

## WEBER'S SYNDROME WITH RECOVERY

CT DEMONSTRATION OF AN END-ZONE INFARCTION IN THE TERRITORY  
OF THE MESENCEPHALIC ARTERY

R. OLIVEIRA-SOUZA — D. L. GUSMÃO

**SUMMARY** — Weber's syndrome is one of the classically described brainstem syndromes. The mesencephalic artery and the syndromes resulting from occlusion of its branches have been attracting increasing interest in the past few years. We present here a case of Weber's syndrome emphasizing that (1) it is one of the major syndromes deriving from infarction in the territory of the mesencephalic artery; (2) that at least two clinical patterns of Weber's syndrome may be distinguished on the basis of the presence or lack of abnormal somnolence, mental confusion, and abulia; and (3) that each one of these patterns seems to be correlated with damage to distinct zones within the general territory of the mesencephalic artery.

**Síndrome de Weber com recuperação: demonstração tomográfica de infarto em zona terminal no território da artéria mesencefálica.**

**RESUMO** — A síndrome de Weber representa uma das síndromes clássicas do tronco cerebral. A artéria mesencefálica e as síndromes que resultam da oclusão dos seus ramos têm despertado interesse crescente nos últimos anos. Apresentamos um caso de síndrome de Weber, enfatizando que (1) é uma das principais síndromes decorrentes de infarto no território da artéria mesencefálica; (2) dois padrões clínicos, pelo menos, podem ser distinguidos da síndrome de Weber, com base na presença ou não de sonolência anormal, confusão mental e abulia; e (3) cada um desses padrões parece se correlacionar com lesão de zonas diferentes contidas no território geral da artéria mesencefálica.

The association of third nerve ophthalmoplegia and contralateral hemiplegia was described by Weber in 1863 in a patient reported to have suffered from «severe rheumatic fever, since which time he frequently felt shortness of breath and palpitations of the heart»<sup>45</sup>. At necropsy, «an oblong clot of blood» at the base of the brain, occupying the medial half of the cerebral peduncle close to the point of exit of the third nerve, was found. Nowadays, hemorrhagic infarction due to emboligenic valvular rheumatic heart disease would seem a reasonable explanation for the picture Weber delineated in his patient. Although he had also emphasized the presence of hemi-hyposthesia in his case, this has not traditionally been acknowledged as part of what later came to be referred to as «Weber's syndrome» (WS)<sup>1A</sup>. In spite of the popularity it has always enjoyed among neurologists, relatively few case reports have been devoted to WS in specialized journals, perhaps because of the rarity with which isolated midbrain infarcts have been shown to occur: for example, Hinshaw et al. could not pick even one such case from their large series of 6,964 consecutive computerized tomographies (CTs) of the head<sup>21</sup>. This might be one of the main reasons why the precise clinical limits and anatomic correlates of WS were never satisfactorily drawn, for in many cases on record additional signs and symptoms

Neurology Service (Prof. H. Alvarenga), Gaffrée e Guinle Hospital, University of Rio de Janeiro (UNI-RIO).

*Dr. Ricardo de Oliveira-Souza — Rua General Belford 226 - 20961 - Rio de Janeiro RJ - Brazil.*

often coexisted with the ophthalmoplegia-crossed hemiplegia complex 5-8,10,13,16,27,31,39,40, WS is said to result from infarction 5-8,13,16,27,31,39,40,41, tuberculoma<sup>9</sup>, meningiomas of the floor of the middle cranial fossa<sup>10</sup>, and Behcet's disease 1\*.

We now report a case of WS in which CT provided evidence of a ventrolateral midbrain infarct. The early differential diagnosis is discussed and the clinical pictures associated with discrete lesions of the high brainstem are briefly considered.

