Research Article

MRI evaluation of variability in the anatomical landmarks in cases of lumbo-sacral transitional vertebrae as compared to normal

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Abstract

Lumbosacral transitional vertebra (LSTV) is a developmental spinal anomaly, in which the lowest lumbar vertebra shows elongation of its transverse process and varying degrees of fusion/failure of segmentation from the sacrum. LSTV has been reported to alter the biomechanics of the lumbar spine and contribute to low back pain. This study was done to assess the prevalence of LSTV, classify the types of LSTV and to determine most reliable anatomical landmark to identify the vertebral levels. The landmarks assessed by us were Iliolumbar ligaments, Coeliac artery, Superior Mesenteric artery, Right Renal artery, Aortic bifurcation and level of Spinal cord termination. We assessed 200 patients in our study. Prevalence of LSTV in our study was 23%. We found that ilio-lumbar ligament was the most reliable anatomical landmark. And we concluded that in patients with lumbarisation the anatomical landmarks were located more towards the caudal direction and in patients with sacralisation the anatomical landmarks were more towards the cephalad direction when compared to normal patients with no lumbosacral transition.

Keywords: lumbo-sacral.

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INTRODUCTION

Lumbo-Sacral transition vertebrae (LSTV) are congenital anomalies of the spine defined as either sacralization of the lowest lumbar segment or lumbarization of the most superior sacral segment of the spine. The term "LSTV" is used to avoid having to decide whether such a vertebrae is a "sacralised L5" or "Lumbarised S1"[1]. It has an incidence of 4%-30% in the general population[4]. The radiologic identification and reporting of LSTV may provide the clinician with a potential cause for the patient's symptoms and prevent erroneous numbering of the lumbar vertebrae, which may have serious implications in cases where spinal surgery is contemplated. These anomalies are usually identified incidentally. In these clinical cases, MR imaging is more often indicated, given its superior tissue differentiation within and around the spine. The degree of morphologic variation of these segments ranges from broadened elongated transverse processes of L5 vertebra to complete fusion to the sacrum. LSTV have been classified into different types by Castellvi *et al* and O' Driscoll *et al*[1]. Although LSTV can be sensitively identified on sagittal lumbar spine MRI, based on abnormal morphology of the lumbosacral junction, no standard method is established for their numbering. Techniques that have been used include determining lumbar levels by identification of the Iliolumbar ligaments, Coeliac artery, Superior Mesenteric artery, Right Renal artery, Aortic bifurcation and level of Spinal cord termination[2,3].

OBJECTIVES

1. To know the prevalence of lumbo-sacral transitional vertebrae in the general population.
2. To classify the types of transition at lumbo-sacral junction.

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3. To assess the reliability of various anatomical landmarks for the identification of the vertebral levels.

MATERIALS AND METHODOLOGY

This is a retrospective study conducted in the Department of Radio-diagnosis, Father Muller Medical College Hospital over a period of 6 months, from Aug 2013 to Jan 2014. Lumbar spine MRI of all the patients done in the department during this study period will be reviewed. All the MRI studies were obtained on 1.5T scanner (Philips Achieva 16 Ch system).All the MRI studies will be assessed for presence of lumbo-sacral transitional vertebrae, the level of spinal cord termination, levels of origin of the right renal artery, Coeliac artery and Superior mesenteric artery from the abdominal aorta, presence and level of origin of the ilio-lumbar ligament and level of aortic bifurcation. Axial, Coronal and Sagittal images all are reviewed. The vertebral levels are confirmed from a T2 sagittal view of the whole spine, which is included in the routine spine protocol in our department. The consistency of the above anatomical landmarks with respect to the vertebral levels, are then charted.

Inclusion Criteria

All patients of both sexes who had MRI LS spine done in the dept. of Radio-Diagnosis in Father Muller Medical College during Aug 2013 to Jan 2014 will be included in the study.

Exclusion Criteria

Patients with scoliosis, listhesis greater than grade 1, and with history or MRI findings of spinal trauma, tumor, surgery or infection will be excluded. Patients whose MRI study is inadequate for assessment are also excluded.

RESULTS AND CONCLUSION

Out of 200 patients, lumbo-sacral transition was seen in 47 patients (23.5%). Sacralisation was seen 33 patients (70%) and lumbarisation in 14 patients (29.7%). In patients with sacralisation Castelvi type IIIB was the most common type and in patients with lumbarisation O 'Driscoll type III was the most common type. In patients with no transition vertebra, the ilio-lumbar ligament was seen to arise from L5 vertebral transverse process in patients 127(83%), Aortic bifurcation was located at L4 vertebral level in 112 patients (73%) , the proximal portion of right renal artery was situated at L1-L2 disc space in 85 patients (55%), Superior Mesenteric artery origin was located at L1 vertebral level in 78 patients (50%), Coeliac artery origin was located at D12- L1 disc space in 76 patients (49.6%) and the Conus Medullaris was located at D12-L1 disc space in 67 patients (43%). In patients with sacralisationilio-lumbar ligament was seen to arise from L4 vertebrae in 51% of patients and in patients with lumbarisation it was seen to arise from S1 vertebrae in 71% of patients, thus shifting one level up and down respectively when compared to patients with no travsitional vertebrae. And this shift of location by one level was also seen in other landmarks as well. In majority the patients with and without transition, ilio lumbar ligament showed a relatively constant location with respect to the vertebral levels. Spinal cord ending showed a variable location in majority of patients. Hence we concluded ilio lumbar ligament was the most reliable landmark to determine vertebral levels. Thus we concluded that in patients with lumbarisation the anatomical landmarks were located more towards the caudal direction and in patients with sacralisation the anatomical landmarks were more towards the cephalad direction when compared to patients with no lumbosacral transition.

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