



Remote memory in patients with acute brain injuries

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Abstract—Remote memory was investigated in an unselected sample of 26 patients with either unilateral tumours in the temporal lobes or traumatic brain injuries. Six patients underwent excisions within the left temporal lobe, and nine patients were operated on within the right temporal lobe. In both groups, patients with excisions including and sparing the hippocampal formation were studied. Their performance was compared to that of 11 patients with moderate to severe head trauma and to a normative sample of 214 healthy controls. Remote memory was assessed using a famous events test with items of extremely low salience that had been proven to be of low difficulty for those old enough at the time of the event's actuality. The results show severely disturbed retrograde memory functions in the left temporal tumour group. These patients achieved similar scores to patients with severe traumatic brain injury. Right hemispheric patients showed a pattern of results comparable to that of healthy controls. The strongest effects were in the free recall part of the test. In most of the patients, no graded memory loss was observable. No consistent association to recent memory function could be identified. Since most of the remote memory test items used denoted famous names which were cued by rich semantic information, the type of deficit seen may be best understood in terms of a specific dysfunction of the semantic stores containing information about famous proper names. © 1997 Elsevier Science Ltd.

Key Words: remote memory; memory; anomia; temporal lobe; excisions; brain injury; neuropsychology.

Introduction

In contrast to anterograde memory deficits in patients with medial temporal lobe damage, which have been studied extensively, retrograde memory has been investigated to a lesser extent, particularly with respect to unilateral temporal lobe lesions. The only group study was undertaken with six patients with left unilateral temporal lobectomies, six matched patients with right temporal lobectomies and six controls [3]. Severe retrograde deficits were found in the left temporal group without the more remote memories being spared.

Occasionally, alterations in retrograde memory functions in temporal lobe patients have been investigated by means of case studies. In one of the earliest reports, two patients with circumscribed left temporal lobe tumours and severe deficits in autobiographic memory were described [41]. Two of the four classic cases from Walker [53] were operated on within the left temporal lobe and displayed selective naming deficits for people known for

several years prior to the operation. With respect to the two right temporal cases, no such deficit could be inferred from the anecdotal report.

More recently, a patient with a right temporal lobectomy including the uncus and amygdala, showed severe retrograde amnesia covering a period of about 10 years [10]. Another case with a lesion of the left anterior and inferior part of the temporal lobe including the uncus, hippocampus and amygdala showed selective semantic amnesia with recognition of objects, persons and faces being markedly impaired, whereas personal-episodic memory was preserved [9]. Strikingly similar cases were investigated with a circumscribed lesion within the left parietal lobe [16] and with a lesion involving the anterior portion of the middle and the inferior parts of the left temporal gyri [52].

These reports about unilateral cases complement case studies of bilateral damage of the medial temporal lobes and the hippocampi (e.g. [7, 8, 12, 43, 50]), the more anterior parts of the temporal lobes with spared hippocampi [22, 23, 35, 36] or additional but occult lesions of the hemisphere contralateral to the impaired temporal lobe [39, 40, 42, 48]. However, in recent years, there has been an increase in the literature not only about persisting

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naming deficits following left-sided anterotemporal lobectomy (e.g. [26]), but also about selective proper name anomia frequently observed in patients with either extensive damage to the left temporal lobe [18], restricted lesions of its anterior [19, 45], medial [47] and posterior parts [33], the left posterior parietal lobe [44, 46] or with more extensive damage of subcortical structures including the left thalamus [30] and the capsula interna [14].

Since remote memory is often assessed by means of 'famous persons' or 'famous faces' tests, this issue is of special relevance for the present investigation. Usually, these patients are unable to name people from pictures, voices or descriptions, whereas they are able to give detailed information about the people they cannot name. Recognition, matching-to-sample techniques and phonemic cueing at least in combination with semantic cues have been shown to be beneficial in most of the cases studied. Thus, proper name anomia has been understood by means of an inability to deal with pure referential, non-descriptive semantic relations [45], a difficulty to retrieve arbitrary relations [19], a breakdown of a central store of semantic information about people [11] or by means of a learning deficit [47]. On the contrary, selective sparing of proper names in conjunction with severe impairments of memory for common nouns has been observed in cases with left posterior damage [6, 25, 34, 46] and has been related to the fact that common names are more prone to interference [6], are less emotional and meaningful [45] or do not represent definitions and are thus less crystallized [34, 46].

