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Blood Supply of the Trigeminal Ganglion of the Crab-eating Monkey (Macaca fascicularis)

By

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(With one textfigure and fourteen figures in five plates)

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Summary: The arterial distribution of the trigeminal ganglion was investigated in the crab-eating monkey by means of the acryl plastic injection method, and the basic and topographical anatomy of the ganglion was also assessed.

1. The ganglion was located mostly in the remarkable impressio trigemini on the anterior surface of the petrosal part of the temporal bone, and the remaining small part of the ganglion extended anteriorly along the superolateral side of the internal carotid artery, with its anterior end reaching up to a position lateral to the posterior clinoid process.

2. Ganglionic branches were derived from the following arterial sources: the marginal tentorial branch, the anterior petrosal branch, the basal tentorial branch and the trigeminal nerve branch of the internal carotid artery; the pontine branch of the basilar artery; and the accessory meningeal branch of the maxillary artery.

3. Ganglionic branches from various vessels formed a network in the triangular plexus, although such a network was scarcely found in the trigeminal capsule and ganglion.

In conclusion, it can be said that the main supply route of the trigeminal ganglion in the crab-eating monkey was the intracranial arterial source, in assistance with the extracranial.

Recently, the blood supply of the trigeminal ganglion in the dog was investigated in detail by Okuda (1979). Strong anastomoses between the external and internal carotid systems were found to be the anastomotic ramus and artery, situated close to the anterolateral side of the ganglion, and the main supply route of the ganglion was the extracranial blood source.

The present work deals with the detailed arterial distribution of the trigeminal ganglion and additionally its basic and topographical anatomy in the crab-eating monkey. The pattern of the carotid system of this monkey bears a close resemblance to that of man. The ramifications of both the internal and external carotid systems are well developed, although there are rarely distinct and strong communications between the two systems. Detailed investigation of the vascular supply of the ganglion in the crab-eating monkey is invaluable for comparison with that of man.

Materials and Methods

Twenty-eight adult crab-eating monkeys and five dry skulls were used.

Acryl plastic was injected via the common carotid arteries utilizing the plastic injection method (Taniguchi, Ohta and Tajiri 1952, 1955) in all 28 heads. Twenty-five of the heads were prepared to corrosion specimens of the carotid system after treating tissues for observation and measurement of the vascular structures. One side of each of the other three injected heads was fixed in formalin, and the trigeminal ganglion was extracted en bloc and embedded in celloidin, cut serially at 30 μm and 60 μm in the horizontal, sagittal and vertical directions of the ganglion, and stained with hematoxylin and eosin. The remaining side of each of the three heads was fixed in absolute alcohol, and the ganglion with the central radix and bases of the three divisions was extracted, cut in the same directions as mentioned above at the respective thicknesses, and stained with 1% cresyl violet.

By using these serial slide sets, the fine vasculature of the ganglion was surveyed, and a wax-reconstruction model, magnified ten times, of ganglion cell masses, was made. Usual observation and measurement of the vessels were prepared under the

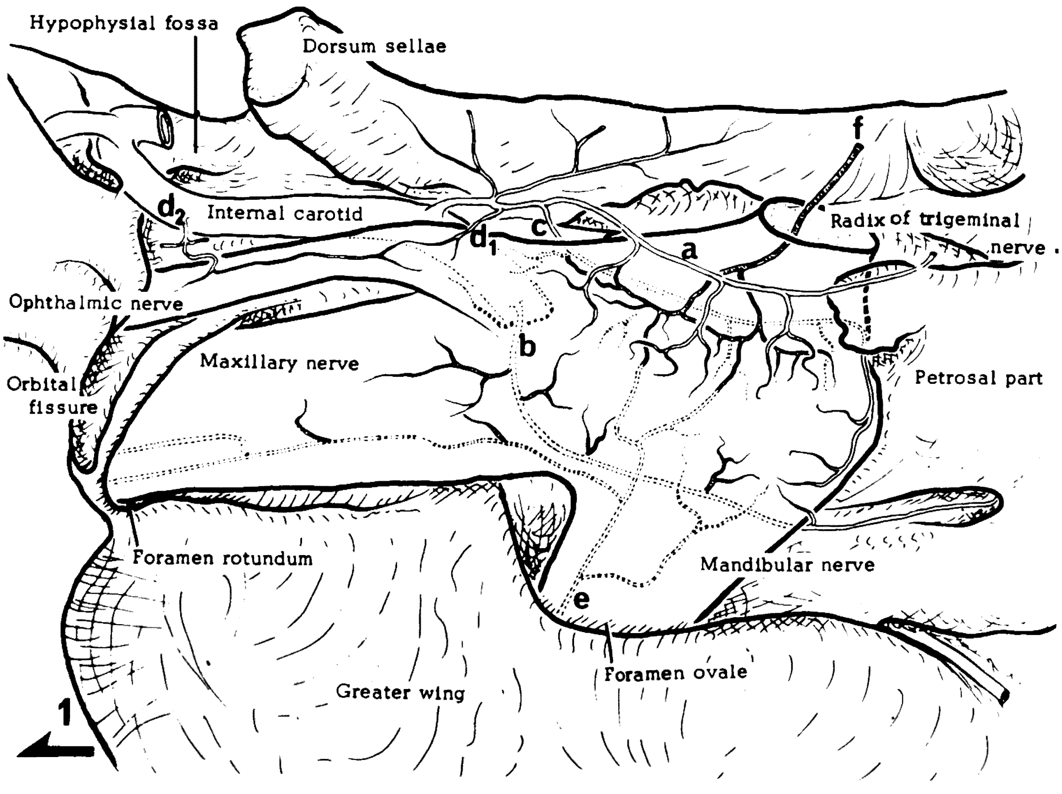

Fig. 1. Schematic illustration of the blood supply of the trigeminal ganglion of the crab-eating monkey. Distributing branches above the ganglion are indicated by solid lines, those beneath it by dotted lines, and those within it by hatched lines. a: Marginal tentorial branch, b: anterior petrosal branch, c: basal tentorial branch, d_1: trigeminal nerve branch of the marginal tentorial branch, d_2: trigeminal nerve branch of the internal carotid artery, e: ganglionic branch of the accessory meningeal branch, f: ganglionic branch of the pontine branch.

binocular magnifier and microscope. Dry skulls were used for surveying the anatomical relations between the internal cranial basis and the trigeminal ganglion.

