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Surgical Method for the Treatment of Multiplanar Deformities of the Proximal Femur in Children with Aseptic Necrosis of the Femoral Head

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Abstract: The aim of the study was to evaluate the effectiveness of corrective intertrochanteric osteotomies of the femur in multiplanar deformities of the proximal femur after bloodless reduction of congenital hip dislocation in children.

Keywords:

The aim of the study was to evaluate the effectiveness of corrective intertrochanteric osteotomies of the femur in multiplanar deformities of the proximal femur after bloodless reduction of congenital hip dislocation in children.

Materials and research methods. The immediate results of treatment of 72 children aged 7 to 12 years with multiplanar deformities of the proximal femur in ANFH after bloodless reduction of congenital hip dislocation were analyzed. All patients had multiplanar deformity of the proximal end of the femur: subluxation of the hip, varus or valgus deformity and shortening of the femoral neck, valgus deviation of the epiphysis, high standing of the greater trochanter, and a negative value of the articulotrochanteric distance.
Results. Corrective intertrochanteric rotation osteotomy of the femur with apophyseodesis or transposition of the greater trochanter of the femur can be successfully used in the treatment of multiplanar deformities of the proximal femur after bloodless reduction of congenital hip dislocation in children. With acetabular dysplasia, they can be supplemented with acetabular plasty. We evaluated radiological criteria for stability, centering of the femoral head in the acetabulum, and congruence of the affected hip joints. Analysis of the results of surgical treatment of aseptic necrosis of the femoral head showed that the correction of secondary changes in the anatomy of the proximal femur and violations of articular relationships has a positive effect on the course of reparative processes and the absence of further progression of the pathology. Aseptic necrosis of the femoral head (ANHF) is one of the most serious complications in the treatment of congenital hip dislocation, significantly lengthening the period of aftercare of children, largely determining the functional and anatomical outcome and leading to the early development of dysplastic coxarthrosis and disability, the leading pathological trigger for the development of which is ischemia of the femoral head [1,3,5,8]. According to the literature, the frequency of this complication in closed reduction of hip dislocation varies from 10 to 60% [13,18,20]. Most experts recognize that the leading role in the pathogenesis of aseptic necrosis is iatrogenic circulatory disorders in the proximal femur [4,9,19]. Undoubtedly, repeated attempts to reduce, ending in vain regardless of the cause, in combination with prolonged immobilization in a plaster cast in the antephysiological position of the lower extremities, lead to iatrogenic damage to the joint structure, cause vascular disorders, which ultimately initiates the occurrence of various deformities of the femoral head [2, 3,4,6,10,15]. The severity of residual deformities, according to Luhmann S.J. et al, Herold H.Z. depends on the severity of the lesion of the ossification nucleus of the epiphysis of the femoral head, at the beginning of the pathological process. [16,20]. It is believed that type II deformation according to Kalamchi is the most common and ranges from 25 to 61% [17,19]. Often, in this type of pathology, in addition to the above problems, a multiplanar deformity of the proximal femur develops [4]. Treatment of type II deformity of POB according to Kalamchi-MacEwen: is extremely complex, and the most difficult is the correction of multiplanar deformities, in which the main task of the intervention is to normalize all deviations, “as far as possible” [22], and the works devoted to it are single [19] . The problem of treatment of ANFH and the consequences of impaired growth of the

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lateral part of the proximal femoral growth plate does not always lead to satisfactory results [7,11,12,17,22,]. Deformities of the proximal femur (POFT) in children after ANFH are not uncommon and often require complex surgical interventions [11,17,21]. To normalize the ratios in the joint, the surgical method is the only one, and N. Clarke [14] saw the main task of treating deformities after AN in their "surgical minimization", and Yu.I. Pozdnikin [9] considered the restoration of the form and function of the joint as the "ideal of treatment". Almost all children with unsatisfactory outcomes and at least half of those with satisfactory ANFH after conservative reduction of VHD need surgical treatment or it will be shown to them in the coming years [2]. However, a wide variety of the above surgical methods for the treatment of ANFH in children makes it difficult to choose the right one, and the lack of clear indications for the use of one or another method of surgical correction of the femoral component, depending on specific clinical and radiometric parameters, age and stage of the disease, reduces the effectiveness of the interventions used..

