

INTERVERTEBRAL DISC LESIONS

A New Etiological Concept

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Our knowledge of the pathology of the intervertebral discs is a modern development, mostly within the last quarter century. It is more than likely that lesions of these structures were equally if not more prevalent in earlier times, but were not generally recognized until X-ray technique became a major factor in physical diagnosis. Another reason for non-recognition of these lesions may have been the fact that the vertebral column is so firmly bound together with ligaments and fasciae that it has not been customary to make minute examination of these structures in routine anatomical dissections or post-mortem investigations. The extensive post-mortem studies of Schmorl (1927-1932) gave initial impetus to the subject, following which there has been a constantly expanding bibliography.

The intervertebral disc lesions most commonly met with consist of mass or partial displacement ("slipping discs") or rupture of the annulus fibrosus with herniation of the semi-fluid nucleus pulposus, often resulting in disabling neurological lesions from impingement on spinal nerve structures. These lesions of the discs have usually been related etiologically to traumatism, although a definite history of such is obtainable in a minority of cases. The possibility of preconditioning etiological factors, in the form of degenerative changes, has been intimated by most writers, but the exact nature or cause of such changes has not been clarified.

In the earlier etiological concepts, the role of congenital defects was emphasized. Later functional strain, or traumatism superimposed upon such faulty tissue, was given prominence. According to Beadle,¹ "It is submitted as the most probable theory that certain faults in the texture of the cartilage matrix occur . . . and give rise to the rupture of the cartilage by minute traumatic influences that would have no effect upon perfectly normal tissue." As degenerative changes advance in the disc structure the elasticity of the annulus fibrosus and fluid content of the nucleus pulposus lessens, and this loss of function is sometimes hastened by deposition of calcium and the efficacy of the confining fibro-elastic network is lost. When the stage of rupture and herniation is reached, the resultant lacerations are often

accompanied by extensive hemorrhages, which further complicate the picture. That these lesions are not due to senile degenerative changes is shown by the age incidence, which, beginning in the second decade, reaches its peak in the fourth decade, after which it gradually declines. Key² has reported intervertebral disc lesions in young children and adolescents.

From a carefully correlated study of the nutritional background of subjects of intervertebral-disc lesions, and from the records of analogous post-mortem findings regarding the condition of cartilaginous structures in scurvy, as cited by Lind³ in his classical treatise on this subject (1753), the writer is convinced that deficiency of vitamin C plays an important etiological role in these lesions.

The most definitely established physiological function of vitamin C is that of assisting in the formation of collagen for the maintenance of stability and elasticity of connective tissues generally, and this would include the bones, cartilages, muscles and vascular tissues, in fact all tissues of mesenchymal origin. In deficiency of the vitamin, instability and fragility of all such tissues is believed to be caused by the breakdown of "the intercellular cement substance" (collagen), resulting in easy rupture of any and all of these connective tissues, which would include the intervertebral discs.

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Today the hemorrhagic tendency is regarded as a cardinal symptom of deficiency of vitamin C, or sub-clinical scurvy; but Lind³ makes a more subtle observation. After reporting that in scurvy the muscles, in post-mortem examination, are found to be so "lax and tender that they readily fall apart" he records a similar

"laxity" of the intestinal musculature, and continues: "Why the scurvy should so frequently, and in so singular a manner, affect the cartilages of the ribs, so as sometimes to separate them altogether from their connection with the breast bone, and why it seats itself so commonly in the joint of the knee, I own I am at a loss to account for."

In this connection, Lind³ cites the pathological findings of Willis, the great English anatomist, of "circle of Willis" fame, who, in his *Tractus de Scorbuto* (1667), relates a symptom which he had observed several times, viz., "a crackling of the bones upon moving the joints. Even upon turning in bed, by rubbing of the vertebrae on each other, a considerable noise was perceived, like to the rough handling of a skeleton," which, he remarks, is an almost sure sign of incurability.

Lind³ also cites similar findings reported by the great French surgeon, Poupert, whose name is linked with "Poupert's ligament," and who, in his many post-mortem studies on scurvy victims in Paris (1699), is quoted as follows: "In some [clinical scurvy cases], when moved, we heard a small grating [crepitus] of the bones. Upon

opening these bodies [post-mortem] the epiphyses were found entirely separated from the bones, which by rubbing against each other occasioned this noise. In some we perceived a small low noise when they breathed. In those [post-mortem] the cartilages of the sternum were found separated from the bony part of the ribs. All those in whose breast [chest] any matter or serosity was found, had their ribs thus separated from the cartilages, and the bony part of the ribs next the sternum was carious for four fingers breadth. . . . The ligaments of the joints [throughout the body] were corroded and loose. Instead of finding in the cavities of the joints the usual sweet oily mucilage [synovial fluid] there was only a greenish liquor. All the young persons under eighteen had in some degree their epiphyses separated from the body of the bones."

If such gross cartilaginous lesions were found in times past in frank cases of scurvy, it is only logical to conclude that lesions of lesser degree, such as we now find in the intervertebral discs, the semilunar cartilages of the knee, the sacroiliac synchondrosis, etc., may be etiologically related to deficiency of vitamin C in the many unrecognized subclinical cases of scurvy. These modern lesions of cartilaginous structures differ from those of frank scurvy only in degree. In all such lesions, whether involving dislocation of the discs or cartilages, or rupture and herniated extrusion of their collagenous contents, there is obvious evidence of loss of stability of the connective tissues involved, which can be accounted for physiologically by nutritional deficiency of vitamin C.

It would seem almost unbelievable that in this day and age, when fresh fruits and vegetables are so plentiful, any of our population should be found deficient in vitamin C; but, during the last fifteen years in the writer's practice as a nutritionist, more than five thousand qualitative chemical tests for vitamin-C status in clinical cases have been made, and less than 10 per cent of adult subjects have been found to be at optimal level in this respect. It is true our infants and young children are better provided for in this respect than at any time in the past, since it is now routine practice to include citrus and other fresh fruit juices in their diet from early infancy until they leave the nursery. Then there follows a marked nutritional deterioration, due to the inroads of candy, soft drinks, etc., and later, in teen age and early adult life, tea, coffee, tobacco and alcohol, further distort the normal nutritional pattern.

Vitamin C, aside from its action as a vitamin, is a potent chemical-reducing agent, being thus capable of neutralizing both inorganic and organic toxins, such as lead poisoning in painters, rattlesnake bite and scorpion sting. For this same reason, it has powerful chemotherapeutic effect in infectious diseases, as stressed by the author's in previous papers. But this chemical action is reciprocal, in that the vitamin suffers a proportionate loss, making less available for physiological needs. As evidence of this reverse effect, the writer has found, in clinical and laboratory research, that the smoking of one cigarette neutralizes in the body approximately 25 mg. of ascorbic acid, or the equivalent of the vitamin C content of one average-size orange. On this basis, the ability of the heavy smoker to maintain normal vitamin C status from dietary sources is obviously questionable, and this alone may

account for the prevalence of vitamin C deficiency in our modern adult population. Incidentally, the writer has found that all his intervertebral-disc cases have been heavy smokers and definitely C-hypovitaminotic by chemical test.

If the writer's hypothesis, as herein set forth, is sustained a new field is opened for the prophylactic and therapeutic use of vitamin C. Even, as a means of testing the validity of this hypothesis, supplemental therapeutic trial of the vitamin, in liberal dosage, should be made as part of the non-surgical management of all suitable cases of intervertebral-disc and other cartilaginous lesions. It is conceivable that such means might result in fixation of a slipping disc or cartilage and prevent rupture and herniation of same.

"An ounce of prevention is worth a pound of cure."

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