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Letter to the Editor

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Cortical Blindness: A Rare but Dramatic Complication following Coronary Angiography

B. Gellen T. Remp T. Mayer P. Milz W.-M. Franz

Department of Cardiology, Klinikum Grosshadern, Ludwig Maximilians University Munich, Germany

Dear Sir,

Transient cortical blindness (CB) is a rare but dramatic dye-induced complication associated with coronary angiography (only 11 cases are known). It is characterized by complete loss of visual perception with preservation of ocular motility, papillary responses and normal fundoscopic examination. CB is selective functional impairment of the occipital visual cortex. Symptoms of dye-induced CB result from extravasation of the contrast medium into the posterior circulation of the brain.

We report on a 52-year-old hypertensive patient with end-stage renal failure and a LIMA bypass graft developing blindness immediately following diagnostic coronary angiography. 400 ml of the contrast agent iopamidol were applied. Immediately following angiography, the patient complained of visual impairment which progressed to complete blindness within 30 min. Neurologic examinations including fundoscopy and pupillary responses were normal. A CT of the brain performed 3 h after angiography revealed extensive contrast extravasation into the posterior circulation (fig. 1A, B). The following day, the patient's vision improved gradually. A second CT scan 30 h after angiography showed only residual enhancement (fig. 1E, F). Three days after catheterization, the patient's vision returned to normal.

Currently used non-ionic contrast media have an osmolality which is about twice that of plasma. The intravascular injection of hyperosmolar contrast agents causes a transient increase in blood osmolality, leading to a temporary breakdown of the blood-brain barrier in some patients. Subsequent injections may result in extravasation of the dye into the subarachnoid space and brain tissue resulting in neurological deficits due to direct neurotoxic effects of the contrast medium. The exact mechanism of the neurotoxicity is still unclear. Factors that may contribute to the disruption of the blood-brain barrier are decreased clearance of the substance in patients with impaired renal function and pre-existing endothelial dysfunction in patients with cardiovascular risk factors.

CB after coronary angiography was reported following both high-osmolality ionic [1, 2] and modern low-osmolality non-ionic contrast agents [3–7]. The incidence and duration of blindness seem to be unrelated to the dose of contrast medium applied. The majority of the patients had previously been exposed to dye without developing any neurological symptoms. Four patients with a history of CB were re-exposed to contrast medium within a few months [4, 5]. They were pretreated with corticosteroids, and a relatively small amount of contrast agent was given (80–180 ml). In 3 cases [5], re-exposure did not lead to recurrence of CB. In contrast, 1 patient [4] developed CB again. Thus, patients with CB following previous contrast medium exposure may be at increased risk of developing CB at re-exposure. In the future, if re-exposure to a contrast medium in patients with previous CB is inevitable, pre-treatment with corticosteroids should be performed and the smallest possible amount of contrast medium should be given.

Five of the 12 cases observed to date (table 1) had a LIMA bypass graft. As the LIMA graft and the left vertebral artery arise in close proximity to the subclavian artery, it is possible that during repeated attempts at selective cannulation of the LIMA graft, a considerable amount of contrast medium passed into the left vertebral artery. If dye applied at the beginning of the procedure has already led to disruption of the blood-brain barrier, selective injection of the vertebral artery may result in extravasation of a large amount of contrast medium into the posterior circulation. Thus, in patients with a LIMA bypass graft, we suggest to perform injection of the LIMA graft at the beginning of the procedure and to avoid selective vertebral artery injection if possible.

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Priv.-Doz. Dr. Wolfgang-M. Franz, Department of Cardiology
Klinikum Grosshadern, Ludwig Maximilians University Munich
Marchioninistrasse 15, D–81377 Munich (Germany)
Tel. +49 89 7095 3094, Fax +49 89 7095 6094
E-Mail wfranz@helios.med.uni-muenchen.de

