

THE CRANIOPHARYNGEAL CANAL IN MAN AND ANTHROPOIDS

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So infrequent is the occurrence of the genuine *canalis craniopharyngeus medius* in the adult human cranium (0.2 per cent. skulls), that any particular instance of such appears worthy of record, particularly when, as in the present case, concomitant departures from the normal are manifest elsewhere in the same subject. It is here not so much intended to review the literature of the craniopharyngeal canal, as to describe briefly a given example in man, and to augment our knowledge of its incidence in the anthropoid series.

CRANIOPHARYNGEAL CANAL IN MAN

(a) *Case report*

The present specimen¹ was discovered in a 38-year-old male recently dissected in this department, the cervical spine and skull being collected during routine maceration; there is no clinical history, nor are the bones of the extremities available. The cranium discloses a somewhat asymmetrical sphenoid, presenting considerable backward extension of its anterior clinoid processes, with ossification between each of these and a well developed middle process to form the carotico-clinoid foramen (fig. 1); the dorsum sellae is well formed, but its uppermost portion—the transverse bar bearing at its extremities the posterior clinoid processes—is independent of the rest of the bone to which it has attachment by fibrous tissue only (fig. 2). A deep pituitary fossa, well ringed in by bone, presents in its floor (as does the pre-sphenoid) numerous minute vascular foramina, as well as a wide circular hole (3.5 mm. diameter), the mouth of a craniopharyngeal canal which the probe discovers to extend for a distance of 16 mm. downwards and forwards through the median septum of the sphenoidal sinus to a vomerine termination in the nasal septum; the un-deviating median course of this canal (presumably occupied by pituitary tissue *in vivo*) is clearly demonstrable by skiagram upon the insertion therein of a metal probe (see fig. 3). There is ossification of the pterygospinous ligaments, and of the uppermost inch or so of the stylohyoid ligaments; numerous bony spicules project from the external pterygoid plate, the rim of the foramen magnum and from the nuchal portion of the occipital.

¹ Exhibited at the Summer Meeting of the Anatomical Society, Newcastle, 1929.

There is a striking asymmetry of the maxillary air sinuses, the right maxilla being the seat of certain changes not due to any ascertainable pathological process. On the left, the canine fossa is concave, the normal antrum of that side extending forward to the canine ridge and outward into the malar process, though not into the malar bone, nor into the hard palate. On the right, the canine fossa is markedly convex, being filled out by an unusually large antrum which extends both forwards past the canine ridge and medially well into the palatine process, reaching quite to the mid-line in the anterior palatine region, and thereby conferring upon the nasal aspect of the hard palate a bulging convexity in place of the customary concavity. The nasal surface of the right maxilla has a greater concavity than has its fellow, the inferior meatus being consequently unduly wide on that side: the nasal septum suffers no deviation from the median plane.

In the cervical spine certain incipient though definite changes have occurred, indicative of a disturbance of pituitary activity, and which, if further developed, would reproduce exactly the features characteristic of this part of the vertebral column in the acromegalic subject. These changes, like those in acromegaly, constitute the expression of an abnormal response on the part of the skeletal tissues to the mechanical stimuli of stress and strain, and consequently affect mainly those parts concerned in the support and transmission of weight, taking the form of an irregular general hypertrophy. Thus, the vertebral bodies show an increased depth and width, with a characteristic exaggeration and out-splaying of their neuro-central apophyses; the articular pillars are massive (those of C.V. III being relatively enormous) as are their posterior tubercles; the articular facets are increased in area and altered of outline, whilst the intervertebral foramina have suffered some change of size and shape (see fig. 4).

From the posterior aspect of the cervical column, the tips of the transverse processes are invisible owing to the increased girth of the articular pillars; in this respect the specimen resembles the acromegalic, and differs from the normal, spine wherein the vertebral width taken between the extremities of the transverse processes definitely exceeds that taken across the articular pillars.

