A COMPARISON OF PERDRIOLLE RULER AND CT FOR MEASURING VERTEBRAL ROTATION

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Scoliosis is a three-dimensional deformity. Correction of deformities in frontal, saggital and axial planes is the main point of the surgical treatment of idiopathic scoliotic curves. To determine the effectiviness of the surgical treatment in the axial plane several methods of radiographic or clinical examinations have been described. Two of these methods were "torsion meter" designed by Perdriolle and Vidal (5) and "CT".

The aim of this study was to determine the effectiviness of Perdriolle ruler (PR) and CT for measuring vertebral rotation in both thoracal and lumbar segments.

MATERIAL and METHOD

This study incoluded 8 patients with idiopathic adolescent scoliosis, treated with the Cotrel-Dubousset instrumentation, at the Department of Orthopaedic Surgery and Traumatology, Ankara University İbni Sina Hospital, Ankara. Four of these patients were female, and the average age at operation was 17.6 years (13-35 years). The type of the curves was; thoracal in 5, thoracolumbar 1, and double major (thoracolumbar) in 2 patients.

Preoperative and postoperative rotation angles of 3 vertebrae, the apical vertebra, one below and one above the apical vertebra were measured in every major curve by 2 different methods, Perdriolle ruler and CT.

The total amount of vertebrae, which were evaluated was 30, 23 thoracal and 7 lumbar.

Percentage of axial plane correction was calculated in both groups. Statistical analysis of "percentage of correction, obtained by PR and CT" was made by "Wilcoxon test".

The angle of rotation was measured from the apical vertebra using the "torsion meter", described by Perdriolle and Vidal (5), on an anteroposterior radiograph of the patient. The measurement was read directly by superimposing the transparent torsion meter upon the radiograph. First midpoints of lateral borders and long axis of convex pedicle of the apical vertebra were determined. Then the sides of torsion-meter were superimposed on the lateral borders of the apical vertebra. The angle of rotation was read from the protractor along the prolongation of the noted pedicular diameter.

While measuring vertebral rotation by CT, two different measurements were made. The angle of rotation of the vertebra about the longitidunal axis relative to the saggital plane (RAsag) was the angle between the line through the dorsal, central aspect of the vertebral foramen and the middle of the vertebral body and the saggital plane (3). This angle was dependent on the patient's rotational relationship to the radiographic table. The angle of rotation about the longitidunal axis relative to the anterior midline of the body (RAml) was the angle between the line through the midline of the vertebral body and the dorsal central aspect of the vertebral foramen and the line from the vertebral foramen to the anterior midline of the body, the mid-sternum in the thorax, and the space between the two heads of the rectus abdominus in the lumbar area (3). This measurement was affected by the lateral deviation as well as the rotation of the vertebra, but was not affected by the patient's position relative to the table.

RESULTS:

Table 1: The average correction in the axial plane, measured by 3 different methods

	PR	CTsag	CTml
Correction (%)	22.2	31.1	28.6

Table 2: The average correction in the axial at thoracal and lumbar areas, measured by 3 different methods

	PR	CTsag	CTml
Thoracal correction (%)	22.8	29.7	25.7
Lumbar correction (%)	20.3	36.0	37.9

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When the average correction of all vertebrae, measured by 3 different methods, was determined it was observed that there was a significant difference between PR and CTsag ($p < 0.05$), but no diffrence between PR and CTml ($p > 0.05$).

In thoracal vertebrae, no statistical difference was found between these methods ($p > 0.05$).

In lumbar vertebrae, statistically there were significant differences between PR and CTsag ($p < 0.05$), and also between PR and CTml ($p < 0.05$).

DISCUSSION:

The ability to measure vertebral rotation accurately from an AP radiograph is clinically important. It is a cheap and not time consuming device, and also requires little irradiation, and if interpreted correctly it is accurate (1, 4). But, of course this accuracy depends greatly on the accuracy of the radiologic landmarks.

Gunzburg et al. (4) showed that, in the lumbar spine, the technique of Perdriolle and Vidal for evaluating vertebral rotation was relatively accurate. BLarsanti et al. (1) stated that evaluation of vertebral rotation in the lower thoracic segments could be made by torsiometer accurately.

The authors who use CT for measuring vertebral rotation claim that measurement of vertebral rotation is difficult without the use of CT scans as it allows accurate localisation of the three bony landmarks both before and after operation (2). The reasons why they don't use torsion meter are;

1) The pledicles are often obscured by the longitidunal metal rods of the instrumentation, so it is very difficult to make the postoperative measurement,

2) Measurements of rotation from anteroposterior radiographs in mild to moderate scoliosis are often unreliable due to variations in the angle and projection of the pedicles in the preoperative and postoperative radiographs.

In our study, evalution of convex sided pedicles on the postoperative anteroposterior radiograph was not so difficult, but sometimes estimation of lateral border of the vertebra on the concave side was difficult. To solve this problem we used the preoperative distance between two distance between the table and the x-ray tube was constant, and we easily pointed out the convex lateral border of the vertebra, accurate estimation of the concave lateral border of the vertebra was made.

In our study, it was found that, the "torsion meter" for measuring vertebral rotation was not reliable in the lumbar segmets, but on the other side reliable in the thoracal segments. Barsanti et al. (1) already suggested that "torsion meter" was reliable when preoperative vertebral rotation was under 35°. Preoperative vertebral rotation was more than 35° in 5 of 7 (71 %) lumbar vertebrae, whereas in 8 of 23 (35 %) thoracal vertebrae (measured by CT).

So, as a result in our opinion, as vertebral rotation is higher in lumbar vertebrae of the scoliotic curves than the thoracal ones, and the accuracy of "torsion meter" depends on the preoperative amount of vertebral rotation (less than 35°), this device can be safely used in the measurement of vertebral rotation in the thoracal segments.

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