#### CASE REPORT

LAM, a 56-year-old white housewife with no previous history of hypertension, diabetes, cigarette smoking, or alcohol abuse was admitted to the Gaffree e Guinle Hospital on September 10, 1988, because of drowsiness and weakness of the left side of the body. Earlier on that morning, soon iafter standing up, she fell to the ground without immediately losing consciousness. Unable to wake up her relatives by shouting for help, she crept to the living room where she was found «asleep» on the sofa around midday. On admission, two hours later, the examination revealed a mentally confused drowsy woman with a right incomplete eyelid ptosis and a left dense proportional hemiplegia. Periods of wakefulness were at first stimulus-bound; then, there was a rapid decline, requiring an ever-increasing amount of incentive to keep her awake. Concentration of attention was barely possible, inappropriate and brief answers being the rule. She appeared rather bewildered and easily fatigable. Motor responses tended to perseverating. This globally disordered mental state was accompanied by an expressionless face and an almost complete absence of spontaneous speech and body movements. The patient was specifically asked if she experienced hallucinations and the answer was negative. She had no insight into her condition («I'm fine, thanks...»). Swallowing was difficult, speech dysarthric and slurred. A predominantly lower facial palsy for voluntary and emotional movements was noted. The left soft palate was paretic, but the tongue did not deviate on protrusion. The right upper eyelid showed an incomplete ptosis and the eye had a mild divergent strabismus, most evident on sustained vertical gaze, either up or downwards. Adduction of the right eye was paretic, yet diplopia was not referred to upon direct questioning. The pupils were anisocoric (R=3.5mm; Li—1.5mm), and rective to both direct and consensual light and to accomodation, the right one less so. The corneal reflexes were, intact. The tendon jerks were symmetrical (2-J-/6-J-), the plantar reflex was extensor on the left and flexor on the right. Coordination of the right limbs was normal. No abnormal purposeless movements nor any disturbances of muscle tone were noted. Sensory assessment could not be made due to confabulatory answers, yet she reacted to pinprick equally well on either side of the body. The neck was supple and she did not show any signs of raised intracranial pressure. No visual field defects were ever detected. A mini-mental state examination (MMSE) 12 gave a score of 7. The blood pressure was 110/70 ramHg and the heart rate was regular at 84. The remainder of the physical examination was normal. Serum trygliceride levels were slightly elevated at 370mg/dL. Other results of routine laboratory screening were normal, including blood cell counts, ESR, glucose, blood urea nitrogen, cholesterol and uric acid levels, coagulogram, partial prothrombin time and activity, ionogram, proteinogram, VDRL, urinalysis, and parasitologic examination. Chest X-rays, an E'CG and an echocardiogram were all within normal limits. An EEG recorded during wakefulness six days after the ictus displayed a well-preserved posterior alpha rhythm with preserved arrest reactions. Slow irregular waves in the delta range were frequently seen on the fronto-temporal leads, bilaterally. Photic driving and hyperventilation did not remarkably change the tracing. A CT scan of the head was obtained MI day 4 of the ictus. A Siemens Somatom CR (matrix=256x256; scan time—7s; slices parallel to the orbito-meatal line 4mm thick) was employed. A hypodense kidney-shaped area with a medially oriented shallow concavity was detected in unenhanced slices at the level of the superior colliculus. It had defined contours and was seated on the external half of the right peduncle, grossly outlining its natural edges (Fig. 1A). It extended in the vertical plane down to the inferior collicular level. At least some patency of the large vessels issuing from the circle of Willis, including the middle cerebral, upper basilar, right posterior communicating and right posterior cerebral arteries, could be demonstrated by venous infusion of iodinated contrast material (Fig. 1B). No mass effect upon adjacent structures became apparent. Specific therapeutic measures were not employed and only general clinical supportive items were prescribed.

