

COMPARISON OF THE POSSIBILITIES OF SCOLIOSIS DIAGNOSTICS DURING SCREENING OF SCHOOLCHILDREN BY COMPUTER OPTICAL TOPOGRAPHY AND VIDEO RASTERSTEREOGRAPHY USING TODP AND FORMETRIC SYSTEMS

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Introduction

Schoolchildren screening for scoliosis using the Adam's test was initiated in the USA in the mid-60s, and in the 80s it became widespread due to the moiré topography proposed by Takasaki. However, due to the large number of false positives and the need for X-ray verification in many countries it was abandoned now, which led to a decrease in the effectiveness of conservative scoliosis's treatment. Since the mid-80s, computer systems for surface topography appeared, which opened up new possibilities for solving screening problems. Since 1996, topographic screening using TODP has been carried out in many Russian cities (about 600000 examination) has demonstrated in practice its high efficiency in organizing, and most importantly, it has proved the reliability and accuracy of the scoliosis diagnostic in comparison with X-ray. Since mid-90s Formetric has been widely used in Europe for the control of the scoliosis's patients treatment and has recently been used for screening also.

Research Question

Comparison of the results of scoliosis diagnostics during screening by two topographic systems TODP (Russia) and Diers Formetric III 4D (Germany).

Methods

364 schoolchildren were examined (197 girls and 167 boys, age 8.9 ± 1.9), they were divided into 3 groups by age: "6-8 years" (135, age 7.2 ± 0.7), "8-10 years" (134, age 8.9 ± 0.6); "10-12 years" (95, age 11.4 ± 1.6). Schoolchildren of 2 preliminary schools (Dimitrovgrad, Russia) were examined in turn on two topographs: TODP (produced in 2021 with WTOPO 5.4-2021 software) and Formetric 4D (produced in 2015 with DICAM2.6.4 software). For TODP, 3 standard screening poses were used, as for Formetric - one natural pose with an average of 12 frames. Parents has signed the informed consent for topographic examination.

Results

The obtained distribution for all 364 schoolchildren of the topographic analog of Cobb angle of the main scoliosis curve showed a significant difference in the number of cases for specified angle ranges (TODP/Formetric): 0-5° - 50/4.1%; 5-7° - 33.8/9.3%; 7-9° - 12.4/17.9%; 9-15° - 3.8/51.6%; 15-25° - 0/16.2%; 25-50° - 0/0.8%. (Fig.1). The clinically significant scoliosis (9° or more) revealed by TODP/Formetric: 3.7/71.1%, 2.2/70.1%, 6.6/63.2% in age groups. Fig.2 shows a general view of the comparison of the revealed scoliosis angles for TODP and Formetric and also demonstrates a significant discrepancy in the results of two topographs. The possible reason was the incorrect forming of the spine model, which did not correspond to the reconstructed 3D model of the dorsal surface as shown on Fig.3.

Conclusions

TODP has confirmed its effectiveness for schoolchildren screening, but Formetric system cannot be recommended for this purpose, due to overdiagnosis of healthy children examination and low reliability and accuracy of the assessment of the initial forms of scoliosis.

Discussion

Scoliosis statistics from different countries show the prevalence of scoliosis from 0.6 to 3.5% (10° or more). According to the TODP data, matching statistics were obtained, and the Formetric data exceeded this statistics by several times. TODP may be an alternative to X-ray for yearly and middle scoliosis forms for screening and monitoring.

Disclosures (any Conflicts of Interest)

V.N.Sarnadskiy is the author of the method "Computer optical topography".

D.Y.Batorov, O.A.Shchuchkina have been used Formetric system in a clinic for several years.

