The choroid plexus of the fourth ventricle and its arteries

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[Received 14 March 2005; Revised 5 June 2005; Accepted 20 June 2005]

INTRODUCTION

The choroid plexus of the posterior fossa is composed of two inverted L-shaped fringes that arise on the ventricular surface of the tela choroidea of the fourth ventricle and are located on each side of the midline [3, 7]. The paired sagittal (longitudinal) limbs bordering the median plane are referred to as the medial segments. The horizontal (transverse) limbs that originate from the rostral ends of the medial segments are the lateral segments. The entire structure presents the form of a letter T, the vertical limb of which, however, is double [3, 7] (Fig. 1).

The medial segments are located in the roof near the midline and the lateral segments extend through the lateral recesses and the foramina of Luschka into the cerebellopontine angles. Each medial segment...
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is subdivided into a rostral and a caudal part. The
rostral parts are widest at their junction with the
lateral segments, extend from the level of the nod-
ule anterior to the tonsils to the level of the foramen
of Magendie and are parallel to the rhomboid fossa.
The caudal parts are located between the tonsils and
climb on the vermis to the level of the pyramid border-
ing the foramen of Magendie. The rostral and caudal
ends of the medial segments are often fused [3, 7].

The choroid plexus is supplied by small branches
arising from AICA and PICA, and, rarely, SCA. The
arteries supplying the choroid plexus in the posteri-
or fossa are smaller than those supplying the chor-
oid plexus in the lateral or third ventricles [4, 3]. In
this study the arteries supplying each part of the
choroid plexus were counted with regard to their
origin. It is worth mentioning that very few authors
to date have focused on the number and origin of
the choroidal arteries in the manner presented here.

MATERIAL AND METHODS

The study was based on 15 human cerebella,
making a total of 30 cerebellar hemispheres or cere-
bellopontine angles. The specimens were collected
fresh during autopsies and injected with coloured
gelatine to facilitate observation and then fixed in
10% formaldehyde solution. The fixed specimens
were dissected and examined under a surgical mi-
croscope.

RESULTS

A count of the branches from the main trunks of
AICA, PICA and SCA revealed that the majority of
branches originated from PICA.

To facilitate the observations we divided the en-
tire choroids plexus into four segments instead of
the sagittal and horizontal parts of the lateral and
medial segments described, as mentioned earlier, by
previous authors. The four segments are as follows:
the lateral horizontal segment, the medial horizon-
tal segment, the rostral sagittal segment and the
caudal sagittal segment.

The blood supply to each of the segments was
described separately.

1. The lateral horizontal segment (LHS), which
protrudes through the foramen of Luschka, was prin-
cipally supplied by the AICA (Fig. 2A). However, PICA,
basilar artery and vertebral artery also give out
branches (Fig. 2B, Table 1).

2. The medial horizontal segment (MHS), located
within the fourth ventricle, was mostly supplied by the
PICA (Fig. 3). In a few cases it was supplied by a con-
tralateral PICA, AICA and hypoplastic PICA (Table 2).

3. The rostral sagittal segment (RSS), also locat-
ed within the fourth ventricle, was supplied in most
cases by PICA (Fig. 3), together with other branches
from AICA and a hypoplastic and contralateral PICA
(Table 3).

4. The caudal sagittal segment (CSS) was chiefly
supplied by PICA (Fig. 3, 4) and less frequently by AICA
and a hypoplastic and contralateral PICA (Table 4).
DISCUSSION

Our classification of the choroid plexus into four segments, two horizontal (lateral and medial) and two sagittal (rostral and caudal), corresponds in general to the lateral floccular, lateral peduncular, medial nodular and medial tonsillar segments distinguished by Fujii et al. [3] and reproduced in other publications after them. Our nomenclature is more practically oriented with regard to the known variability of the choroid plexus of the fourth ventricle and appears more logical and easy to comprehend.

Our findings on the blood supply of the different segments of the plexus are similar to the results presented by Fujii et al. in their paper [3]. We found...
that AICA most commonly supplied the lateral horizontal segment and PICA supplied most of the other segments. From a practical point of view, it is worth noticing that the contralateral AICA or PICA sometimes supplied segments of the choroid plexus. This finding was also confirmed in our study. In our material it was also noticed that the basilar artery in one case and the vertebral artery in two cases gave choroidal branches to the lateral horizontal segments.

Table 3. Rostral sagittal segment (RSS) within the fourth ventricle

<table>
<thead>
<tr>
<th>Artery of origin</th>
<th>Number of choroidal branches to the left RSS</th>
<th>Number of choroidal branches to the right RSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posterior inferior cerebellar artery</td>
<td>47 in 15 cases</td>
<td>80 in 15 cases</td>
</tr>
<tr>
<td>Hypoplastic posterior inferior cerebellar artery</td>
<td>11 in 2 cases</td>
<td>–</td>
</tr>
<tr>
<td>Contralateral posterior inferior cerebellar artery</td>
<td>5 in 1 case</td>
<td>–</td>
</tr>
<tr>
<td>Anterior inferior cerebellar artery</td>
<td>3 in 1 case</td>
<td>–</td>
</tr>
<tr>
<td>Contralateral anterior inferior cerebellar artery</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

Table 4. Caudal sagittal segment (CSS) within the foramen of Megendie

<table>
<thead>
<tr>
<th>Artery of origin</th>
<th>Number of choroidal branches to the left CSS</th>
<th>Number of choroidal branches to the right CSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posterior inferior cerebellar artery</td>
<td>66 in 15 cases</td>
<td>60 in 15 cases</td>
</tr>
<tr>
<td>Hypoplastic posterior inferior cerebellar artery</td>
<td>3 in 1 case</td>
<td>–</td>
</tr>
<tr>
<td>Contralateral posterior inferior cerebellar artery</td>
<td>4 in 2 cases</td>
<td>–</td>
</tr>
<tr>
<td>Anterior inferior cerebellar artery</td>
<td>1 in 1 case</td>
<td>–</td>
</tr>
<tr>
<td>Contralateral anterior inferior cerebellar artery</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

The choroidal arteries may supply tumours, arteriovenous malformations and aneurysms arising in and adjacent to the choroid plexus and ventricles [1–3, 9, 10]. Fortunately, the choroidal branches and the arteries from which they arise course around, rather than through, vital neural structures such as the medulla and pons and may be exposed by operative approaches that are compatible with good surgical results [3]. The choroidal vessels enter the plexus from outside, in other words from the cerebelomedullary fissure or through the foramina of the ventricle, which may sometimes be serviceable topographical landmarks during tumour resection. The operative approaches to lesions in the choroid plexus should be so designed that both ends of the pathological segment and its attachment to the tela choroidea are isolated, as the blood supply is from both ends of the plexal segment [3]. The choroidal arteries are also angiographical landmarks for the recognition and localisation of tumours in the posterior fossa. The choroidal branches of PICA serve as markers of the area of the fastigium of the fourth ventricle and are displaced by a tumour growing within the fourth ventricle [3, 6, 11].

The choroidal arteries frequently enlarge as tumours near the fourth ventricle derive their blood supply from them. The enlargement of the choroidal arteries is greatest with meningiomas, papillomas of the choroid plexus and intraventricular ependymomas [2–4]. Arteriovenous malformations and aneurysms of the choroidal arteries in the posterior fossa are uncommon and, when present, more commonly involve the proximal trunks of PICA, AICA, and SCA [3, 5, 8].
REFERENCES