The Turkish Journal of Pediatrics 32: 217-224, 1990

CEREBELLAR INFARCTION: COMPUTED TOMOGRAPHY, MAGNETIC RESONANCE AND IMP – SINGLE PHOTON EMISSION TOMOGRAPHY FINDINGS*

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Summary: Caner B, Caner H, Toyoma T, Ishii Y. (Department of Nuclear Medicine, Hacettepe University Faculty of Medicine, Ankara, Turkey). Cerebellar infarction: computed tomography, magnetic resonance and imp-single proton emission tomography findings. Turk J Pediatr 32: 217-224, 1990

In this report, a rare case of a child with cerebellar infarction (CI) confirmed by vertebral angiography, magnetic resonance imaging (MRI), computed tomography (CT) and N-isopropyl-p^{123}-I-iodoamphetamine single photon emission tomography (IMP-SPECT) is presented. It was concluded that although all imaging modalities could demonstrate CI, MRI is superior to the other methods because of its fine display of anatomical detail, its lack of bony artifacts and its ability to show infarction in early stages. *Key words: cerebellar infarction, magnetic resonance, N-isopropyl-p-^{123}I-iodoamphetamine (IMP-SPECT), computed tomography (CT).*

Cerebellar infarction is often difficult to diagnose clinically. Moreover, isolated cerebellar infarction is rarely seen in children[1]. This report describes a child with cerebellar infarction proved angiographically. We correlated the findings obtained from computed tomography (CT), magnetic resonance imaging (MRI) and N-isopropyl-p-^{123}I-iodoamphetamine single photon emission tomography (IMP-SPECT).

Case Report

An eight-year-old boy suddenly developed dizziness, aggravated by movement, nausea, vomiting and difficulty in talking. He had unremarkable family and past histories. Because his symptoms persisted without any improvement, he was referred to the Fukui University Hospital. Examination revealed that the patient was uncomfortable from persistent dizziness. He had pallor but was alert and oriented. His speech was slightly slurred. The blood pressure was 110/68 mm Hg,

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and the pulse rate was 84 beats/min and regular. The visual fields were intact and the pupils were of the same size and reactive. The extraocular movements were normal. There was no pathological reflex. Cerebellar tests were slightly poor, mostly on the left side. Blood chemistry results including an analysis of serum immunoglobulin, ASO and CRP were all within the normal range.

The patient had a CT scan evaluation on the second day of admission, which revealed two focal low intensity lesions of the cerebellum without hydrocephalus (Fig 1). Magnetic resonance (MR) scanning was performed on the seventh day using a Yokogawa Medical 0.35T superconducting system. T1 and T2-weighted images were obtained with a spin-echo pulse sequence. T2-weighted images showed abnormally bright signal intensity involving the territories of the left posterior cerebellar arteries (PICA) and left and right superior cerebellar arteries

