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PARAPLEGIA IN INFANCY AND CHILDHOOD

Essay

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By

ABD EL MAGIED EL SERAI EL DEEB
M.B, B.Ch.

Supervised by

رسالة

Prof. Dr. SAWSAN AMIN EL SOKKARY
Prof. of Pediatrics
Ain Shams University

26649

Faculty of Medicine
Ain Shams University
Cairo

1987

سوسان امين
فوق تخصص
سوسان امين



618-92835

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

وَمَا أَوْفَقْتُمْ مِنَ الْمَدِينِ الْأَحْيَا

سورة الإسراء (آية ٨٥)



To My Family

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INTRODUCTION

PARAPLEGIA

Paraplegia means paralysis confined to the lower limbs, this may be caused by disorders of function at different levels (*Bannister, 1984*).

Paraplegia is usually due to disease of the spinal cord, less often affections of the peripheral nerves, occasionally to intracranial lesions. It may also be hysterical. Congenital cerebral disease accounts for the majority of cases of infantile diplegia (*Mackenzie, 1979*). Congenital malformation of the spinal cord or birth injury of the spinal cord are other possibilities, Friedreich's ataxia and familial paraplegia, progressive muscular dystrophy and chronic varieties of polyneuropathy tend to appear later during childhood and adolescence and are slowly progressive (*Raymond & Victor, 1985*).

Paraplegia may also be caused by a lesion of the anterior horn cells of the lumbosacral region of the spinal cord e.g. in poliomyelitis or rarely progressive muscular atrophy or by lesion of the cauda equina (*Brain, 1961*).

There are two forms of spastic paraplegia, paraplegia-in extension and paraplegia-in flexion (*Walch, 1970*).

The first step in diagnosis therefore is to decide from a consideration of their history and physical finding, whether the condition is due to disease of the upper motor neuron in the brain and spinal cord or lower motor neuron. It may also be based on the time taken for the paraplegia to develop and clinical examination, plain x-ray of the spine, examination of the cerebrospinal fluid and when necessary myelography (*Mackenzie, 1979*).

Aim of Essay

The aim of this essay is to discuss the paraplegia in infancy and childhood. The main points of the essay are to discuss the important aetiological causes for paralysis especially in pediatric age. Also, the clinical picture and investigations will be discussed. The most important and recent method for the treatment of paraplegia will be covered.

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ANATOMICAL ASPECT OF SPINAL CORD & CEREBRAL CORTEX

The spinal cord is markedly shorter than the vertebral column, the more caudal spinal roots descend for varying distances around and beyond the cord to reach their corresponding foramina fig. (2). They form largely caudal to the apex of the cord, divergent sheaf of spinal roots, the cauda equina, gathered around the filum terminale (*Young & Suckermann, 1936*).

The region of the spinal cord associated with a given pair of spinal nerves is described as a spinal segment, but there is no clear indication of segmentation apart from this. The spinal cord is supported in the vertebral canal by the filum terminale, the denticulate ligaments which are thickened portions of pia mater on either side passing laterally between the anterior and posterior roots to attach the spinal cord to the dura mater which is attached above to the margins of the foramen magnum, and on either side to the margins of the intervertebral foraminae (*Jit & Charnalia, 1959*).

The grey matter of spinal cord is central in situation in the form of a fluted column. In transverse sections, this column consists of symmetrical right and left comma shaped masses connected by a transverse grey commissure resembling the letter H. The commissure is transversed by the central canal, the grey matter in the cervical and lumbar regions is formed of two dorsal (posterior) horns and two ventral (anterior) horns. The anterior horns contain motor nuclei which give fibres of the anterior roots of the spinal nerves, the posterior horns contain sensory nuclei which receive sensory fibres from the posterior roots (*Chang, 1951*).

