

The Early Filling of a Vein in the Carotid Angiogram

G.B. Bradac, R.S. Simon, and W. Fiegler

Neuroradiological Section of the Department of Radiology of the Klinikum Steglitz, Free University of Berlin,
F.R. Germany

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Summary. The authors studied the sign of early filling of veins in the carotid angiogram. This angiographic sign is always pathological but not pathognomonic of a special lesion, because it is present in different lesions.

Résumé. Les auteurs ont étudié le signe angiographique de l'injection précoce des veines. Il s'agit là d'un signe angiographique toujours pathologique, mais qui n'est pas

spécifique car on peut le trouver dans des lésions différentes.

Die frühe Venenfüllung im Carotis-Angiogramm

Zusammenfassung. Anhand zerebraler Angiogramme wurde das Zeichen der frühen Füllung einer Vene studiert. Es handelt sich um ein pathologisches aber nicht pathognomisches Zeichen, da es bei Läsionen unterschiedlicher Art auftritt.

In the literature [1—10] the term "early filling of a vein" is often used in connection with differing pathology. To our knowledge there is no uniform precise definition of this term. We restudied this problem reviewing our angiographic material.

In his study of the cerebral circulation, Greitz [7] demonstrated that the parietal veins fill about 4 sec after the start of the intracerebral circulation; he measured the time between the filling of the carotid siphon and the parietal veins. He also demonstrated that there is a characteristic sequence of filling of the different veins.

In accordance with Greitz, we defined the beginning of the intracerebral circulation with the filling of the carotid siphon, but in addition we required the filling of the ophthalmic artery. In the material reviewed, about 300 normal angiograms performed under general anaesthesia, the appearance of the first vein, generally the frontal vein, occurred between 3 and 7 sec after the beginning of the intracerebral circulation. As an explanation of this variation there are several facts to be taken into consideration: the use of different techniques (direct puncture or catheter technique), individually different injection speed, different cardiac phase at the moment of the injection, different diameter of the intracranial vessels anatomically as well as dependent on different CO₂ tension and, finally, a different local reaction of the vessel to the contrast medium. Concerning the sequence of vein filling we were able to confirm the findings of Greitz. In normal cases the frontal veins fill first of all, isolated or simultaneously with deep veins (thalamostriate veins, internal cerebral vein, basilar vein) and superficial veins (parietal veins, sylvian veins). In some cases the deep veins or

the sylvian veins may fill earlier than the frontal veins, but the parietal veins never fill earlier than the frontal veins. In the late venous phase the occipital veins and, of the deep veins, the septal veins are filled.

In order to define the term "early filling of a vein" we stated, that the following signs are pathological:

1. The filling of a vein within the first 3 sec after the beginning of the intracerebral circulation.
2. An abnormal sequence of vein filling after a normal interval to the start of the intracerebral circulation.

Some examples of differing pathology will illustrate our observations. In the study of tumor circulation, tumors with pathological vessels and fistulae with consequent early filling of a vein, were not regarded; on the contrary we turned attention to cases in which no conspicuous pathological signs were present. In these cases the early filling of a vein was the main pathological finding; the veins were anatomically normal and also visible in the later venous phase. We could differentiate two types of early filled veins. First, the vein may be located within the tumor tissue, as in cases of infiltrating glioma (Figs. 1, 2), or the vein may be located in the region surrounding the tumor as in cases of infiltrating glioma (Fig. 3) or meningioma (Fig. 4).