Observations

1. Basic structure and topography of the trigeminal ganglion (Fig. 1)

The trigeminal ganglion of the crab-eating monkey was flat and rather oblong (10~12 mm in length, 3~3.5 mm in width and 0.5~1.5 mm in height) (Figs. 4, 5), facing its convexity anteroinferolaterally (Figs. 3, 10).

The ganglion was located in the trigeminal cavity, pouched by the dura mater, in which it was covered by a capsule of the epineurium. It was in relation to the internal carotid artery and the abducent nerve inferomedially, the trochlear nerve superomedially, and the marginal tentorial branch of the internal carotid superoposteriorly, respectively (Figs. 1, 3).

Most of the ganglion lay in the remarkable impressio trigemini (Fig. 2), extending from the major petrosal nerve canal hiatus to the apex of the petrosal part, and the remaining small part stretched anteriorly up to a position lateral to the posterior clinoid process, superolateral to the internal carotid and the abducent nerve (Fig. 2).

The ganglion consisted of three cell groups (Figs. 4, 5). The ophthalmic group, the smallest, was in the shape of a slender pyramid, facing its apex anteriorly located in the anterosuperomedial part of the ganglion. The maxillary group, the largest, was in the shape of a shell, facing its convexity anteroinferolaterally beneath the ophthalmic group. The posteromedial part of this group was thicker; and its thickest part, close to the superolateral side of the cavernous, beginning portion of the internal carotid, appeared to form a recess in connection with the ophthalmic group. The mandibular group was flat and oblong, and located in the lateral half of the impressio trigemini. The anteromedial end of this group was close to the posterolateral end of the maxillary group. Cell masses of each group tended to congregate on the cerebral side of the ganglion but to be scattered on the opposite cranial floor side. In accordance with such locations, the inferoposteromedial surface had a concave outline, to which the trigeminal nerve radix was connected (Figs. 3, 4, 5).

The epineurium of the ganglion was not thick and did not invade deeply and distinctly between the cell groups, so that the ophthalmic and maxillary groups were found as a single mass. However, the mandibular group was separated from the maxillary group since the minor portion of the nerve passed anterolaterally adhering to the inferior surface of both groups (Fig. 5). Each cell group consisted of elongated cell masses (Fig. 4), between which nerve fiber bundles passed. The radix of the major portion ran anterosuperolaterally in a notch, extending from the posterior surface to the superior margin of the petrosal part, which was guarded by a tiny process (Figs. 2, 3) protruding medially from the upper margin of this part towards the impressio.

Three divisions of the trigeminal nerve arose from the convexity of the ganglion (Figs. 3, 4, 5); the ophthalmic and the maxillary anteriorly and the mandibular inferoanteriorly.

2. Arterial supply of the trigeminal ganglion

Ganglionic branches were supplied directly or indirectly from the following principal sources: the internal carotid artery, the accessory meningeal branch of the external carotid artery and the basilar artery (Fig. 1).

Ganglionic branches of the internal carotid were distributed to most of the ophthalmic and maxillary cell groups from the medial, superior and inferior sides of the ganglion as well as part of the mandibular group from the inferior and lateral sides. Similar branches of the basilar artery were distributed to the recess of these three cell groups. Similar branches of the accessory meningeal branch were distributed to most of the mandibular group and part of the maxillary group adjacent to it.

1) Ganglionic branches arising from the internal carotid artery and its ramifications

All branches supplying the ganglion have been designated as the cavernous branches arising from the cavernous portion of the internal carotid artery in man by Gray (1973). These branches, however, were found as a kind of arterial complex, indefinitely named by some scholars even in man, but with no description in the crab-eating monkey. Accordingly, the present author will utilize the nomenclature applied to man.

(1) Ganglionic branches of the marginal tentorial branch (Schnürer et al. 1963) (Fig. 1)

This parent branch (370~410, M. 395 μm in diameter) arose from the superior wall of the internal carotid artery in the cavernous sinus and lateral to the tuberculum sellae in the 50 examples observed. It had various relations to other branches as follows: in common between the basal tentorial and the trigeminal nerve branches in 13 cases; in common between the basal tentorial, the clival and the trigeminal nerve branches in 10 cases (Fig. 8); in common with the trigeminal nerve branch in seven cases (Fig. 7); in common between the basal tentorial and the clival branches in seven cases; independently in six cases; in common with the basal tentorial branch in four cases (Fig. 6), and in common with the clival branch in three cases.

The marginal tentorial branch, giving off the clival branch (Schnürer et al. 1963, Lang et al. 1976) posteriorly in 20 of the above cases, passed superiorly along and medial to the abducent nerve and to the anterior end of the ganglion up to its upper level. Also, this branch en route sent off the trigeminal nerve branch anteriorly in 30 of the above cases (Figs. 7, 8) and the basal tentorial branch inferoposteriorly in 34 of the above cases (Figs. 6, 8). This branch bent posterolaterally to pass through between the ganglion and the trochlear nerves (Figs. 3, 6), then in the basis of the tentorium cerebelli. In this course it gave rise to the ganglionic branches (70~125, M. 95 μm in diameter), which passed tortuously anteroinferolaterally to enter the ganglion penetrating the capsule at the posteromedial end of its upper surface. They were distributed to most of the ophthalmic group and part of the maxillary and mandibular groups from their posteromedial side.