The spinal cord receives its blood supply through an arterial and venous system. The arteries which nourish the spinal cord are derived from the vertebral, ascending cervical, costovertebral, intercostal, lumbar, ilio lumbar, and lateral sacral arteries, of these parent arteries, only the

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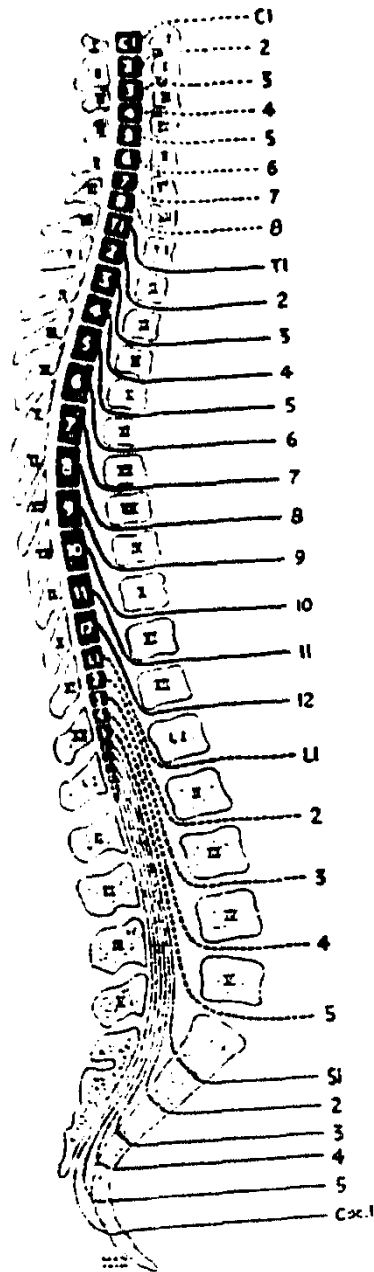


Fig. 2: The relation between the spinal cord and the vertebral column (Swaiman & Wright, 1982).

vertebral arteries are vulnerable in injuries of the spine they may be torn or occluded in fracture-dislocations of the cervical spine. Just caudal to the point at which the vertebral arteries merge to form the basilar artery, each vertebral artery contributes a branch which runs downward in front of the medulla oblongata. At the level of the foramen magnum these two branches unite to form a single anterior spinal artery which extends along the entire anterior surface of the cord, lies over the anterior median fissure, and is covered by rather thick pia mater. It tapers as it proceeds caudally in the upper thoracic cord and often deviated to the right or left to receive branches. Each vertebral artery also yields a branch near the lateral margin of the medulla oblongata to become a posterior spinal artery as they progress downward. The delicate veins of the spinal cord emerge from the interior and drain into six main longitudinal channels. Three veins are situated on the anterior surface of the cord, the anterior central vein lies in close proximity to the anterior spinal artery, there are two anterior external veins, one on each anterolateral sulcus. Combined, they make up the anterior spinal venous trunk and drain the anterior portion of the cord and possibly, additional portion of the lateral columns. There are also three veins on the posterior surface of the cord, which, with their anastomoses, make up the posterior venous trunk, the posterior central vein and the two posterior external spinal veins. They drain the greater portion of the dorsal cord, some blood drains directly into the posterior radicular veins. Finally, those channels unite to form a single vein in the neighbourhood of the dura, the blood then passes into the longitudinal venous sinuses and then drains into vertebral, intercostal, lumbar, and sacral veins (*Daniel, 1977*).

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The Cerebral Cortex

The cerebral cortex forms a complete mantle or pallium covering the hemisphere and obviously variable in thickness, it is thicker on the exposed convexities of gyri than in the depths of sulci. In its microscopic structure the cortex of the cerebrum, like grey matter elsewhere consists of an intricate blending of nerve cells and fibres, neuroglia and blood vessels (*Warwick & Williams, 1973*).

The precentral area

The Convexity of the frontal lobe has four principal convolutions:

1. a precentral gyrus that parallels the central sulcus and,
2. three horizontally oriented convolutions, the superior, middle and inferior frontal gyri.

The precentral area includes the whole of the precentral gyrus and the posterior parts of the superior middle and inferior frontal gyri (area 4,6), the precentral area has been divided into posterior and anterior parts, motor (area 4) and premotor (area 6).

A feature of the whole precentral area is the prominence of pyramidal nerve cells of all sizes, the largest of these the giant pyramidal cells of Betz. It is clear that the huge majority of corticospinal and probably corticobulbar fibres are derived from smaller pyramidal cells (*Carpenter, 1976*).

The supplementary motor area like other projection areas, sensorimotor in nature, but being predominantly motor and in the frontal lobe. It is anterior to, and probably confluent with the medial extension of the first somatomotor area into the paracentral lobule which mediates leg and perineal movement (*Warwick & Williams, 1973*).