ESTIMATION OF SURGICAL TREATMENT EFFICIENCY FOR YOUNG CHILDREN WITH HIP DYSPLASIA BASED ON X-RAY ANATOMICAL DATA

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INTRODUCTION

Hip joint (HJ) dysplasia is a set of pathological anatomical and functional anomalies, including poor development of the hip socket (HS), the proximal femur (PF), ligamentous apparatus failure, which is accompanied by a disturbed relationship of the joint parts [1–4]. Joint radiography in young children still remains the only reliable way for diagnosing and identifying the severity of dysplastic changes in the HJ [5, 6], which determines the treatment [7–10]. One of the major objectives for treating HJ dysplasia is the approximation of the joint bone structures relationships to the age norms.

Aim of study.

To propose an effective system for assessing the severity of HJ dysplastic changes in young children, which would help determine the treatment method, and comparing the joint radiological parameters prior to surgical treatment and in the early postoperative period.

Objects and methods of study.

The study was based on analyzing dysplastic HJ changes in 82 children (113 joints) aged 1–3, with a mean age of 2.3±0.8. All the patients were treated in the Child Trauma and Orthopedics Department of Research Institute for Traumatology, Orthopedics and Neurosurgery of Saratov State Medical University within the period of 2015–2018. The study was conducted upon receipt of the respective child's parents' due consent subject to Clause 32, Basics of Russian Legislation on Health Protection. The results of the study were compared with similar indicators for 32 children of the same age (mean age 2.4±0.6 years) revealing no signs of HJ dysplasia. Apart from a set of examinations including clinical and electrophysiological methods, the children had 6 HJ angular parameters evaluated on radiographs following the degree of deviation from the age norm. We identified the following: Wiberg angle (WA), Sharp's angle (SA), acetabular angle (AA), cervical-diaphyseal angle (CDA), femoral neck anteversion angle (AtA), vertical correspondence angle (VCA), which were scored in points (from 0 to 3), identified the parameters severity (mild — from 2 to 7 points, moderate — from 7 to 13, severe — from 14 to 18 points) and determined the treatment [8].

Data format: $M \pm \sigma$. In order to evaluate the treatment results, Cohen's concept of effect size was employed, which was calculated following the formula:

R = (Mean score before surgery – Mean score after surgery) / Standard deviation before surgery [11].

RESULTS

The normal (N) value for the AA in children aged 1–3 is 20°–25°; at an angle of 26°–30° it is estimated at 1 point, at 31°–35° — at 2, with an angle of > 35° — at 3 points; CDA (130°–145° — N, 146°–154° — 1, 155°–160° — 2, > 160° — 3 points); SA (45°–49° — N, 50°–55° — 1, 56°–60° — 2, > 60° — 3 points); WA (30°–21° — N, 20°–16° — 1, 15°–11° — 2, <11° — 3 points), VCA (> 75° — N, 74°–70° — 1, 69°–65° — 2, <64° — 3 points); AtA (16°–34° — N, 35°–45° — 1, 46°–55° — 2, > 55° — 3 points). 28 children (33 joints) were found to have mild dysplastic alterations, 31 (42 joints) — moderate, and another 23 (38 joints) — severe. In mild cases of dysplasia were recommended dynamic observation and, if necessary, conservative treatment and coxarthrosis prevention. For moderate cases, an intertrochanter osteotomy of the proximal femoral bone was used with calculated mediali-

zation; in severe cases, combined surgery on the proximal femoral bone with pelvic osteotomy was the treatment of choice. The mean values of the HJ angular parameters after the surgery approached the age norms. In patients with moderate dysplastic HJ changes, the average values of angular signs increased: WA — from 13.0° to 23.0° (by 43.5%); VCA — from 67.0° to 77.5° (by 13.6%); the other angles, on the contrary, decreased: SA — from 58.0° to 44.0° (by 21.2%), AA — from 33.0° to 21.5° (by 34.9%); CDA — from 157.0° to 135.5° (by 13.5%); AtA — from 51.0° to 23.5° (by 44.0%). The mean score sum in children with moderate dysplastic changes prior to the treatment was 11.7; the mean score was 1.95 ± 0.5 points, and the mean score in the group after surgery was 1.3±0.2 points. The mean effect was 1.3, which can be defined as strong (R = (1.95–1.3) / 0.5 = 1.3).

The patients with prominent dysplastic changes had a decrease in the HJ values: SA — from 63.0° to 43.0° (by 31.7%); AA — from 40.0° to 20.5° (by 48.8%); CDA — from 162.0° to 135.0° (by 16.3%); AtA — from 62.0° to 23.0° (by 62.9%); WA had an increase from 8.0° to 24.0° (by 66.6%), VCA — from 62.0° to 78.5° (13.5%). The effect size in children with prominent HJ dysplasia was 0.87 (strong effect), the mean score of dysplastic signs based on radiographs before the surgery was 2.3±0.7 points, after — 1.45 ± 0.2 points (R = (2.3 – 1.45) / 0.7 = 1.2).

CONCLUSION

Selecting an adequate method of surgical treatment, taking into account the degree of the HJ dysplasia allows obtaining positive results, while the HJ anatomical parameters get close to the age norm.

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