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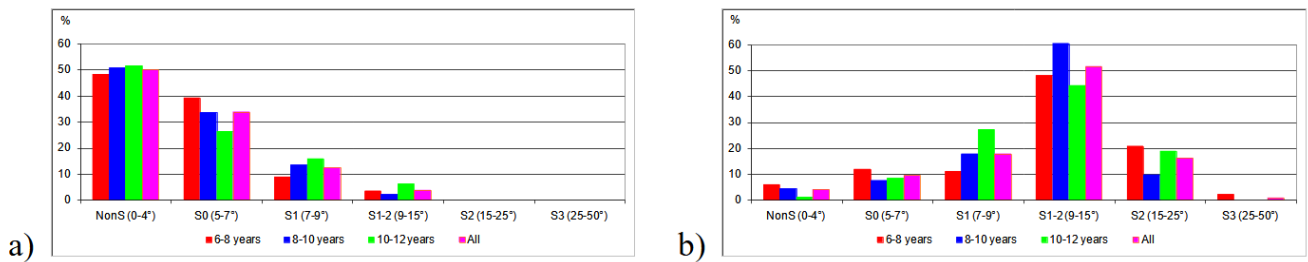


Fig.1. Distribution of detected scoliosis according to the angles of the main curve and age groups for TODP (a) and Formetric (b).