Apart from the changes described, there is no sign of disease in the cervical vertebrae, whose articular processes are well formed and clean cut.

(b) General

In the human subject the true craniopharyngeal canal is a rarity, as may be seen from Table I. Le Double's(4) statement that it may be found in some 10 per cent. of new-born children is very suspect; this figure is much too high, and serves only to emphasise the need for precision in terminology and for caution in distinguishing the actual canal from the relatively common vascular foramina of the sphenoidal body and from the gap between pre- and post-sphenoid so characteristic of the macerated sphenoid of the infant and young child.

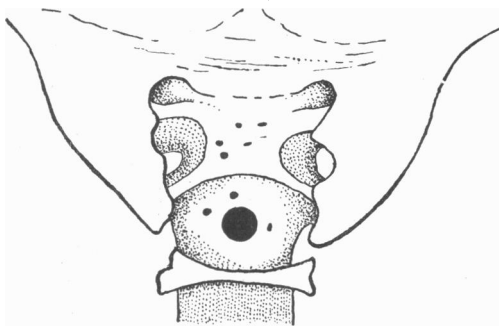


Fig. 1. Cranial mouth of craniopharyngeal canal and associated minor vascular foramina.

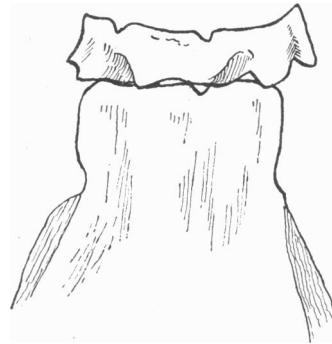


Fig. 2. The condition of the dorsum sellae.

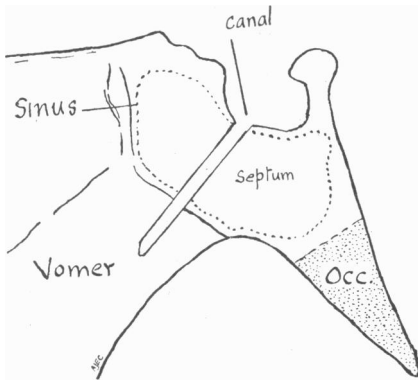


Fig. 3. The relations of the canal (from a skiagram).

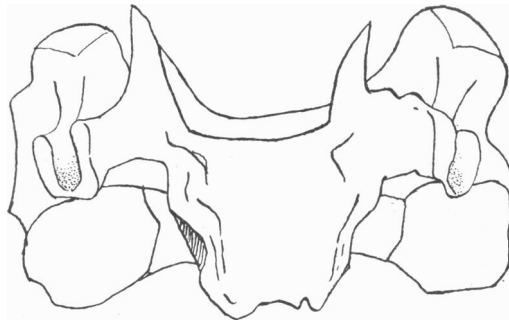


Fig. 4. The condition of the IVth cervical vertebra.

Table I. *Crania specifically examined for craniopharyngeal canal*

Observer	No. of crania examined (adults)	Canal found in
Romiti	800	0
Rossi	3712	9
Le Double	317	1
A.J.E.C.	105	0
Total	4934	10=0.2 %

In character, the canal may be either (a) complete, containing a prolongation of dura which blends with the periosteum clothing the under surface of the sphenoid (as in Romiti's case from a 5-year-old girl), or (b) incomplete, containing a dural *cul de sac*, with or without pituitary contents, and terminating in the body of the sphenoid or in the posterior part of the nasal septum. Suchanek (10) reported one such incomplete canal filled by a solid epithelial

plug from a 4-year-old child. When the canal presents an inferior opening, that aperture is usually situate about 1.5 mm. behind the postero-superior angle of the vomer.