The purpose of this study was to evaluate the effectiveness of corrective intertrochanteric osteotomy of the femur in multiplanar deformities of the proximal femur after bloodless reduction of congenital hip dislocation in children. Materials and research methods. The immediate results of treatment of 72 children aged 7 to 12 years with multiplanar deformities of the proximal femur in ANFH after bloodless reduction of congenital hip dislocation were analyzed. All patients had multiplanar deformity of the proximal end of the femur: subluxation of the hip, varus or valgus deformity and shortening of the femoral neck, valgus deviation of the epiphysis, high standing of the greater trochanter, and a negative value of the articulotrochanteric distance. During radiological examination of children, radiography of the hip joints was performed in the anterior-posterior projection with the average position of the hips, with internal rotation and abduction of the lower limb. On radiographs, indicators characterizing the angular values of the hip joint and the proximal femur were measured: the angle of the vertical inclination of the cavity, the angle of vertical correspondence, the acetabular angle, the cervical-diaphyseal angle, the anteversion angle, the Alsberg angle, the bone coverage ratio and the indicators characterizing the ratio of the femoral head and greater trochanter in the frontal plane: articulo-trochanteric distance, trochanteric-trochanteric distance, articulo-trochanteric distance. The indications for the use of corrective osteotomies were a combination of clinical and radiological data: lameness, malposition of the lower limbs, significant limitation of hip abduction, weakness of the gluteal muscles, abnormal relations in the hip joint, subluxation of the hip, deformity of the proximal femur: plow valga (caudal position of the greater trochanter), plow vara (cranial position of the greater trochanter), plow breva, high position relative to the head of the femur (relative overgrowth of the greater trochanter), plow magna, and not the shortening of the lower limb itself. In the treatment of patients, the following types of surgical treatment were used: extra-articular or open centration of the femoral head with intertrochanteric detorsion-varus or devarization and rotation osteotomy of the femur with apophyseodesis or bringing down (transposition) of the greater trochanter in the caudal direction. In acetabular dysplasia, corrective intertrochanteric rotational osteotomies of the femur were combined with acetabuloplasty, which should be performed simultaneously with femoral osteotomy. The results of treatment were analyzed within a period of 8 months to 3 years. Clinical outcomes are assessed by McKey.

Clinical example No. 1. Patient N.M. was admitted to the department with complaints of walking with internal rotation of the lower extremities, quick fatigue during long walks, fatigue in the legs and increased lumbar lordosis and pelvic tilt. From the anamnesis: congenital dislocation of the hips was diagnosed at 6 months. She was treated by applying a plaster cast according to the Whisperer method for a period of 2 months. After removing the hypowax bandage, a Vilensky splint was put on the lower limbs. She started walking after 2 years. In dynamics, ANGBK developed, about which, for 3 years, she received inpatient treatment in the sanatorium named after. N.K. Krupskaya. In 2020, she filed the above complaints with the RCDO. According to the parents, the intensity of the above complaints increased over time. After the examination, the diagnosis was made: Congenital dislocation of the hips. Condition after bloodless reduction. Residual subluxation of the hips due to aseptic necrosis of the femoral heads. Type IV deformity of the proximal femur according to Kalamchi. coxa vara, coxa breva et antetorsia, high standing of the greater skewer. Clinically: the patient walks with internal rotation of the lower extremities, limping on the right leg, there is an increase in lumbar lordosis and pelvic tilt. The length of the lower limbs is the same, the axis is even. Trendelenburg's sign is positive. Movements in the hip joints: extension-1800/00/1800, flexion-1200/00/1200, abduction-400/00500, internal rotation-700/00/600, external rotation-400/00/400. X-ray: there is a classic deformity of the proximal

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femur, such as shortening of the femoral neck (coha breva), anterior rotation of the proximal femur (antetorsia), high standing of the greater trochanter (relative overgrowth of the greater trochanter). The stability of the joints is reduced, the head and neck of the femur are shortened, NSA: 1000/1100, the tops of the greater trochanters are located above the joint space (ATD: has a negative value of -25mm / 8mm), the Shenton line is broken by 1.0 cm, incongruence of the articular surfaces is noted and multiplanar deformity of the proximal femur. Fig. No. 1 (a).

Fig. No. 1 (a). X-ray and MSCT of the hip joints: deformity of the proximal femur by the type of shortening of the femoral neck (plow breva), anterior rotation of the proximal femur (antetorsia), high standing of the greater trochanter (relative overgrowth of the greater trochanter) . Joint stability is reduced, the head and neck of the femur are shortened, NSA: 1000/1100, the tops of the greater trochanters are located above the joint space (ATD: has a negative value -), Shenton's line is broken by 1.0 cm, incongruence of the articular surfaces and multiplanar deformity are noted proximal femur.

