

Make Love to Forget: Two Cases of Transient Global Amnesia Triggered by Sexual Intercourse

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ABSTRACT

Transient global amnesia (TGA) is characterized by a sudden onset and by a typical resolution within several hours. Several precipitating events have been proposed: physical exertion, emotional experiences, etc. The aim of this paper was to present two cases of TGA triggered by sexual intercourse and to suggest a possible mechanism for the development of TGA. In both patients, clinical examination revealed elevated blood pressure. Laboratory examinations and brain CTs were normal. EEG demonstrated diffuse dysrhythmia and slow spike-waves, respectively. SPECT revealed hypoperfusion in the left frontal and right medial temporal regions. Various explanations of the mechanism of TGA are discussed. Based on the observed hypoperfusion in the medial temporal regions, a new hypothesis is advanced, suggesting the possibility that TGA occurs due to a pathologically changed or less adaptable anterior chorioid artery, initially constricted by hypotension following a blood shift from the center towards periphery.

Keywords: *transient global amnesia, memory, sexual intercourse, anterior chorioid artery*

Introduction

Transient global amnesia (TGA) is certainly one of those states that create more impression than real harm, both to the patient and to his/her surrounding. This distinctive form of amnesia is characterized by a sudden beginning and a typical resolution within several hours. Mean

duration of an episode has been estimated at 6–7 hours, ranging from 15 minutes to 7 days¹. Due to difficulties in learning new contents, the patients repetitively ask questions and look extraordinarily confused², although general cognition seems intact.

Numerous cases have been described since the first recognition in 1950-s and the coinage of the term a decade later³. The majority of the reports mention disturbances in the recall of recent memories, with rare or no difficulties in the retrieval of remote events. Unlike episodic memory, immediate and semantic memories seem to be preserved³. According to certain reports, other cognitive functions also may be slightly disturbed⁴. Follow-up of patients' memory functions demonstrates that after the disturbance was resolved, a complete amnesia typically is present for the period of TGA and a short period before it⁴. Several precipitating events have been proposed: besides physical exertion⁵ and highly emotional experiences⁶, exposure to cold/heat³, exposure to high altitude⁷, mild head trauma, and many other have been mentioned^{5,8}. Certain potential risk factors have also been pointed out, like hypertension, ischemic cardiac disease, or migraine^{8,9}.

One of the curiosities is the revelation of sexual intercourse as a possible precipitating factor for TGA^{10,11}. This relation does not seem to be rare at all. In a study by Fisher⁶, precipitating factors were recognized in 26 out of 85 spells: out of those 26, 7 were connected with sexual intercourse. In two cases described by Fisher and Adams³, patients experienced TGA at the climax of sexual intercourse, suddenly asking »Where am I? What's happened?« and other questions typical for TGA¹².

Stirred up by two observed cases of TGA triggered during sexual intercourse, we decided to further investigate that connection and to attempt to benefit from it in contributing to the elucidation of the pathological condition of TGA, but also of human memory processes in general.

Results

Case 1

A 55-year old teacher, accompanied by her friend, came to the Department of

Neurology due to a suddenly appeared memory disturbance. The patient reported that her companion had visited her that day about 10 a.m. They had had sexual intercourse but she could not remember the details. She could not remember when her partner had left. Her close friend, who accompanied her to the Hospital, told the physician that she had come to the patient's house about 1 p.m. The patient was upset, repeating the same questions: »Where am I?«, »What happened to me?«, »What day is today?«, etc. She seemed confused and could not remember the partner's name or what was his job. She did recognize her friend, who kept answering her questions. After two hours, the patient gradually calmed down. When she understood that she had not been able to remember a period of several hours, she got frightened and decided to visit her physician, who referred her to the neurologist. The patient was admitted at 4 p.m. Clinical neurological examination demonstrated no focal deficit. She had amnesia for a period of five hours, while her retrograde amnesia disappeared. Her blood pressure was 150/ 110 mmHg; routine blood tests and coagulogram were normal. A routine neuropsychological battery, administrated about five hours after the beginning of the attack, revealed no deficits except in the realm of episodic memory (Table 1). Administrated approximately seven hours after the onset of the disturbances, singlephoton emission tomography (SPECT) detected hypoperfusion in the left frontal and right medial temporal regions. The electroencephalography (EEG), applied on the next day, showed moderate diffuse dysrhythmia, while computerized tomography (CT) of the brain was normal. SPECT and neuropsychological tests were re-administered after seven days, and revealed no abnormalities. After six months, a repeated EEG resulted normal and the patient felt generally well.

