Lesions of the Cervical Intervertebral Disc

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By

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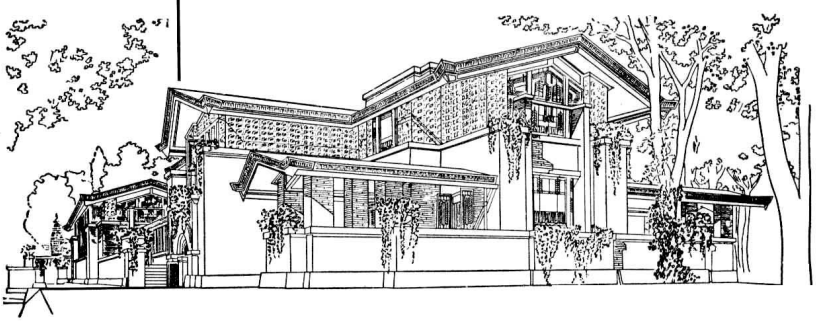

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To

Byron Stookey, M.D.

who in 1928 first described the clinical features of cervical intervertebral disc disease and who described them so lucidly and so clearly that subsequent authors have failed to find a flaw in his basic concepts.

Preface

WHEN the monograph entitled "Lesions of the Lumbar Intervertebral Disc" was published some two years ago I had hoped to start work immediately on a companion monograph, to be entitled "Lesions of the Cervical Intervertebral Disc."

Work was started as planned, but it was not long before I discovered that there were too many gaps in my knowledge for me to produce an acceptable manuscript. There followed a period of study, beginning with basic anatomy, physiology and pathology and ending with a comprehensive review of all of the pertinent literature upon the clinical aspects of the problem. Meanwhile, my personal experience with treatment of these lesions increased. This text is now offered as a summary of my present personal philosophy and practice on the subject of cervical intervertebral disc lesions. I have drawn freely from both the old and new contributions, and I have included in the bibliography the works of those authors who have had the most influence upon my present thinking.

Many pertinent questions regarding the cervical spine and its disorders still remain unanswered. I have tried to indicate the areas of nebulous thinking, in the hope that they will stimulate further research both in the laboratory and on the clinical services.

I am, as usual, indebted to many people for their help in preparing this monograph. I would be derelict if I failed to acknowledge, first, my debt to my associates, past and present, who have worked with me on this problem. Many of the ideas which I have indicated as being original with me may well have originated with one or another of them. If I have unwittingly embraced them as my own, I am sorry for the error.

My particular thanks are due to a number of others:

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the interested reader will have an easier time deciphering some of the complex problems of this subject.

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Lesions of the Cervical Intervertebral Disc

CHAPTER I

Historical Note

LESIONS of the lumbar intervertebral disc and the cervical intervertebral disc differ from each other both clinically and pathologically. The story of the recognition of the importance of both structures, however, was originally simply the story of the recognition of the intervertebral disc as an anatomic structure.

THE INTERVERTEBRAL DISC

The first recorded description of the intervertebral disc, by Vesalius in 1555, was sufficiently detailed to make clear the difference between the consistency of its outer aspect, the annulus fibrosus, and its inner aspect, the nucleus pulposus. Another three centuries were to elapse, however, before details of the embryologic and the structural anatomy of the intervertebral disc were published. Then, between 1855 and 1880, came a whole series of publications by Virchow, von Luschka, Remak and Löwe, among others. These contributions concerned the embryology and anatomy of the disc, the development of the spine and its components, and, among other points, the important role of the fetal notochord in the formation of the intervertebral disc.

Although many important anatomic studies on the intervertebral disc have appeared in the literature since 1880, none has correlated so completely the embryologic, anatomic and pathologic details of this subject as the study of Keyes and Compere, which was published in 1932. This study is a confirmation and extension of the very important studies published by Schmorl in 1927, 1928 and 1929. His postmortem studies, published in 1928, had called attention to the frequency (38 per cent) with which the nucleus pulposus was displaced into the spongiosa of the vertebral body. In 1929 he again reported many instances in which cartilaginous masses found in the spinal canal proved, upon examination, to consist of nucleus pulposus which had herniated through a defect in the annulus fibrosus. In the same year, Andrae, working independently, reported similar observations. It seems fair to say that the brilliant work of Schmorl

is really the cornerstone upon which rests our present clinical knowledge of lesions which affect the intervertebral disc.