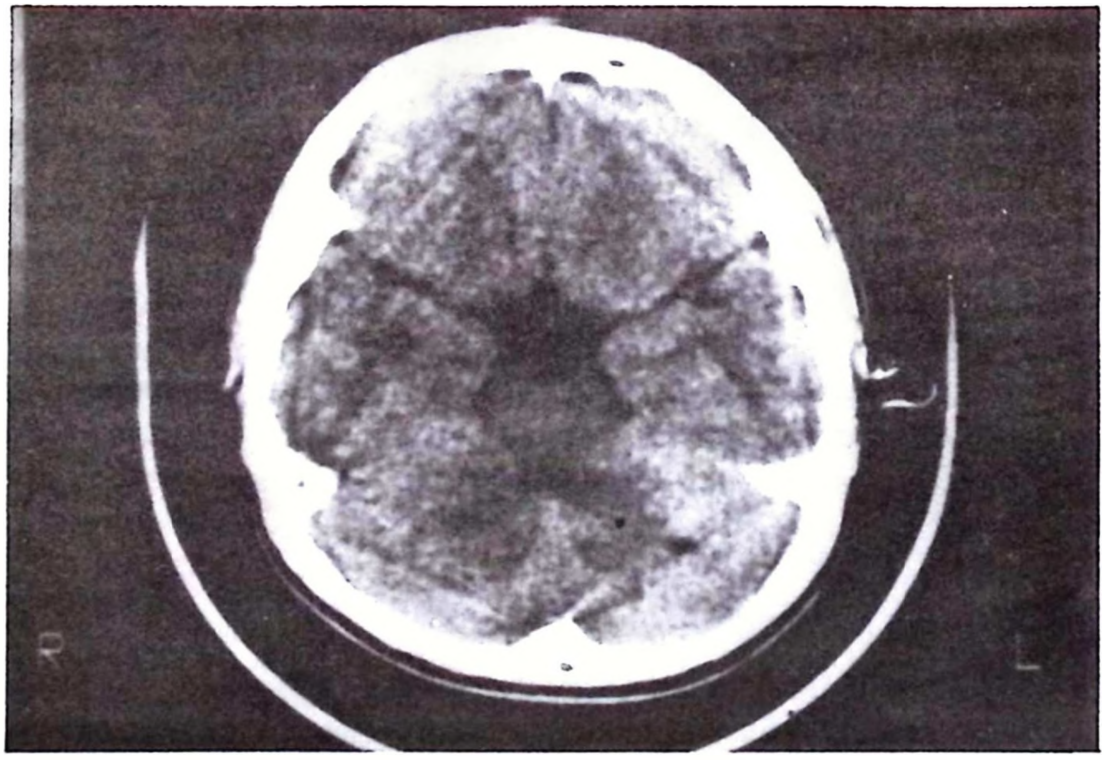
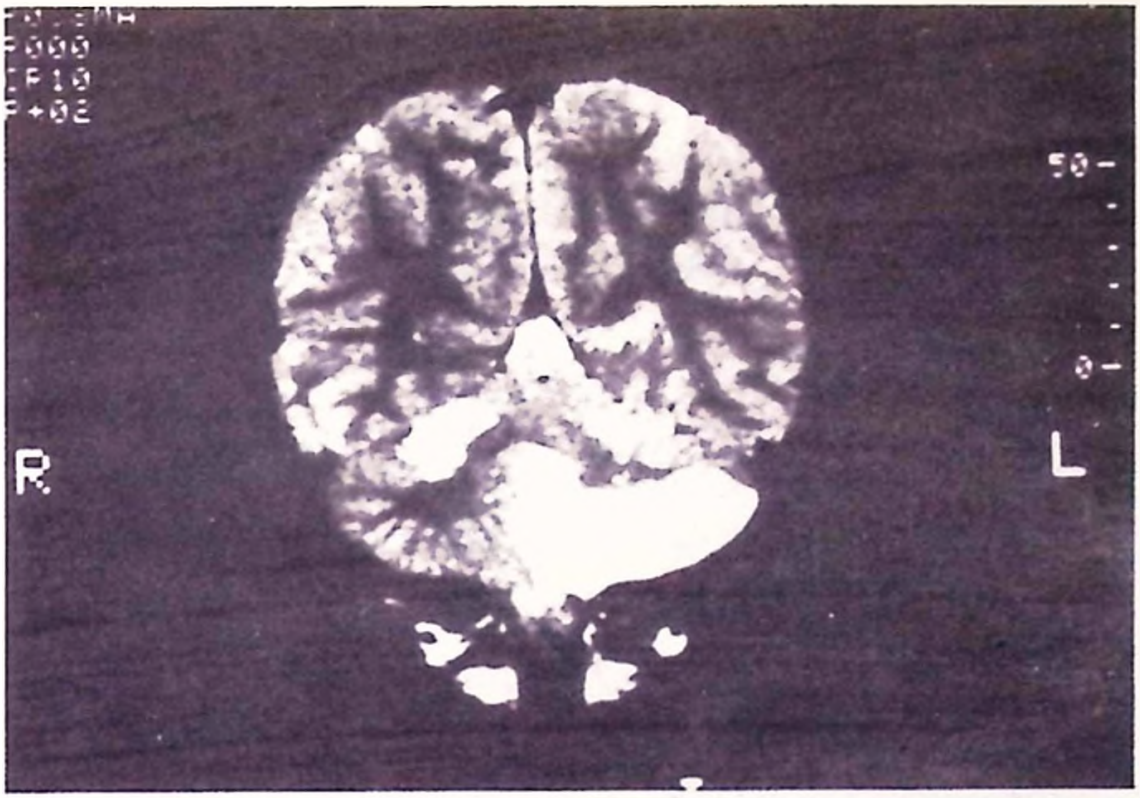


