

POST-OPERATIVE NEUROLOGICAL OUTCOME OF INTRADURAL SPINAL TUMORS IN TERMS OF IMPROVEMENT IN McCORMICK'S CLASSIFICATION SCHEME

Naseer Hassan¹, Mehran Ali², Mansoor Ahmad³, Hanif ur Rehman⁴, Hamayun Tahir⁵, Raza Hassan⁶, Samir Khan Kabir⁷

ABSTRACT:

OBJECTIVES:

To determine the post-operative neurological outcome of intradural spinal tumors in terms of improvement in McCormick classification scheme.

METHODOLOGY:

Total of 95 patients diagnosed as case of intradural spinal tumor as per operational definition with any McCormick grade were analyzed. After admission and complete neurological examination, pre-operative McCormick's grades of each patient were determined and followed for one month after surgery. During their stay they were assessed for neurological improvement as per McCormick grade.

RESULTS:

There were total 95 patients presenting in OPD with the mean age of 45±12.36 years. There were 42% male and 58% female. There were 62% patients who were improved in neurological outcome while 38% patients were not improved.

CONCLUSION:

Surgical removal of spinal tumor is beneficial to the affected individual and has positive effect on his life.

KEYWORDS: *Post-Operative Neurological Outcome, Intradural Spinal Tumors, McCormick Classification Scheme, Improvement*

How to cite this article:

Hassan N, Ali M, Ahmad M, Rehman HU, Tahir H, Hassan R, Kabir SK. Post-Operative Neurological Outcome of Intradural Spinal Tumors In Terms of Improvement in McCormick's Classification Scheme. J Gandhara Med Dent Sci. 2021;8(4): 9-13

Correspondence:

¹Naseer Hassan, Assistant Professor, Department of Neurosurgery. Nowshera Medical College, Nowshera.
Cell# +92-321- 9119080

Email: dnaseerhassan@gmail.com

²Senior Registrar, Department of Neurosurgery. Nowshera Medical College, Nowshera.

³Senior Registrar, Department of Neurosurgery. Nowshera Medical College, Nowshera.

⁴Specialist Registrar, Department of Neurosurgery, Hayatabad Medical Complex, Peshawar

⁵Senior Registrar, Department of Neurosurgery. Nowshera Medical College, Nowshera

⁶Senior Clinical Fellow, Trauma and Orthopedics, Royal Free London Hospital, London

⁷Assistant Professor, Department of Orthopedics, Hayatabad Medical Complex, Peshawar

INTRODUCTION:

Spinal cord tumors account for approximately 15% of all CNS tumors,^{1,2} that are classified into two groups on the basis of their anatomical location at which they originate such as intradural and extradural. It can be defined as the mass of abnormal cell growth in the cord or its surroundings. Globally about 10-20% of primary CNS tumors are intradural spinal tumors. Unlike to western population, in Asian population the ratio of male gender is predominant. Mostly the spinal cord tumors affect both gender in pediatric age and adult's

age which is approximately 35%, out of which about 2/3rd of these lesions fall in the extramedullary category and the remaining are counted as intradural spinal tumors³⁻⁵. Pain is the most common symptom in individuals suffering from IMSCT, which are severe at night when the patient is resting. The purpose of this study is to review neurological outcomes of intradural spinal tumors in terms of improvement in McCormick's classification scheme after surgery. Intradural spinal tumors are difficult to resect and manage. This study will highlight the importance of surgery in spinal tumors and improvement in neurological status.

METHODOLOGY:

In this descriptive case series study, a total of 95 cases were studied at the department of Neurosurgery, Lady Leading Hospital, Peshawar. The sample size was 95 keeping the 55.8% proportion of neurological improvement post-operatively, 95% confidence interval, 10% margin of error using WHO sample size calculator. Duration of the study was 6 months (May 2018-November 2018). Patients were recruited by non-probability consecutive sampling techniques. Inclusion criteria were all patients with an already diagnosed case of intradural spinal tumor as per operational definition of any McCormick's classification scheme, between age of 18-60 years and either gender. Exclusion criteria were the redo cases, patients having concomitant chronic renal failure and on hemodialysis (diagnosed on history and medical records), and patients having comorbid conditions like uncontrolled diabetes mellitus (fasting blood glucose more than 126 mg/dl) and uncontrolled hypertension (blood pressure more than 140/90). According to inclusion criteria total 95 patients diagnosed as case of intradural spinal tumor as per operational definition with any McCormick grade were enrolled in our study. All the patients were diagnosed and treated in our setup. Approval was obtained from College of Physicians and Surgeons Pakistan (CPSP) and hospitals ethical committee before starting the study. The patients were included in