On September 16, 2020, a surgical intervention was performed: Extra-articular centering of the head of the left femur with intertrochanteric detorsion-valgus-posterior rotation osteotomy of the femur with transposition of the greater trochanter of the femur. Fig. No. 1 (b).

Fig. No. 1(b) Fig. No. 1 (c) Fig. No. 1 (d)

Rice. No. 1 (b). SPO: corrective intertrochanteric osteotomy of the left femur was performed with fixation of bone fragments with a Blount-type fixator and 3 screws, the head of the left femur was centered on the bottom of the acetabulum, the femoral neck was elongated, the articular surfaces were congruent, the joint space was of sufficient height, the position of the greater trochanter was normalized brought down in the caudal direction with fixation by 2 screws, SDU:1250, ATD:25mm. Continuity of the Shenton Line restored.

After receiving 2 courses of rehabilitation treatment, 5 months after surgery on the left hip joint on February 16, 2021, a surgical intervention was performed: Extra-articular centering of the head of the right femur with intertrochanteric detorsion-valgus-posterior rotation osteotomy of the femur and transposition of the greater trochanter of the femur. Rice. No. 1 (c).

Rice. No. 1 (c). SPO: corrective intertrochanteric osteotomy of the right femur was performed with fixation of bone fragments with a Blount-type fixator and 3 screws, the head of the right femur was centered on the bottom of the acetabulum, the femoral neck was elongated, the articular surfaces were congruent, the joint space was of sufficient height, the position of the greater trochanter was normalized - brought down in the caudal direction with fixation with 2 screws, SDA: 1250, ATD: 22mm. Continuity of the Shenton Line restored.

Result after 8 months. After surgery, the patient walks with crutches. In a planned manner, he receives rehabilitation treatment. Movements in the hip joints: extension-1800/00/1800, flexion-1000/00/1000, abduction-500/00/600, internal rotation-300/00/400, external rotation-300/00/400. Fig. No. 1 (d).

Fig. No. 1 (d): SBT: femoral heads are centered on the bottom of the acetabulum, the femoral necks are elongated, the articular surfaces are congruent, the continuity of the Shenton line is restored, the position of the greater trochanters of the femurs is normalized (ATD: 25/22mm). Satisfactory consolidation of bone fragments in the area of intertrochanteric osteotomy. The ratios in the joint achieved after osteotomy are preserved, the joint space is of sufficient height.

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Clinical example No. 2. Patient E.E. 07/24/2011 He was admitted to the clinic with complaints of pain and fatigue in the left hip joint after physical exertion. Previously treated for congenital dislocation of the left hip conservatively. Dz: Congenital dislocation of the left hip. Condition after bloodless reduction. Residual subluxation of the left femur due to aseptic necrosis of the head. Deformation of the proximal femur type II according to Kalamchi: coxa vara, coxa breva et antetorsia, high standing of the greater trochanter. Acetabular dysplasia.

Clinically: walks independently, limping on the left lower limb. Movements in the hip joints of the sagittal plane in full, extension-1800/00/1800, flexion-1200/00/1200, abduction-500/00/300, internal rotation-400/00/600, external rotation-300/00/ 300. Trendelenburg's sign is positive on the left.

Fig#1(a) Fig#1(b) Fig#1(c) Fig#1(d)

X-ray: there is a classic type II deformity of the proximal femur of the left femur: shortening of the femoral neck (plow breva), anterior rotation of the proximal femur (antetorsia), hypertrophy of the greater trochanter. Joint stability is reduced. Pronounced shortening of the head and neck of the femur. NDA: 1300/1250, the tip of the greater trochanter of the left femur is located somewhat closer to the upper pole of the head (ATD on the left 10 mm), the Shenton line is broken by 1.0 cm. No. 1 (a, b).

Rice. No. 1(a) X-ray of the hip joints: subluxation of the left femoral head, classic deformity of the proximal left femur by the type of shortening of the femoral neck (plough breva), anterior rotation of the proximal femur (antetorsia), hypertrophy of the greater trochanter. Joint stability is reduced. Pronounced shortening of the head and neck of the femur. NDA: 1300/1000, the tip of the greater trochanter of the left femur is located somewhat closer to the upper pole of the head (ATD on the left 10 mm), Shenton's line is broken by 1, see Fig.

Fig. No. 1 (b) X-ray in the position of internal rotation of the left lower limb: the head and neck of the femur are shortened and thickened, centered on the bottom of the acetabulum, NDA: 1000, ATD: 10 mm., Shenton line break by 1.0 cm, acetabular dysplasia.

