

Morphometric evaluation of the pedicles of the lumbar spine according to L5 lateral tilt classification

Fabio Trimarchi¹ - Giorgio Cacciola¹ - Ludovico Magaudda¹ - Giuseppe Santoro¹ - Silvia Marino² - Carmelo Milazzo¹ - Alessandro Pisani³ - Andrea Barbanera⁴ - Francesco Speciale¹

¹Dipartimento di Scienze Biomediche, Odontoiatriche e delle Immagini Morfologiche e Funzionali, Università degli Studi di Messina, Messina, Italia - ²I.R.C.C.S. Centro Neurolesi "Bonino Pulejo", Messina, Italia - ³Istituto Ortopedico del Mezzogiorno d'Italia I.O.M.I. "Franco Scalabrino", U.O. Chirurgia Vertebrale, Messina, Italia - ⁴Azienda Ospedaliera Nazionale SS. Biagio e Antonio e Cesare Arrigo, U.O.C. Neurochirurgia, Alessandria, Italia

A classification of the lumbar spine according to the pedicle lateral tilt (PLT) of L5 pedicle was recently proposed [1]. In this work the sample was divided into three categories, the first or Wing Type (WT) includes people with a PLT $>36^\circ$ (41,8%), the second or V Type (VT) includes people with a PLT between 30° and 36° (48%) and the third or U Type (UT) includes people with a PLT $<30^\circ$ (10,2%). The aim of the study is to evaluate the bone morphometric values and the distance between the pedicles and the nervous structures. Similar works are present in literature [2], but some are lack or for the size of the sample or for the parameters analysed. In our work seven parameters were considered: Pedicle Width (PW), Pedicle Height, Interpedicular Distance (IPD), Pedicle-Inferior Root Distance (PIRD), Pedicle-Superior Root Distance (PSRD), Root Exit Angle (REA), Nerve Root Diameter (NRD). In this study 325 patients were evaluated, a CT and MRI scan were taken to analyse respectively bone morphometry (CT) and distance between nervous structures (MRI). Statistically significant results were observed in five out seven categories, at L5: PW has a mean value of 18,5 mm in WT, 17,2 mm in VT and 15,8 mm for UT; PH has a mean value of 13,4 mm in WT, 12,8 mm (VT) and 11,2 mm in UT; IPD has a mean value of 29,2 mm in WT, 27,3 mm in VT and 25,8 mm in UT; PSRD has a mean value of 4,9 mm in WT, 4,6 mm in VT and 4,4 mm in UT; PDSRD has a mean value of 1,9 mm in WT, 1,5 mm in VT and 1,3 mm in UT; REA has a mean value of 43° in WT, $40,2^\circ$ in VT and $37,8^\circ$ in UT. No differences were observed for PIRD (with a mean value of 1,5 mm) and NRD (with a mean value of 4 mm). Similar results were also observed for the pedicles of L4, whereas for the proximal pedicles (L3, L2 and L1) were not observed statistically significant differences into the three categories. In conclusion, the results obtained in this paper confirms the need to adopt our proposed classification according to the anatomic differences observed into our sample; in particular VT pedicle of L5 and L4 could be considered as "complicated" in a pedicle screw fixation surgery, based on the reduced bone volume and the close distance to nervous structures.

References

- [1] Giorgio Cacciola et al. (2016) Classification of L5 according to pedicles's lateral pendance. *European Spine Journal*; 25(4): 1325
- [2] Ayhan Attar et al. (2001) Lumbar pedicle: surgical anatomic evaluation and relationships. *Eur Spine J*; 10 :10-15 DOI 10.1007/s005860000198

Keywords

Pedicle; nerve root; morphometry.