Fig. 1: CT demonstrates ill-defined areas of low density in both cerebellar hemispheres.

(SCA) (Fig 2a). Four days following the MR study, the patient underwent IMP-SPECT study. N-Isopropyl-p-^{123}I-iodoamphetamine (IMP) was obtained from Nihon-Medi Physics (Japan). 3 mCi IMP was injected i.v and SPECT images were obtained using a low energy parallel hole collimator (General Electric Model; 400AC Starcam, USA) at 30 min postinjection. A total 60 frames were recorded (30 sec/each). In this study, the left cerebellum could not be visualized, and



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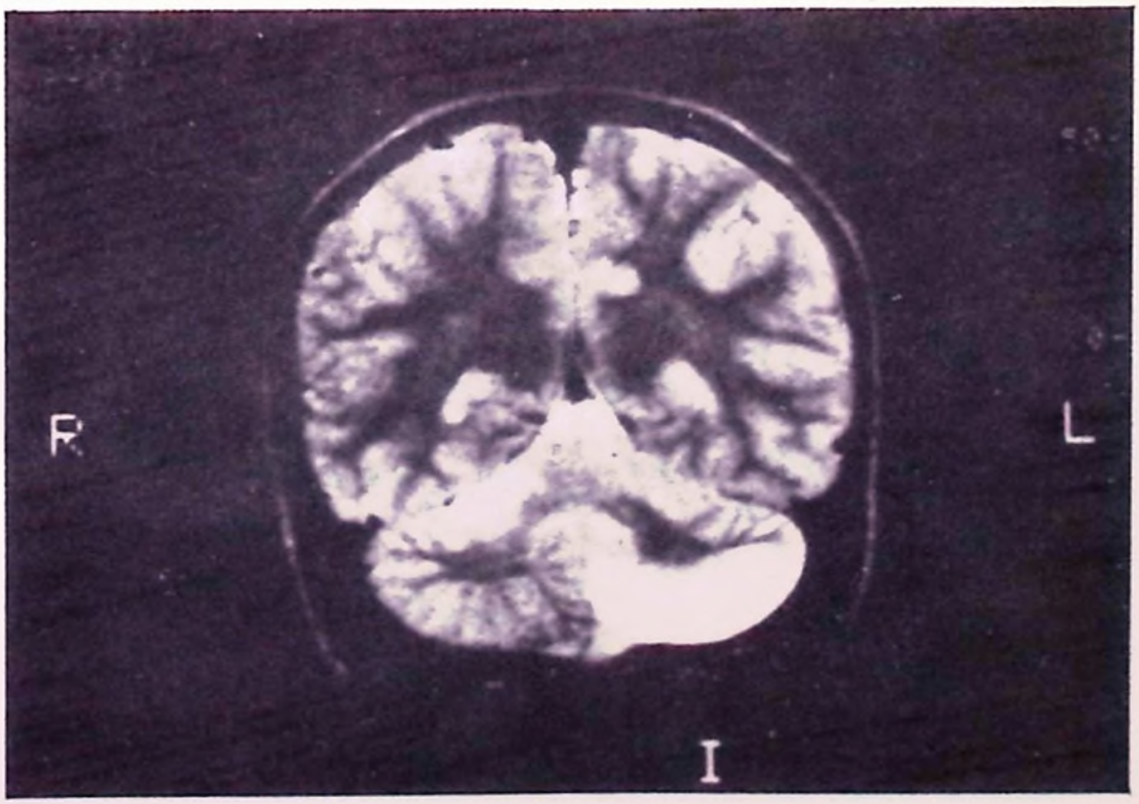

