Sagittal plane

A sagittal plane is a vertical plane which passes from anterior to posterior, dividing the body into right and left halves.

The sagittal plane is the primary driver of disability in patients with adult spinal deformity (ASD), and spinopelvic radiographic thresholds have been established for pelvic tilt (PT), pelvic incidence (PI) and lumbar lordosis mismatch (PI-LL), and C7 sagittal vertical axis (SVA) in which disability occurs based on an Oswestry Disability Index (ODI) of 40. However, the patients' age was not accounted for in determining these thresholds and ODI has been shown to vary with age.

Recent evidence has revealed sagittal plane malalignment to be a key driver of pain and disability in this population and has led to a significant shift toward a more evidence-based management paradigm.

Deformity correction focuses on restoration of global alignment, especially in the sagittal plane, and decompression of the neural elements. General realignment goals have been established, including sagittal vertical axis <50 mm, pelvic tilt <22°, and lumbopelvic mismatch <±9°; however, these should be tailored to the patient. Operative management, in carefully selected patients, yields satisfactory outcomes that appear to be superior to nonoperative strategies.

In order to establish a sagittal plane curve reference table for standing subjects examined laterally, we determined an easily reproducible standard posture. A sample of 100 healthy subjects from 20 to 29 years of age, was chosen (43 women, 57 men). The reciprocal angulations of each vertebral body in relation to the others were fed into a digitalizer and studied by computer. The study particularly concerns maximum kyphosis, maximum lordosis, sacral base slopes, and the tilt of intermediate vertebral bodies. The dispersion of the results is remarkably wide and, within the extreme values, the distribution is irregular. Individual correlations of these values are often dispersed, but spinal morphotypology. For considerable lengths, average values cannot be used as norms, given the wide span of values. Only the extreme limits are useful for the appreciation of curves as excessive, insufficient, or inverted.

The impact of sagittal plane alignment on the treatment of spinal disorders is of critical importance. A failure to recognise malalignment in this plane can have significant consequences for the patient not only in terms of pain and deformity, but also social interaction due to deficient forward gaze. A good understanding of the principles of sagittal balance is vital to achieve optimum outcomes when treating spinal disorders. Even when addressing problems in the coronal plane, an awareness of sagittal balance is necessary to avoid future complications. The normal spine has lordotic curves in the cephalad and caudal regions with a kyphotic curve in between. Overall, there is a positive correlation between thoracic kyphosis and lumbar lordosis. There are variations on the degree of normal curvature but nevertheless this shape allows equal distribution of forces across the spinal column. It is the disruption of this equilibrium by pathological processes or, as in most cases, ageing that results in deformity. This leads to adaptive changes in the pelvis and lower limbs. The effects of limb alignment on spinal posture are well documented. We now also know that changes in pelvic

posture also affect spinal alignment. Sagittal malalignment presents as an exaggeration or deficiency of normal lordosis or kyphosis. Most cases seen in clinical practise are due to kyphotic deformity secondary to inflammatory, degenerative or post-traumatic disorders. They may also be secondary to infection or tumours. There is usually pain and functional disability along with concerns about self-image and social interaction due to inability to maintain a horizontal gaze. The resultant pelvic and lower limb posture is an attempt to restore normal alignment. Addressing this complex problem requires detailed expertise and awareness of the potential pitfalls surrounding its treatment [1].

Cervical sagittal alignment

Cervical sagittal alignment.

1)
Roussouly P, Nnadi C. Sagittal plane deformity: an overview of interpretation and management. Eur Spine J. 2010 Nov;19(11):1824-36. doi: 10.1007/s00586-010-1476-9. Review. PubMed PMID: 20567858; PubMed Central PMCID: PMC2989270.