The Facilitated Segment

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Under normal circumstances the spinal cord functions largely in a vertical direction, connecting higher centers of the central nervous system to the various spinal nerve roots. It also serves to interconnect nerve roots vertically with each other.

A spinal-cord segment is the terminology applied to a transverse level of the spinal cord. The segment, therefore, includes the two dorsal (sensory) nerve roots and the two ventral (motor) nerve roots. Thus, each spinal cord segment is composed of four spinal cord nerve roots, the internuncial neurons which connect sensory with motor neurons at that transverse level, and the connections with the ascending and descending tracts at that given level.

The spinal cord has generous communication with the sympathetic para vertebral chain ganglia at each segment between C-8 and L-3 (there is some individual variation at the extreme ends) via the gray and white communicating rami.

Spinal cord communication with the parasympathetic division of the autonomic system is at the level of the medulla and above, and via sacral segment nerve roots 2, 3, and 4.

When conditions are such that the components of a given transverse spinal cord segment are forced to function under abnormal circumstances, the transverse segment of the spinal cord may become hypersensitive to incoming stimuli and hyperactive in its motor function. When this occurs this transverse segment of the spinal cord is spoken of as being in a state of facilitation. It is commonly called the facilitated segment in neurophysiological circles. This concept of the facilitated segment was first presented in the literature by I. M. Korr, Ph.D. Dr. Korr was a researcher and physiologist at the Kirksville College of Osteopathy and Surgery when he developed this concept in the early 1940's.

The facilitated segment may be considered as a neuronal magnifying lens. It seems to gather impulses into it. It does not spread its sensory input but rather it accumulates and hoards not only those stimuli which come into it through its own segment, but also impulses which are attempting to pass through the facilitated (transverse) segment on their journey between other transverse segments and higher centers of the central nervous system. Thus, the facilitated segment is always sitting on the very edge of sending out a mass of efferent motor nerve impulses to the various end organs which it innervates. This characteristic has caused the facilitated segment to be thought of as hyperexcitable a well as hypersensitive.

Experimental work by Drs. Korr, Denslow and their associates has demonstrated electromyographically an increased electrical activity of the muscles which are served by the nerve roots and nerves of the facilitated segment. Increased stimulus into the nervous system almost anywhere will result in increased electrical activity of those muscles related to a facilitated segment.

These measurable increases in facilitated segment motor activity were induced by several means. Some of the methods used were: 1) subject sitting on a chair with a non-horizontal orientation; 2) subject standing on a slanted floor; 3) other postural stresses; 4) induction of anger; 5) induction of fear; 6) showing blurred moving pictures to subject; 7) inducing pain by pin-pricking other parts of the body; 8) pressure on the related spinous process, and 9) pressure on distant spinous processes.

The overt physical manifestations of the facilitated segment are numerous. There is pain when the related spinous process is pressed. There is hypertonus in the related paravertebral muscles. There is a ropiness and a shoddy feel to the related connective tissue. There is a restriction of motion of the area. This lack of mobility is both gross and subtle. Joint motion is reduced as is the physiological craniosacral motion amplitude. There is autonomic nervous function change as evidence by either increased redness or pallor of the involved region. There is also change in sweat gland activity. The skin over the region of the facilitated segment will either be more moist or drier than the surrounding area.

The facilitated segments seem to occur at areas of focus for postural stress, at sites of trauma, and at segmental levels related to visceral problems. Once a facilitated segment occurs it becomes a self-perpetrating problem. That is the hyperactivity of the motor root causes the related sympathetic ganglion to become hypertonic. This in turn causes dysfunction of all autonomically influenced end organs in the segment. Visceral blood supply is reduced. The devitalized viscera then sends increased quantities of sensory stimuli back to the segment causing it to further facilitate. Skin sensitivity and pain sensitivity are increased which also sends increased sensory impulses to the segment in question causing further facilitation. Muscle and connective tissue tones are increased which again causes an increase in sensory input to the segment and further facilitation.

The discomfort of the facilitated segment causes increased impulse bombardment from higher centers of the central nervous system. The decrease in mobility causes stasis and edema which result in further discomfort and heightened stimulus input to the segment which further increases its level of facilitation.

The story continues and it is easy to see how the facilitated segment becomes a self-perpetuating vicious circle. The vertical location of the transverse facilitated segment determines the clinical syndrome which it will foster. A facilitated segment at T-4 will contribute to heart devitalization, at T-10 to gall bladder problems, at T-12 to kidney dysfunction, at L-5/S-1 to urogenital problems, etc. The clinical manifestation is dependent upon which viscera are innovated by the autonomic and motor outflow of the specific transverse spinal cord segment which is hyperactive and hypersensitive, and upon duration and degree to which it has been facilitated. A viscera can cause the facilitated segment as can musculoskeletal stress. Once the segment becomes facilitated all of the structures, connective tissue, muscle, bone, blood vessels, skin, sweat glands and internal organs will become deleteriously effected. The whole segmental complex is more vulnerable to any disease process which may present itself.

Therapeutically any approach which can interrupt the self-perpetuating activity to the facilitated segment will work. The stimulus input to the segment must be reduced and the body response to the increased motor impulses outflow must be reduced. Effective therapeutic approaches therefore include those which will relax the muscles, such as massage or manipulations, those which will mobilize the area and thus reduce stasis and edema such as structural manipulative therapy, those which will reduce postural stress such as Rolfing and Alexander Technique, those which will reduce the number of signals from higher centers of the central nervous system such as relaxation techniques, biofeedback, hypnotherapy, psychotherapy, tranquilizers, etc.

When one considers the concept of the facilitated segment in its entirely as an ethologic agent for somatic dysfunction and visceral disease it is easy to see why such a wide variety of therapeutic approaches offers positive results.

Any means which is effective in desensitizing the facilitated segment and thus interrupting the vicious circle is efficacious and should be used. To focus on any one modality of treatment is to settle for less than maximal benefit.