EVALUATION OF THE POSSIBLE CLINICAL USE OF AUTOMATICALLY MEASURED COBB ANGLE USING MACHINE LEARNING TECHNIQUES

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Scoliosis is generally defined as lateral curvature of the spine but the condition is actually a 3D deformation. The curvature is defined on AP standing X-ray, by an upper and lower end vertebrae taken as a reference to measure cobb angle. Many disadvantages of this method include an error of about 5°-11.8°, resulting mainly from variances in choosing end vertebrae, also vertebral end plates often are difficult to delineate. In addition, the method is not accurate as it is based on 2D image to measure a 3D deformation.

Lately, automatic measurement with machine learning (ML) is being searched extensively. In a study published in 2021 [1], a review was made to evaluate the current clinical application of automatic cobb angle measurement, based on artificial neural networks. Actually, few studies available suggesting new methods for measurement of scoliosis angle. The much more subject that is being currently studied is vertebral segmentation and 3D reformation from biplanar x rays.

All the new methods share the same principle of cobb technique that is the largest angle of inclination. However, by this way the main source of error in the manual measurement is being avoided, which is determination of the end vertebrae. Though some studies show excellent results, till now there are limitations that preclude successful clinical applications of these methods. Limited size of training dataset is a common problem. The limited severity range of scoliosis deformity is another drawback. Also, we cannot rely on comparing the results of 3D models with the manual 2D cobb method because this may be misleading. Another very important limitation is that all the studies are retrospective though in order to successfully introduce these new methods to clinical practice, retrospective studies must be tried depending on the new methods results.

For achieving this a multidisciplinary team including programmers, radiologists and orthopedic surgeons is needed.

Conclusions: 1. Lack of consensus and criteria defining the optimal method of ML. 2. Shifting from the basic 2D measurement to a 3D method may require new severity criteria or classifications. 3. The next era of researches must involve both the standardization of ML techniques and at the same time their introduction into clinical practice.

References:

1. Chen K., Zhai X, Sun K. et al. A narrative review of machine learning as promising revolution in clinical practice of scoliosis // Ann Transl Med. 2021 Jan; 9(1): 67