VERTEBRAL ARTERY INSUFFICIENCY IN ACUTE AND CHRONIC SPINAL TRAUMA

WITH SPECIAL REFERENCE TO THE SYNDROME OF ACUTE CENTRAL CERVICAL SPINAL CORD INJURY*

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For many years surgeons have been puzzled by the fact that some patients with injuries of the cervical spine have sustained severe neurological deficit without alteration in the alignment of the bony spine. This neurological disability frequently has followed a definite pattern which was described several years ago as the "acute central cervical spinal cord injury syndrome." It was thought that this syndrome resulted from a certain type of cervical cord "contusion." However, careful neurological evaluation of subsequent cases has suggested that this syndrome also may be caused by a second mechanism, namely, one of "partial" or "relative" insufficiency of the vertebral artery to the cervical spinal cord.

In this paper 4 cases are presented to demonstrate the mechanisms involved and to support the evolution of these concepts.

CONTUSION

In 1948 Taylor and Blackwood described paraplegia in patients with hyperextension injuries of the cervical spine with normal radiographic appearances. Three years later Taylor demonstrated conclusively by myelography in cadavers with cervical spondylosis that there was simultaneous encroachment by the hypertrophic spur anteriorly on the cord as well as impingement posteriorly by the wrinkled ligamentum flavum in hyperextension. This resulted in severe compression or "squeezing" of the cervical spinal cord. Schneider et al. reported that when this occurred the center of the cervical cord received the major damage resulting in a group of symptoms designated as the "acute central cervical spinal cord injury syndrome."

The syndrome "is characterized by disproportionately more motor impairment of the upper than of the lower extremities, bladder dysfunction, usually urinary retention, and varying degrees of sensory loss below the level of the lesion. If the findings are caused by central cord destruction with bleeding, hematomyelia, there may be caudal or cephalad extension of the lesion with further progression of symptoms, perhaps culminating in complete tetraplegia or death. But if the symptoms are caused by concussion or contusion, with an edematous type of central cord involvement, there may be gradual return of function in a definite sequence. The amount of recovery depends upon the degree of edema present compared to the extent of hematomyelia (Fig. 1). The lower extremities tend to recover motor power first, bladder function returns next, and finally strength in the upper extremities reappears, with the finer finger movements coming back last. The varying degrees of sensory impairment do not follow any set recovery pattern."17

This syndrome was first described in 1954 with a presentation of 9 cases. Four years later another report of an additional 12 cases

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was published.\textsuperscript{20} One of these (Case 9)\textsuperscript{17} presented the first pathological proof in support of the proposed syndrome. Fig. 2 shows the cervical segment of the spinal cord of a 72-year-old man with cervical hypertrophic arthritis who had sustained an hyperextension injury with the pattern of acute central cord injury and had followed the classical pattern but with only partial recovery. He died of atelectasis and pneumonia 1 month after injury.\textsuperscript{20}

The explanation of the clinical pattern still seemed satisfactory from a motor standpoint, but puzzling facts remained unexplained in connection with the sensory findings. In some of the patients showing the syndrome there was an immediate complete loss of all sensation, while in others there was little or no alteration of the sensory pattern.

There are some patients with cervical hypertrophic arthritis who sustain “deceleration hyperextension cervical spine injuries” (the authors have discarded the term “whiplash”) with some degree of transient neurological disability. This is caused by oscillation of the head forward and backward without any apparent fracture or dislocation of the hypertrophic cervical spine. It may be associated with marked transient motor impairment and only a minimal degree of sensory loss, which is confined primarily to impairment of the cervical sensory root. This is illustrated by the following case.

Case 1. J.S., a 58-year-old man, was admitted to the hospital on Aug. 16, 1939, following an accident in which his slowly moving car was struck from the rear by another vehicle. The patient did not strike his head nor lose consciousness, remembered the sound of the crash, and could describe accurately the following course of events. Immediately after the crash, he had “numbness” of...