(2) Ganglionic branches of the anterior petrosal branch (Lang et al. 1976) (Fig. 9)

This parent branch (95~110, M. 83 μm in diameter) arose from the internal carotid or the accessory meningeal branch as follows.

i) From the internal carotid artery

The anterior petrosal branch arose laterally from the lateral wall of the internal carotid, immediately after passing through the inner orifice of the carotid canal. It arose independently in 38 cases (Figs. 7, 9), in common with the basal tentorial branch in four cases, and in common with the clival branch in three cases. This branch ran anterolaterally towards the anterior end of the major petrosal nerve groove, then along it or on the inferomedial

side of the convexity of the ganglion (Figs. 7, 9). Ganglionic branches (35~50 μm in diameter) arose from this branch in positions where it passed beneath the ganglion and where it reached its posterolateral end. They arose mostly from the superior wall of the parent branch superolaterally and reached the ganglion spreading into smaller twigs within a short distance. They were distributed to the maxillary and mandibular groups from their inferior and lateral sides of the convexity.

ii) From the accessory meningeal branch

The anterior petrosal branch, observed in five cases, arose from the accessory meningeal branch which entered the cranial cavity through the oval foramen with the mandibular nerve. It ran posterolaterally in the major petrosal nerve groove up to the posterolateral end of the ganglion, where it gave off anteromedially the ganglionic branches. These were distributed to the mandibular group from the lateral side of the ganglion.

(3) Ganglionic branches of the basal tentorial branch (Schnürer et al. 1963) (Figs. 8, 10, 14)

This parent branch (230~320, M. 280 μm in diameter), observed in 46 cases, arose from the superior wall of the internal carotid artery in the cavernous sinus in the following relations with other branches: in common between the marginal tentorial and the trigeminal nerve branches in 13 cases; in common between the marginal tentorial, the clival and the trigeminal nerve branches in 10 cases (Fig. 8); in common with the clival branch in eight cases; in common between the marginal tentorial and the clival branches in seven cases; in common with the anterior petrosal branch in four cases; and in common with the marginal tentorial branch in four cases (Fig. 6). From the common trunks in the above 34 cases, in which the marginal tentorial branch was included, the basal tentorial branch diverged medial to the ophthalmic division (Fig. 6), and passed inferoposteriorly between the ganglion and the abducent nerve up to the anterosuperior end of the petrosal part. Further, from the common trunks in the 12 cases in which the marginal tentorial was not included, the basal tentorial also followed the above features. In both cases it continued to pass along the superior margin of the petrosal part posterolaterally, and more laterally in 14 cases (Fig. 10). In this course, the basal tentorial gave rise to ganglionic branches on the posteromedial side of the ganglion (only found in the above 33 cases), and the inferoposterior side of it in all examples observed, anterolaterally. It still gave off ganglionic branches and small twigs to the major petrosal nerve at the posterolateral end of the ganglion anteromedially, and ran anterolaterally to give rise to small twigs to the mandibular nerve (Fig. 14).

All these ganglionic branches (45~115, M. 75 μm) were distributed to the ophthalmic and maxillary groups from their medio- and inferoposterior surfaces, as well the mandibular group from both the posteroinferior and lateral ends.

(4) Ganglionic branches of the trigeminal nerve branch (Schnürer et al. 1963, Lang et al. 1976)

This parent branch (120~198, M. 160 μm in diameter) arose laterally from the lateral wall of the upward curvature of the internal carotid as follows: independently in 48 cases, in common between the marginal and the basal tentorial branches in 13 cases, in common between the basal tentorial and the clival branches in 10 cases (Fig. 8), and in common with the marginal tentorial branch in seven cases (Fig. 6).

The branch arising independently passed laterally between the trochlear and the ophthalmic nerves, giving small twigs to

them, and continued along the superolateral side of the latter backwards up to the anterior end of the ophthalmic cell group. While, the branch arising in common with the other branches mentioned above spread into ganglionic branches, medial to the above-mentioned nerves. They supplied the ophthalmic cell group from its superior and medial sides (Figs. 8, 10), and still continued forwards between the nerves to supply them, anastomosing with the similar ganglionic branches arising independently (Figs. 7, 11).

2) Ganglionic branches of the accessory meningeal branch (Figs. 10, 11, 12, 13)

The parent branch (190~220, M. 210 μm in diameter), numbered one in 39 cases (Figs. 11, 12, 13) and two in 11 cases, diverged from the medial pterygoid branch, medial to the mandibular nerve. In five of these cases the branch arose in common with the anterior petrosal branch. This branch in 19 of the above 39 cases bifurcated before the oval foramen (Fig. 12).

Actually this branch was only distributed to the dura mater around this foramen, but its main continued as the ganglionic branches. They ascended medial to the mandibular nerve (Figs. 10, 11) up to the fork between the maxillary and mandibular nerves or the lateral corner of the latter. They spread into small twigs, some of which entered the ganglion to supply the maxillary and mandibular cell groups from their convexity, and ran forwards along the maxillary nerve to pass through the foramen rotundum to the pterygopalatine fossa, where they anastomosed with a small twig, running with the maxillary nerve, of the anterior deep temporal artery (Fig. 11). The remaining small twigs ran beneath the ganglion posteromedially towards its posteromedial margin, where they entered the ganglion to supply the maxillary and mandibular cell groups. One of them divided into two, one branch supplying the mandibular cell group and the other running posterolaterally as the anterior petrosal branch in the five cases mentioned in (2) on page 204.

