

## DETERMINING TREATMENT TACTICS OF INFANTS OF 0-2 MONTHS WITH CONGENITAL HIP DISLOCATION

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**ABSTRACT** — 248 children of age from 10 days to 12 months were treated in 2002–2012 at Outpatient surgical center of N.F. Filatov's City Children's Clinic in Moscow. The therapy included regular methods (such as expanding splint, cast bandage), and therapy progress was verified by X-ray scanning. Roentgenograms were rated with standard plans (H. Hilgenreiner plan) and additional index (K and L). Evaluating the results of the therapy a method has been developed to determine treatment tactics for infants with congenital hip dislocation revealed before 2 months of age.

Congenital hip dislocation — one of the most prevalent impairments of our locomotor apparatus. This malformation appears in hypoplasia of all coxal joint elements and in dislocation between hip and acetabulum.

Due to the facts the impairment can be found in 2–6 cases among every 1000 newborns, the defect is difficult to be found timely and the therapy can be provided lately or be incorrect – it is important to diagnose and to start treatment as early as possible.

When hip dislocation is figured out the therapy starts immediately, and firstly means in applying a special legs expanding splint.

When the defect is found out parents often want to learn about the way and time limits of the therapy. And it is hard to answer these questions momentarily because the depth of the pathological process differs and that causes the wideness of terms of the therapy.

Hip dislocation treatment includes the mono-therapy and a complex of several methods as well. First means legs expanding splint. Complex of methods additionally includes cast bandages, limb traction system and also invasive or noninvasive dislocated hip reduction. Terms of the treatment in this cases can exceed 15 months.

Timely found hip dislocation allows to use commonly the mono-therapy method that can observably decrease the treating time.



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For this reason the list of methods concerning coxal joint impairments diagnostic enlarged, and earlier developed methods were upgraded and improved.

One of the most proved diagnostic method that is practiced in Russia and other countries is ultrasonic scanning. But the most available scan method in Russia is still X-ray – it allows to examine bone and cartilage condition in various phases of the treatment. So the X-ray scanning is yet the most reliable and trustworthy method to examine coxal joint defects, and ultrasonic scanning is used additionally but doesn't substitute the X-ray.

Due to newborns anatomic specialties during first months of their life it is rather hard to explore pelvis shape, its dimensions and edges, dimensions and location of femur proximal part and its relative position to the pelvis, and anatomic points ratio of the pubic. So we discovered new differential and diagnostic features to assess volume of movements in child's coxal joint which in addition with x-ray picture improve our selection of cure tactics and specify the treatment duration.

The way we suggest improves us picking our tactic to treat congenital hip dislocation among 0–2 months newborns by adding new roentgenogram marks to the previously discovered to provide more clear diagnostic rating.

Standard medical survey to find out hip dislocation includes x-ray scan of newborn's coxal joints in his age of 3 months. In uncertain cases the scan can be provided anytime and doesn't depend on child's age. Appreciation of the roentgenogram can be complicated because the femur proximal part is generally built of cartilage, moreover its hard to set child's proper position for the x-ray scanning.

Features used in H. Hilgenreiner plan do not allow doctor to forecast surely he will pick mono-therapy or a therapy complex. But significantly important to tell child's parents the most precise plan and period of the therapy we apply. So our roentgenological marks we're talking about are able to help us choosing the treating way more clearly and already in the beginning of our therapy help us to collect the group of newborns we are able to treat by expanding splint only.

Here I try to reveal our method (patent for invention №2495624 "Way for determining tactics of treating babies with congenital hip dislocation diagnosed in age up to 2 months" dated 20 oct. 2013).

A newborn is examined in age up to 2 months. On the roentgenogram of his coxal joints we mark a horizontal line that runs through both Y-shaped cartilage and we detect next:

- $\alpha$  — acetabular angle (see Fig. 1)
- $h$  — perpendicular line (goes from the top of femur diaphysis up to the horizontal line) (see Fig. 1)

- $d$  — distance between Y-shaped cartilage and perpendicular  $h$  (see Fig. 1)
- $K$  — index counted out of the ratio between acetabulum width and width of the femur proximal part (see Fig. 2)
- $L$  — interval from acetabulum osseous edge till the line that connects the iliac spine to the Y-shaped cartilage (see Fig. 2).

First X-ray scanning is made momentarily after first signs for congenital hip dislocation are noticed. If  $K=0.7-0.8$ ,  $L=0-1$ mm,  $\alpha=37-42^\circ$ ,  $h=7-8$ mm and  $d=16-19$ mm — therapy with the expanding splint only is assigned.

Second x-ray scanning is performed 1.5 months later. If we see  $K$  index approaches 1.2,  $L$  is up to 3–4mm, acetabular angle ( $\alpha$ ) is now 34–36°,  $h=9-10$  mm and  $d=13-14$  mm – expanding splint is considered effective and the therapy proceeds.

If the  $K$  index on the first X-ray scan is below 0.7,  $\alpha$  widens over 42°,  $h=3-5$ mm and  $d=25-27$ mm — cast bandage is needed additionally with expanding splint. Making the second x-ray survey if  $K$  increases up to 1.2,  $L=3-4$ mm,  $\alpha$  angle lowers to 34–36°,  $h=9-10$ mm and  $d=13-14$ mm – cast bandage can be removed. If all index during second scan stay constant or change slightly ( $\alpha=38-40^\circ$ ,  $h=4-6$  mm,  $d=22-24$  mm) – double-therapy with expanding splint plus cast bandage is continued.

