CYSTIC FORMATIONS ASSOCIATED WITH HUMAN SPINAL NERVE ROOTS

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Since the description by Tarlov14-17 of cystic dilatations along the sacral nerve roots and the subsequent elaboration of a clinical syndrome of pain associated with these lesions, a considerable number of papers on this subject have appeared in the literature. Many of these articles have been concerned chiefly with confirmatory clinical reports of patients in whom this condition was present, and with various diagnostic and therapeutic ramifications. In addition, extensive discussions of the anatomical, histological and pathological nature of these lesions have been presented by Tarlov14-17 and Rexed.5-7 Taheri et al.,8-10 Strully and Heiser,12 and others1,8,11 have demonstrated the occurrence in the lumbar and sacral region of cyst-like meningeal diverticula by Pantopaque myelography, and subsequently verified the presence of these formations at surgical exploration.

The above descriptions have been concerned largely with lesions found in association with the lower lumbar and sacral nerve roots, although reports of their presence in the thoracic and upper lumbar roots had been made earlier by Marburg,3 Hinrichs,2 and later by Tarlov.17

It is of interest that no detailed analysis of the extent or frequency of occurrence of these cysts had appeared in the literature prior to the monograph by Tarlov17 in 1953, in which he reported 13 patients with cystic lesions of the spinal nerve roots out of a total of 90 dissections of the spinal canal. However, only the sacral canal was examined in 30 of these cases.

MATERIAL AND METHOD

The purpose of this paper is to present some of the data and observations made in a study of spinal nerve roots and ganglia removed during 100 consecutive autopsies of the human spinal canal. Over 2,000 spinal nerve roots and their ganglia were observed grossly, and approximately 1,000 specimens were prepared for routine microscopic examination with hematoxylin and eosin. When indicated, selected material was sectioned serially, or studied with multiple histological techniques including cresyl violet, Mallory’s tri-chrome, and intensified protargol, as described by Stotler.10

OBSERVATIONS

The material analyzed revealed cyst-like formations in 9 patients. In all instances they were multiple, the number per patient varying between 5 and 13. There was a marked tendency for symmetrical involvement of the nerve roots. Their location comprised thoracic, lumbar, and sacral roots. The most rostral spinal nerve root found involved was the 5th thoracic, and the most caudal was the 3rd sacral. No attempt, however, was made during the study to remove roots below the 3rd sacral. The cysts were always found proximal to the dorsal root ganglion and were intimately associated with the dorsal root. A definite gradient existed with respect to size, the smaller cysts being the more rostral, and the larger the more caudal. While most of the cysts were macroscopic in size and readily seen at autopsy, several were demonstrable only by microscopic preparations.

In all 9 patients there was no history of a neurological disorder prior to the terminal illness, and in 6 of the patients death was unassociated with a neurological disease. One patient died of a subarachnoid hemorrhage following rupture of an aneurysm of the right internal carotid artery, another of an acute

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Fig. 1 (left). A collection of four blood-filled cysts from patient who expired from massive subarachnoid hemorrhage. Prominent nerve root shown is the ventral root (V). These particular cysts are from 0.5 cm. to 1.5 cm. in diameter.

Fig. 2 (right). Two perineurial cysts filled with blood. They have been sectioned to show opposing cut surfaces. Note difference in appearance of clot in the two specimens. Microscopic sections showed a marked difference of meningeal reaction, confirming a clinical impression that the patient had several episodes of bleeding within the terminal period of illness.

tuberculous meningitis, and the third from an extensive bronchogenic carcinoma of the right lung with involvement of the right brachial plexus. This patient had expired 1 week following a left high-cervical cordotomy. The ages in this group of patients ranged from 43 to 79 years. However, within the total of 100 patients autopsied, the first eight decades of life were represented.

As previously stated, the cystic formations were always in association with the dorsal root and proximal to the dorsal root ganglion. This is in agreement with the observations of Tarlov. Why the ventral root has never been found to be the site of this formation is not completely clear. The explanation most likely involves the difference in the development and structure of dorsal and ventral roots and the relationship of the spinal meninges to the roots distal to the hiatuses of the nerve roots. In all instances it was possible to identify readily the dorsal and ventral roots and to follow their course and eventual junction.

The cysts were filled with a clear, watery fluid and several could be emptied and refilled in situ by alternate compression of the cysts and the spinal dural sac, demonstrating a free communication with the spinal subarachnoid space. In the patient with subarachnoid hemorrhage, the multiple cysts were all filled with dark blue, clotted blood, giving an appearance not unlike ripe grapes (Figs. 1 and 2).

Microscopically, the cystic cavity is lined with arachnoid, and proliferative, densely layered accumulations of arachnoid form a significant portion of the wall of the cyst. Dense collagenous fibers derived from and continuous with the dura mater of the dorsal root sleeve constitute the outermost layer, although in places this was stretched to the point of extinction. In no instance was the entire nerve root found to lie free within the cystic cavity, but the fascicles were compressed and distorted, and usually were lying along the dorsal margin of the wall. Several microscopic specimens showed marked intrafascicular dilatations and arachnoidal proliferations which could in serial sections be seen to communicate with the main cystic cavity.

Of particular interest was the absence of frank changes associated with degenerative processes, either of the cyst proper or of adjacent structures. A notable exception was the dorsal root ganglion, where compression