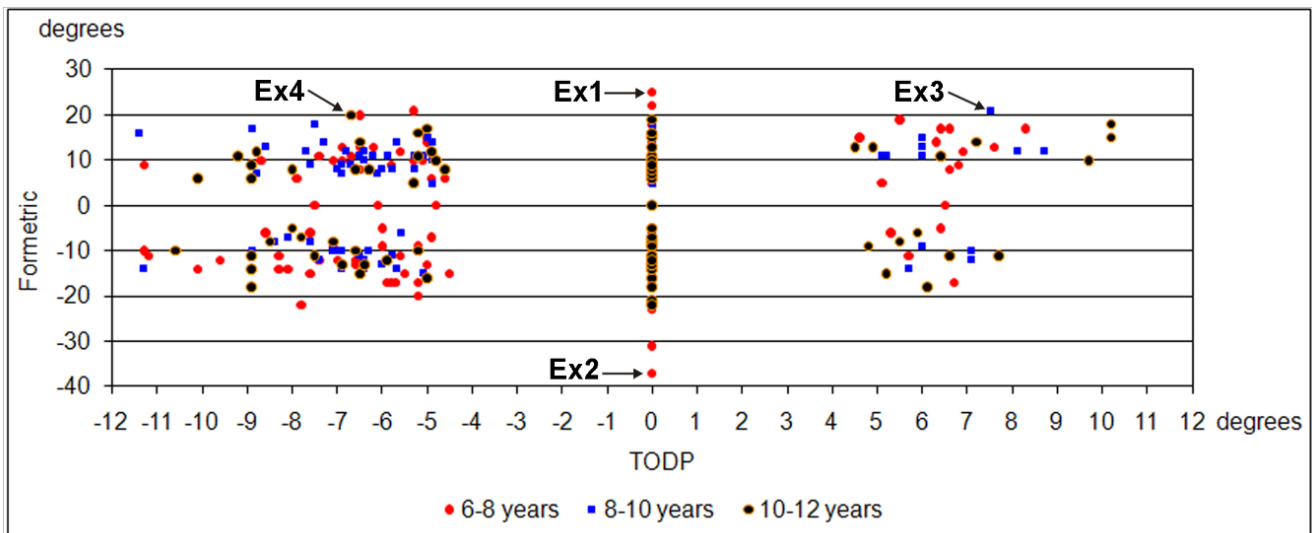


Fig.2 Comparison of the topographic analog of Cobb angle for TODP and Formetric

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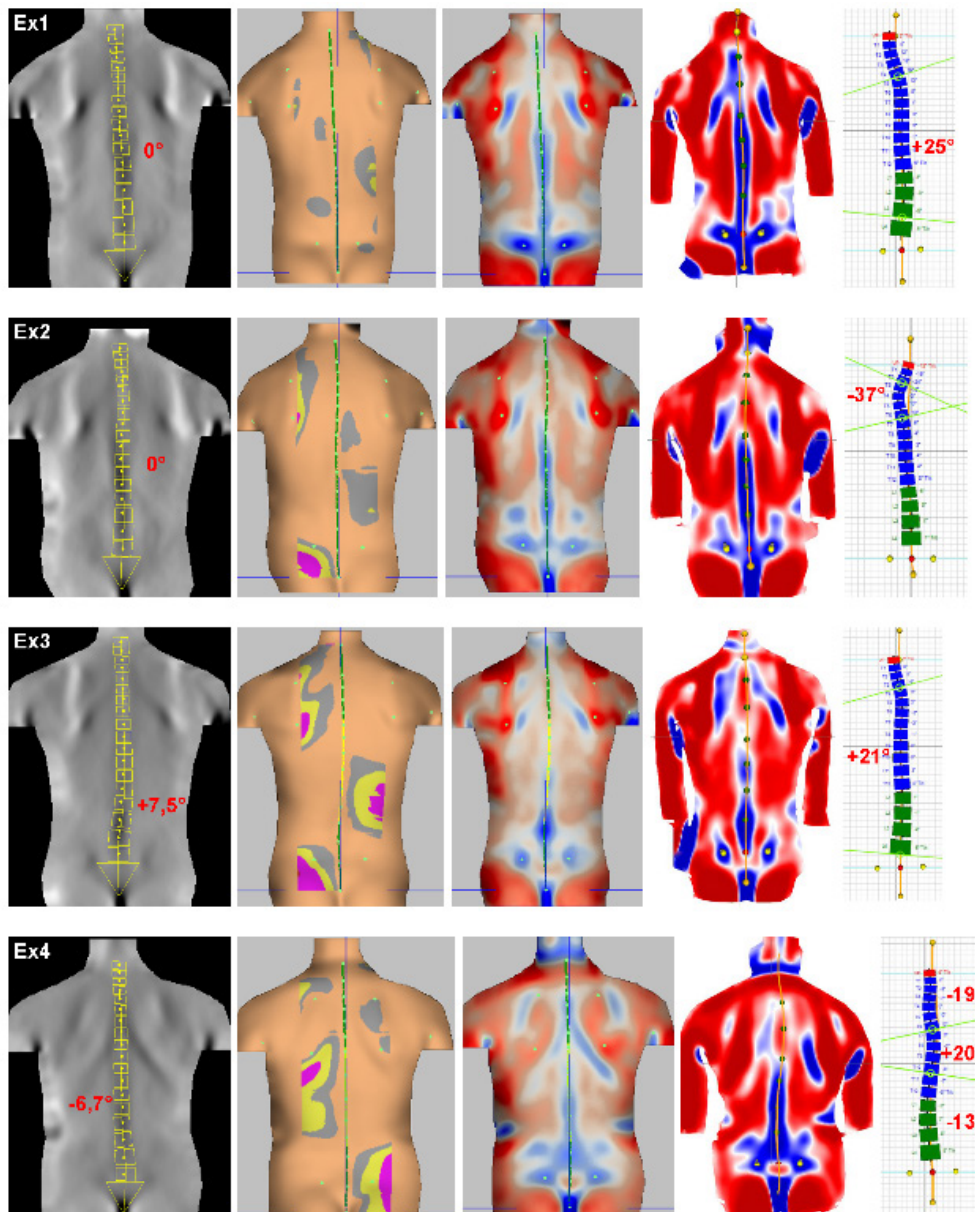


Fig.3. Clinical examples Ex1-Ex4, marked in Fig.2 and having the maximum discrepancy in the topographic angle of scoliosis for TODP and Formetric. For each example topographic results are shown: TODP – the spine model, surface paravertebral asymmetry coloring, surface curvature and Formetric - surface curvature and the spine model.