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Fig. 2(a): T2-weighted coronal MR image showing high intensity areas involving the territory of left PICA, right SCA and left SCA. (b): Follow-up study revealed that high intensity areas were smaller compared to the previous study.

decreased activity of the right cerebellum was noticed (Fig 3a). Vertebral angiography performed on the eleventh day revealed that the left SCA and posterior cerebral artery were spastic and that the left PICA and right SCA were

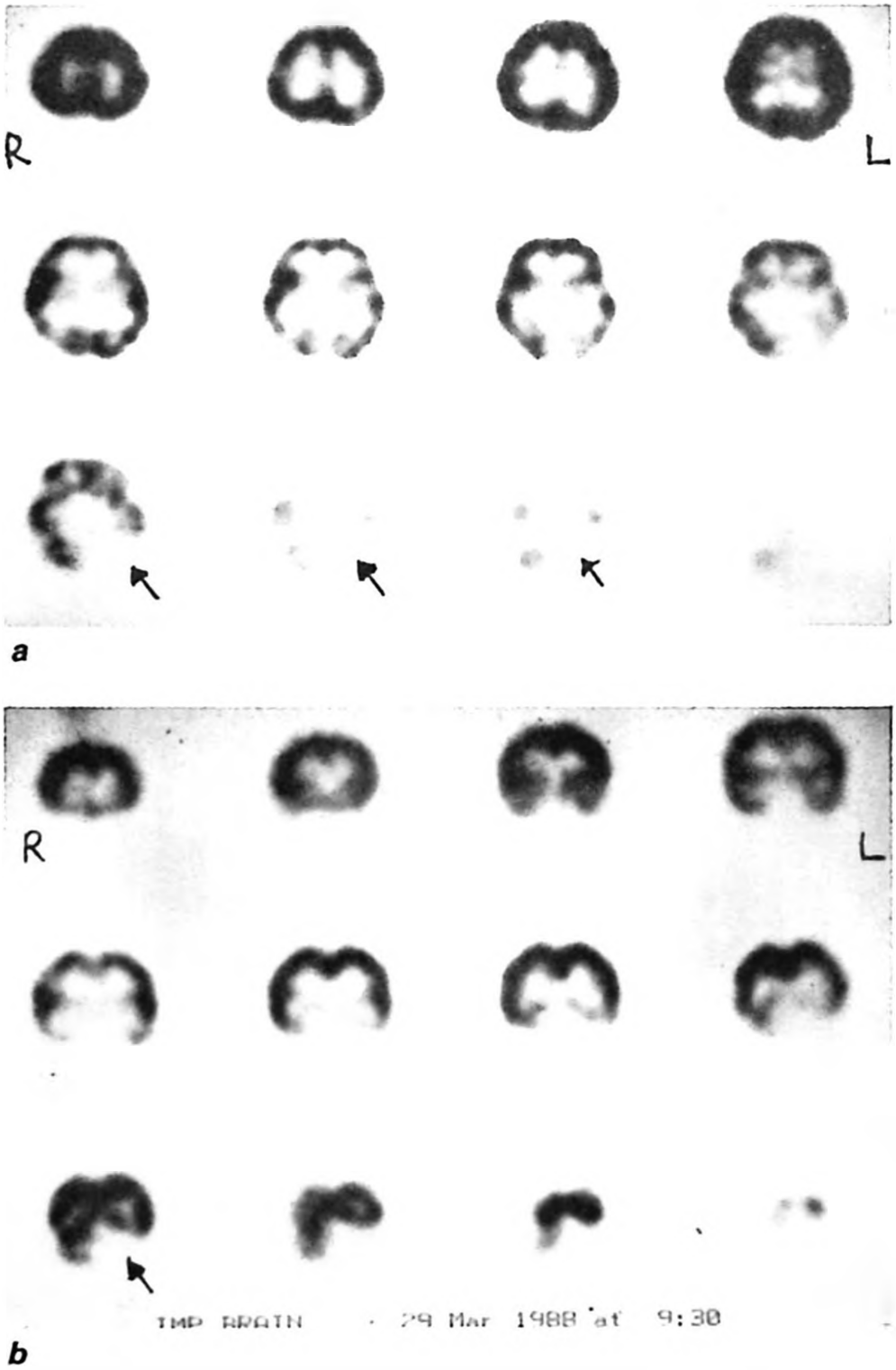
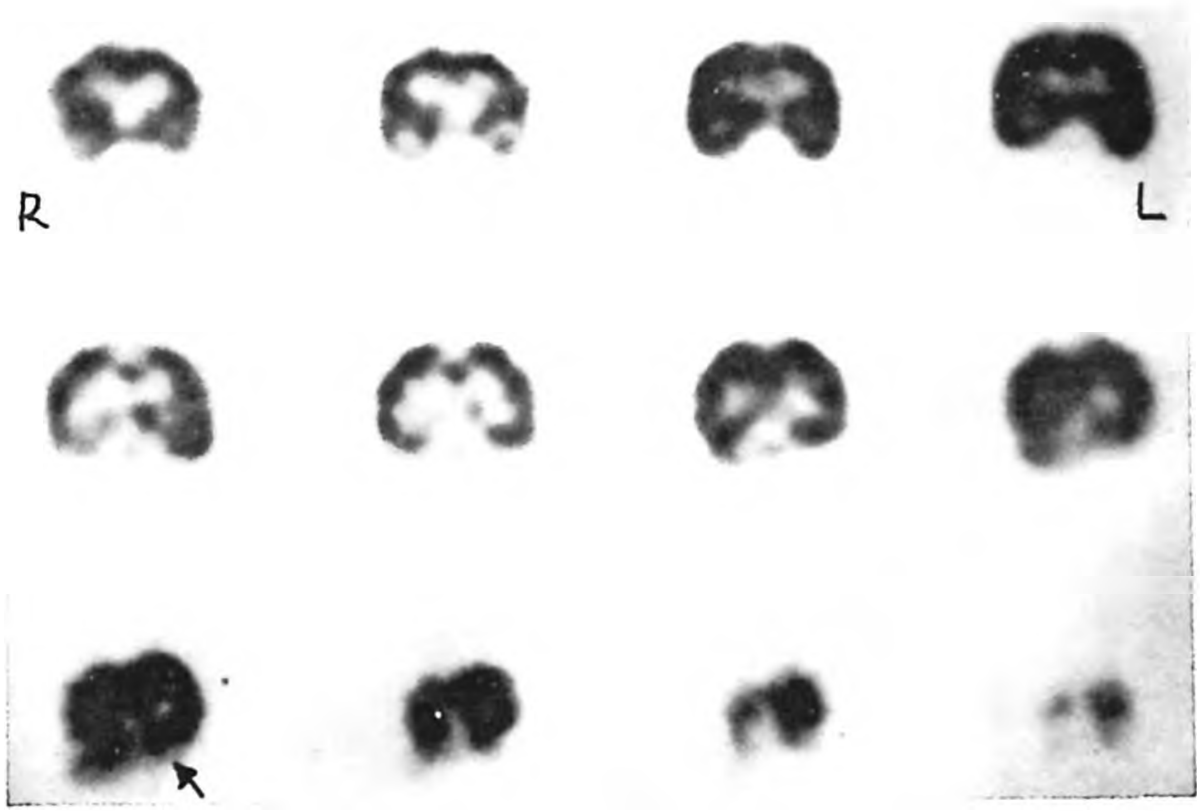


Fig. 3(a): Transaxial and coronal IMP-SPECT images. Note nonvisualization of the left cerebellum and faint visualization of the right cerebellum (arrows). (b): Follow-up study. The left cerebellar hemisphere is faintly visible (arrows).



