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Original Research Paper

Anatomy

MRI BASED STUDY OF VERTEBRAL LEVEL SPINAL CORD TERMINATION IN NORTH INDIAN POPULATION OF KASHMIR

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ABSTRACT

INTRODUCTION

Specific knowledge of anatomy is important for successful clinical procedures. Lumbar puncture may result in damage to spinal cord if anatomic knowledge is deficient. Wide range of spinal cord termination was found after invention of MRI.

MATERIAL AND METHOD

MRI of 100 adults was obtained from Radiodiagnosis Department, GMC, Srinagar. MRI was performed in sagittal and axial plane. T1 and T2 weighted sagittal MRI sequences of spine were used for localization of tip of conus medullaris. Horizontal line was drawn from most distal part of spinal cord on midsagittal image perpendicular to longitudinal axis of spine. Position of spinal cord termination was determined as vertebral segment of intervertebral disc space which is determined by line.

RESULTS

Among 100 cases observed, it was observed that spinal cord termination at L1 lower level is 38 %, 15% at L1 middle level and 14% terminate at L2 upper level.

CONCLUSION

Racial, genetic, environmental factors and different age and sex groups are responsible for differences between our study and other studies. This study provides data base for range of spinal cord termination which can be helpful to clinicians. It is helpful to anaesthetists practicing regional anaesthesia.

KEYWORDS : Spinal cord, conus medullaris, intervertebral disc.

INTRODUCTION

Specific knowledge of anatomy is important for successful clinical procedures. The communication between brain and the body parts is a very important organ of the body i.e. the spinal cord. It is prone to trauma, tumours and various degenerative diseases (1). Lumbar puncture may result in damage to spinal cord if proper anatomic knowledge of the spinal cord is deficient (2). Conus medullaris which is the terminal part of the spinal cord has always been an area of special interest, in order to make diagnosis of low lying cord in children (3,4).

Before invention of modern imaging techniques, study of termination of spinal cord was done by dissecting cadavers and it was concluded that spinal cord termination was at lower border of L1 (3,5). Wide range of termination of spinal cord was found after invention of MRI by scientists. MRI being the procedure of choice for spinal cord examination, can be of help to clinicians for doing clinical procedures (6). Anaesthetists ought to know the anatomy of spinal cord to avoid any neurological complications (7).

MATERIAL AND METHOD

In the present study, MRI of 100 adult individuals between the age group of 18 to 65 years of either sex was obtained from the Radiodiagnosis Department of Government Medical College, Srinagar. All patients with intervertebral disc diseases and vertebral column abnormalies were not included in the study. MRI was performed in sagittal and axial plane.

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In our study, T1 and T2 weighted sagittal MRI sequences of spine with patient in supine position for the localization of the tip of conus medullaris were used. Each vertebra was divided into 3 equal parts- upper, middle and lower thirds and intervertebral discs between the vertebrae were taken a separate region (8). A horizontal line was being drawn from most distal part of spinal cord on midsagittal image perpendicular to the longitudinal axis of the spine. The position of spinal cord termination was determined as vertebral segment of intervertebral disc space which is being determined by line.

RESULTS

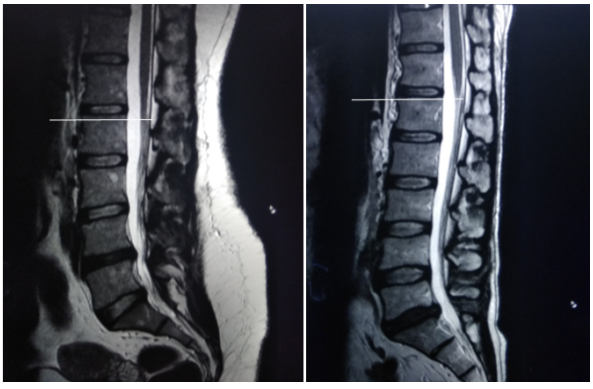
In our study, among the 100 cases observed, maximum cases have spinal cord termination at L1 and L2. After calculating percentage of individual level, it was observed that spinal cord termination at L1 lower level is 38 % which is maximum in number, 15 % at L1 middle level and 14% terminate at L2 upper level (Table 1)(Fig 1).