In cases of ischaemic disease we may also find an early filled vein, which may be located in the ischaemic area or in the surrounding tissue. This will be illustrated by two examples. The angiogram (Fig. 5) of a patient with transient stroke and no neurological signs at the time of the examination shows a typical blush and an early filled vein in the parietal region. The angiogram of another patient (Fig. 6) with completed stroke shows an insult in the parietooccipital region

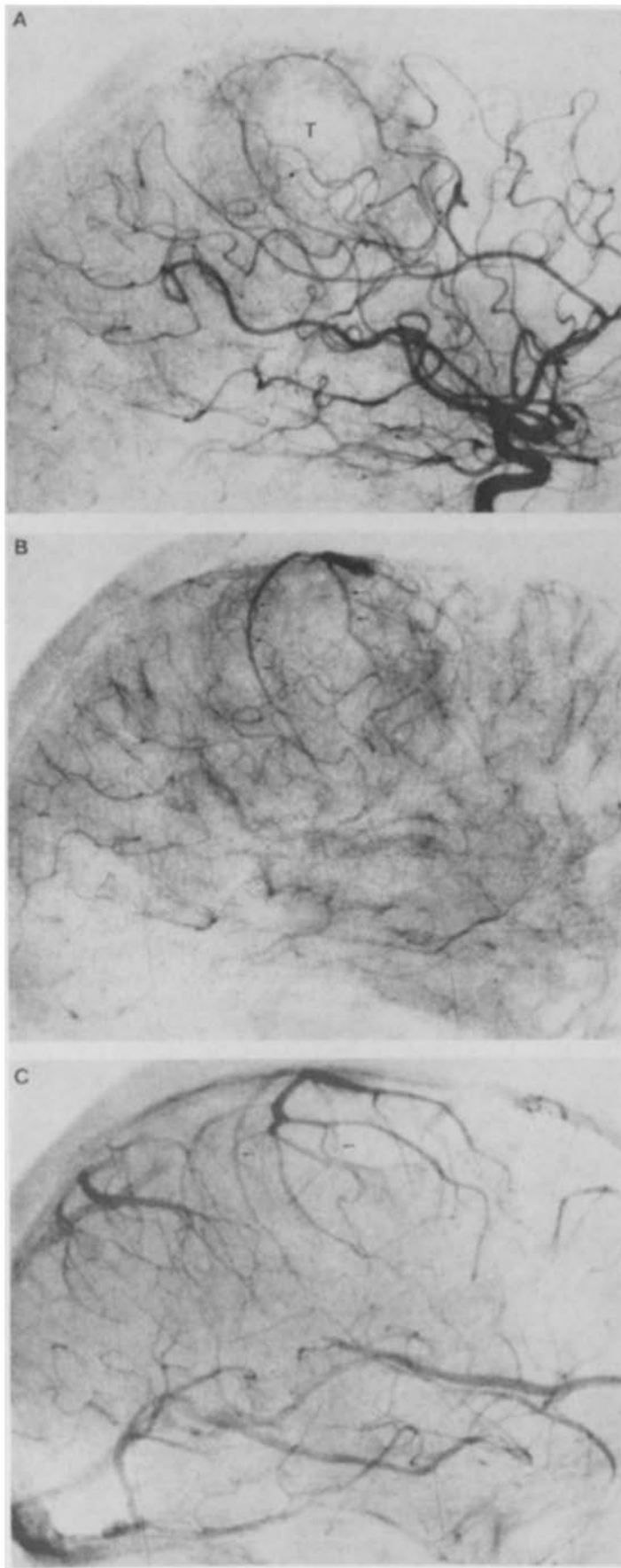


Fig. 1. Glioma of the parietal region. a) Arterial phase: tumor (T), b) Later arterial phase: early filling of veins (→), c) Venous phase: the veins described above (→) disappear slowly