One week after the ictus, she was less disoriented and stayed awake for slightly longer periods. She exhibited spontaneous blinking at a rate of 15 per minute and attached more interest to ongoing surrounding events. The physipgnamy was more expressive, despite the

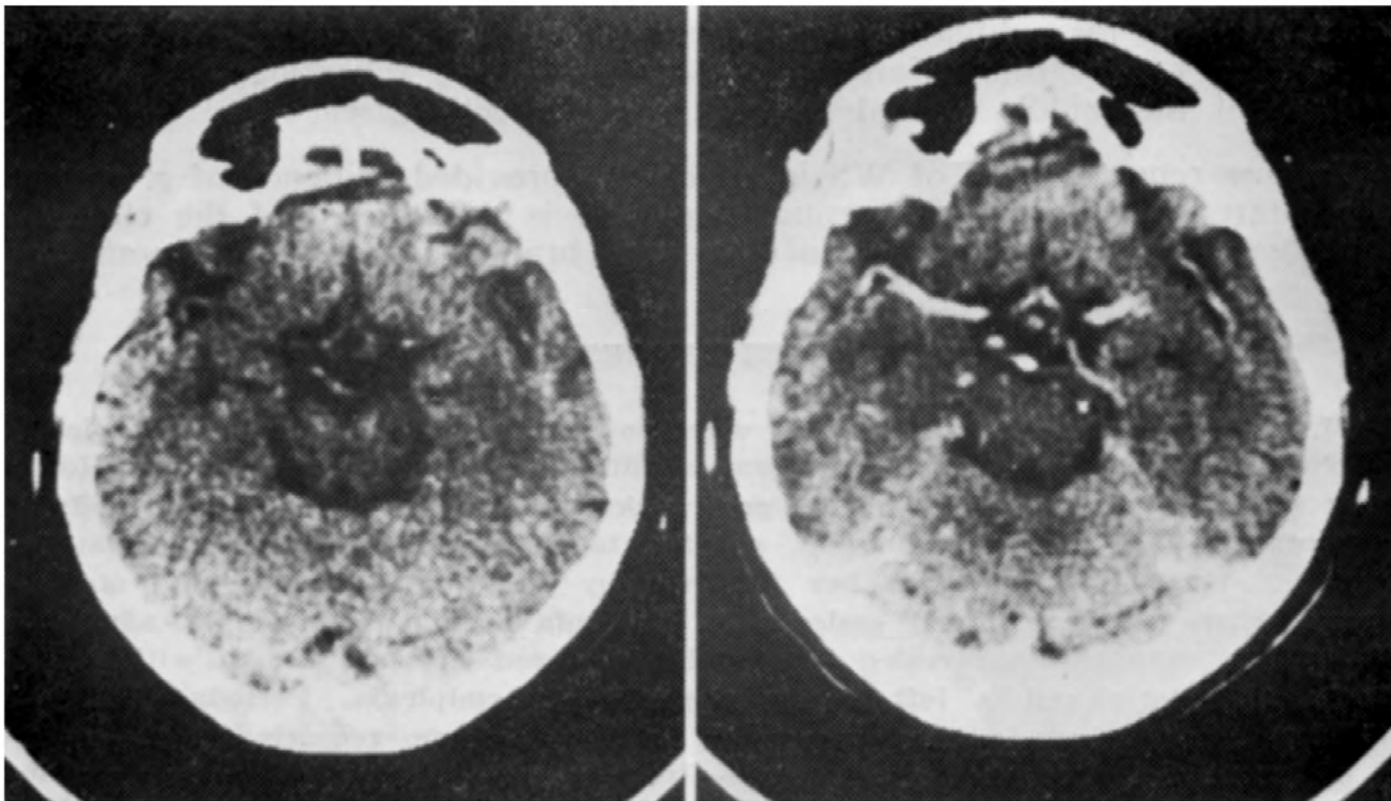


Fig. 1 — Case LAM. CT head scans four days after the ictus: A, hypodense area on the lateral half of right peduncle; B, contrast enhancement of the large arteries of the circle of Willis.