3) Ganglionic branch of the pontine branches of the basilar artery

Any of the anterior ones of the pontine branches (250~320, M. 290 μm in diameter) gave rise to a ganglionic branch (70~110, M. 95 μm), which entered the radix and ran forwards (Figs. 10, 12, 13), in 21 cases bifurcated within it. All of the branches entered the trigeminal cavity and spread fan-shapedly to supply the maxillary and mandibular cell groups and part of the ophthalmic cell group from their posterior side. Some of the final ramifications formed a network (Figs. 12, 13, 14) in the triangular plexus, with a contribution from ganglionic branches of the marginal and the basal tentorial and the accessory meningeal branches.

3. Arterial vasculature in the trigeminal ganglion

All the ganglionic branches (35~110, M. 70 μm in diameter) of all the sources reached both the superior and inferior surfaces of the ganglion and its convexity, and spread fan-shapedly into capillaries to supply ganglionic cell masses directly.

While, numerous small twigs (30~94, M. 45 μm) of the ganglionic branches of the pontine branch formed the network mentioned before in the triangular plexus on the concavity of the ganglion, with the ganglionic branches of the marginal, the basal tentorial and the accessory meningeal branches (Figs. 12, 14). Extensions of the component vessels of this network ran anterolaterally towards the concave margin of the ganglion with nerve bundles in the plexus (Fig. 15). They thus entered the ganglion and arborized (Fig. 15) into short and long vessels passing on the perineurium, although they rarely anastomosed

between both vessels. The former usually supplied only the concave side of the ganglion. The latter spread into capillaries, but a few passed through the ganglion up to the three divisions of the trigeminal nerve.

Discussion

Concerning the feature of the trigeminal ganglion of the rhesus monkey, Christensen (1961) in his textbook described that it was a large triangular ganglion and the three large nerves left its base, which was directed lateralwards and forwards. In the present paper, the ganglion of the crab-eating monkey was found to be located in the impressio trigemini, being similar to that of man in gross anatomy, on the anterior slope of the temporal petrosa. This impressio was much deeper than that of man, and its superolateral edge protruded from the petrosal part just onto the trigeminal radix. If this protrusion had extended over it medially like a roof, a canal would have been found like the trigeminal canal in the dog described by Okuda (1978). He stated that the impressio with the ganglion in such a case, as seen in the dog, moved onto the basis of the greater wing of the sphenoid bone.

As regards the cell groups of the ganglion, Ferner (1939) reported that the cells of man were arranged in irregularly radical groups for each division of the trigeminal nerve and the nerve bundles were led through them. Okuda stated that the arrangement of the cell groups in the dog was similar to that described by Ferner, adding trabecula-like extensions from the epineural capsule between the cell groups. The present author could not find such extensions in the crab-eating monkey, but the details were similar to those stated by Ferner.

Bergmann (1942) investigated in detail the supplying arterial vessels of the trigeminal ganglion in man, as well as Okuda (1979) in the dog. Bartholody (1897) and Grigorowsky (1928) stated that the trigeminal ganglion was supplied by the aa. sinus cavernosi of the internal carotid, the middle meningeal artery and the accessory meningeal branch. Schnürer et al. (1963) described that the tentorial and basal dura in the neighbourhood of the sella were supplied by the lateral and dorsal main stems arising from the cavernous portion of the internal carotid, and the former supplied the trigeminal ganglion. Later Lang et al. (1976) attempted to classify these cavernous vessels based on their origin and distribution territories, and described this stem as the truncus carotico-cavernosus lateralis, while Lasjaunias et al. (1977) gave a detailed report on the inferolateral trunk. Both scholars pointed out that this was the blood source for the trigeminal ganglion and its vicinity. Bergmann (1942) described the situation in man as follows. The extrinsic arteries of the Gasserian ganglion were seen as an arch on the medial side of the ganglion or on the emerging primary divisions. The arch, directing its convexity forwards, was supplied by a twig of the internal carotid. Gasserian twigs left the cavernous sinus and crossed over the abducent nerve, and the lower end of this arch was formed by a medial branch of the middle meningeal or by the small meningeal artery. Further, the distributing arteries were very small, and some of them sprang from the pontine branch of the basilar artery, entering Meckel's cavity with the the trigeminal stem. As the supplying sources in the dog, Okuda indicated the internal carotid, the anastomotic, the middle meningeal arteries and the anastomotic ramus and the accessory meningeal branch, and the ganglionic branches arising from these arterial vessels formed the

supra- and infraganglionic retia in the capsule.

Distributing arteries in the crab-eating monkey can be attributed to three sources: the internal carotid and the basilar arteries and the accessory meningeal branch. Ramifications of the internal carotid in the moneky corresponded to the cavernous branches in man, but these differed from those of the monkey to some extent, that is, in the marginal tentorial, the basal tentorial, the anterior petrosal, the trigeminal nerve, the clival, and the hypophysial branches. All these branches apart from the last two gave rise to the ganglionic branches independently or via common trunks. While, Okuda in the dog stated that the ganglionic branch was seldom supplied by the internal carotid, although this artery was an important and constant source in the crab-eating monkey. The pontine branch of the basilar artery described by Bergmann in man and a similar branch of it described by Okuda in the dog did not supply the cell groups of the ganglion but the trigeminal root. Such branches, however, were distributed to the ganglion after spreading within the triangular plexus as described in the present paper. The accessory meningeal branch constantly contributed to the blood supply of the ganglion in these three species.

Concerning the communications between many ganglionic branches, Bergmann indicated anastomoses along the convexity of the ganglion beneath it in man, and Okuda noted rich anastomoses in its capsule in the dog. Such anastomoses in the crab-eating monkey were found in the triangular plexus or along the concavity of the ganglion.

Okuda concluded that the main supply route of the ganglion in the dog was the extracranial source, that is, the external carotid and its limited branches. This may reflect the strong communications between the external and internal carotid as well as the locational relation of the ganglion to both sources. No contribution from the basilar artery was demonstrated over the longer distance to the ganglion because of the forward movement down onto the greater wings of the sphenoid bone. On the other hand, the ganglion was mainly supplied by both the internal carotid and the basilar arteries. This may be related to the infrequent communication between both carotid systems and the shorter distance from the basilar artery.