Table 1: Spinal cord termination at different levels among study group

Level of spinal cord termination	Frequency	%
T12-L1	4	4
L1 UPPER	10	10
L1 MIDDLE	15	15
L1 LOWER	38	38
L1-L2	5	5
L2 UPPER	14	14
L2 MIDDLE	7	7
L2 LOWER	6	6
L2-L3	1	1
L3 UPPER	-	-
TOTAL	100	100%



A –at middle L1 B- at lower L1



C- at upper L2 D-at upper L1

Fig 1: Pictures showing termination of spinal cord at different levels, white line depicting it.

DISCUSSION

In the present study, among 100 MRI, maximum number of MRI had spinal cord termination around L1 and L2 in which, 38% had termination at L1 lower level, 15% at L1 middle level and 14% at L2 upper level. Saiffudin et al (1998) conducted study on 231 men and 273 women, age between 16-85 years. The conus position was the lower third of L1 in maximum cases. Conclusion of study was distribution of conus location to range from middle third of T12 to upper third of L3 (8).

In 2005, Soleiman J et al studied MRI of 635 patients and concluded that mean spinal cord termination was at L1 middle level, range being from lower third of T11 to upper third of L3 vertebra (9). In 2009, Rahmani M et al found that mean level of conus was at upper third of L1 and range was from T12 upper third to L2 middle third of vertebra (10). Gatonga et al did a study in which the median level of termination of spinal cord was the upper third of L2 (11).

In our study, there is wide range of spinal cord termination (i.e. from T12 to L3) because spinal cord termination is being assessed by MRI rather than by cadaveric dissection.

CONCLUSION

The results obtained in present study are being compared to the previous studies. Racial, ethnic, genetic, environmental factors and different age and sex groups are responsible for the differences between our study and the other previous studies. This study is the source to provide data base for range of spinal cord termination which can be of help to clinicians performing skilled procedures like lumbar puncture. It can also be of help to anaesthetists practicing regional anaesthesia.

REFERENCES

1. JaehanKoh, Peter D. Scott, Vipin Chaudhary. An automatic segmentation method of the spinal canal from clinical mr images based on an attention model and an active contour model. Proscan Imaging of Buffalo Williamsville, NY 14221, USA.
2. Wigton RS. Training internists in procedural skills. Ann Int Med. 1992; 116:1091-1093.
3. Demiryurek D, Aydingoz U, Aksit MD, Yener N, Geyik PO. MR imaging determination of the normal level of conus medullaris. J Clin Imaging. 2002; 26:375-377.
4. Snider KT, Kribs JW, Snider EJ, Degenhardt BF, Bukowski A, Johnson JC. Reliability of tuffiers line as an anatomic landmark. Spine. 2008; 33: e161-E165.
5. Boonpirak N, Apinhasmit W. Length and caudal level of termination of spinal cord in thai adults. Acta Anat 1994; 149:74-78.
6. Preeti, Chaturvedi M. MRI study of level of termination of spinal cord (conus medullaris). International Journal of Science and Research. 2016; 5(10): 122-124.
7. Vertebral level of spinal cord termination on MRI and its correlation with age and gender in Indian population. International Journal of Biological and Medical Research. 2015; 6(3): 5087-5089.
8. Saifuddin A, Burnett SJ, White J. The variation of position of the conus medullaris in an adult population. A magnetic resonance imaging study. Spine (Phila Pa 1976).1998 Jul1; 23(13):1452-1456.
9. Soleiman J, Demaerel P, Rocher S, Maes F, Marchal G. Magnetic resonance imaging study of the level of termination of the conus medullaris and the thecal sac: influence of age and gender. Spine. 2005; 30(16): 1875-1880.
10. Rahmani M, Shabani Samghabadi MA, Vaziri Bozorg SM. Magnetic resonance imaging based determination of conus medullaris position in adults. Research Journal of Biological Sciences. 2009; 4(2): 157-159.
11. Gatonga PI, Ogeng'o JA, Awori KO. Spinal cord termination in adult Africans: relationship with intercristal line and the transumblical plane. Clin Anat. 2010 Jul; 23(5): 563-565.