Long before Schmorl's work was published, small, localized tumefactions extending into the ventral portion of the spinal canal opposite the intervertebral disc had frequently been observed. They were always considered true neoplasms. The earliest recorded cases of this kind were simply included, without clinical or pathologic description, in reports of tumors of the spinal cord. Later observers designated them by such terms as chondroma, enchondroma, and fibrochondroma.

Steinke, in 1918, in a group of 330 spinal tumors which he collected from the literature and which included Frazier's unpublished cases, listed 6 enchondromas, 2 of which were cervical, 3 dorsal, and 1 lumbosacral. Between 1921 and 1929 other chondromas in this location were reported by Clymer, Mixter and Mella, by Adson and Ott, and by Elsberg. Elsberg had already reported 15 cases of chondroma of the spinal cord in 1913, in a paper based on 60 laminectomies for spinal disease. At this time he clearly pointed out the similarity between these supposed tumors and certain parts of the intervertebral disc.

In 1911, Bailey and Casamajor reported 5 cases of osteoarthritis of the spine which had caused compression of the spinal cord and its roots. Their very logical explanation of these lesions was as follows: The primary pathologic process was a thinning of the intervertebral disc. As a result of this change, the vertebral bodies abutting on the disc, being without their normal protection, were readily traumatized. The end-result of the trauma was a bony overgrowth. When this overgrowth occurred posteriorly, the spinal cord and its roots were compressed, and varying degrees of paraplegia and radiculitis ensued.

The paper which Byron Stookey read in May 1927, before the fifty-third annual meeting of the American Neurological Association, on the subject of compression of the spinal cord by ventral extradural cervical chondromas, was destined to become a landmark in the clinical understanding of lesions of the cervical intervertebral disc. It is true that he still misunderstood the precise pathologic nature of the lesion, but his description of the clinical findings in relation to the anatomic location of the lesion has never been improved upon. Furthermore, in spite of the title which he gave his

paper ("Compression of the spinal cord due to ventral extradural cervical chondromas"), it is clear, when the description of the surgical specimens is read carefully, that he understood that these supposed tumors were actually not true neoplasms, since all the microscopic sections showed adult fibrocartilage. Had Stookey had the benefit of Schmorl's studies, which were to be published within the next several months, he would undoubtedly have recognized the true nature of the lesions he was describing as chondromas, and the field of intervertebral disc surgery would have opened up six years earlier than it did.

As early as 1913, Elsberg, as already mentioned, had called attention to the similarity between so-called chondromas and certain structures of the intact intervertebral disc. In 1928, Alajouanine and Petit-Dutaillis recognized that the masses in the lumbar spinal canal which had formerly been called chondromas were really made up of displaced nucleus pulposus from the intervertebral disc and thus were similar to the knorpelknötchen described by Schmorl in the studies already referred to. This report is apparently the first attempt to correlate clinical findings with Schmorl's pathologic studies.

It is interesting to note that the same concept had been arrived at by Goldthwait, 17 years earlier. His arguments, which were only theoretic, were based upon a case in which, after trauma, sciatica developed and was followed by paraplegia. It was Goldthwait's idea that as the result of trauma, the substance of the intervertebral disc might cause compression of the cauda equina. When Cushing operated upon the patient, the only positive finding was a considerable narrowing of the osseous canal at the lumbosacral junction. The anterior epidural space was not explored and the cause of the narrowed canal was never determined but the history of the case is so characteristic that Goldthwait later reported it as an instance of ruptured intervertebral disc.