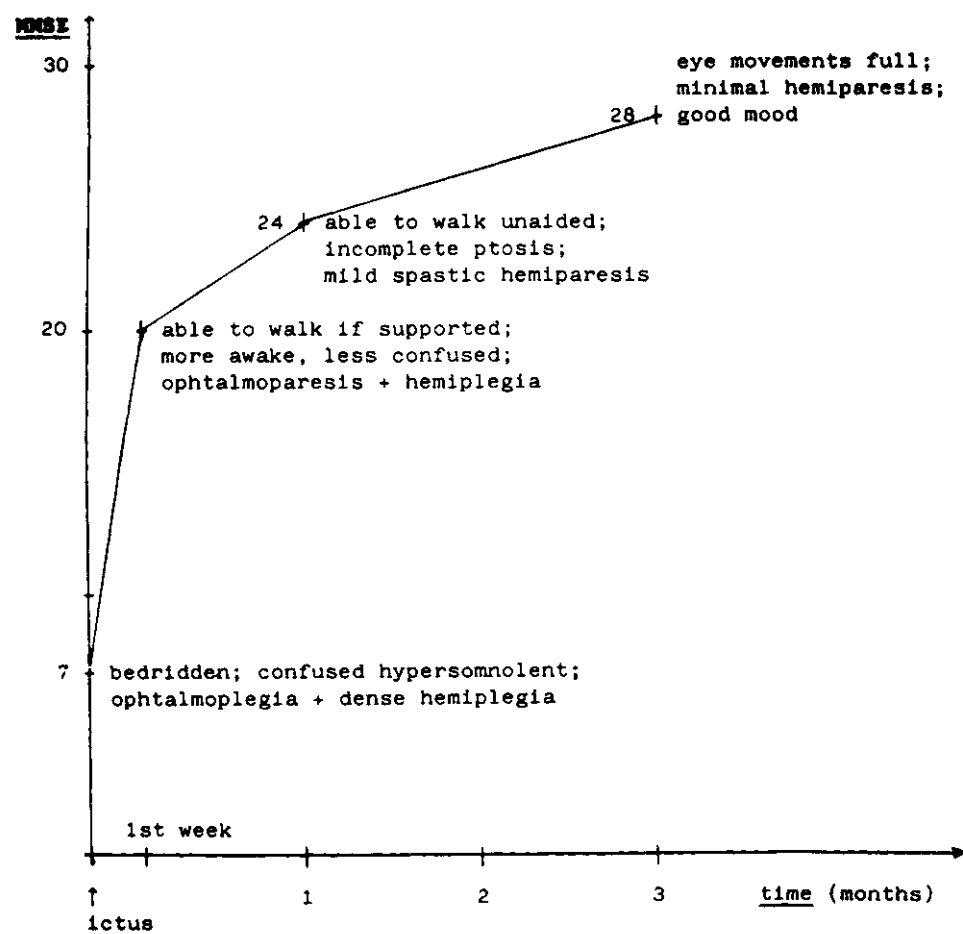
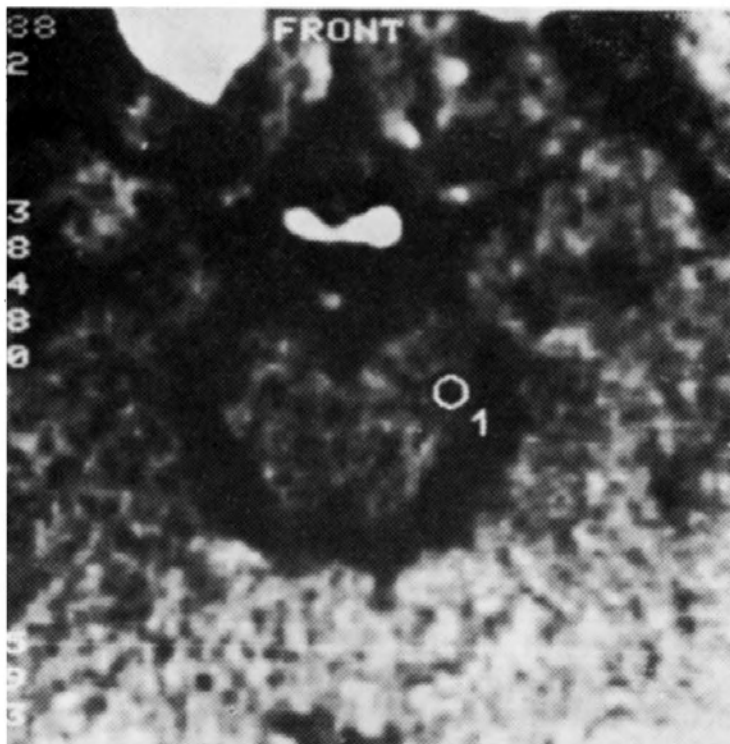


