

Headline: Evaluation of force reaction of orthoses to skeleton in growth period.

Problem

For the correction of congenital and acquired defects there are used spinal orthoses in a full-time regime and leg orthoses in a night-time regime. These aids affect a human skeleton by forces in order to obtain the best treatment by remodeling of the skeleton. The doctor who prescribes and revises the orthopaedic aid also prescribes and recommends the therapeutic regime (it depends on the size of deformity, on cooperation and tolerance of the aid by the patient). The doctor monitors the corrective force which is only estimated. The problem is that usually the therapy rules are not followed carefully by the patients because the orthoses are unpleasant to wear. The patients or their parents write the information about application times in a use table themselves and often the data are deliberately changed.

Aims and Hypotheses

- An objective monitoring of timelines and force effects of spinal and leg orthoses to a human skeleton in its growth period
- Data processing and their evaluation of conservative treatment by spinal and leg orthoses
- Hypothesis - individual spinal and leg orthoses are probably in reality used less time than it is prescribed by doctors - the recommended therapeutic regime is not followed

Methods

The research group of patients in their growth period consisted of 15 patients with spine deformities and 3 patients with leg valgus. X-ray pictures of spine without and with a spinal orthosis provably indirectly demonstrated force and corrective effects which were read as angles according to Cobb. It was possible to determine a magnitude of correction to the previous level of curve in degrees or per cent. In order to show the effectiveness of the corset therapy, the axial rotation of the most rotated vertebrae in main spinal curve was also evaluated by the original graphic method (in print). In leg correction orthoses the magnitude of correction was evaluated from X-ray pictures in degrees using the anthropology method or clinically measured the inter-maleolar (IM) and inter-condylar (IK) distance during the treatment.

Time courses of application (spinal orthoses) and moreover force effects of leg orthoses were monitored by electronic sensors with small pressure sensing element.

Force effects of corrective orthoses were verified by adjustment of force fixators and by pressure sensing elements.

Results

In the group of patients with the average age 11.2 there were measured curvatures in standing position by the method according to Cobb before the corset therapy. Their average age was 11,2. During the treatment there were acquired X-ray pictures of 10 patients in spinal braces and the level of correction was specified. The average correction of the thoracic curve was 44% and of the lumbar curve 54%. The monitored period varied from 148 to 343 days. Spinal orthoses were worn on average 12,5 hour daily. Then the X-ray pictures of 11 patients in standing position without dressed orthoses were evaluated. In 10 patients the scoliotic curves improved by 36% on average. As another parameter of the corset therapy there were evaluated the changes of vertebral axial rotation, which improved by 55% on average during the monitored period. The average application time was 76,9% to the prescription 16 hours/day.

The patients who were treated with leg orthoses with force effect, were of average age 5,1. The IM distances improved by 35,2% on average in all three cases. The orthoses were used on average 8,6 hours daily during 9 month and the average corrective torque was 6Nm.

Conclusion

Appointed aims and objectives of the thesis were achieved. Objective monitoring of conservative treatment of children's spinal and leg deformities in growth period was realized with electronic sensors. Data acquired during monitored periods were evaluated by originated software and then real therapeutic results of orthotic conservative treatment were evaluated. Based on acquired experience, effective process was proposed to evaluate obtained data. After another long-term monitoring of orthotic applications by these above methods it will be possible to give precision to current prescription rules for individual corrective spinal and leg orthoses.

Key words: *spine scoliosis, valgozity, knee joint varozity, corrective orthosis, correction monitoring, corset therapy.*