TABLE 1
NEUROPSYCHOLOGICAL ASSESSMENT: AT 5 HOURS (CASE 1) AND 7 HOURS (CASE 2),
RESPECTIVELY, AFTER THE ONSET OF TGA

Patient	Sex	Age	Orientation in time/space*	Digit span†	Semantic memory: famous facts & faces‡	Episodic memory#
NN	F	55	4/7 (7/7)	6 (6±2)	12/14 (12±2)	4/13 (12±1)
VD	M	63	3/7 (7/7)	6 (6±2)	13/14 (12±2)	2/13 (12±1)

Note: The values in parentheses correspond to an age- and education matched ad-hoc control group (N=16). All the fractions in the Table represent the ratio between the result obtained by the patient and the maximal score for the given test.

* To test the patient's orientation in time/space, the first seven questions from the Galveston Orientation Amnesia Test (GOAT) were used.¹³

† Short-term memory was tested by applying the Digit Span Test from the Wechsler Intelligence Scales.¹³

‡ Semantic memory was tested by asking about 7 widely-known facts (e.g., the capital of Croatia) and presenting the patient with the photographs of 7 widely-known personalities (e.g. Charlie Chaplin) and requiring to name them.

Episodic (autobiographic) memory was tested by asking questions regarding the immediate past (the last 24 hours). The correctness of the reported was established by confronting the answers given by the patients to those provided by the family members.

Case 2

A retired 63-year old policeman was admitted to our Hospital due to memory disturbances. His wife, who accompanied him, reported that he had felt well that morning. He had always been in good health. They had a sexual intercourse at about 8.30 a.m. Soon afterwards, he felt pressure in his head, but the feeling disappeared a few minutes later. She noticed that he had become confused and kept repeating: »Where am I?« »What happened to me?«. He was very excited. On his way to the hospital, he gradually calmed down. Upon his arrival to the hospital, at about 1. p.m., he was submitted to a neurological examination but no focal neurological deficit was detected. He lost his memory for a period of approximately three hours. He did not complain of headache. He could not remember the sexual intercourse or his arrival to the hospital. His blood pressure was 160/100 mmHg. Blood tests and coagulogram were normal. He demonstrated no trace of retrograde

amnesia. A routine neuropsychological battery was applied seven hours after the onset of the disturbances, revealing no defects but in the realm of episodic memory (Table 1). SPECT examination performed about eight hours after the onset of the attack demonstrated hypoperfusion in the medial temporal region bilaterally. After two hours, brain CT was made and was found normal. EEG, made two days later, demonstrated diffuse slow spike-waves. Both SPECT and neuropsychological tests were repeated after 7 days and revealed no abnormalities. Three months later, his EEG was normal and the patient felt generally well.

In both cases, the technetium-labeled hexamethyl-propylene-amine-oxime SPECT technique was applied and the analysis was performed using anatomically defined regions of interests. Hypoperfusion was determined by comparing z-scores of each of our patients to those of the control group. The control group (N=16) matched our two cases in sex and age.

Discussion

There are at least two issues to be discussed when considering the pathophysiology of TGA: the nature of the phenomenon and its localization. If we suppose that not mild head trauma, but physical exertion, emotional experience and pain connected with it, may be the cause of TGA, then we will agree that the majority of precipitating factors described (including migraine, physical exertion, highly emotional experience, sexual intercourse, thermal shock), could be reduced to temporary disturbance of cerebral circulation. The hypothetical circulatory disturbance must occur in a pathologically changed or at least in a less adaptive vascular system. Recently also was suggested that a (physiological) Valsalva maneuver, »blocking venous return through the superior *vena cava*, may allow brief retrograde transmission of high venous pressure from the arms to the cerebral venous system, resulting in venous ischemia to the diencephalon or mesial temporal lobes and to TGA¹⁴.