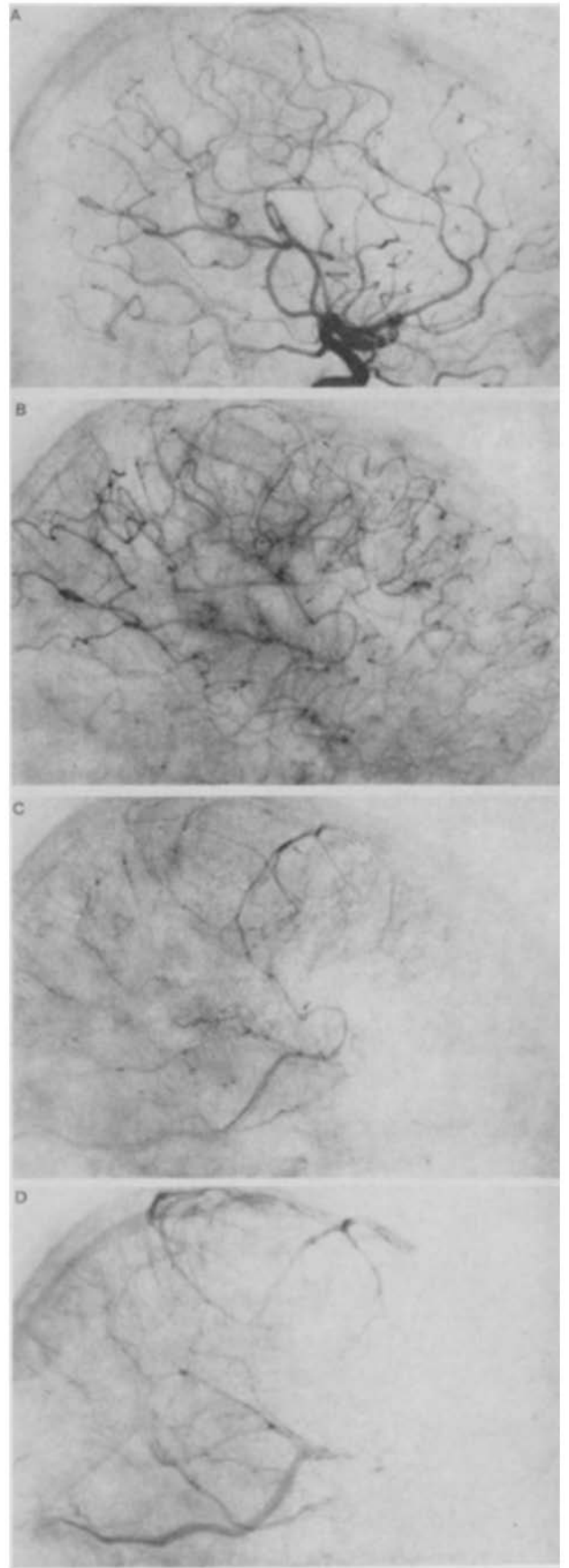


Fig. 2. Glioma of the parietal region. a) Arterial phase: normal, b) Later arterial phase: early filling of veins (→), c) Early venous phase: the veins described above (→), are now more visible, d) Later venous phase: normal

