We wish to comment on certain aspects of the paper by Clarke et al, who report a case of acute global amnesia occurring in a patient with cerebral infarct involving the left anterior thalamic nuclei, the adjacent mammillothalamic tract, and the anterior part of the internal medullary lamina. They stress the specific role of the anterior thalamic regions in memory dysfunction and conclude that longlasting amnesia from a thalamic lesion can occur without structural damage to the dorsomedial nucleus.

The authors attributed the amnesia to the lesion of the anterior thalamic nucleus and did not consider the damage to the white matter.

Recently, amnesia as a "disconnection syndrome" has been attributed to selective damage to the mammillothalamic tract that connects the mammillary body to the anterior thalamic nucleus and to the anterior part of the internal medullary lamina that in turn connects the amygdala to the dorsomedial thalamic nucleus.1-4

The damage to the internal medullary lamina is mentioned by the authors only to underline that the dorsomedial nucleus could have been spared. Nothing is said about the lesion of the mammillothalamic tract.

We believe that, in the presented patient, dysfunction of the white matter structures could be involved in amnesia and this should have been considered and discussed.

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Clarke et al reply:
De Marinis' and Argenta's wish for a more detailed discussion of the possible role of white matter in the symptomatology of our patient is welcome. Our patient had a small infarction limited to the left anterior thalamic nuclei, the incoming mammillothalamic tract, and the anterior part of the internal medullary lamina. As we have already stated in our paper,1 the dorsomedial nucleus was mostly spared, but it was probably partially deafferented. Tracing studies in macaque monkeys2 and partial evidence from human material indicate that the pathway from the amygdala to the dorsomedial nucleus is a route to the mammillothalamic tract, which is believed to convey fibres from the mammillary body to the anterior thalamic nuclei.3 The internal medullary lamina is believed to contain fibres from the amygdala and from the orbitofrontal, anterior cingulate, insular and temporal cortices to the dorsomedial nucleus.4 Thus as stated in our paper, the lesion of the mammillothalamic tract merely deafferented the anterior thalamic nuclei that were in any case damaged.

We believe that the lesion of the anterior thalamic nuclei, and not the partial deafferentation of the dorsomedial nucleus, played the predominant part in the amnesia in our patient. Three lines of evidence support this view. Firstly, the lesion of the anterior thalamic nuclei, but not the deafferentation of the dorsomedial nucleus, produced observable metabolic changes in target territories. Indeed, we have found a relative decrease in the deoxyglucose uptake in the posterior cingulate cortex, which is known to receive input from the anterior thalamic nuclei, but not in any part of the frontal cortex. Lesions of the dorsomedial nucleus have been reported to decrease frontal cortex metabolism (for references see Clarke et al). Secondly, macaque behavioural studies support this conclusion. Indeed, complete lesions of the anterior thalamic nuclei and mammillothalamic tract associated with degeneration in the dorsomedial nucleus produced a less severe amnesia than large mediodorsal lesions. Thirdly, neurotoxic lesions of anterior nuclei (destruction of the neuronal somata but not of fibres of passage) have been shown to produce memory deficits in rats.5

The role of white and grey matter structures in diencephalic amnesia is an interesting issue, but with each case report more problems tend to appear than to be solved. In many cases the precise content of the lesion and its relation to anatomical structures are difficult to establish. Few of such studies have been combined with metabolic investigations. But by far the greatest problem is the lack of data on the connectivity of this region in humans. Our knowledge is an extrapolation of studies done mainly in nonhuman primates and in rodents. A relatively precise tracing technique (a modification of the Nauta method for anterogradely degenerating axons) can be used in humans and it has contributed to better understanding of functional organisation in other systems.6 This technique allows the connectivity of each nucleus to be traced from a damaged area in postmortem tissue, but its use requires experience and it is extremely tedious for analysis. Nevertheless, it is routinely used for research purposes in the laboratory of one of us (SC) and we could envisage collaboration for chosen cases.


