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Correlations between spine biomechanical parameters and clinical data for the quantitative analysis of pathologic lumbar spine and its surgical treatment

Our century is marked by an important and increasing incidence of degenerative spine diseases (causing invalidating low back pain) and of their surgical treatments that, in spite of a true explosion of dedicated methods and implants, do not always succeed to relieve symptoms and to allow a normal personal and professional life for the patient.

The purpose of this PhD project, in partnership between the Laboratory of Biomechanics, the ANRT, EuroSurgical/Spinenetwork (industry) and six clinical centres, was the analysis of correlations between spine biomechanical parameters, clinical and functional outcome of the surgical treatment and patient's quality of life, in order to better understand the biomechanical reasons of the success or failure in lumbar spine surgery and to identify the eventual key factors. After a detailed literature analysis tracing the state-

of-art, we realised a multicentric data collection (mainly retrospective) and implemented a method of quantitative analysis, based on a software allowing the calculation of biomechanical parameters from radiological exams (that we first validated).

This allowed, for 319 selected patient's files, a clinical and biomechanical "in extenso" analysis connecting clinical outcome and patient's configuration during his follow-up and highlighting the factors having an impact on the outcome (and the biomechanical parameters allowing to describe them).

Thus, some vertebral parameters were related to early detection of complications (adjacent segments disease, subsidence, loss of correction) and satisfactory clinical outcomes were associated to some values of spinal and pelvic parameters, describing normal spine geometry and balance. Moreover, quantitative biomechanical analysis based on Xrays films allowed to verify the obtained correction and its

stability over time, the normality of patient's configuration, associated to an "economical" balance, as well as the kinematics of the treated and adjacent segments.

These elements may complete clinical exam and give additional information (to the surgeon) concerning the prognosis of a chosen treatment (i.e. good or marked by a risk of recurrence or complication), modifying and supporting patient's specific/individual care. (1)

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