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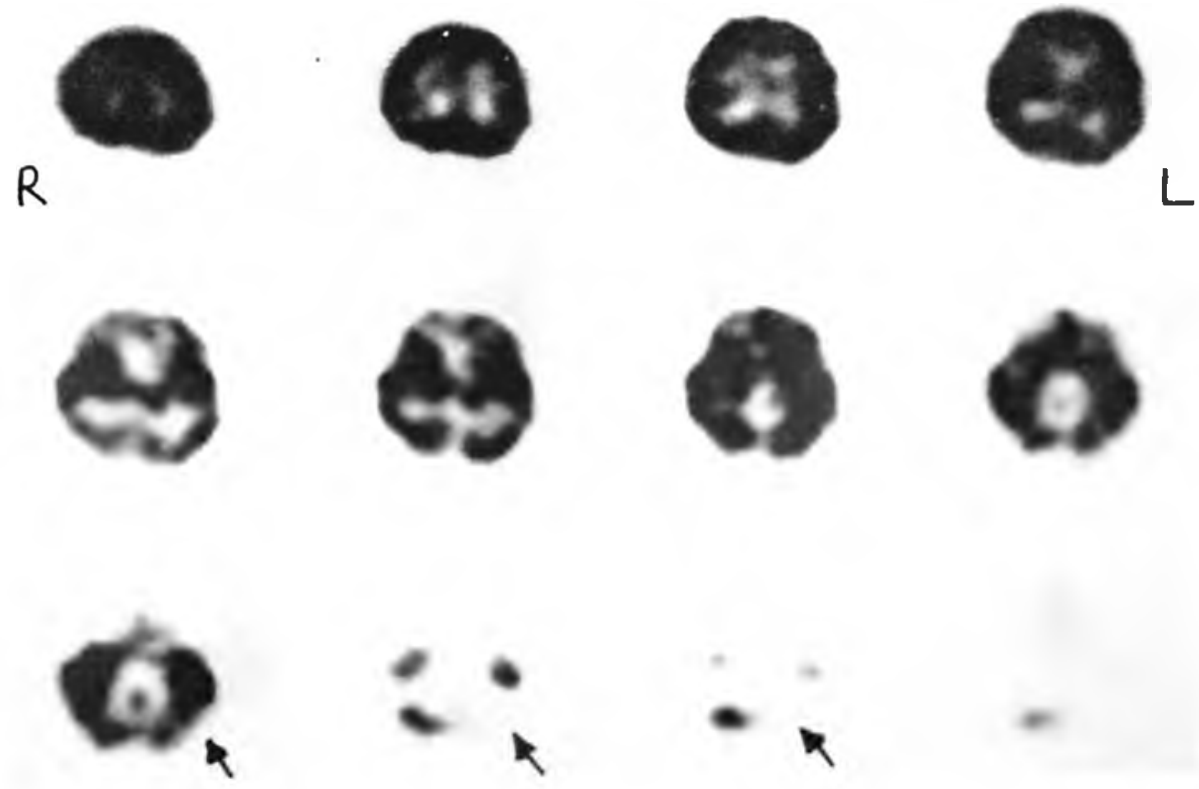

occluded (Fig 4a). There was no remarkable change either in clinical status or upon neurologic examination during the time interval of the tests. The second IMP-SPECT taken on the thirty-sixth day revealed that the defective area in the right cerebellar hemisphere had become smaller and that the left hemisphere could be visualized very faintly compared to the previous study (Fig 3b). The second MR scan taken on the thirty-eighth day showed that the high intensity areas seen on both cerebellar hemispheres had become smaller (Fig 2b). At the follow-up vertebral angiography performed on the fortieth day, the left PICA could not be visualized, there were no abnormalities of the left SCA, left posterior cerebral artery or right SCA (Fig 4b). On the forth week of admission, the patients's clinical status showed moderate improvement, and he was discharged with mild residual slurred speech on the 45th day of admission.