The second issue regards the localization. It was suggested that TGA is due to transient vascular insufficiency of arteries supplying the medial temporal lobe⁹, the right basal ganglia and left temporal lobe¹⁵, or due to hypoperfusion of the temporo-basal region¹⁶. Examinations with SPECT and positron emission tomography (PET) revealed quite inconsistent findings^{4,17,18}. This incongruity could provoke only a vague idea about the pathoanatomy of TGA. Goldenberg⁴ devotes a lot to the possible thalamic origin of TGA, advocating especially the mediadorsal thalamic/dorsal diencephalic engagement¹⁹. In our first case, SPECT revealed hypoperfusion changes both in the fronto-basal cortical region (left) and in the medial temporal one (right). It really could be that various regions contribute to the symptomatology of TGA: the difference among the findings

might reflect the difference among the symptoms observed (primarily the presence or absence of retrograde amnesia, but also the presence or absence of the alteration of cognitive functions other than memory⁴). Kapur et al.²⁰ suggested that the »recovery of some types of human amnesia, such as that associated with TGA, follows a 'lateral-to-medial' rule – lateral inferotemporal areas that play a major role in retrograde amnesia recover first from hypometabolism related to the TGA attack, followed by 'interface' areas such as the rhinal and parahippocampal cortices that are considered to have a role in both anterograde and retrograde memory functioning, with the last areas to recover physiological integrity being discrete limbic-diencephalic structures such as the hippocampus.« To this interpretation, one has to add the possibility that only anterograde memory might be deficient in TGA.

Recent interpretations of data obtained by functional magnetic resonance imaging (fMRI) suggest that the recruitment of fronto-parietal areas during the amnesic state (typically associated with the temporolimbic circuit) may signify »a compensatory reliance on visuospatial or working memory strategies.«²¹.

The data reported by Eustache et al.²² connect TGA with a deficit in the encoding/storage, but not in the retrieval of information. This speaks in favor of the assumption that the structures altered in TGA are not in the frontal, but in the medial temporal region. More precisely, if we accept that perirhinal and entorhinal cortices are important for recognition memory²³, while the hippocampus itself is responsible for episodic memory²⁴, combining semantic knowledge with a temporo-spatial context, then one highly speculative possibility remains that the circulatory system feeding the hippocampus (anterior chorioid artery; AChA) is the site where the changes characteristic for TGA occur. Although quite logical, this hypoth-

esis contains several weak points. The pattern observed in our SPECT results, for instance, with hypoperfusion in the frontal and medial temporal regions, was much larger than the territory supplied by the AChA. Additionally, the pathophysiological mechanisms that should result in an isolated vasoconstriction of the AChA are not so easy to understand. If one suggested a more general vasoconstriction in our two patients (e.g. a migraine equivalent), the absence of additional symptoms is difficult to explain. Some other studies using SPECT to assess brain perfusion during TGA have demonstrated different cerebral-blood-flow (CBF) alterations in medial temporal¹⁵ and thalamic regions¹⁶. One has to note also that, »as SPECT assesses only CBF, which may be unmatched to synaptic dysfunction in acute pathological circumstances, it may provide misleading information about the neurobiological basis of memory dysfunction in TGA, and incomplete information about its mechanisms«¹⁷. Using PET and measurements of CBF and oxygen metabolism might prove to be more valuable in this context¹⁷. Additional criticism to the »AChA hypothesis« might be that the typical clinical picture of an occlusion of the AChA has been described to consist of hemiparesis, hemisensory loss, and hemianopia²⁵, or pseudobulbar palsy, mutism, and quadriparesis in the cases of bilateral AChA infarction²⁶. One might argue, of course, that a temporary dysfunction is pathophysiologically quite a different entity than infarction. In order to discern the two states and rule out small infarctions of the amygdaloid nucleus or the hippocampus, one should perform MRI, which, unfortunately, was not possible in our case. Certainly, more observation and diagnostic comparisons are needed to establish the neural underpinnings of the TGA phenomenology.