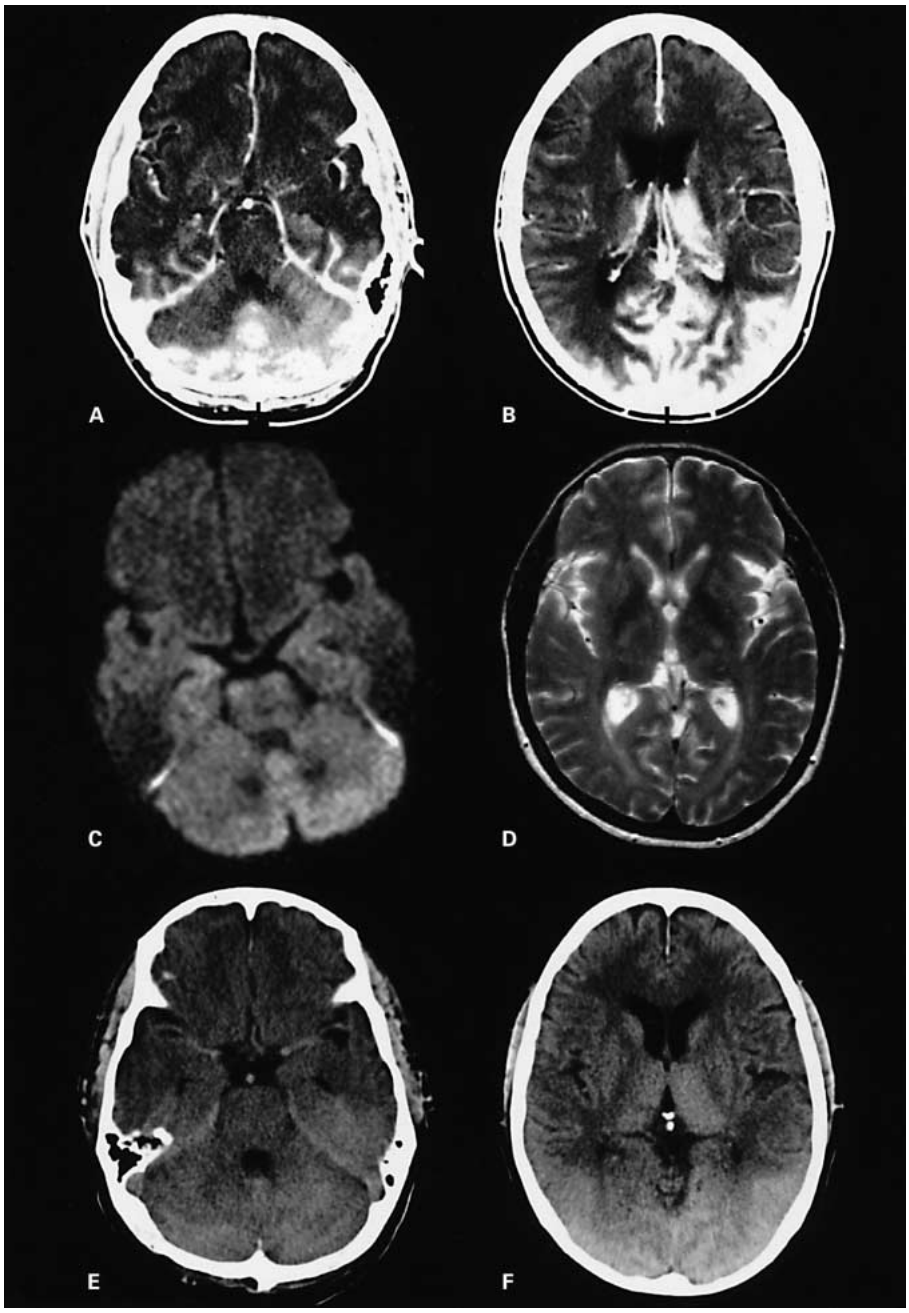

Fig. 1. A, B CT scan 4 h after catheterization: contrast extravasation into the subarachnoid space and enhancement of the cerebellum, the occipital cortex, the posterior part of the temporal gyri and the left thalamus. C, D MRI scan 5 h after catheterization: in the diffusion weighted images, slight signal increase in the cerebellar hemispheres. Normal signal in the T_2-weighted images. E, F CT scan 30 h after catheterization: still enhancement of both occipital and dorsal temporal lobes. Contrast medium remnant in the local sulci.

In future cases of visual impairment following heart catheterization, a CT of the brain without additional contrast medium should be performed immediately. If no signs of acute thromboembolism are present and subarachnoidal extravasation of the contrast medium could be documented, the diagnosis of dye-induced CB can be made. Thus the prognosis of CB is excellent, the most important step is to reassure the patient that symptoms will resolve completely within a few days. No therapy has been proven to be effective, therefore no additional steps should be taken.

In future studies on dye-induced CB, all pre-existing cardiovascular risk factors and the actual renal function of the patient should be assessed in order to better identify possible risk groups and to develop prophylactic and therapeutic strategies. The excellent prognosis of CB justifies re-exposure under the above-mentioned precautions.

Table 1. Summary of all known cases with CB following coronary angiography

	Sex	Age	Contrast medium	Osmolality mosm/kg	Volume injected cm^3	Duration of CB	Previous exposure	LIMA bypass graft	Impaired renal function	Arterial hyper-tension
1	W	52	Diatrizoate	2,100	NI	18 h	no	no	NI	yes
2	W	57	Ioxaglate	577	200	48 h	yes	yes	no	yes
3	M	55	Diatrizoate	2,100	228	24 h	yes	no	NI	yes
4	M	61	Diatrizoate	2,100	210	36 h	yes	yes	NI	yes
5	M	44	Diatrizoate	2,100	112	12 h	no	no	NI	yes
6	M	59	Ioversol	790	220	12 h	yes	no	NI	NI
7	M	45	Ioversol	790	167	24 h	yes	no	NI	NI
8	M	68	Ioversol	790	262	15 min	no	no	NI	NI
9	M	62	Iopamidol	774	270	72 h	yes	yes	NI	yes
10	M	55	Iomeprol	610	280	120 h	yes	yes	NI	no
11	M	53	Ioversol	790	100	12 h	no	no	NI	NI
12	M	52	Iopamidol	774	400	72 h	yes	yes	yes	yes

NI = Not indicated.

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