On February 22, 2019, a surgical intervention was performed: extra-articular centering of the head of the left femur with intertrochanteric detorsion-valgus-posterior rotation osteotomy of the femur, apophyseodesis of the greater trochanter, and plasty of the roof of the acetabulum according to Pemberton. Fig No. 1 (c).

Figure 1(c): STR: the head of the left femur is centered on the bottom of the acetabulum, intertrochanteric correction of the femur was performed with fixation of the bone fragments with an “L” shaped plate and 3 screws, apophysiodesis of the greater trochanter with 2 screws, pericapsular roof plasty of the acetabulum with an anterior, outward and downward inclination of the distal fragment with the insertion of an autograft into the formed groove and its synthesis with a pin. SHDU:1300/1300.

On August 08, 2019, a surgical intervention was performed: removal of a metal structure from the proximal section of the left femur and iliac wing.

The result 2 years after surgical treatment: the head of the left femur is centered on the bottom of the cavity, with good coverage of the roof of the acetabulum, NDA: 1300/1300, ATD 8 mm. Fig No. 1 (d). The intervention made it possible to restore the centering of the left femoral head, the cervical-diaphyseal angle, improve the congruence of the articular surfaces, normalize the position of the greater trochanter, improve the biomechanics of the joint, lengthen the femoral neck and the limb as a whole.

Results and discussions. Violation of the growth and formation of the proximal end of the femur depends on the premature closure of the growth zone, its "epiphyseodesis" in one or another of its departments after bloodless reduction of congenital hip dislocation. Patients were admitted to the clinic with complaints of pain and fatigue in the or hip joint after exercise. All of them had previously been treated conservatively for congenital hip dislocation. In dynamics, aseptic necrosis of the femoral head was diagnosed with the development of various deformities of the proximal femur, depending on the age of the child, the anatomical state of the hip joint at that time. Most of the patients went to the hospital with complaints of walking with

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internal rotation of the lower extremities, lameness, quick fatigue during long walks and fatigue in the legs. We evaluated radiological criteria for stability, centering of the femoral head in the acetabulum, and congruence of the affected hip joints. X-ray control was carried out 3-6-12 months after the operation, and then once a year. Analysis of the results of surgical treatment of aseptic necrosis of the femoral head showed that the correction of secondary changes in the anatomy of the proximal femur and violations of articular relationships has a positive effect on the course of reparative processes and the absence of further progression of the pathology.

Conclusion. Surgical intervention in childhood must be carried out not only taking into account the existing deviations, but also those deformations that will inevitably arise as a result of the continued functioning of the damaged growth zones of the proximal femur. Dystrophic lesions after bloodless reduction of congenital hip dislocation can affect the head in combination with damage to the growth zone of the femoral neck. Violation of the growth and formation of the proximal femur depends on the premature closure of the growth zone, its partial or total "epiphyseodesis" in one or another of its sections after bloodless reduction. Quite often, the formation of a deformity is accompanied by a violation of joint stability, both due to valgus deviation of the femoral head, and in connection with secondary acetabular dysplasia, decentration of the femoral head, incongruity of the articular surfaces, and proximal migration of the greater trochanter. Each type of deformation requires correction of its inherent deviations, including multiplanar ones. Corrective intertrochanteric rotation osteotomy of the femur with apophyseodesis or transposition of the greater trochanter of the femur can be successfully used in the treatment of multiplanar deformities of the proximal femur after bloodless reduction of congenital hip dislocation in children. With acetabular dysplasia, they can be supplemented with acetabular plasty. Operations allow changing the spatial position of the femoral head and neck in three planes and normalizing the position of the greater trochanter. All children who have undergone aseptic necrosis of the femoral head, even without signs of a violation of the stability of the hip joint, need dynamic observation in order to select the optimal timing for correcting the emerging deformity, if necessary.

