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Original article

Size of cervical vertebral canal –measurements in lateral cervical radiographs & dried bones

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ABSTRACT

In this study we have determined the size of cervical vertebral canal in adult population around Jabalpur and correlate the findings with those of other workers. Mid sagittal diameter of spinal canal and anteroposterior diameter of vertebral body were measured with spreading callipers and Vernier calipers in 3rd, 4th, 5th and 6th cervical vertebrae in 100 radiographs as well as 100 sets of dried cervical vertebrae. The values of mid sagittal diameter of cervical vertebral canal are higher in lateral cervical radiographs than those in dried bones, but there is no significant difference between the values of Torg's ratio in radiographs and dried bones. The values are compared with observations of other workers. The importance of Torg's ratio in lateral cervical radiographs for determining the stenosis of cervical vertebral canal is confirmed. The values of mid sagittal diameter of cervical vertebral canal in lateral cervical radiographs and dried bones are larger than those in Japanese.

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1. Introduction

Pynae & Spillene 1956, Murone 1974 measured cervical vertebral canal & found narrower canal diameter in spondylosis cases [1-14]. Various authors have reported different measurements in radiographs. A ratio method was devised by Torg in 1986. Blackley in 1999 conducted same study on anatomical specimens. Available normal values are mainly from western population. This study was carried out in normal adult population in and around Jabalpur.

Aims and objectives of this study were following -

1. To determine the mid sagittal antero - posterior diameter of cervical spinal canal.
2. To determine the normal range of cervical spinal canal / vertebral body ratio (Torg's ratio).
3. To correlate the findings on dried cervical vertebrae and lateral cervical radiographs

2. Methods

- *100 lateral cervical radiographs,
- *100 sets of dried cervical vertebrae.

Measurements were taken in 3rd, 4th, 5th & 6th cervical vertebrae both in the radiographs as well as dried bones.

1. Mid sagittal diameter of vertebral canal (A).
2. Anteroposterior diameter of vertebral body (B).
3. Torg's ratio (A / B)

3. Results

3.1. Measurements in lateral cervical radiographs

Mid sagittal diameter of cervical vertebral canal - The mean values were 17.46 (\pm 2.11) mm, 17.38 (\pm 1.98) mm, 17.62 (\pm 2.03) mm and 17.95 (\pm 2.02) mm respectively at 3rd, 4th, 5th, and 6th cervical vertebral levels.

Anteroposterior diameter of cervical vertebral body - The mean values were 15.86 (\pm 2.83) mm, 18.09 (\pm 2.24) mm, 18.54 (\pm 2.34) mm and 19.11 (\pm 2.27) mm respectively at 3rd, 4th, 5th, and 6th cervical vertebral levels.

Torg's ratio - The mean values were 1.13 (\pm 0.23), 0.96 (\pm 0.07), 0.95 (\pm 0.07) and 0.94 (\pm 0.07) respectively at 3rd, 4th, 5th, and 6th cervical vertebral levels.

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3.2. Measurements in Dried cervical vertebrae

Mid sagittal diameter of cervical vertebral canal - The mean values were 14.38 (± 1.43) mm, 14.40 (± 1.31) mm, 14.36 (± 1.32) mm and 14.55 (± 1.21) mm respectively at 3rd, 4th, 5th, and 6th cervical vertebral levels.

Anteroposterior diameter of cervical vertebral body - The mean values were 13.83 (± 1.50) mm, 14.15 (± 1.63) mm, 14.35 (± 1.68) mm and 14.55 (± 1.51) mm respectively at 3rd, 4th, 5th, and 6th cervical vertebral levels.

Torg's ratio - The mean values were 1.04 (± 0.34), 1.02 (± 0.12), 1.01 (± 0.13) and 1.01 (± 0.13) respectively at 3rd, 4th, 5th, and 6th cervical vertebral levels.