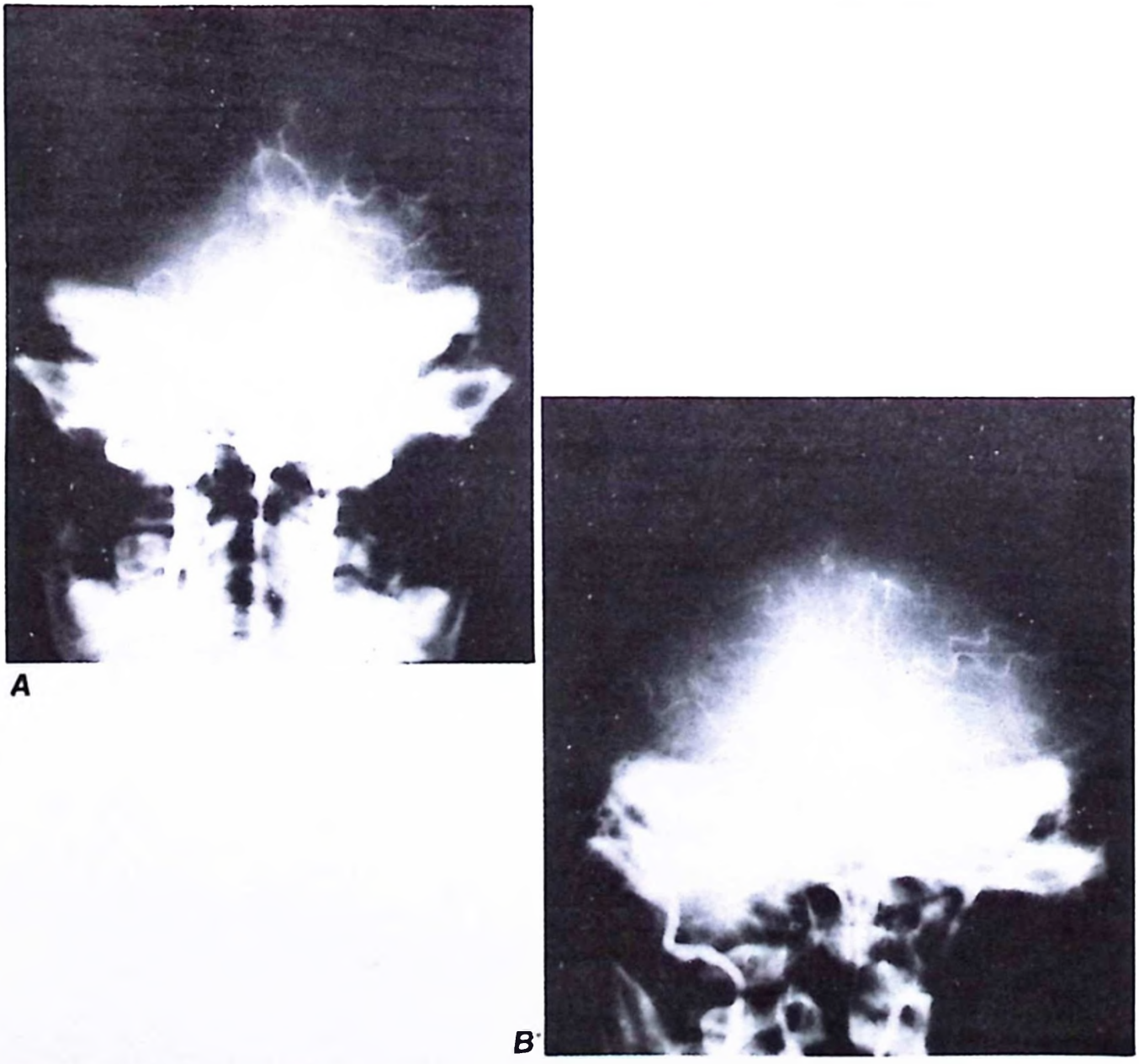

Fig. 4(a, b): First and follow-up vertebral angiographies of the patient. See text for explanation.

Discussion

Isolated cerebellar infarction is a rare occurrence not only in childhood but also in adulthood. The clinical features of cerebellar infarction cover a wide spectrum, mimicking symptoms and signs from acute labyrinthitis to a rapidly expanding posterior fossa mass lesion with brain stem and cerebral dysfunction[2,3]. It has been concluded in various studies that cerebellar infarction is uncommon, but the true incidence is not known[4,5]. In children, acute cerebellar ataxia, acute labyrinthitis and drug intoxication may result in the onset of acute cerebellar signs and symptoms[6,7]. In a number of previous reports, trauma to the vertebral artery and chiropractic manipulations have been implicated in this condition[8,9].

The diagnosis of cerebellar infarction had a poor prognosis in the pre-CT scan era, and postmortem studies show that the diagnosis was often overlooked. The introduction of CT has made it possible to rapidly distinguish cerebellar infarction from hemorrhage[10]. But it has been reported that the correlation between angiographic and CT localization of the infarction is not good, and that CT has limited resolution in the posterior fossa because of the presence of bony artifacts[11]. Moreover, CT is often normal in the first 48 hours after an ischemic infarction even with high resolution scanners[12]. In our case, low density areas were noticed in both cerebellar hemispheres. Since MRI has no bony artifacts and infarctions can be visualized earlier, information obtained by MRI is superior to that of CT[13-15]. In our case, the high intensity areas on the cerebellar hemispheres were more on the left side, indicating that the cerebellar infarction was clearly detected. Information obtained by MRI regarding the extent and localization of the lesion was much better than that obtained