Most interesting, perhaps, and not devoid of clinical significance, is the association of the ventral extremity of the craniopharyngeal canal with the vomer, in or near which the canal may end. Such a termination is in complete accordance with embryological findings, Prof. Frazer⁽¹⁾ having demonstrated that the pituitary stalk, during development, becomes associated with the posterior border of the nasal septum, down which it travels for a considerable distance. As far back as 1888 Killian had observed that a small mass of pituitary tissue may occur in the naso-pharynx, and in 1909 Haberfeld⁽²⁾ found this mass (about the size of a rice grain) to be constant in the human subject, lying immediately behind the upper end of the posterior edge of the septum. Erdheim is quoted by Sir Arthur Keith⁽³⁾ as having discovered this pharyngeal pituitary remnant in each of a series of over fifty bodies examined for its presence, whilst Keith himself⁽³⁾ has figured much the same condition of things from a 15-month-old child.

That tumours may arise from pituitary remains in this situation is sufficiently well established and calls for no comment here.

CRANIOPHARYNGEAL CANAL IN ANTHROPOIDS

As might be expected from the nature and morphological value of this structure, the craniopharyngeal canal may be traced as a normal or as a variant cranial character from such lowly vertebrates as the ganoids and sharks throughout the higher forms to man himself, although, indeed, large gaps exist in the data available for the different intervening groups. Even among the mammalia no extensive systematic search appears to have been made regarding its incidence, references to its presence being few and scattered.

According to Leche⁽⁵⁾ the hedgehog exhibits a persistent pituitary stalk whose ventral (anterior) extremity frequently enlarges to form an independent extracranial bud of tissue, not unlike the condition occasionally obtaining in the human subject. As an anomaly, the canal has been described in the cat by Romiti⁽⁸⁾ and in the dog by Le Double⁽⁴⁾; the hare and rabbit possess it normally, though in other rodents it occurs as but an uncommon variation, having, as such, been recorded in the adult cavy by Maggi⁽⁶⁾ and in *Hystrix cristata* by Le Double. Information concerning primate mammals is of the scantiest. The last author met with the canal in *Cercopithecus sabaues*, but as regards anthropoids, Maggi's⁽⁷⁾ findings, from a specific examination made in 1891 of fifty-seven anthropoid crania are those most commonly quoted; to these no recent addition seems to have been made—certainly the extensive bibliography on anthropoid literature given in 1924 by Sonntag⁽⁹⁾ contains no reference to further papers on this subject.

Maggi's findings are embodied in Table II, together with the results of a recent critical investigation of a much wider range of anthropoid and primate

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material (see Table II), from the Hunterian Museum of the Royal College of Surgeons and from the Institute of Anatomy, University College, London¹.

Table II. *Craniopharyngeal canal in primates and anthropoids*

Observer	Species	No. examined	Canal found in	%
Maggi	Chimpanzee	5	4	80
"	Gorilla	10	6	60
"	Orang	42	9	21.4
A.J.E.C.	Chimpanzee	56	36	64
"	Gorilla	57	20	35
"	Orang	44	6	14
"	<i>Hylobates</i> sp.	5	1	—
"	Catarrhines (various)	13	3	—
"	<i>Macacus rhesus</i>	3	1	—
"	<i>M. fascicularis</i>	2	0	—
"	<i>M. nemestrinus</i>	1	0	—
"	<i>Cercopithecus sabaeus</i>	1	1	—
"	<i>Papio hamatryas</i>	1	1	—

Twenty-six adult skulls of lower primates were carefully examined, and 157 anthropoid crania, the latter including animals of various "races," of both sexes, and of all ages from 2 months' old babies to aged adults. In every specimen examined, the calvaria had been removed and both aspects of the basis cranii were critically scrutinised, the greatest care being taken to distinguish the true craniopharyngeal canal from the vascular foramina in the pituitary fossa. Frequently both cranial and pharyngeal mouths of the canal could be determined, or the passage proved to terminate in the sphenoid or in the nasal septum: all doubtful cases have been rigorously excluded.

Neither age nor sex appears to have any direct bearing upon the incidence or the features of the canal, which is seen to be much commoner in the orang than in man, three times more common in the gorilla, and commoner still in the chimpanzee.

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