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Abbreviations

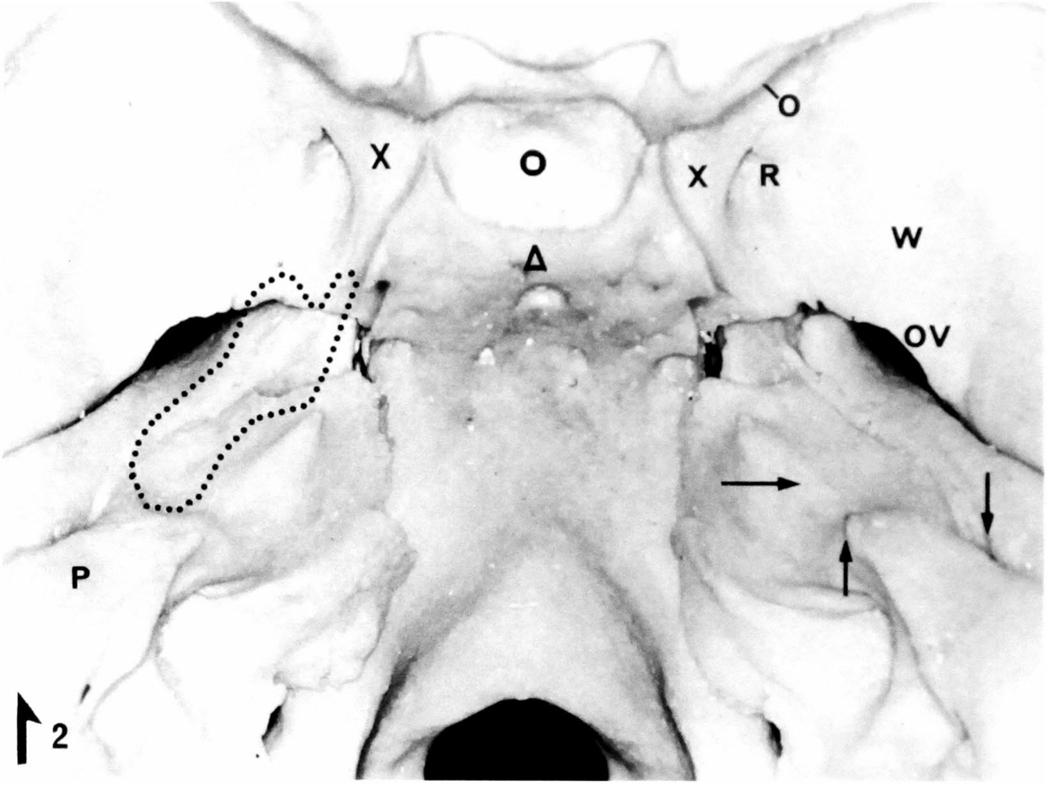
bt : Basal tentorial branch
ic : Internal carotid artery
mt : Marginal tentorial branch
rm : Ganglionic branch of the accessory meningeal branch
rn : Trigeminal nerve branch
rp : Anterior petrosal branch
MX : Maxillary nerve
NM : Mandibular nerve
NO : Ophthalmic nerve
NT : Trigeminal radix
O : Orbital fissure
OV : Oval foramen
P : Petrosal part
R : Foramen rotundum
W : Greater wing of the sphenoid bone
←—— Direction of the snout

Explanation of Figures

Plate I

Fig. 2. Superior view of the middle cranial fossa. X3.0.
The whole outline of the trigeminal ganglion of the left side is indicated by a dotted line. The major petrosal nerve hiatus (↓), the same named groove anteromedially, hypophysial fossa (○), dorsum sellae (△), the inner orifice of the carotid canal and the groove for the internal carotid artery (X), an incisura for the trigeminal radix (→) on the superior margin of the petrosa and a small protrusion (↑) medially from it.

