The Classic

Studies on Spina Bifida

F. von Recklinghausen

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- I. Spina bifida occulta with lumbosacral hypertrichosis, clubfoot, and neurogenic ulcer caused by myofibro-lipoma of the spinal cord

On March 20th in 1884, the cobbler Kieffer sought help in the local surgical clinic due to an ulcer on the outer side of his left foot; it resembled to an ulcer which I had observed in a girl in 1882. During the close examination of the patient my interest increased, as I found a hairy spot in the area of the sacrum, which resembled the lumbar trichosis of the aforementioned girl. The girl was diagnosed with spina bifida occulta, and the diagnosis was later confirmed for Kieffer by autopsy.

Part of p. 243–250 Abridged

After dividing the lumbar portion of the spine and the pelvis by a sagittal transection into a right and a left half, the most conspicuous abnormality is apparent. In order to avoid damaging the spinal cord, the line of transection was not exactly median, but 7 mm left from the medial plane. Thus, we could split the full length of the spinal canal

without opening the dural sac, with the following observations:

1. The lower end of the spinal cord, the conus medullaris, was not at the level of the second lumbar vertebra as usual, but that of the second sacral vertebra.
2. The spinal canal was wider than usual within the last lumbar and the first sacral vertebra, its cross-section formed a scalene triangle of which the right longer side was outwardly convex and measured 27 mm in height in the fourth lumbar vertebra, 30 mm in first sacral vertebra and 27 mm in second sacral vertebra, adding to an extra 10 mm.
3. This broad part was completely filled not only with spinal cord but also with a substance resembling fat tissue, which pressed the spinal cord against the front septum of spinal canal, concealed it in the back and on the side and embedded most of the nerves of cauda equina, leaving out only conus medullaris.
4. The aforementioned fat substance seemed to be an unusually developed extradural cushion of fat which often accompanies nerve fibers from the dural sac to the vertebral foramens; however, in areas where the

dura was cut the cushion of fat extended abnormally in intra dural direction, penetrated the soft meninx of the spinal cord from the back, and was elevated from the peripheral spinal cord but it still rested inseparably on its dorsal side while at the same time enveloping the spinal cord, dislocating it in ventral direction, and deforming it.

5. The dura could be seen well on the ventral side and be considered a separate membrane; even in the lowest part of the sacral canal it could be separated from the periosteum of the sacrum including the fifth sacral vertebra, but with difficulty could be traced in dorsal direction from first sacral vertebra. On one hand it was incorporated into the periosteum, but on the other hand it dispersed in fibers in the fat tissue and disappeared. In the same way the fibers, which entered the sacral canal from the outside through an opening of the tectorial membrane, dispersed in the fat tissue nestling against the canal wall.
6. Except these white bands of connective tissue there were, however, light reddish fiber tracts, clear fiber bundles (MM) themselves, which were not dendritic, but could be isolated as real linear and spindle-shaped bellies of muscles and consisted microscopically of normal transversely striated muscular fiber. The individual muscles were delicate and thin, most of them

short, 1–2 cm; however several linear muscles were up to 55 mm long, with tendinous endings that disappeared either in fat tissue or in periosteum. These muscles could be dissected and were orientated in the longitudinal direction of the spinal canal (or at a small angle to that direction), arose from the septum of sacrum vertebra canal, and terminated proximally in the fat tissue. Often the flat muscles covered each other and repeated the pinnate arrangement that is particular for the Multifidus spinae, the deep back muscles. Many muscle bellies resided compactly in the left side of sacrum vertebra canal, enclosed from this point the cauda equina and even reached the anterior side, at least in third sacral vertebra in which a narrow 15 mm long belly of an extradural muscle could be separated from the spinal cord. On the back side of the spinal canal the muscles descended to the fourth sacral vertebra, embedded in abundant fat tissue and in contact with the nerves of cauda equina. On top one could macroscopically see and show microscopically that the bellies of muscles were dispersed in loose fat tissue nearly reached the spinal cord.

7. The mass that consisted of fat cells, bands of connective tissue, and bundles of muscular fiber were not only nestled against the spinal cord from the outside but strongly coalesced with it and reached farthest on the left front side of spinal cord. After incising the mass at that point the embedded strands could be followed with groups of distinctive nerve roots emerging and distinguished by their white color and their abnormal rough consistency. The spinal cord felt firm to the touch, much firmer than the soft upper lumbar and dorsal cord but also firmer than a normally firmer spinal cord, especially on its back side. The nerve roots were inseparably attached to this indurated spinal cord, whereas they were easily moveable and easily peeled off in the fat tissue.

Fig. 1

Part of p. 253–295 Abridged

Hahn and Virchow suggested the possibility that ancient mythology designed its animal-like figures after observing human beings who have hypertrichosis as an abnormality or even a pathological heritage in the area of the sacrum, and formed the basis, especially of figures of the satyr, who was still marked in the zenith of ancient art by a hairy tail in the area of lumbar spine. We can go even further with our present knowledge and therefore can relate not only the thick hair growth of the lower extremity, but also the cloven foot in older illustrations of Satyr and associated with ailments linked with spina bifida and occurring in combination with the hairy tail in the area of the sacrum.

Part of p. 295–296 Abridged

Certainly we can now imagine how such natural phenomena inspired the minds of romancing pagans to create an individual between man and animal with a human torso and a

goat-like lower body, a basis for which is surely pathologic, but definitely not preposterous to nature. How else was it transferred from pagan mythology to the incarnated dogma and to the fine arts of Christianity and kept alive in the physical attributes of the devil for thousands of years!