Right temporal lobe lesions with damage to its anterior [11, 13] and posterior parts [17] have been shown to lead to a similar picture of proper name anomia as in left hemispheric cases. One of these patients had progressive atrophy of the anterior right temporal lobe and showed prosopagnosia with spared knowledge of people from names at the beginning of the disease, which progressed to a cross-modality loss of person-based semantic knowledge 9 months later [13]. Another case showed only covert access to semantic information related to the people in question [17]. A case with bilateral lesions of the medial parts of the temporal lobes with a dominance of right hemispheric pathology displayed the opposite pattern of results to those usually observed in patients with proper name anomia. This patient showed a preserved ability to name famous people as well as family members but was severely deficient in the recall of salient episodic information related to the people he could name [32].

In sum, unilateral left temporal lobe lesions may be sufficient to cause retrograde memory losses, which seem to be more pronounced if the test used relies heavily on the patient's naming capacity. Given that very few patients with unilateral lesions of one temporal lobe have been studied with respect to remote memory, this investigation was carried out to investigate: (1) whether or not patients with unilateral lesions in one of the temporal lobes show retrograde memory deficits concerning famous events and persons of well-defined low salience and

item probabilities; (2) whether there is a dissociation between left and right temporal patients; (3) whether a difference between hippocampal involvement and damage to more lateral regions sparing the hippocampi can be detected; (4) whether recognition improves remote memory when compared to free recall; (5) whether a temporal gradient can be identified; and (6) whether the deficits differ from those of patients with moderate to severe head trauma of various origin.

Methods

Patients

A consecutive group of 15 patients with cerebral tumours, who had undergone excisions of the temporal lobes, were studied. Six patients (three males) were left hemispheric (LTL), and nine were right hemispheric (RTL, four males) cases (Table 1). All of them were operated on in the Clinic for Neurosurgery at the University Hospital in Kiel. One LTL patient (No. 1) and four RTL patients (Nos 7–10) had tumours affecting the hippocampus. In two LTL (Nos 5 and 6) and in one RTL patient (No. 11), the tumours were located within the parahippocampal gyrus. In three further LTL (Nos 2–4) and two RTL patients (Nos 12 and 13), the tumours were sited in the anterior parts of the temporal lobes, whereas in two RTL patients (Nos 14 and 15), the dorsal-posterior parts were affected. Patients with concomitant neurological diseases or psychiatric disorders were excluded.

Eleven trauma patients (eight males) were recruited from a specialized clinic for patients who have suffered traumatic brain injuries of various origin (Table 1; Nos 16–26). All of them were in-patients and were studied for a mean duration of 3.1 months after their accidents. In three patients, the main site of the lesion was left hemispheric (Nos 17, 21 and 24), in two patients, the right hemispheres were primarily affected (Nos 19 and 22), and in the remaining six patients, the brain was damaged bilaterally.

Healthy controls

In addition, a healthy sample of 214 subjects was investigated with respect to normal remote memory for famous persons and names. Subjects were recruited from eight age groups ranging from 35 to 75 years of age (Table 2). Within each age group, the subjects were recruited as closely as possible to census data with respect to age, sex, income and rural/urban distribution. Overall, 38.5% of the subjects were male, and 53.7% were residents in regional capitals. Family income was rated 'low' for 15.0% of the participants, 'average' for 50.9% and 'high' for 34.1%. Only those subjects, who had not left well-defined regions in the north-western part of Germany throughout their lives, were investigated. This was the distribution area of the newspaper that served as the database for item collection (see below). A maximum of 6 months outside this region was accepted for a subject to meet the inclusion criterion.

Measures

Background variables. Two estimates of premorbid cognitive functioning were used. Firstly, the MWT-B [27], a test of word recognition, which is functionally equivalent to the widely used NART test [37], was administered. Secondly, premorbid intel-

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