Evaluation of Different surgical Modalities in the Management of Spinal Intradural Cord Tumors in Children and Adolescents

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By

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List of abbreviations

ATP: Adenosine tri phosphate.

CE: Contrast enhancement.

CNS: Central nervous system.

CSF: Cerbrospinal fluid.

CT: Computed tomography.

CUSA: Cavitron ultrasonic surgical aspirator.

DIT: Diffusion tensor imaging.

DREZ: Dorsal root entery zone.

EMSCTs: Extra medullary spinal cord tumors.

GBM: GlioblastomaMultiforme.

IMSCTs: Intra medullary spinal cord tumors.

IV: Intravenous.

MEPs: Motor evoked potentials.

MIS: Minimal invasive surgery.

MMFG: Modified McCormick functional scale.

MRI: Magnetic resonance imaging.

MRS: Magnetic resonance spectroscopy.

Nd:Yag Laser: neodymium-dopted yttrium aluminium garnet laser.

NF: Neurofibromatosis.

OPC: Oligodendrocyte precursor.

PNET: Primitive neuro-ectodermal tumor.

PNS: Peripheral nervous system.

PO: Per oral.

SCT: Spiral computed tomography.

SLT: Surgical laser technology.

SNR: Signal to noise ratio.

SRS: Stereotactic radiosurgery.

SSEPs: Somato sensory evoked potentials.

T1WI: T1 weighted image.

T2WI: T2 weighted image.

VEGF: Vascular endothelial growth factor.

VHL: Von Hippel – Lindau.

WHO: World Health Organization.

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AIM OF THE WORK

The aim of this work is to determine the relationship between clinical presentations, radiographic features, pathology, and surgical treatment strategies on functional outcome of newly diagnosed primary intradural spinal cord tumors in children and adolescents.

Introduction

The spinal cord is a precious part of the central nervous system, being the most vital of all connections between the brain and the body. It extends from the level of the cranial border of the atlas down to the cranial border of the first or second lumbar vertebrae.**(Fischer and Brotchi, 1996).**

Tumors of the central nervous system are common in the pediatric population and constitute the second most prevalent tumor type of childhood.**(Nadkarni and Rekate, 1999).**

The clinical presentation of primary spinal cord tumors is determined in part by the location of the tumor, and in nearly all clinical instances pain is the predominant presenting symptom **(Marc and Trent, 2011).**

Diagnosis of a primary spinal cord tumor requires a high index of suspicion based upon clinical signs and symptoms as well as spine-directed MRI **(Marc and Trent, 2011).**

Strategy has been deeply modified, mainly with magnetic resonance imaging MRI, ultrasonic aspiration, and recently, with preoperative neurophysiology. But one should not forget the value of the clinical history because (MRI) alone doesn’t guarantee an accurate diagnosis in every case **(Brotchi et al., 2006).**

Primary treatment of primary spinal cord tumors is surgical resection and predictors of outcome include preoperative functional status, histologic grade of tumor, and extent of surgical resection **(Marc and Trent, 2011).**

Surgical Anatomy

The surgical anatomy of the spine is that of vertebral column, spinal cord and their related vascular and meningeal relations. The anatomy of the spine is a road map to understand the pathophysiological changes, surgical approaches and clinical criteria.

The vertebral column:

The vertebral column consists of 33 vertebrae joined by ligaments and cartilages. The upper 24 vertebrae are separate and movable, but the lower nine are fixed: Five are fusing to form the sacrum, and the last four are usually fused to form the coccyx. The vertebral column consists of 7 cervical (C1-7), 12 thoracic (T1-12), 5 lumbar (L1-5), five sacral (S1-5), and four coccygeal (Co1-4) vertebrae. In some individuals, vertebra L5 is partly or completely fitted with the sacrum. The vertebral column is slightly S-shaped when seen from the side. The cervical spine is ventrally convex, the thoracic spine ventrally concave, and the lumbar spine ventrally convex, with its curve ending at lumbosacral angle**(Parke et al, 2011).**

- **The Individual Vertebra:**

The vertebra typically is composed of two parts; ventral heavy part the body and posterior part the arch enclosing the spinal canal and spinal cord. The arch consists of three chief parts, 2 pedicles uniting the arch to the body and a roof, the laminae. The spinous, process projects dorsally or dorsally and inferiorly. Projecting laterally from the junction of the pedicle and the lamina are the transverse process. From the upper border of the lamina at the junction with pedicle, arises the superior articular facet, on each side and from the lower border of the lamina there is the inferior articular facet on each side. The vertebral body

is roughly cylindrical but varies in the different regions of the column of human in the transverse plane, the body is convex except where the dorsal aspects complete the vertebral foramen; here it, concave, vertically, it is concave except on its dorsal aspects where it is flat **(Parke et al, 2011)).**

The intervertebral foramen is a space between pedicels of adjacent vertebrae. It is bordered anteriorly by the vertebral body and disc, and posteriorly by the articular facets. Through this foramen passes the spinal nerve with its dural sleeve an accompanying arteries and veins. In general, the foramina are longer vertically that is necessary to allow the existing of the spinal nerves. In the lumbar region, each spinal nerve occupies the upper part of each foramen**(Snell 2010).**

- **The differences in cervical vertebrae:**

Of the seven cervical vertebrae, the first two and the last require special rotation, but the third to the sixth are fairly uniform, and a common description. Because the cervical vertebrae bear the least weight, their bodies are relatively small and thin with respect to the size of the vertebral arch and vertebral foramen. In addition, their diameter is greater transversely than in the anteroposterior direction. The lateral edges of the superior surface of each body are sharply turned upward to form the uncinate processes that are characteristic of the cervicalregion. The most obvious diagnostic feature of the cervical vertebrae is the transverse foramina that perforate the transverse processes and transmit the vertebral arteries (**Parke et al, 2011).**

The anterior part of the transverse processes represents fused costal elements that arise from the sides of the body. The lateral extremities of the transverse processes bear two projections, the anterior and posterior tubercles. The former serve as origins of anterior cervical muscles; the latter provide origins