Computer-aided Measurement of Lumbar Canal Body Ratio for the Sri Lankan Population

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This study aimed to propose a computer-aided method to measure the average lumbar canal body ratio for the Sri Lankan population. Lumbar canal body ratio (CBR), the relationship between the antero-posterior diameters of bony spinal canal and lumbar vertebral body, has been considered a key method to assess the spinal stenosis which is the narrowing of the spinal canal. 110 DICOM images of 39 female and 71 male patients who underwent abdomen computed tomography (CT) scans were collected using an interviewer administered questionnaire based on a specific selection criterion where patients with sciatica, focal bony lesion and numbness in lower limb, trauma or surgery or congenital anomalies of lumbar spine and CT images with artifacts were rejected. A computer algorithm was developed using Java computer language to measure the CBR for all five lumbar vertebrae by measuring antero-posterior diameter of the lumbar vertebra bodies and bony spinal canal. To assess the reliability of the computer aided measurements, the CBR of each sample was calculated manually with the use of RadiAnt DICOM Viewer. The average CBR of lumbar vertebrae for the Sri Lankan population was obtained using the computer-aided method as 0.56725 ± 0.08544 and using the manual method 0.53723 ± 0.09561 with a 95% confidence level. Different values of CBR were obtained for male and female Sri Lankan population and CBR value was observed to be higher for female. Finally to analyze the reliability of all the measurements, the concordance correlation coefficient (CCC) was obtained using R software as 0.554 which indicated that there was a mild agreement between manual and computer-aided measurements. As a conclusion, the proposed computer algorithm could be useful in assessing the CBR in lumbar vertebrae easily with minimum human intervention to assess the lumbar spinal stenosis condition even when the patients show no symptoms.

Keywords: Canal body ratio, CBR, Lumbar vertebra, Spinal canal, Vertebral body