Fig. 3. Superolateral view of the trigeminal ganglion of the left side. X7.0.
The dura mater on the trigeminal ganglion and its vicinity were removed to show large supplying arteries located around the gaglion. The whole outline of the ganglion is indicated by a dotted line. Dorsum sellae (△), oculomotor nerve (X), trochlear nerve (○), the major petrosal nerve and the groove for it (*), a small protrusion of the petrosal part (←) (cf. Fig. 2).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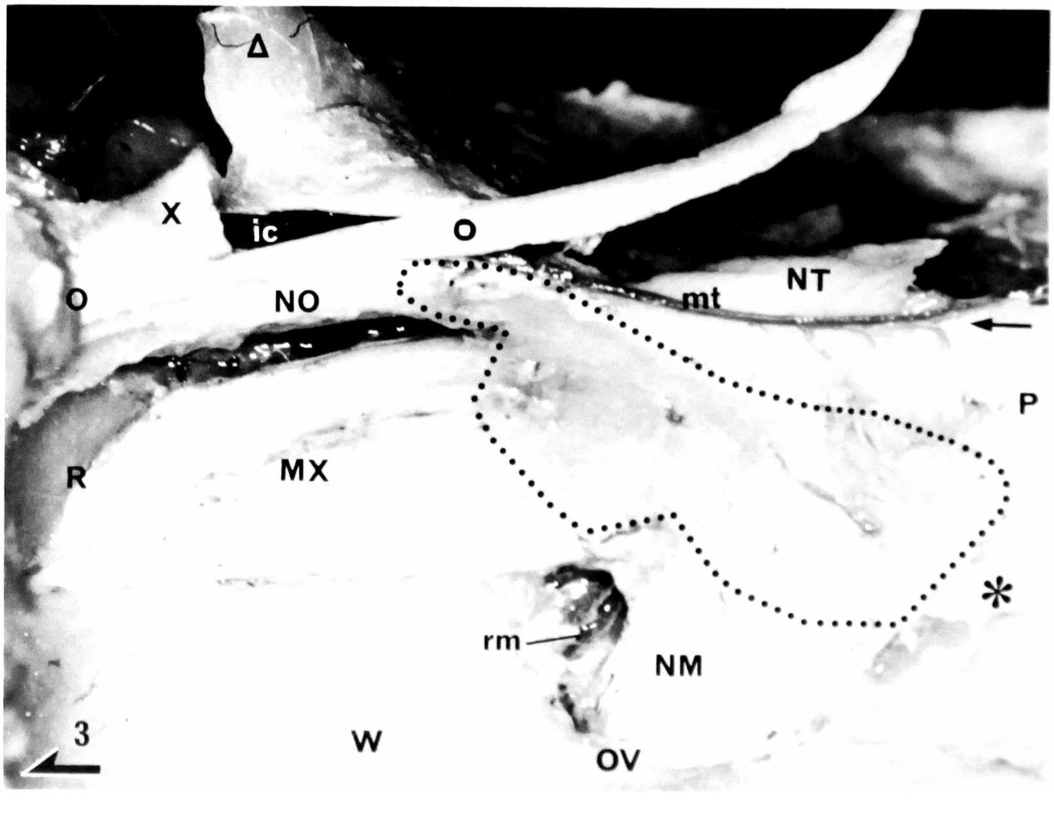
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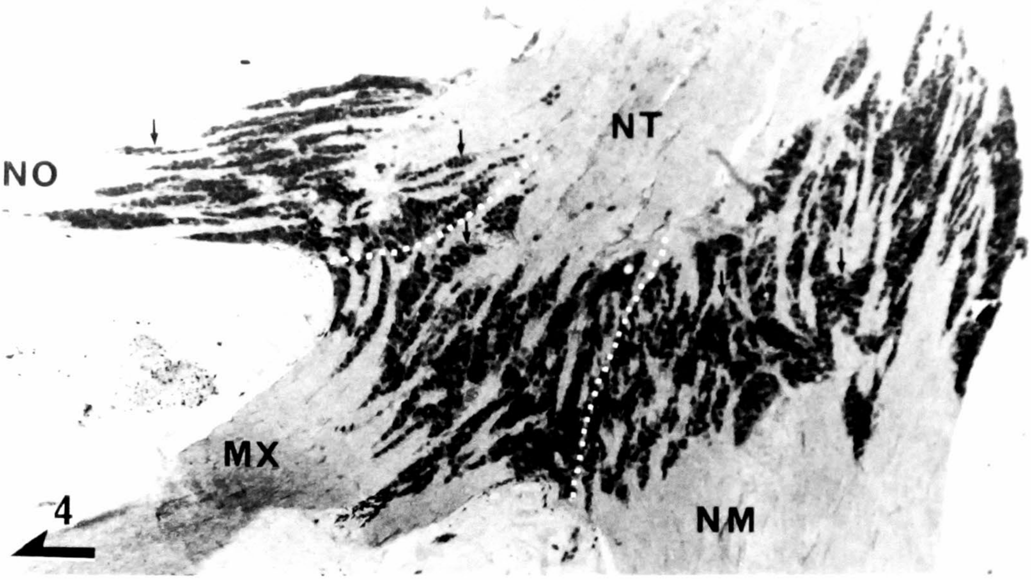
Plate II

Fig. 4. Cross section through the middle of the trigeminal ganglion of the left side, stained with cresyl violet. X12.0.
The shape of the cell groups is oblong. Each cell group indicated by a dotted line consists of smaller cell masses (↓).

Fig. 5. Inferomedial view of a wax-reconstruction model of cell groups of the trigeminal ganglion of the left side. The minor portion (X). X7.0.

Fig. 6. Medial view of the trigeminal ganglion of the left side. X3.5.
General relations are shown between the trigeminal radix, the oculomotor (X), the trochlear (O), the abducent (△) nerves, the marginal and the basal tentorial branches, and the internal carotid artery.



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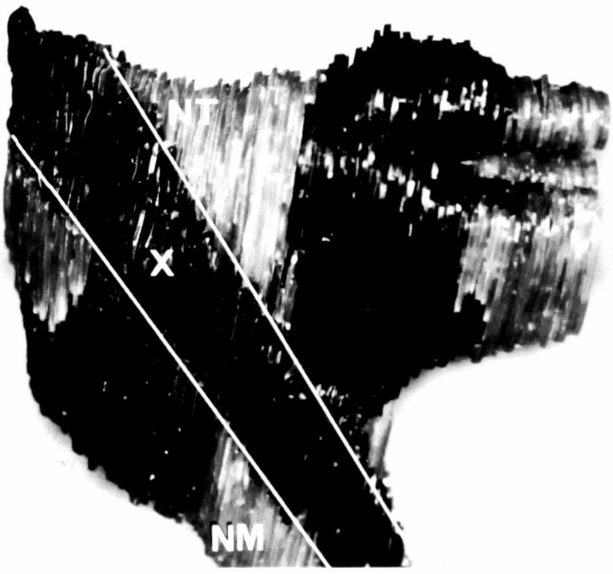

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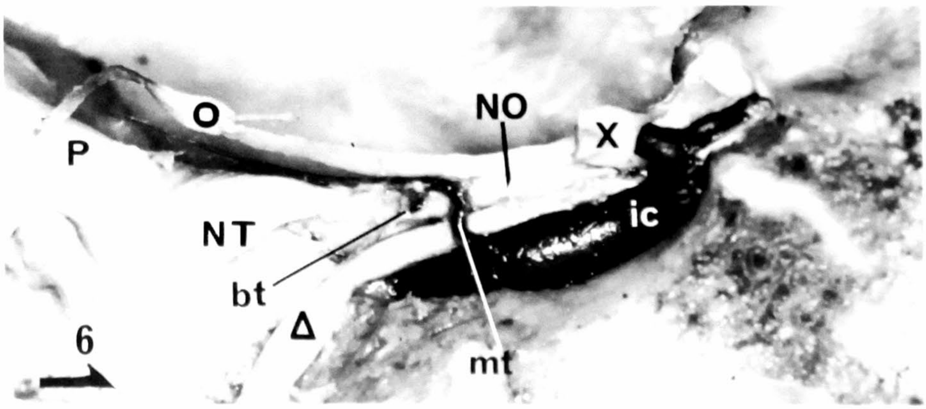