Fig. 2 — Case LAM. Clinical course of Weber's syndrome and hypersomnolent-a-bulic-confusional state, as revealed by serial clinical evaluations and mini-mental state examinations.

persistent facial palsy. Gesticulations during conversation were more often employed. However, a flat affect with indifference and hypokinesia was still evident. She was hemiparetic on the left and a spastic resistance to passive manipulation had appeared on the forearm flexors. Coordination was normal on the four limbs. The deep reflexes were hyperactive on the left limbs (5+/\$-{-}) compared with the right ones (2+/6+). A left Babinski sign with fanning of the toes could be easily elicited. The right plantar reflex was flexor. Sensation was normal for pinprick, contact, vibration, temperature, and segmental position. A score of 20 was obtained at the MMSE.

One month after the ictus, she was awake and oriented, though bradikinetic. A MMSE gave a score of 24. Ocular movements were full and a mild palpebral ptosis on the right was evident. The pupils were equal and reacted to light and accommodation. A proportional mildly spastic left hemiparesis was most obvious on the deficitary manoeuvres of Barré and Mingazzini, and as she walked she dragged the paretic foot. The tendon jerks were brisker on the left than on the right limbs. The left Babinski sign persisted.

Three months after the ictus, she had attained her premorbid behavioral status, scoring 28 at the MMSE. A minimal proportional left hemiparesis with Babinski sign and minimal action spasticity during walking were evident. Occasional slight upper lid ptosis could be observed on the right side. She had no complaints, was in a good mood and slightly hypotensive (110/65 mmHg), on a prescription of dipyridamole (225 mg per day) and aspirin (300 mg per day). Physical therapy was then discontinued in view of her satisfactory level of recovery 2, both in the motor and the behavioral realms (Fig. 2). A second EEG had not significantly changed in comparison with the previous one. A follow-up CT showed a hypodense non-enhancing area in the lateral half of the right peduncle. Its dimensions had not apparently changed (Fig. 3).



*Fig. 3 — Case LAM. Follow-up CT three months after the ictus. Reconstructed image displaying maximal affection of the right lateral peduncle. Average density within this hypodense area = 18.8 Hounsfield units (closed circle marked by number 1).*

#### COMMENTS

From the available evidence it appears that WS due to arterial occlusion may occur in at least two distinctive clinical patterns. In both, it apparently results from infarction within the territory of the mesencephalic artery (MA), a small vessel segment connecting the rostral basilar artery on each side to the point where the posterior communicating artery joins the posterior cerebral artery 24. This arterial bridge was designated the «communicating basilar artery» by Percheron<sup>36</sup> to emphasize its basic property of linking the anterior and the posterior arterial systems of the brain with each other. In the midbrain, the MA supply a large, roughly triangular, ventrolateral area that includes the peduncle, third nerve and nucleus, and most of the tegmentum 20,30. Beautiful schemes of such areal distribution of the midbrain blood supply are provided by Lazorthes<sup>30</sup>. Higher up in the diencephalon, its ascending

branches head for the subthalamus and the paramedian-intralaminar thalamic nuclei 18,20,30,36,39,40. It has been proposed that the complex motor and behavioral manifestations occasioned by occlusion of the MA be called the «mesencephalic artery syndrome» 39,40. It results most often from embolism, either cardiogenic 1,6,7,31,45 or artery-to-artery 28.