the study through the OPD/ER department in a consecutive manner. All patients were admitted in the neurosurgery department of the hospital for further evaluation. After taking detailed history, complete neurological examination (Motor, Sensory and Deep Tendon Reflexes) was done. Preoperative McCormick's grade of each patient was determined. All the patients were followed for one month after surgery. During their stay they were assessed for neurological improvement as per McCormick grade. By using the SPSS version 21.0, all the collected data were analyzed. Descriptive statistics was used to calculate mean±standard deviation for quantitative variables i.e. age. Frequency and percentages were presented for the qualitative variable i.e. gender and improvement. The improvement was stratified among age and gender to see effect modification. Post stratification Chi-square test was applied, keeping P value ≤0.05. All results were presented in the form of tables.

RESULTS:

All 95 enrolled patients with intradural spinal tumors completed the study. Out of total patients, 42% were male and 58% were female. Mean age was 45 years with SD ±12.36 as shown in Table 1.

Table 1: Gender, Age, Distribution of Patients (n=95)

Variable	Frequency	Percentage
Age		
18-30 Years	5	5%
31-40 Years	29	30%
41-50 Years	31	33%
51-60 Years	30	32%
Gender		
Male	40	42
Female	55	58
Improvement		
Improved	59	62
Not Improved	36	38
	Mean	SD
Age	45	12.36

Post-operative neurological outcome in terms of improvement among 95 patients was analyzed

as 62% patients had improvement in neurological outcome while 38% patients didn't have improvement in neurological outcome (Table 1). Stratification of post-operative neurological outcomes in terms of improvement with respect to gender and age is given in Table 2 and 3.

Table 2: Stratification of Improvement with Respect to Gender Distribution (n=95)

Variable	Male	Female
Improved	25	34
Not Improved	15	21
Total	40	55

Chi square test was applied in which P value was 0.9460.

Table 3: Stratification of Improvement with Respect to Age Wise Distribution (n=95)

Variable	18-30 Years	31-40 Years	41-50 Years	51-60 Years
Improved	3	18	19	19
Not Improved	2	11	12	11
Total	5	29	31	30

Chi square test was applied in which P value was 0.9656.

DISCUSSION:

Spinal tumors originate from intraspinal elements such as meninges, spinal cord, blood vessels, nerve roots etc. It may be extradural and intradural tumor⁶⁻⁸. When a spinal tumor enlarges in size it may lead to compression of spinal cord and disrupts sensory and motor loss. Surgically removal of IMSCT causes a major potential risk of postoperative neurological worsening. IMSCT affects a minor number of the population with prevalence of about 8 cases per 1 million people⁹⁻¹², but needed an appropriate assessment and management to make sure of a good result. Treating IMSCT has always remained a challenge for the surgeon. This study was conducted to determine the post-

operative neurological outcome of intradural spinal tumors in terms of improvement in the McCormick classification scheme. For the first time the removal of spinal tumor was done in 1887 by Gowers and Horsley^{13,14}.

Our study shows that among 95 patients 5% patients were in the age range 18-30 years, 30% patients were in the age range 31-40 years, 33% patients were in the age range 41-50 years and 32% patients were in the age range 51-60 years. Mean age was 45 years with SD ± 12.36 . Kenan Arnautovic et al resembled this result; according to him most of the patients were older than 20 year of age¹⁵. Moreover 42% of patients were male and 58% patients were female. Post-operative neurological outcome in terms of improvement was analyzed as 62% patients had improvement in neurological outcome while 38% patients didn't have improvement in neurological outcome. This study was similar to the study performed by Sandalcioglu IE et al¹⁶. In another study conducted by Bakhshi SK et al¹⁷ at department of Neurosurgery, Aga Khan University Hospital, Karachi, Pakistan is also parallel with our study. Another study conducted by Matthew J. McGirt et al, also resembled our study and stated that at median follow-up of 7 months, 38% patients experienced improved neurological function and 50% remained stable¹⁸. In the literature, several studies have described the predictors of neurological outcomes after surgically removal of IMSCT. Intramedullary ependymomas are associated with well neurological results compared to intramedullary astrocytomas¹⁷.

CONCLUSION:

Our study concludes that postoperative neurological outcome (improvement) was observed in 62% patients presenting with intradural spinal tumors in terms of the McCormick classification scheme. Surgical removal of spinal tumors is beneficial to the affected individual and has a positive effect on his life.