Determining the described tactic is based on results of treating 248 children with congenital hip dislocation from 10 day up to 1 year aged at outpatient surgical center located in N.F. Filatov's City Children's Clinic of Moscow in the years 2002–2012. Among 248 children there were 198 girls and 50 boys — so the ratio of girls to boys is 5 to 1. Concerning one-sided impairment 103 of 172 children had trouble in their left coxal joint and 69 in right joint. 76 children had their both coxal joints affected.

X-ray scanning was applied in 147 (of all 248 — 59.3%) cases during first 2 months of baby's life. On the roentgenogram according to H. Hilgenreiner plan there were acetabular angle, length of "h" and "d" to be measured. Then we count extra index "K" and length of "L" (see Fig. 2).

Treating the hip dislocation with expanding splint only (mono-therapy) among children in age of first 2 months of living was effective in 48 cases (32.6%). Initial x-ray scanning was performed when first signs child has his hip dislocated are observed — and we had the results:  $K=0.7-0.8$ ,  $L=0-1$ mm,  $\alpha=37-42^\circ$ ,  $h=7-8$ mm,  $d=16-19$  mm. At next scanning in 1.5 months we saw  $K$  index increased to 1.2,  $L$  — to 3–4mm,  $\alpha$  angle was 34–36°,  $h=9-10$ mm and

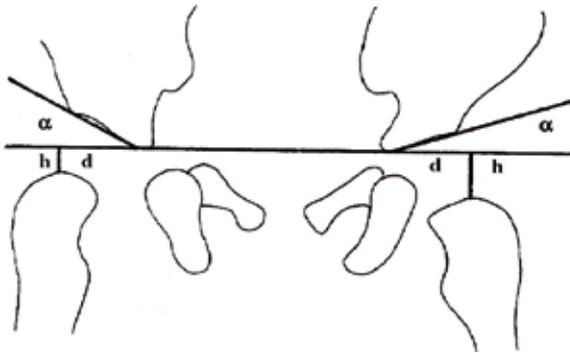


Fig. 1. H. Hilgenreiner plan

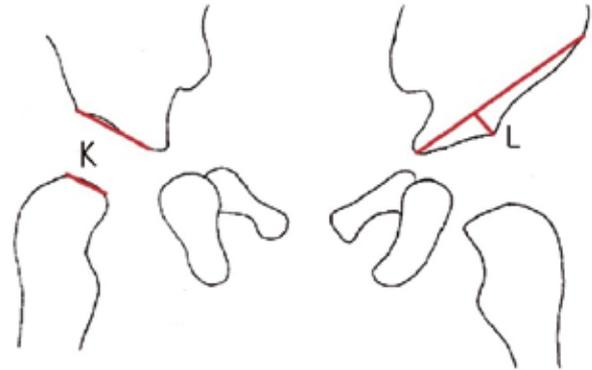


Fig. 2. K and L index

$d=13-14$  mm. That made us conclude the expanding splint therapy is positive. Hip dislocation reduced in time of 4–6 weeks since the treatment started. The total time lapse of splint fixation depends on the grade coxal joint is hurt, on child's age and on acetabulum regeneration activity, particularly in its external osseous ledge. It was 4.5 months on average. And treating the children of first 2 months living is positively predicted.

99 (67.4% of all) children when scanned first time on their roentgenogram had index:  $K < 0.7$ ,  $L=0-1$  mm,  $\alpha > 42^\circ$ ,  $h=3-5$  mm,  $d=25-27$  mm — double-therapy with expanding splint and cast bandage was used. During next x-ray checkup we observed  $K=1,2$ ,  $L=3-4$  mm,  $\alpha=34-36^\circ$ ,  $h=9-10$  mm, and 53 children (35.7%) had index  $d$  decreased to 13–14 mm — further therapy was kept on with splint only saved. 26 (17.9%) children showed their rates permanent. And last 20 (13.8%) children had their rates changed weakly ( $\alpha=38-40^\circ$ ,  $h=4-6$  mm,  $d=22-24$  mm) — we continued the therapy using both expanding splint and cast bandage (spica cast was applied twice). Hip dislocation became reduced in 4–6 weeks. The time child stays fixed by splint and cast bandage is considered 8–10 months as average.

This is how we believe our method to serve us choosing proper treating tactics and terms for children with congenital hip dislocation during first 2 months of their life.

## REFERENCES

1. V.M. KRETYASHIN. «A practical guide to outpatient pediatric orthopedics». Moscow 2013 – p. 232
2. V.M. KRETYASHIN, A.I. GUREVICH, O.U. VASILYEVA, A.O. DOMAREV, O.U. LITENETSKAYA, U.I. LOZOVAYA. «New diagnostic capabilities for children's congenital hip dislocation" – partials of the III Russian outpatient surgery congress, journal «Ambulatory technologies. Outpatient surgery» 2009 vol. 35–36 №3–4 p. 95.
3. V.M. KRETYASHIN, O.U. LITENETSKAYA, U.I. LOZOVAYA. «A new look at diagnostic and treatment of children's congenital hip dislocation», journal «Problems in biology and medicine» 2010 vol.59 №4 p. 79–80.
4. A.B. GUREVICH, K.V. VATOLIN, E.V. SHMITKOVA, T.I. TIKHONENKO, U.I. LOZOVAYA. «Modern techniques of coxal joint scanning among healthful children». Journal «Medical displaying». №2, 2011 p. 79–85.
5. A.B. GUREVICH. «Radiodiagnostics of children's coxal joint malformations», dissertation abstract. Moscow 2001.
6. U.M. RUSTAMOVA. Dissertation «Congenital hip dislocation and subluxation among children of first 3 years of life – radiology scanning importance in diagnostics, treatment selection and predicting the therapy outcome. Tashkent 1991. p. 140.
7. O.U. LITENETSKAYA «Early diagnosing and treating congenital hip dislocation among children of first 6 months age», dissertation abstract. Moscow 2004. 23 pages.