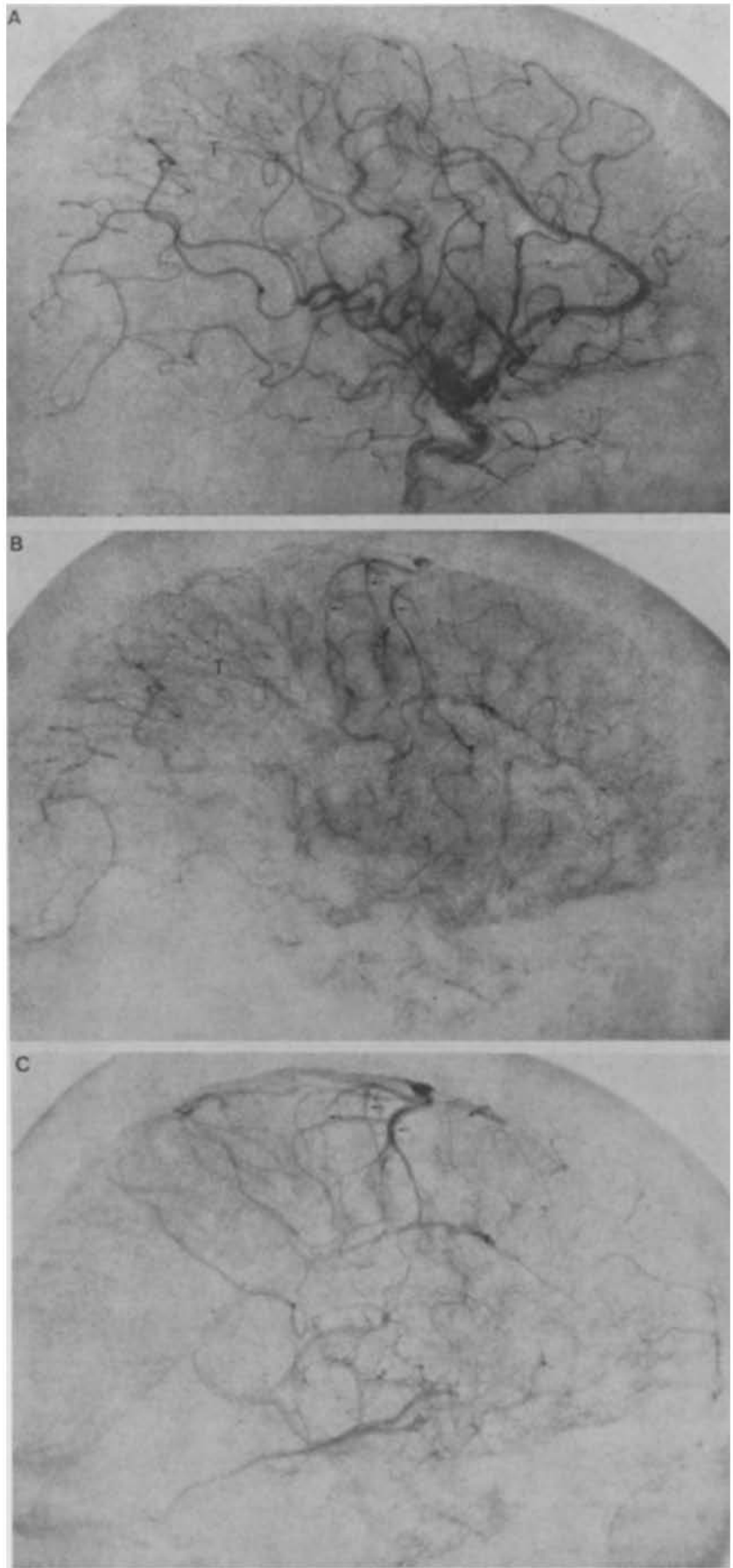


Fig. 3. Glioma of the posterior parietal region. a) Arterial phase: tumor (T), b) Later arterial phase: tumor (T). Early filling of veins (→) in the surrounding region, c) Early venous phase: the veins described above (→) are now more visible