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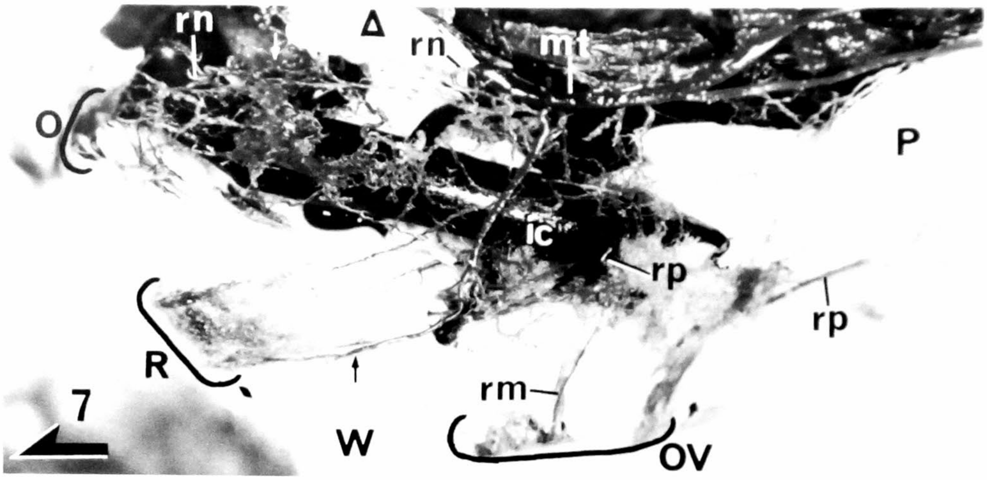
Plate III

Fig. 7. Lateral view of the trigeminal ganglion of the left side. X3.0.
The marginal tentorial branch arises lateral to the dorsum sellae (△) and runs posterolaterally. The ganglionic branch (↑) of it penetrates the ganglion and extends up to the foramen rotundum. The trigeminal nerve branches arise from the marginal tentorial branch and the internal carotid, anastomosing (↓) with each other.

Fig. 8. Medial view of the trigeminal ganglion of the right side. X4.5.
The marginal tentorial and the basal tentorial, and the trigeminal nerve and the clival (↑) branches arise via a common trunk.

Fig. 9. Superior view of the trigeminal ganglion of the right side. X4.0.
The whole course of the anterior petrosal branch is shown up to the major petrosal nerve hiatus (↑). The ganglionic branches (→) are given off upwards in this course. The clival branch (←) and dorsum sellae (△).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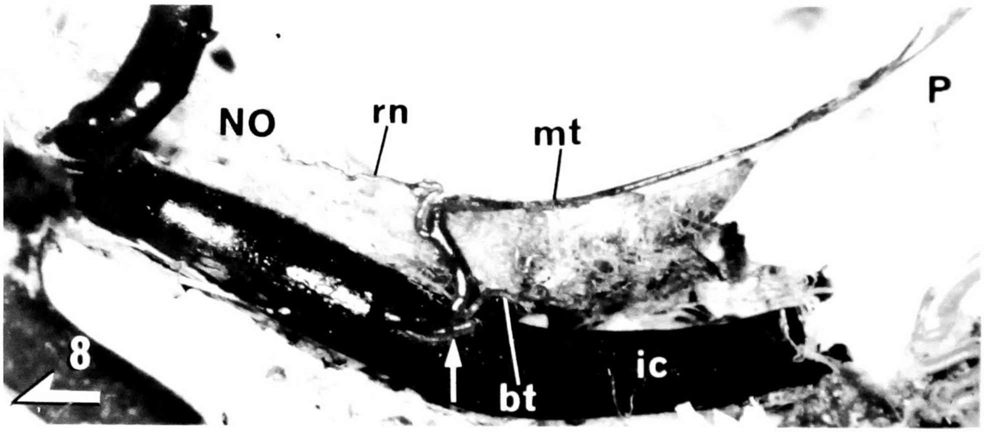
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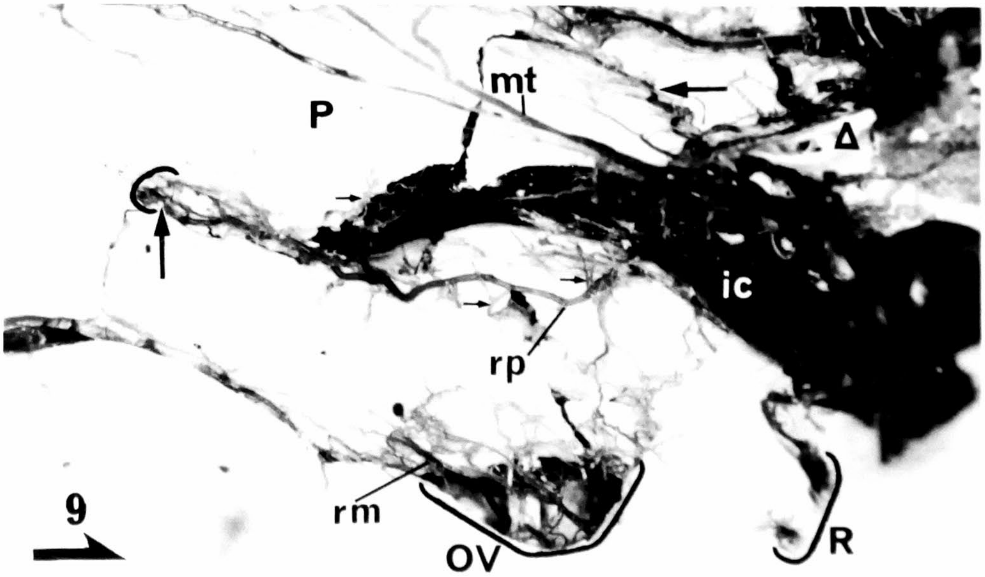
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Plate IV

