Memories of a Sea Horse

Roger A. Brumback, MD; Richard W. Leech, MD

In the late 1500s, the anatomist Arantius sliced through the temporal lobe to expose a convoluted structure lying on the floor of the inferior horn of the lateral ventricle. This he called the hippocampus because of its resemblance to the Mediterranean sea horse:1-3.

At the base of these ventricles, which face inward toward the median line, an elevation of white substances rises up and, as it were, grows there. This is raised up from the inferior surface like an appendage, and is continuous with psalloid body, or lyra. In its length it extends toward the anterior parts and the front of the brain, and is provided with a flexuous figure of varying thickness. This recalls the image of a Hippocampus, this of a little sea-horse. Rather, perhaps it suggests the form of a white silk-worm, embracing at that point the beginning of the spinal marrow...Of this structure the part constituting the head is nearest to the ventricle known as the third, but the body, bent back and passing over into the tail, is drawn forward toward the anterior parts. So, for the purpose of distinguishing the ventricles above, it has been found convenient to refer to them as the ventricles of the Hippocampus, or of the silk-worm.1

A century later, the term pes hippocampus was used to describe this same structure, and two centuries later anatomists likened this structure to a ram's horn or to the horns of the ancient Egyptian god Ammon.1,2

Over the years, the nomenclature was the most controversial aspect of this structure. Recently, however, the term hippocampus has gained acceptance as the correct name for this whole specialized structure in the temporal lobe (including the dentate gyrus and pyramidal cell layer), pes hippocampus describes the convoluted anterior portion that is grossly visible on the floor of the temporal horn of the lateral ventricle, and cornu Ammonis (or Ammon's horn) refers to the layer of pyramidal neurons, which has four subdivisions (CA1, CA2, CA3, and CA4).1-6 In this issue of the Journal of Child Neurology, Braak and colleagues review the latest ideas concerning the anatomy of the hippocampus and related structures.7

Despite the centuries of fascination with this esthetically pleasing structure, its important role in memory functions was not apparent until the late 1950s, when Scoville and Milner described a 27-year-old man (patient HM) who had permanent amnesia following bilateral anterior temporal lobectomies.8 Since that time, numerous human and animal studies have defined the complex nature of the circuitry of the hippocampus involved in a variety of cognitive and memory processes.9,10

Pathologic changes in the hippocampus were first clearly described in 1880 by Sommer who identified atrophy associated with epilepsy.11 The designation Sommer's sector has subsequently been applied to the CA1 segment of Ammon's horn, which seems particularly susceptible to hypoxic-ischemic neuronal injury.

It has been well recognized that structural abnormalities of the temporal lobe can usually be found in most cases of temporal lobe epilepsy.12 However, the explosive growth of seizure surgery popularized the concept that Ammon's horn sclerosis (neuronal loss and gliosis in Ammon's horn) was found in as many as 70% of cases of uncontrollable temporal lobe epilepsy,13,14 but whether this sclerosis is a cause or consequence of the epilepsy has long been debated.15 Theories for the etiology of Ammon's horn sclerosis have included an hypoxic-ischemic insult occurring sometime between birth and early childhood or prolonged febrile seizures leading to hypoxic-ischemic destruction of the pyramidal neurons.16 However, more recently it has been suggested that Ammon's horn sclerosis may represent a malformative lesion in which abnormal circuitry predisposes to the genesis of epileptiform activity.14 Whichever side of this debate one choses, the neuropathology of temporal lobe epilepsy is complex and highly variable. Sclerosis (gliosis) has often been identified in areas of the temporal lobe outside the hippocampus such as the amygdaloid nucleus and adjacent cortex and even distant structures such as the thalamus and cerebellum.17 Also, abnormalities other than hippocampal sclerosis may be identified in seizure patients, including gliomas, hamartomas, vascular anomalies, perivascular lymphocytic cuffing, disorganization of the cortex, neuronal ectopias, and focal mineralizations.17-21
The anatomy, biochemistry, and physiology of the temporal lobe remains as challenging today as at any time in the past. Within the temporal lobe lies the ever enigmatic hippocampus, and it is increasingly necessary that child neurologists understand the normal architecture and function of this important structure.

References