As far as it concerns the mechanism of the (temporary) ischemia in TGA, some

authors have proposed a glutamate-elicited »spreading depression«²⁷, that is, a self-spreading front of depolarization associated by a depression of the neuronal bioelectrical activity for a period of minutes¹. Inzitari et al.²⁸, on the other hand, suggested hyperventilation and an abnormal rise in the blood lactate concentration as a possible cause of TGA. However, it is a real challenge trying to connect the phenomena advocated by the two hypotheses, with so many and seemingly so various precipitating factors, as well as with the fact that the most typical duration of TGA, according to the literature, is up to 24 hours²⁹. Some anamnestic data indeed suggest more generalized circulatory underpinnings (facial pallor one hour from the onset: case 4; blood on the towel: case 2 in Fisher and Adams³). In both our patients, heightened blood pressure was detected at the moment of hospitalization. The fact that both our patients were struck by TGA during sexual intercourse, suggests the possibility that the blood shift from the center (brain) towards the periphery, occurred during the intercourse, might have provoked insufficient circulation and constriction of AChA. Since pathologically changed or less adaptable, the artery did not restore its normal diameter after the blood pressure came back to its normal values, but continued to improperly feed the target tissue, unable to function. The diameter and alimentation were restored only after a few hours. The possibility that TGA occurs due to the Valsalva effect¹⁴ is favored by the well-known observations that some patients complain of headache triggered during sexual intercourse. Moreover, two recent investigations using color sonography and ultrasound venography observed a significantly higher rate of incompetent jugular valves in TGA patients as compared to a control group^{30,31}, which strengthens the hypothesis for jugular valve incompetence as the pathological condition for the development of TGA.

The gradual closing of the memory gap, with coming back of the information from the near past first (case 4 in Fisher and Adams³), as well as senseless motor actions (washing hands, going up and down stairs) reminding of stereotypias characteristic for partial-complex epilepsy, are only some of the marginal TGA-related observations which certainly would be worthy of further examination and which may suggest something about the organization of human memory system as well.

EEG findings in both our patients might also indicate the epileptic TGA. However, it is known that patients suffering from epileptic amnesic seizures are quiet during the seizure since they are not aware what is happening to them. They do not experience retrograde amnesia and the attacks are briefer than the TGA attacks³². Our patients, on the other hand, were aware of disturbances, suffered retrograde amnesia, and their attacks lasted for several hours. Neither ever before nor after several months or even a year from the TGA episode they have not experienced any disturbances of conscience or memory.

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Recently, a relation between TGA and dissociative disorders has been proposed (»psychogenic amnesia«³³). Although the relatively young age of our Case 1 (55 years) might suggest such a pathological entity, it is to be noticed that environmentally induced stress and trauma, typically associated with psychogenic amnesia^{34,35}, were not reported by either of our two patients.

The general idea of this article has certainly not been to solve one of the most intriguing mysteries of modern neurology – TGA, but to pinpoint some phenomena and to suggest some ideas on their mechanism. Our hypothesis about the changes in the circulatory system feeding the hippocampus as a possible locus of TGA pathology, according to our opinion, may be worthy of further investigation.

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VODITE LJUBAV DA BI ZABORAVILI – DVA SLUČAJA TRANZITORNE GLOBALNE AMNEZIJE POTAKNUTE SPOLNIM ODNOSOM

SAŽETAK

Tranzitorna globalna amnezija (TGA) odlikuje se naglim nastupom i tipično se gubi nakon nekoliko sati. U literaturi se spominje nekoliko precipitirajućih čimbenika: fizička iscrpljenost, snažno emotivno iskustvo i dr. Namjera je ovog članka prikazati dva slučaja TGA koju je potaknuo spolni odnos i sugerirati mogući mehanizam razvoja ove bolesti. U oba bolesnika kliničkim je pregledom otkriven povišeni krvni tlak. Laboratorijska su se ispitivanja i CT mozga pokazali normalnima. EEG je otkrio difuznu disritmiju odnosno spore komplekse šiljak-val. SPECT je pokazao hipoperfuziju lijeve čone i desne medijalne sljepoočne regije. U članku se raspravlja o različitim hipotezama nastanka TGA. Na temelju opažene hipoperfuzije medijalnih temporalnih područja, predlaže se nova hipoteza koja ukazuje na mogućnost da je TGA posljedica patološki promijenjene ili slabije prilagodljive prednje koroidne arterije, koja, uslijed pomaka krvi iz središta prema periferiji, prolazi kroz inicijalnu hipertoničku konstrikciju.