

Structure and Function: Testing a Paradigm for Classification of Sacral Morphology

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Background: The purpose of the study was to assess the validity of Fryette's sacral classification system on the anatomical collection at University of New England. The sacrum has been a bone of interest since the inception of its name (*os sacrum*; meaning: sacred bone), to the current practice of medicine where sacral mechanics account for up to 30% of the incidence of low back pain. This fact is of particular interest to those involved in Osteopathic Manipulative Treatment (OMT) where proper diagnosis and treatment of sacral dysfunction is essential to treatment of mechanical low back pain. While much anatomic, radiographic and biomechanical research has focused on determining motion characteristics of the sacrum in apparent health and disease, there is no cohesive model for describing individual variations of sacral morphology or how these data might relate to clinical examination or treatment. There are many case reports of sacral anomalies. However, there is no data available in the literature defining normal structure of the sacrum. While inferior lumbar facet angles have been measured, sacral superior facets have not. Lax et al. (1988) has described and named the angles of incidence that the facets make with the dorsal surface of the sacrum (in German), but did not measure them. Interestingly, Fryette, an author who originated a model for the description of spinal mechanics utilized in all Osteopathic medical schools, described an anatomical model for the classification of sacral morphology in 1936 based on his observations of 23 sacra. Not only did he describe variations in the shape of the sacrum, but he also qualitatively correlated these types to the facet angles. This model has hitherto never been applied in a research setting.

Methods: Specimens were collected from the UNECOM anatomy laboratory, numbered and analyzed according to Fryette's systematic classification system. This involved assigning a letter to each sacrum A through F or Mixed based on anterior/posterior convergence or divergence of the auricular surfaces at the level of the first through third sacral segments according to Fryette methodology. Sacra were then positioned parallel to the relative angle of tilt and transverse facet angles were measured by digital photography. Facet angles were then correlated to sacral types as a cohort. Data analysis was conducted with Systat 11.

Results: Specimen analysis coincided with Fryette's findings; the majority of sacra were assigned to category A or B. Upon analyzing the data, there was a significant correlation of the Fryette model with the sacral model facet angles measured in the lab ($p=.001$).

Discussion: These data illustrates the applicability of Fryette's methods. Outcomes data could be obtained for sacral type via modern imaging modalities (MRI and/or CT) to determine correlates with gender or race, and possibly with pathology or symptoms (e.g. low back pain or spondylolisthesis). This pilot study warrants further research, ideally at an osteological collection, to determine these correlations of sacral type, which could affect OMT modalities.