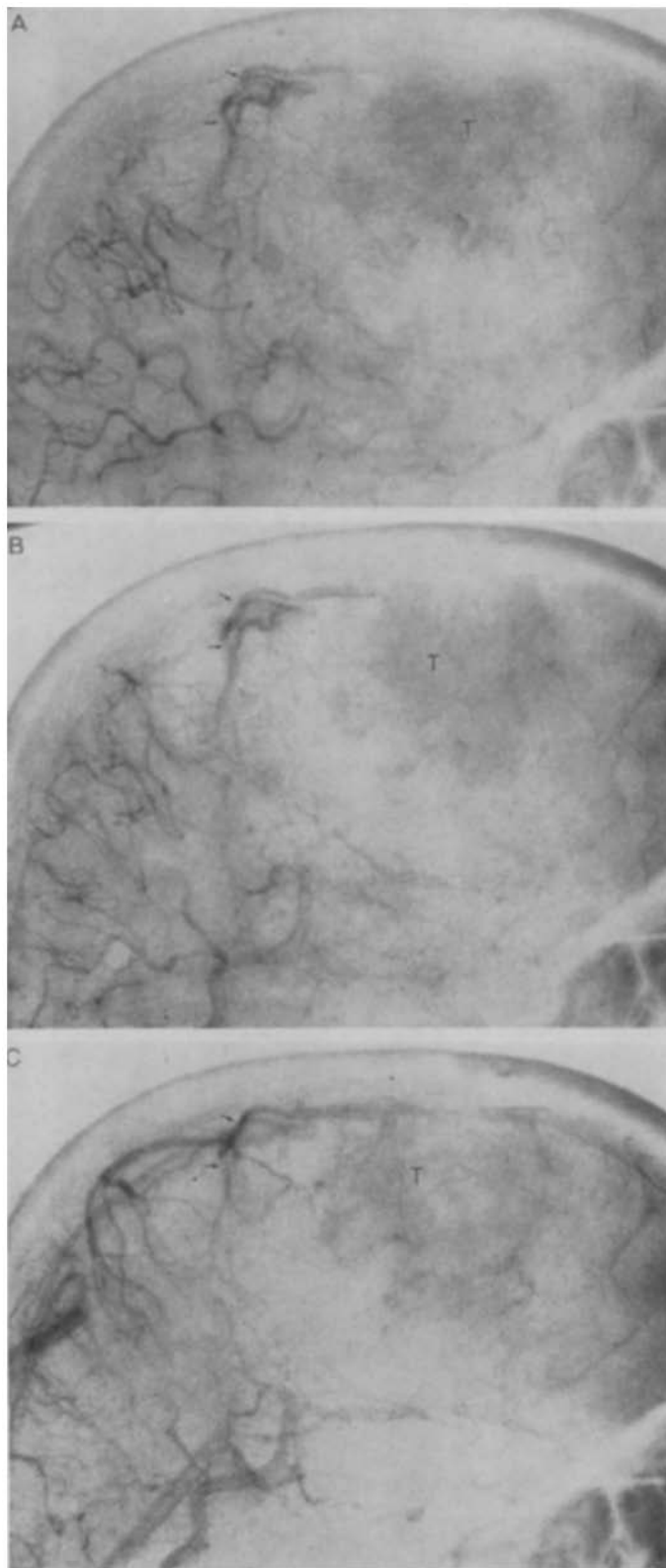


Fig. 4. Meningioma of the parietal region. a, b) Later arterial phase: early filling of parietal veins (→) in the area surrounding the tumor (T), c) Venous phase: the veins described above are now more visible (→)

Fig. 5. Case of apoplectic insult. a) Arterial phase: blush in the parietal region (►), b) Later arterial phase: early filling of veins (→), c) Arterial — capillary phase: the parietal veins (→), described above are more visible, d) Venous phase: normal (→)