The first, or «classic», pattern of WS results from a circumscribed medial peduncular infarct due to occlusion of the short medial penetrating branches of the MA 8,14,41,45. Gillilan refers to this as the ventromedial mesencephalic syndrome» 20. As such, it represents a partial or fragmentary MA syndrome. When bilateral, a true «mesencephalic locked-in syndrome» n>26 (syndrome of the interpeduncular fossa 20) can be expected to occur. Severe and long lasting residual motor symptoms are the rule in these cases, for the intra-axial fascicles of the third nerve as well as most of the pyramidal tract fibers occupying the medial half of the peduncle are usually directly damaged 17,22,33,34,37. Visual and sensitive deficits are variably found on routine examinations, but symptoms indicative of behavioral disorders are typically absent, probably pointing to the integrity of the diencephalic sectors of the MA.

More commonly, however, WS is but one of the manifestations of a full-blown MA syndrome. Accompanying the hemiparesis and the oculomotor paralysis, one also regularly finds somnolence, abulia and mental confusion 13,16,27,31,38,39,40. In the earlier stages, our patient conformed to this pattern. As time elapsed, however, her behavioral symptoms faded and a residual, though attenuated, WS gradually emerged to the forefront. This progression from WS plus confusion, somnolence and abulia towards a «puré», or classical, WS has been occasionally reported on 5,13. In our case, the clinical picture was well-accounted for by the lateral peduncular hypodensity observed on the CT figures, which was otherwise compatible with an end-zone infarction of the mesencephalic territory of the MA 18,20,23,30,34. This impression was further strengthened by the apparent patency to contrast of the posterior communicating and posterior cerebral arteries on the side of the lesion, which may have in time prevented the occurrence of extensive necrosis of the whole mesodiencephalic district of the MA by way of retrograde filling of most of it 25,43. The size of the infarction was thus restricted to a minimum, just to a lateral extreme region of presumably low blood flow, representative of the distal field configuration 32 of the peduncular territory of the MA as it borders the lateral midbrain sectors supplied by the longer circumferential branches coming mainly from the posterior cerebral artery 18,20,30,36. Recovery from the motor deficits in due time 2 which seems to be the rule in ischemic disease of the posterior circulation 31 was certainly made possible by the sparing of the majority of descending fibers from the precentral cortex as well as of the third nerve nucleus and fascicles, which tend to be grouped more medially in the peduncles 17,22,33,34,37. The residual image suggested maximal affection of the corticopontine fibers originating in the parieto-temporo-occipital cortex<sup>44</sup>.

What did not become immediately clear by the CT images alone, however, was the florid acute confusional abulic hypersomnolent state that developed pari passu with the motor signs, from ictus onset to resolution, indicating, as stated above, an involvement of the whole MA territory (Fig. 2). Since functional recovery from the confusional state and from WS proper took place, it might be argued that most of the MA territory, comprised by peduncle and midbrain tegmentum-medial thalamus, was exposed to a particular type of ischemia not necessarily visible on CT images («CT-negative ischemic»<sup>45</sup> 29) for some time. Such effects have been well-recognized, for example, in cases of subcortical aphasia 35<sup>^</sup> but their existence at the posterior circulation level, though probable 15, should be better substantiated yet.

The differential diagnosis in cases of reduced wakefulness, confusional state, and localized motor weakness with slowing of the EEG, includes expanding intracranial mass, drug intoxication, infection 1,31, psychiatric illness 31, and a variety of stroke-inducing diseases 6,7,13,14,17,19,38. The possibility of demonstration of hypodensities in the brainstem by CT<sup>2</sup> has been playing a major role in neurological diagnosis and management. Thanks to it, we can presently not only avoid submitting patients to unnecessary invasive procedures, but may attempt to understand more accurately the capricious logic of symptom production in cases of discrete intracranial lesions as well.

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