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Accelerated long-term forgetting and autobiographical memory disorders in temporal lobe epilepsy: One entity or two?

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ABSTRACT

Temporal lobe epilepsy (TLE) is a type of epilepsy that often has a negative impact on patients' memory. Despite the importance of patients' complaints in this regard, the difficulties described by these patients are often not easy to demonstrate through a standard neuropsychological assessment. Accelerated long-term forgetting and autobiographical memory disorders are the two main memory impairments reported in the literature in patients with TLE. However, the methods used by different authors to evaluate long-term memory and autobiographical memory are heterogeneous. This heterogeneity can lead to differences in the observed results as well as how they are interpreted. Yet, despite the methodological differences, objectification of such memory deficits appears to be both specific and robust within this patient population. Analysis of the literature shows that accelerated long-term forgetting and autobiographical memory disorders share the same clinical characteristics. This leads to the assumption that they are, in fact, only one entity and that their evaluation may be done through a single procedure. Our proposal is to place this evaluation within the context of memory consolidation disorders. With such a perspective, evaluation of accelerated forgetting in autobiographical memory should consist of identifying a disorder in the formation and/or recovery of new memory traces.

1. Introduction

Characterizing the nature of the memory disorders patients complain of is a major factor in enabling arguments for a specific diagnosis and its specific cognitive rehabilitation. During temporal lobe epilepsy (TLE), patients frequently report a memory complaint that is difficult to fully assess through "classic" neuropsychological assessment, which requires patients to recall information learned 20 or 30 min earlier

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[1]. The memory complaint in TLE patients is described in the literature as an accelerated forgetting and/or autobiographical memory disorder [2]. Its importance contrasts in general with the preservation of other cognitive functions, and relatively good familial and professional adaptation. Only specific memory tests make it possible to highlight this particular type of forgetting. The memory impairment reported by these patients is characterized by progressive forgetting over a few days or few weeks of correctly encoded information, as well as difficulty in recalling past personal memories.

The present report documents the accelerated long-term forgetting and autobiographical memory disorders associated with TLE, and discusses the methodology used in studies to evaluate accelerated forgetting. In addition, the possibility of grouping accelerated forgetting and autobiographical memory disorders into a single entity and placing them within the context of memory consolidation disorders is also discussed.

2. Definitions: which concepts?

2.1. *Temporal lobe epilepsy*

TLE can manifest itself through recurrent isolated episodes of amnesia. It is a concept that has appeared in the literature for more than a century and currently includes a number of syndromes.

2.2. *Transient epileptic amnesia*

One of the main ''cognitive'' syndromes that may reveal late-onset TLE is transient epileptic amnesia (TEA) [3], which is characterized by recurrent episodes of transient amnesia starting at around the age of 60 [4,5]. Apart from acute episodes, patients complain of interictal memory impairment is characterized by autobiographical memory disorders [6–8] and long-term accelerated forgetting [7–11], as well as topographical memory disorders [8,12]. Although the entity of TEA is recognized as a specific form of TLE, its recognition as an epileptic syndrome in its own right is still being debated [6]. This is why our present report focuses on the more general framework of TLE.

2.3. *Accelerated long-term forgetting*

Also called ''long-term amnesia'' [13,14], the term ''accelerated forgetting'' was introduced by Blake et al. [15]. It is defined as a lack of longer-term consolidation of information after a few days or weeks, despite normal initial learning and encoding [16].

2.4. *Memory consolidation*

Accelerated forgetting is often interpreted as impaired memory consolidation [14]. The memory consolidation process refers to stabilization of the memory trace over time in long-term storage through two types of processes: a synaptic process and a systemic process [17]. Synaptic consolidation takes place within the first few minutes and hours of acquisition, whereas systemic consolidation can take weeks, months or even years. Information may therefore only be stored in memory for several years after its acquisition [18,19].

3. Accelerated forgetting and autobiographical memory disorders in TLE

3.1. *Accelerated forgetting*

This concept has been well described since the 1990s in case studies of patients with abnormal rates of forgetting learned material (such as a list of words or a story) after various retention time intervals; these were 1 week in the O'Connor et al. study [20] and 6 weeks in the Kapur et al. study [14], despite normal learning and recall at 2 h and at 30 min, respectively.

Other different group studies have also confirmed this phenomenon using various types of material and retention intervals. Martin et al. [21] showed accelerated forgetting of a list of words after 24 h despite normal 30-min recall in patients with unilateral TLE. These results were reproduced by Blake et al. [15], who found deficits in recall and story recognition in epileptic patients at 8 weeks after having been normal at 30 min. Muhlert et al. [22] found accelerated forgetting during recall of a story and visual scene in TLE patients, but not in patients with idiopathic generalized epilepsy. In their study, Cassel et al. [23] measured accelerated forgetting in 18 TLE patients and 18 matched controls at four different delay intervals – 30 s, 10 min, 1 day and 1 week – and with two modalities: verbal and visuospatial. Forgetting in verbal memory was then evaluated using cued recall of stories, which showed progressive forgetting over the four time delays, although the difference was significant only after 1 week. Visuospatial memory was evaluated with a more ecological task of ''road memory'' and was characterized by a faster accelerated forgetting in the first ten minutes after learning. The authors concluded there was an early deficit in memory consolidation processes characterized by two distinct patterns: one that is observable immediately and another that gradually worsens over time.

This difference, however, might also be related to the methodology used by the authors. Even though they used four different stories and four different road routes to avoid learning effects, the 1-day and 1-week recalls were scheduled in advance with the participants, who were asked not to rehearse the material during those intervals. Nevertheless, it is possible that this recommendation may have prompted the opposite effect, although rehearsing was less easily done with the road memory tests compared with the stories.

Several studies have demonstrated the phenomenon of accelerated forgetting in TEA patients [7–11]. These patients showed gradually increasing degradation of their performances, regardless of the type of material used, with delayed recalls at 24 h, 1 week and 3 weeks [14,24–26]. In a study by Zeman et al. [12], 44% of their 50 TEA patients showed accelerated forgetting.

Tramoni et al. [24] went further in their analysis of episodic memory consolidation disorders in TLE patients by demonstrating the presence of a specific dissociation in a certain type of declarative memory performance. During a 6-week recall,