Fig. 10. Lateral view of the trigeminal ganglion of the left side. X6.0.
The well-developed trigeminal nerve branch arises from the marginal tentorial branch. The ganglionic branch (←) of the pontine branch (△) bifurcates towards the ganglion. The accessory meningeal branch bifurcates and enters the cranial cavity (○) through the anterior and posterior margins of the oval foramen.

Fig. 11. Lateral view of the trigeminal ganglion of the left side. X4.0.
The greater wing of the sphenoid bone was removed to demonstrate the communications between the extracranial and intracranial vasculatures. A branch (←) of the maxillary artery (X) enters the cranial cavity with the maxillary nerve through the foramen rotundum. A branch (→) of the accessory meningeal branch enters the cranial cavity through the anterior margin of the oval foramen and supplies the ganglion. The trigeminal nerve branch (↑) of the internal carotid anastomoses with the ganglionic branch (↓) of the marginal tentorial branch. The ganglionic branch (○) of the pontine branch (△) enters the ganglion running along the trigeminal radix.

Plate IV

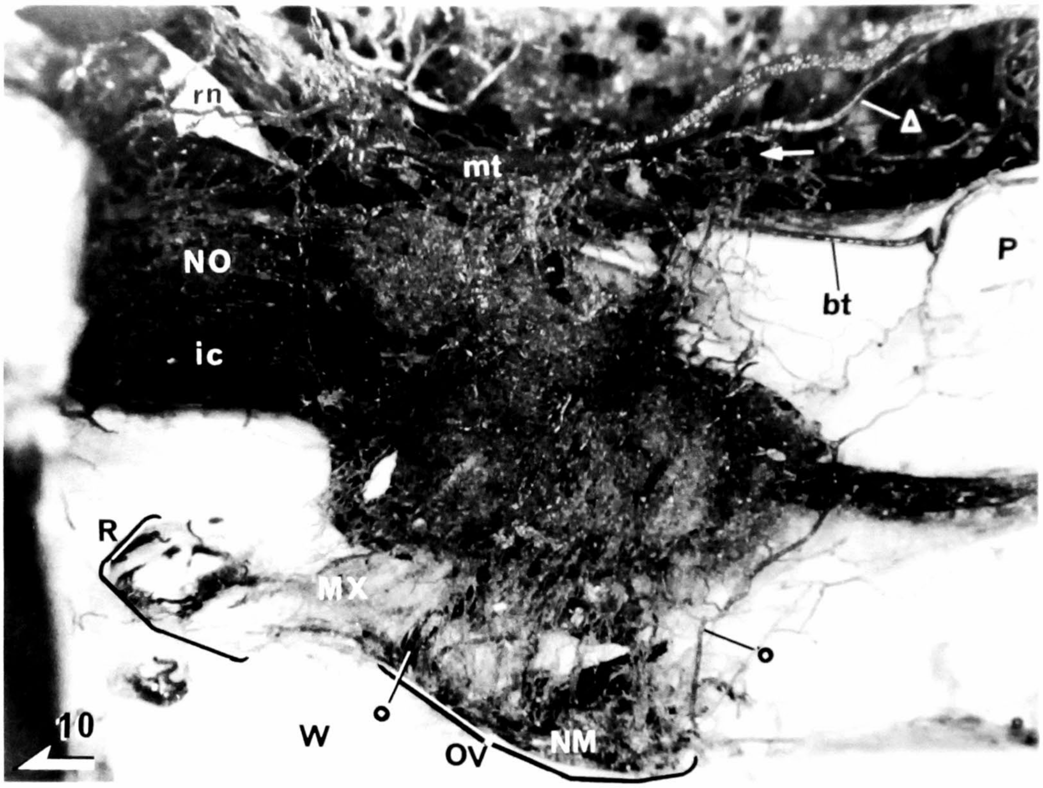

Plate V

Fig. 12. Lateral view of the trigeminal ganglion of the right side. X4.5.
The ganglionic branch of the accessory meningeal branch divides into two (○), of which one branch (↓) passes along the maxillary nerve towards the foramen rotundum. The ganglionic branch (←) of the marginal tentorial branch anastomoses with that (↑) of the pontine branch, and an arterial network (→) is formed at the concave side of the ganglion.

Fig. 13. Lateral view of the trigeminal ganglion of the left side. X6.0.
The anterior petrosal branch runs beneath the ganglion up to its lateral end, where it gives off the ganglionic branch (X). The ganglionic branch (↑) of the pontine branch (△) joins the arterial network at the concave side of the ganglion with the ganglionic branch (○) of the accessory meningeal branch.

Fig. 14. Lateral view of the ganglion of the left side. X6.0.
Fine networks were removed to show anastomoses within the ganglion. Anastomoses between a twig (↑) of the ganglionic branch of the accessory meningeal branch, a twig (→) of the ganglionic branch of the marginal tentorial, the ganglionic branch (←) of the basal tentorial branch and the ganglionic branch (↓) of the pontine branch, together form a network at the concave side of the ganglion.

Fig. 15. Horizontal section through the middle of the maxillary cell group. X87.
A twig (→) of a component vessel (○) of the arterial network in the trigeminal plexus spreads immediately into finer twigs (↓) which supply the cell masses.

Plate V