Table 1 - Mid sagittal diameter (In m.m.) of cervical vertebral canal in radiographs

Parameter	C3	C4	C5	C6
Mean	16.69	16.65	16.90	17.05
±S.D.	±1.67	±1.71	±1.63	±1.56
Minimum	14.2	13.2	13.9	13.2
Maximum	20.4	20.3	20.0	20.2
Mean	18.46	18.33	18.56	19.10
±S.D.	±2.22	±1.91	±2.13	±1.96
Minimum	15.0	14.3	14.6	14.7
Maximum	25.4	22.1	24.7	25.41
Mean	17.46	17.38	17.62	7.95
±S.D.	±2.11	±1.98	±2.03	±2.02
Minimum	14.2	13.2	13.9	13.2
Maximum	25.4	22.1	24.7	25.4

Table 2 - Antero-posterior diameter (In m.m.) of cervical vertebral body in radiographs

Parameter	C3	C4	C5	C6
Mean	15.86	18.09	18.54	19.11
±S.D	±2.83	±2.24	±2.34	±2.27
Minimum	10.7	11.9	12.7	12.4
Minimum	23.3	23.2	27.0	28.0

Table 3 - Torg's ratio in radiographs

Parameter	C3	C4	C5	C6
Mean	1.13	0.96	0.95	0.94
±S.D.	±0.23	±0.07	±0.07	±0.07
Minimum	0.81	0.81	0.82	0.81
Maximum	1.95	1.19	1.28	1.31

Table 4 - Mid sagittal diameter (In m.m.) of cervical vertebral canal in dried bones

Parameter	C3	C4	C5	C6
Mean	14.38	14.4	14.36	14.55
±S.D.	±1.43	±1.31	±1.32	±1.21
Minimum	11.2	11.3	12.0	12.2
Maximum	19.0	18.6	17.8	18.4

Table 5 - Antero-posterior diameter (In m.m.) of cervical vertebral body in dried bones

Parameter	C3	C4	C5	C6
Mean	13.83	14.15	14.35	14.55
±S.D.	±1.50	±1.63	±1.68	±1.51
Minimum	10.7	10.0	9.3	11.4
Maximum	17.6	20.0	19.0	18.9

Table 6 - Torg's ratio in dried bones

Parameter	C3	C4	C5	C6
Mean	1.04	1.02	1.01	1.01
±S.D.	±0.34	±0.12	±0.13	±0.13
Minimum	0.80	0.81	0.80	0.80
Maximum	1.43	1.45	1.40	1.42

4. Discussion

Cervical spondylosis, a progressive and disabling disease of later life, is associated with degenerative changes and other complicating features like osteophyte formation or a herniated intervertebral disc. Acute traumatic lesions of the cervical spine are recognised as common cause of brachial neurapraxia in young athletes [15]. Patients attending outpatient department in hospitals for symptoms related to involvement of cervical segments of spinal cord form a large number. Sensory symptoms in the area of distribution of branches of brachial plexus are the commonest presenting complaint in these patients. Therefore radiologists have always taken interest in knowing about all the factors which can cause pressure on the spinal cord and the nerve roots [16-29].

A number of workers in various countries have attempted to know the anatomical basis of these disorders and to confirm the changes seen in the diameter of cervical vertebral canal in plain lateral radiographs by other special investigations like myelography, CT scan, MRI etc. They have also given data for the dimensions of the cervical vertebral canal in normal individuals, which could be used as a reference while evaluating a patient.

5. Conclusions

The values of mid sagittal diameter of cervical vertebral canal are higher in lateral cervical radiographs than those in dried bones, but there is no significant difference between the values of Torg's ratio in lateral cervical radiographs and dried bones. Thus the importance of Torg's ratio in lateral cervical radiographs for determining the stenosis of cervical vertebral canal is confirmed.

The values of mid sagittal diameter of cervical vertebral canal in lateral cervical radiographs and dried bones are larger than those in Japanese.

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