular circular facet which has an upward and

¹² Testut: *Traité d'Anatomie Humaine*, third edition, *Osteologie*, p. 125.

backward inclination and is slightly and obliquely concave from side to side. The occipital bone shows a large amount of platybasic deformity.

In the second skull from Huaraco, which I have already mentioned, the atlas is fused with the occipital bone through bony union of the condyles. The anterior arch remains free, as does the posterior; the latter, however, is incomplete. There is no abnormal development of the jugular process. The right vertebral foramen is very small, while that of the left side has no anterior border. The transverse processes are greatly undersized.

The fourth specimen is that of a male Kwakiutl from British Columbia. The condition is somewhat similar to the one just described. The atlas is ankylosed to the occipital bone through the condyles and superior articular surfaces. The jugular process of the left side is also united to the transverse process, as is the left half of the posterior arch, which is incomplete for about eight millimetres. The anterior arch is free for the greater part of its course. The left transverse process is bifid.

The first part of the document is a letter from the Secretary of the Board of Directors to the shareholders. The letter is dated the 1st day of January, 1900, and is addressed to the shareholders of the company. The letter is a very long and detailed one, and it contains a great deal of information. It begins with a statement of the financial condition of the company, and then goes on to discuss the various matters which have come before the Board of Directors during the year. The letter is written in a very plain and simple style, and it is very easy to read. It is a very good example of a business letter, and it is one which every business man should read. The letter is signed by the Secretary of the Board of Directors, and it is dated the 1st day of January, 1900.