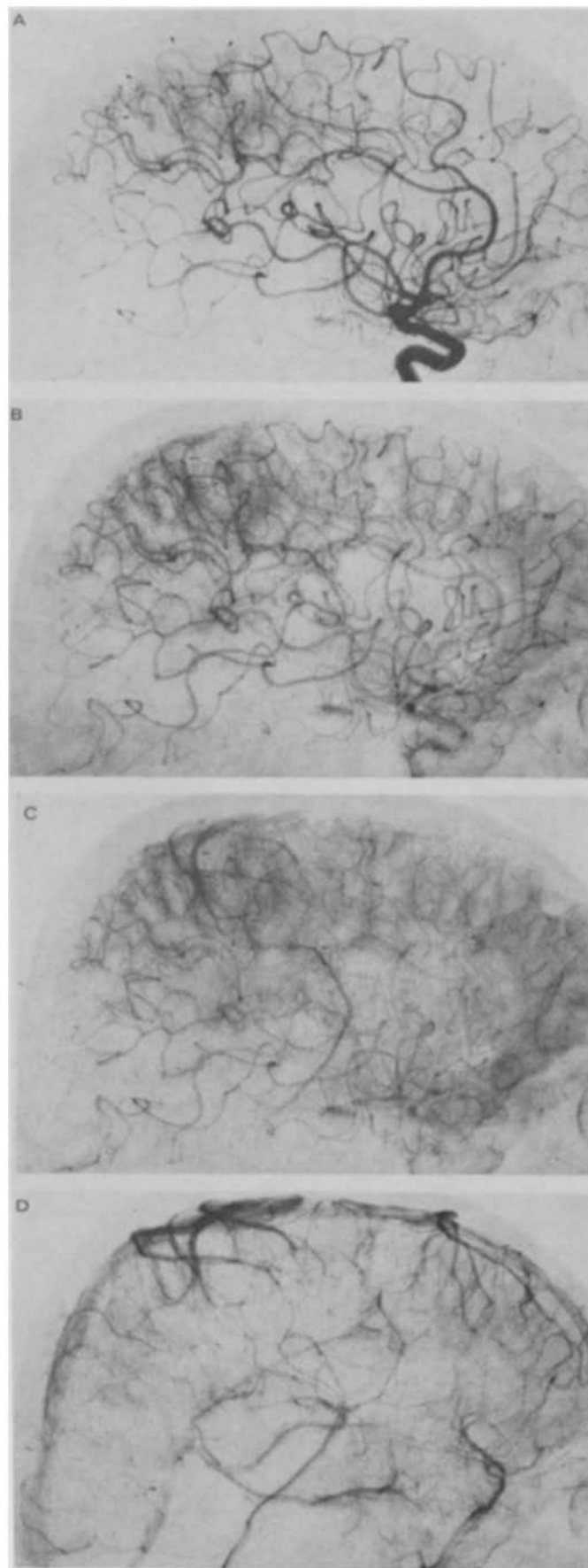


Fig. 5a—d

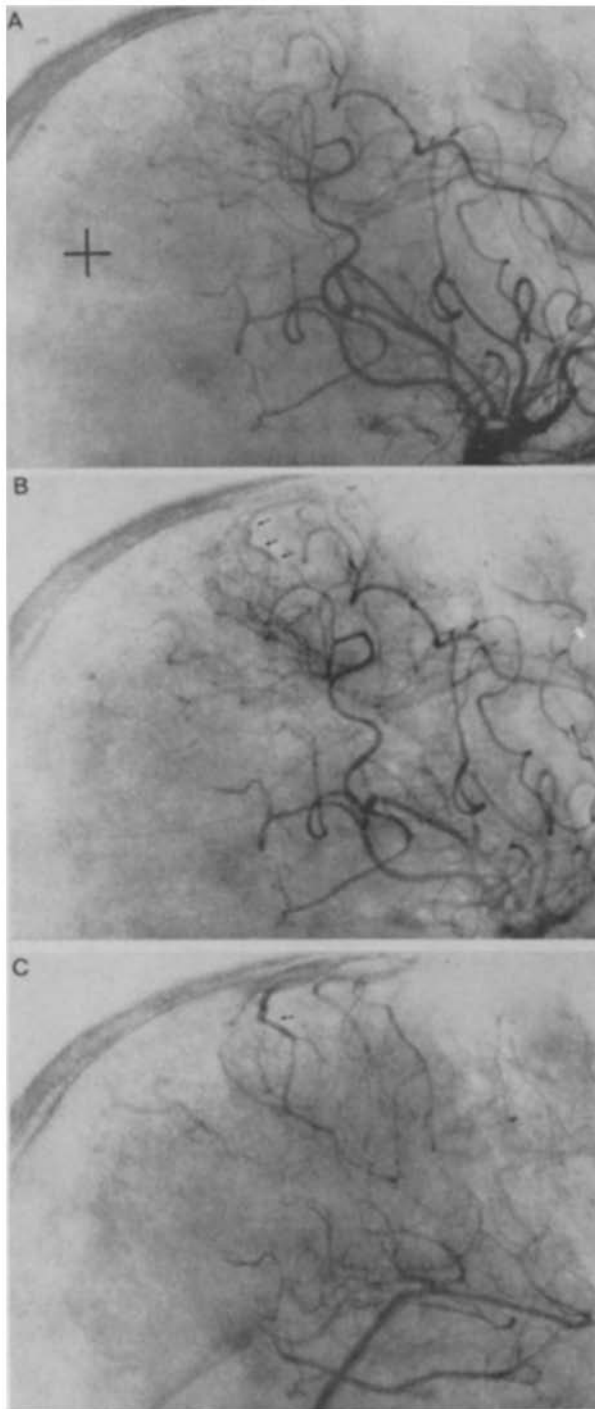


Fig. 6. Case of apoplectic insult. a) Arterial phase: infarction in the parietooccipital region (+), probably due to multiple occlusions of branches of the middle cerebral artery, b) Later arterial phase: early filling of veins in the adjacent parietal region (→), c) Venous phase: the veins described above are now more visible (→)

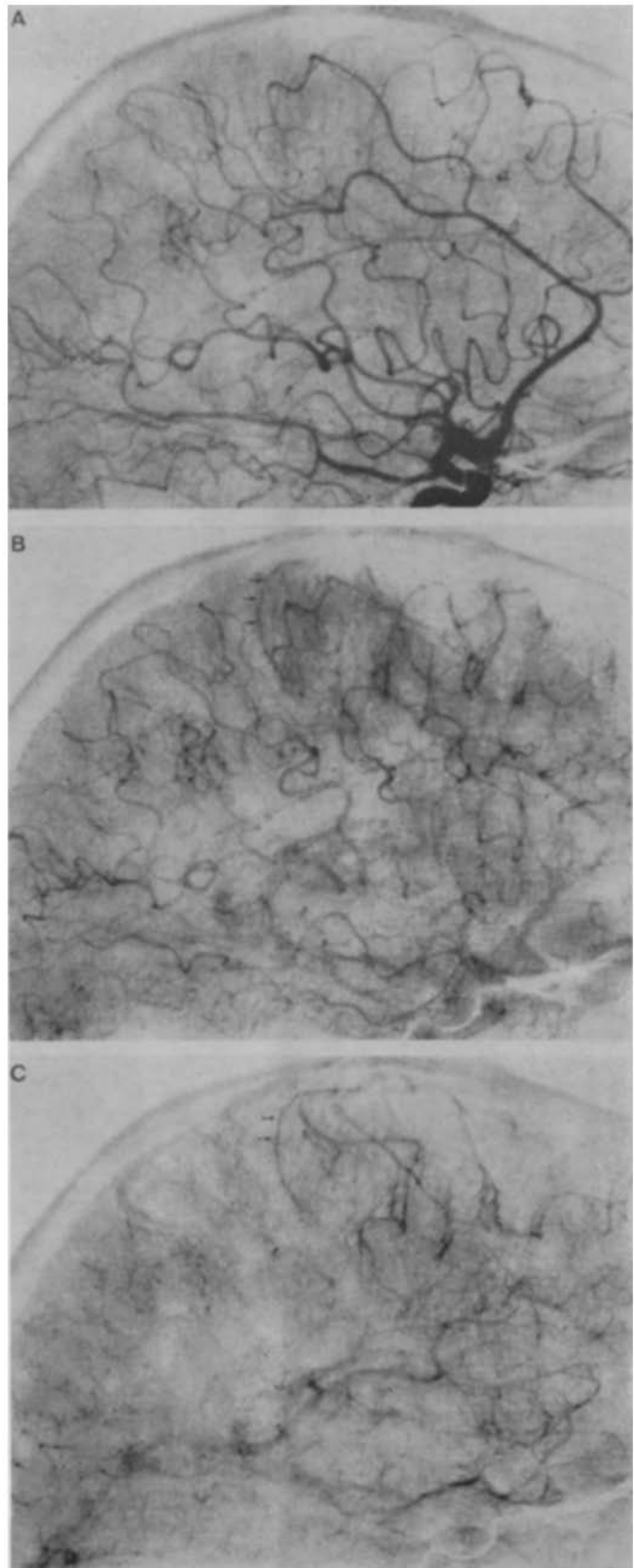


Fig. 7 a—c

Fig. 7. Toxic encephalopathy. a) Arterial phase: normal, b) Later arterial phase: early filling of parietal veins (→), c) Venous phase: the veins described above are now more visible (→)

and an early filled vein in the adjacent parietal region. The patient improved slowly and finally the neurological findings cleared. In ischaemic lesions of the middle cerebral artery we often noticed an early filling of the deep veins; although this sign may also occur in normal cases, it is more often recognizable in patients with ischaemic lesions.