Reference

1. 1.Abakarov A.A., Huseynov A.G. A new method of complex prevention of aseptic necrosis in the treatment of congenital hip dislocation in children.//Current issues of pediatric traumatol. and orthop.-S.P., 2000.-S.314-315.
2. 2.Alpysbaev Kh.Sh. Early diagnosis, prevention and treatment of aseptic necrosis of the femoral head after conservative reduction of congenital hip dislocation in children: Abstract of the thesis. dis. cand. honey. Sciences - Tashkent, 2009.-22p.
3. Akhtyamov I.F. Degenerative-dystrophic diseases of the hip joint in children and adolescents. Kazan, 2003. P.6-13.
4. Beletsky A., Akhtyamov I., Bogosyan A., Gerasimenko M. Aseptic necrosis of the femoral head in children. - Kazan 2010. -255p.
5. Vinokurov V.A., Bakhteeva N.Kh., Biryukova L.I., Saidov R.M. // Topical issues of pediatric traumatology and orthopedics: Mater. scientific-practical. conf. pediatric traumatologists-orthopedists of Russia.-SPb, 2004.-p.218.
6. Kutsenok Ya.B., Rulla E.A., Melnik V.V. Congenital hip dysplasia. Congenital subluxation and dislocation of the hip. Kyiv: Health, 1992, 182p.
7. Malakhov O.A., Kozhevnikov O.V., Ivanov A.V. Treatment of Legg-Calve-Perthes disease by methods of damper dynamic unloading using new generation biocompatible polymers. // Patol. large joints and other topical issues. det.travmatol. and orthotop.- St. Petersburg.-1998.-S.149-151.
8. Malakhov O.A., Tsygankova E.E. // Actual issues of pediatric traumatology and orthopedics: Mater. scientific-practical. conf. pediatric traumatologists-orthopedists of Russia. - St. Petersburg, 2005.-p.229-230.
9. Pozdnikin Yu.A. Acetabuloplasty-osteotomy of the pelvis as a method of reconstruction of the dysplastic acetabulum / Yu. A. Pozdnikin // Orthopedics, traumatology and prosthetics.–1983. 10. Sokolovsky A.M., Krisyuk A.S. Surgical treatment of diseases of the hip joint. Minsk: Navukatekhnika, 1993.248s.

ISSN NO: 2770-2936
Date of Publication:13-12-2022

10. Sokolovsky A.M., Sokolovsky O.A., Kovalchuk O.V., Likhachevsky Yu.V. Surgical correction of type II deformities according to Kalamchi after avascular necrosis of the proximal femur in children: Proceedings of the scientific and practical conference of pediatric traumatologists and orthopedists of Russia. - Syktyvkar, 2008. -p.249-250.
11. Bar-On E., Huo M.H., DeLuca P.A. // J. Pediatr. Orthop. B. - 1997. - Vol.6. - P.138-145.
12. Brougham D.I., Broughton N.S., Cole W.G., Menelaus M.B. Avascular necrosis following closed reduction of congenital dislocation of the hip // J. Bone Joint Surg. 1990 Vol. 72-B, No. 4.P.557-562.
13. Clarke N. M. The surgical treatment of established congenital dislocation of the hip: results of surgery after planned delayed intervention following the appearance of the capital femoral ossific nucleus / N. M. Clarke, A. J. Jowett, L. Parker // J Pediatr Orthop. - 2005. - Vol. 25, No. 4. – P. 434–39
14. Connolly., Connolly P., Weinstein S. L. The course and treatment of avascular necrosis of the femoral head in developmental dysplasia of the hip // Acta Orthop Traumatol Turc. 2007. Vol.41, No.l.P.54-59.
15. 16.Herold H.Z. Unilateral congenital hip dislocation with contralateral avascular necrosis. //Clin.Orthop.-1980-Vol.148.-p.196-202.
16. Kim HW., Morcuende J.A., Dolan L.A., et al. // J. Bone Joint Surg. Am. - 2000. - Vol.82. - P.1692-1700.
17. Kruczynski J. Avascular necrosis of the proximal femur in developmental dislocation of the hip incidence, risk factors, sequelae and mr imaging for diagnosis and prognosis // Acta Orthop Scand.1996.Vol.67, No.268.P.4- 12. 19. Luedtke L.M., Flynn J.M., Pill S. G. A Review of avascular necrosis in developmental dysplasia of the hip and contemporary efforts at prevention // Univ. Pennsylv. Orth. - 2000. - Vol.13.P.22-28.
18. 20. Luhmann S.J., Schoenecker P.L., Anderson A.M., Basselt G.S. The prognostic importance of the ossific nucleus in the treatment of congenital dysplastic of the hip. //J. Bone and Joint Surg.-1998.-Dec:80(12):1719-27.
19. 21.Maquet P. //Acta Orthop. Belg. - 1999. - Vol.65, N3. - P.302-314.
20. 22. Millis, M.B., Murphy S.B., Poss R. //Instr. Caurse Lect. -1996. - Vol.45. - P.209-226