by CT. With the introduction of IMP-SPECT, it has become possible to evaluate brain perfusion noninvasively[16]. Single photon scanning with intravenously administered I-123 amines or ^{99m}Tc labelled amines such as ^{99m}Tc-HMPAO is innocuous to the patient, requires a low level of cooperation and can be performed by nuclear medicine personnel familiar with SPECT. To our knowledge, no significant morbidity has been reported with IMP-SPECT. The distribution of IMP mainly reflects the regional cerebral and cerebellar blood flow on the images taken immediately postinjection. Decreased tracer accumulation indicates the presence of ischemia. In the present case, perfusion defects were clearly demonstrated by IMP-SPECT, with anatomic information inferior to that of MRI. Follow-up study of IMP-SPECT revealed that perfusion to the involved areas was better than in the previous study, supporting the follow-up angiographic data. The second MRI successfully demonstrated that the high intensity areas became smaller, indicating either a resolving of vasospasm, edema and/or recanalization of some occluded vessels. Angiography is a classical imaging modality which evaluates a cerebellar infarction, but it may not show the exact location of the cerebellar infarction because the distribution of

vascular territories in the cerebellum is quite variable. Moreover, infarcts may involve only some part of a vascular territory, but fortunately clinical history, CT, IMP-SPECT and MR follow-up studies always help in establishing the correct diagnosis.

In conclusion, MRI is the method of choice for evaluating cerebellar infarction, but it is not routinely available. Moreover, patients with resuscitation devices cannot undergo MR evaluation. Although anatomic information obtained by IMP-SPECT is inferior to that of MRI, it can demonstrate perfusion abnormalities of the cerebellum and is valuable in its follow-up.

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