Method for predicting the progression of idiopathic scoliosis

The present invention relates to medicine, particularly, orthopedics, and can be used for predicting the progression of idiopathic scoliosis. In order to predict the progression at the early stages, the level of sulfated glycosaminoglycans (S-GAGs) is determined in the urine of patients who are developing idiopathic scoliosis; when the level is 10.0 mg/mmol of creatinine and above, a repeat determination is performed in 3 – 6 months; if the level of S-GAGs increases to within the range of 15 – 20 mg/mmol or higher, a progressive form of idiopathic scoliosis is diagnosed.

Specification

The invention relates to medicine, particularly, to orthopedics, and can be used for predicting the progression of idiopathic scoliosis.

Methods are known for the prediction of the progression of idiopathic scoliosis through dynamic clinical and radiological examination. The method involves dynamic radiological monitoring. When the deformity increases by a **Cobb** angle of more than 5º by per year and a positive **Risser's** sign [is observed], a progressive form of scoliosis is diagnosed (V.D. Chaklin, Ye.A. Abalmasova, in the book "Scoliosis and kyphosis". 1973. M.: Meditsina, p. 255). The method is informative; however, it requires repeated radiography which is far from being safe for a growing organism.

Most similar to the claimed method is the method that includes the detection of the calmodulin level in the blood thrombocytes in combination with **Risser's** sign for patients developing idiopathic scoliosis. When the **Risser's** sign is grade 0 – 1 and the calmodulin content is 4.42 ng/mg of protein, the progressive form of idiopathic scoliosis is diagnosed (Kindsfater K. et al. "Levels of plate calmodulin for the prediction of progression and severity of adolescent idiopathic scoliosis." J. Bone. Joint Surgery. 1994. V. 76-A, p. 1186-1192). The method is invasive and expensive, and requires special equipment and expensive reagents. The sampling of 5 mL of venous blood is traumatic for children.

The problem [to be solved] is to offer a method for predicting the early progression of idiopathic scoliosis.

The solution of the above problem will provide population screening, including for children, to fulfill health improvement programs, prevent the progression of the marked forms of deformity, decrease the indications for surgical treatment and prevent disability among children and juveniles.

The present problem is solved by making a determination of the sulfated glycosaminoglycans (S-GAGs) in the urine of patients who are developing idiopathic scoliosis, and when the value is higher than 10.0 mg/mmol of creatinine, a repeat examination is carried out in 3 – 6 months; when the level of S-GAGs increases to within the range of 13 – 18 mg/ mmol of creatinine or above, a progressive form of idiopathic scoliosis is diagnosed.

The method is accomplished as follows.

The level of sulfated S-GAGs in a random portion of urine is determined by adding 1.6 mL of 0.2% solution of alizarin blue, which is diluted in a solution that contains 2% sulfuric acid and 15% orthophosphoric acid, to 0.15 mL of urine. The test tubes are shaken and allowed to stand at room temperature for 15 min. The color is measured on an SF-46 spectrophotometer at a wavelength of 480 nm, [measured] against a blank test. A solution with a chondroitin sulfate-C concentration of from 10 to 100 μg in 150 μL of water is used as a reference. The creatinine level is checked by standard methods. The level of sulfated GAGs is calculated in mg per 1 mmol of creatinine, since it is believed that the decomposition and excretion of creatinine take place uniformly over a 24 hour period. In the standardized determination of excreted urinary metabolic products, it is important to avoid the collection of a 24-hour urine [specimen].

Clinical example.

Dynamic clinical – radiological examination and biochemical analysis of urine were carried out for children who were studying at Novosibirsk specialized boarding school, and who developed idiopathic scoliosis and had incorrect posture.

For the repeat examination in 3 – 6 months, the children having a diagnosis of “grade 1 or 2 idiopathic scoliosis” were selected, those whose urine levels of sulfated GAGs were higher than 10.0 mg/mmol of creatinine. The progressive form of idiopathic scoliosis was diagnosed for the children who had an S-GAG increase within the range of 15.0 – 20.0 mg/mmol of creatinine.

Example 1. Patient V. 10 years old. Grade 2 spinal deformity was determined clinically and radiologically. The sulfated GAG content in the urine was 13.8 mg/mmol of creatinine; after three months the level increased to 18.0 mg/mmol of creatinine, and after 6 months it was 20.4 mg/mmol of creatinine. The progressive form of idiopathic scoliosis was diagnosed and orthopedic treatment was recommended.

Example 2. Patient F. 10 years old. Clinical spine deformity. The urine sulfated GAG level was 9.8 mg/mmol of creatinine. After three months, it was 11.6 mg/mmol of creatinine. A non-progressive form of idiopathic scoliosis was diagnosed.

Claim

A method for the diagnosis of the progressive form of idiopathic scoliosis by biochemical analysis of biological fluids, wherein the level of sulfated glycosaminoglycans (S-GAGs) is determined in urine and when the value is higher than 10.0 mg/mmol of creatinine, a repeat determination is carried out over a 3 – 6 month period, and in the case where the S-GAG content increases to within 15 – 20 mg/mmol of creatinine and above, a progressive form of idiopathic scoliosis is diagnosed.

Notices to the patent for an invention

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