Early filling of a vein also may occur in other lesions as in cases of trauma, subarachnoid bleeding with spasm, or after inflammatory or toxic processes. As an example we demonstrate a case of toxic encephalopathy following eclampsia (Fig. 7) in a young patient with right hemiparesis. The angiogram reveals an early filled vein in the parietal region as the solitary angio-

firmed that early filling of a vein is present in different pathology. Generally we have to say that early filling of a vein is due to an increased CO_2 tension in a circumscribed area. It is uncertain if this explanation is also valid in cases of infiltrating glioma, or if in these cases the early filling of a vein is caused by a fistula of microscopic dimension. The early filled vein in the area surrounding the tumor is probably caused by compression of tissue with consequent ischaemia. In different pathology the early filled vein is anatomically a normal vein which will also be filled in the regular venous phase.

It has to be emphasized that the early filling of a vein is a pathological but not a pathognomonic sign

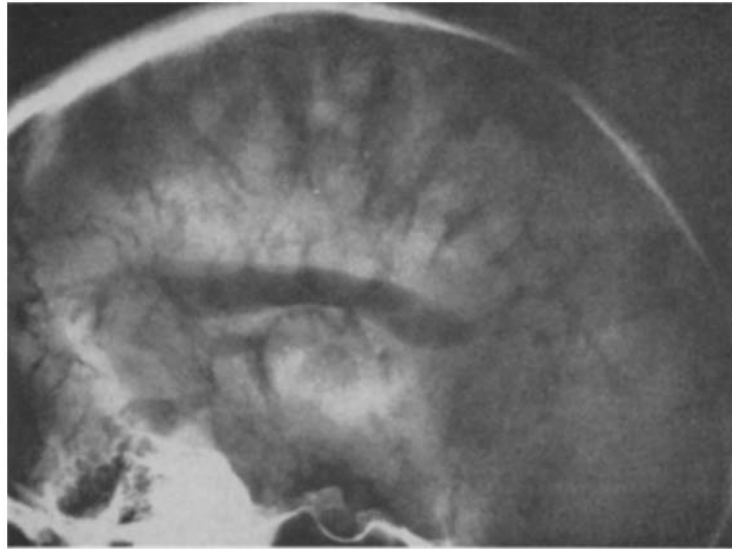


Fig. 8. Toxic encephalopathy (same case as Fig. 7) Pneumoencephalogram: cortical atrophy in the parietal region

graphic finding. The pneumoencephalogram performed 7 months later showed cortical atrophy of the parietal region (Fig. 8).

Discussion

In order to define the term "early filling of a vein" the moment of the filling of the first vein, as well as the sequence of filling of the different veins, were studied in 300 angiograms. The moment of the filling of the first vein is variable depending on the reasons mentioned above. Concerning the sequence of filling of the different veins we were able to confirm the findings of Greitz [7] and Cronquist and Laroche [2, 3]. We stated that a vein filling within the first 3 sec after the start of the intracerebral circulation, or an abnormal sequence of vein filling, is pathological.

In the study of pathological angiograms only cases without angiographically verified fistula were considered. In accordance with other authors we con-

firm that early filling of a vein is present in different pathology. In cases of solitary early filling of a vein without other pathological angiographic signs the diagnosis may be difficult. A careful clinical observation and a neuroradiological control examination are indicated.

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Prof. Dr. G.B. Bradac
Klinikum Steglitz der FU Berlin
Neuroradiologie
Hindenburgdamm 30
D-1000 Berlin 45
F.R. Germany