In 1934, Mixter and Barr published their observations upon radicular compression as a common cause of sciatic pain. When they pointed out that the compression results from pathologic changes in the intervertebral disc, they put the last stone upon the edifice of our understanding of this lesion. As so often happens in medicine, they built upon the foundation laid by the anatomists, pathologists, neurosurgeons and orthopedic surgeons who had preceded them in

the field. That this new clinicopathologic entity was discovered by utilization of knowledge accumulated by many different investigators does not, of course, in any way detract from the brilliance of their achievement.

THE CERVICAL DISC

Although some of the early cases of so-called chondroma had involved the cervical cord, no one seems to have traced the connection between them and the intervertebral disc, even those observers who had some concept of the role of the intervertebral disc in lesions of the spine. Elliott, in 1926, was apparently the first to describe the connection between radicular symptoms and narrowing of the intervertebral foramina in the cervical area. In the case which he reported, the primary pathologic process was arthritis of the cervical spine.

The paper read in 1927 by Stookey, already referred to as a landmark in our understanding of lesions of the intervertebral disc, was based upon 7 cases, all of which were supposed chondromas located in the cervical spine. It is curious that his observations, which were published in 1928, could have been so long disregarded. They clearly pointed the way to a logical explanation of persistent radicular pain affecting the shoulder girdle and arm.

It was not until 15 years later, however, in 1943, that the contribution of Semmes and Murphey clarified the whole confused and confusing situation. In the meantime, the lesion which was later shown to originate in the cervical disc had been variously described as brachial neuritis, wry neck, and the scalenus anticus syndrome, the latter being the most universally popular diagnosis.

After Adson and Coffey's astute observations on the part played by the scalenus anticus muscle in the syndrome of the cervical rib, Naffziger (whose studies were never formally reported) found a number of patients who had no demonstrable cervical ribs and who presented symptoms not unlike those with true cervical ribs. Section of the scalenus anticus muscle and the fibrous bands beneath it usually relieved the symptoms.

In 1935, Ochsner, Gage and DeBakey described 6 patients whose clinical histories met the criteria set up by Naffziger and who had been treated by scalenotomy. They named this new entity "the anterior scalenus syndrome (Naffziger)." Many similar reports followed

in quick succession, and by 1942 scalenotomy was likely to be advised for all patients with pain in the shoulder and arm, unless they had an obvious fibrous ankylosis of the shoulder. The procedure was simple, as free from risk as any operation could be, and, curiously, was temporarily effective in a large percentage of the cases in which it was performed. This fact is now explained by the frequent finding of a so-called scalenus syndrome overlay in many diseases which affect the shoulder girdle and cervical spine.

In 1943, as already mentioned, Semmes and Murphey published their now classic observations upon lesions of the cervical intervertebral disc which extend laterally into the spinal canal and compress the nerve roots without compressing the spinal cord. It was their contention that this type of lesion explained most cases of radicular pain in the arm. They also pointed out that many cases were being overlooked because the syndrome could easily be confused with the symptoms of coronary disease. Finally, Semmes and Murphey predicted that most of the patients who were then being operated upon for the supposed scalenus anticus syndrome would eventually be found to be suffering from a rupture of the cervical disc. The paper, fortunately, was published in the *Journal of the American Medical Association* and was therefore widely read. Most neurosurgeons, after re-evaluating their cases, were soon in agreement with Semmes and Murphey that lateral lesions of the cervical disc are the most common cause of shoulder and arm pain and that the true primary scalenus anticus syndrome is extremely uncommon.

The present state of our knowledge of the cervical disc has been reached by adding together bits of information from many sources, and the names of many other investigators would be mentioned in a more comprehensive review of the history of the recognition of these lesions. Even this brief note, however, would be incomplete without mentioning the work of Raney and his associates, who called attention to the frequency with which headaches of a certain pattern accompany lesions of the cervical disc.

The two milestones which stand out in the story are: (1) Stookey's brilliant description of the clinical characteristics of these lesions, and (2) Semmes and Murphey's very accurate description of the clinical findings in laterally placed cervical disc lesions. It was the work of Semmes and Murphey which made clear the frequency of these