CONFLICT OF INTEREST: None

FUNDING SOURCES: None

REFERENCES:

1. Hersh DS, Iyer RR, Garzon-Muvdi T, Liu A, Jallo GI, Groves ML. Instrumented fusion for spinal deformity after laminectomy or laminoplasty for resection of intramedullary spinal cord tumors in pediatric patients. *Neurosurg Focus.* 2017;43(4):E12.
2. Kheirkhah P, Denyer S, Bhimani AD, Arnone GD, Esfahani DR, Aguilar T, et al. Magnetic drug targeting: a novel treatment for intramedullary spinal cord tumors. *Sci Rep.* 2018;8(1):1-9.
3. Wilkinson BM, Galgano M. Instrumentation following intradural tumor resection: a case analyses and literature review. *Surg Neurol Int.* 2020;11.
4. Yousaf A, Usman M, Akram MN. Positive predictive value of magnetic resonance imaging in intradural spinal tumors taking histopathology as gold standard. *Pak J Neurol Surg.* 2020;24(1):82-6.
5. Haider A, Khanzada K, Muner A, Khan A, Hassan M. To analyze outcome of spinal intradural extramedullary tumors: experience of Lady Reading Hospital Department of Neurosurgery B unit. *J Saidu Med Coll.* 2019;9(1):3-5.
6. Alizada O, Kemerdere R, Ulu MO, Akgun MY, Isler C, Kizilkilic O, et al. Surgical management of spinal intramedullary tumors: ten-year experience in a single institution. *J Clin Neurosci.* 2020;73:201-8.
7. Pillai SS, Harishankar M. Intradural extramedullary spinal tumors—a review of modern diagnostic and treatment options and a report of a series of 40 cases. *Kerala J Orthop.* 2019;32(1):41-5.
8. Behmanesh B, Gessler F, Quick-Weller J, Spyranitis A, Imöhl L, Seifert V, et al. Regional spinal cord atrophy is associated with poor outcome after surgery on intramedullary spinal cord ependymoma: a new aspect of delayed neurological deterioration. *World Neurosurg.* 2017;100:250-5.
9. Bakhshi SK, Waqas M, Shakaib B, Enam SA. Management and outcomes of intramedullary spinal cord tumors: a single center experience from a developing country. *Surg Neurol Int.* 2016;7(Suppl 23):S617.
10. Noh T, Vogt MS, Pruitt DW, Hummel TR, Mangano FT. Pediatric intramedullary spinal cord tumor outcomes using the WeeFIM scale. *Child Nerv Syst.* 2018;34(9):1753-8.
11. Chou SC, Kuo MF, Lai DM, Chen CM, Xiao F, Tsuang FY, et al. Contemporary management of pediatric spinal tumors: a single institute's experience in Taiwan in the modern era. *J Neuro-Oncol.* 2020;146(3):501-11.
12. Svoboda N, Bradac O, de Lacy P, Benes V. Intramedullary ependymoma: long-term outcome after surgery. *Acta Neurochir.* 2018;160(3):439-47.
13. Wild F, Hartmann C, Heissler HE, Hong B, Krauss JK, Nakamura M. Surgical treatment of spinal ependymomas: experience in 49 patients. *World Neurosurg.* 2018;111:703-9.
14. Khalid S, Kelly R, Carlton A, Wu R, Peta A, Melville P, et al. Adult intradural intramedullary astrocytomas: a multicenter analysis. *J Spine Surg.* 2019;5(1):19.
15. Wu J, Wu Y, Xu WL, Li GY. The surgical treatment of intramedullary spinal cord tumors: a retrospective analysis of 76 patients. *CNS Neurosci Ther.* 2018;24(6):575.
16. Ottenhausen M, Ntoulias G, Bodhinayake I, Ruppert FH, Schreiber S, Förschler A, et al. Intradural spinal tumors in adults—update on management and outcome. *Neurosurg Rev.* 2019;42(2):371-88.
17. Tahamtani F, Khoshnevisan A, Jafari M. Investigating long-term outcomes of

- surgical treatment in spinal tumors: a 10 years follow-up study. Acad J Surg. 2017;4(2):48-52.
18. Behmanesh B, Gessler F, Dützmann S, Dubinski D, Imoehl L, Seifert V, et al. Natural history of intramedullary spinal cord ependymoma in patients preferring nonoperative treatment. J Neuro-Oncol. 2017;135(1):93-8.

CONTRIBUTORS

1. **Naseer Hassan** - Data Acquisition
2. **Mehran Ali** - Concept & Design; Critical Revision; Supervision
3. **Mansoor Ahmad** - Critical Revision
4. **Hanif ur Rehman** - Data Analysis/Interpretation; Drafting Manuscript
5. **Hamayun Tahir** - Drafting Manuscript
6. **Raza Hassan** - Data Analysis/Interpretation; Drafting Manuscript
7. **Samir Khan Kabir** - Data Analysis/Interpretation; Drafting Manuscript

