

CLINICAL SCIENCE

DEVELOPMENTAL DISORDERS OF THE HIP TREATED AT THE CLINIC FOR ORTHOPAEDIC DISEASES – IN A PERIOD OF 10 YEARS (2009-2018)

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Abstract

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Developmental hip dysplasia includes a wide range of conditions such as subluxation, dislocation, hip instability, and teratological hip. The diagnosis was confirmed by clinical examination, ultrasound examination and anterior-posterior view radiograph (AP). Treatment varied depending on the patient's age and the degree of dysplasia: Pavlik harness, closed reduction, open reduction and corrective osteotomies. In this study 242 patients were included, of whom 198 were female patients and 44 male. All of the patients were treated with conservative treatment-closed reduction and spica casting. Left-sided dislocations were more common than right sided dislocations with predominance in the female patients. The main treatment in follow-up patients was closed reduction with or without adductor muscle tenotomy (m. add. longus). In cases with unsuccessful attempt of closed reduction, open reduction was performed with or without adductor muscle tenotomy. Depending on the residual dysplasia, patients were additionally treated with pelvic osteotomies (Salter, s inominate osteotomy), varus derotation osteotomy, valgus osteotomy, proximal femoral resection, and trochanter major transposition. 167 patients were treated with closed reduction and 3 with open reduction. The remaining patients were treated with closed reduction and additional surgery or with open reduction and additional surgery. Out of all treated patients, only 10 patients had recurrent dislocation of the hip, 7 female and 3 male patients. Closed reduction was performed again on two patients, and open reduction of the hip was performed on one patient. The average age of patients was 21.5 months. By presenting the cases in a period of 10 years, it was concluded that most cases were diagnosed later. Also, the standard closed reduction treatment was successful even after the first year in said patients. Depending on the residual dysplasia of the hip, in order to achieve better congruence of the joint, additional surgeries were performed.

КЛИНИЧКИ ИСТРАЖУВАЊА

РАЗВОЈНИ НАРУШУВАЊА НА КОЛКОТ КОИ СЕ ТРЕТИРАНИ НА КЛИНИКАТА ЗА ОРТОПЕДСКИ БОЛЕСТИ - ВО ПЕРИОД ОД 10 ГОДИНИ (2009-2018)

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Извадок

Цитирање: Комненовиќ М, Божиновски З, Трајановски А, Савески А, Дамјановиќ Д, Атанасовски И. Развојни нарушувања на колкот кои се третирани на клиниката за ортопедски болести-во период од 10 години (2009-2018). Арх Ј Здравје 2022;14(1): doi.org/10.3889/aph.2022.6050

Клучни зборови: развојни нарушувања, колк, некрвава репозиција, оперативен третман.

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Печатарски права: ©2022 Марина Комненовиќ, Зоран Божиновски, Александар Трајановски, Александар Савески, Дејан Дамјановиќ, Игор Атанасовски. Оваа статија е со отворен пристап дистрибуирана под условите на неограничена лиценца, која овозможува неограничена употреба, дистрибуција и репродукција на било кој медиум, доколку се цитираат оригиналните автор(и) и изворот.

Конкурентски интереси: Авторот изјавува дека нема конкурентски интереси.

Во развојните нарушувања на колкот влегуваат широк спектар на состојби како сублуксација, дислокација, нестабилност на колк и тератолошки колк. Дијагнозата се потврдува со клинички преглед, ехо-сонографски преглед и антеро-постериорна радиографија (АП). Третманот во зависност од возраста на пациентот и степенот на дисплазија може да биде со Павликови ременчиња и некрвава репозиција се до крвава репозиција и корективни остеотомии. Цел на овој труд е да се прикаже третманот на развојните нарушувања на колкот на Клиниката за Ортопедски болести во Скопје. Материјал и методи: Во оваа студија се вклучени вкупно 242 пациенти од кои 198 се женски пациенти и 44 машки пациенти. Кај сите пациенти основен третман е некрвава репозиција. Левостраните луксацији се побројни со преминација кон женскиот пол. Основен третман кај следените пациенти е некрвава репозиција со или без тенотомии на аддукторната мускулатура (m. add. longus). Кај пациенти со неуспешен обид за некрвава репозиција направена е крвава репозиција со или без тенотомии на аддукторната мускулатура. Во зависност од резидуалната дисплазија на зглобот пациентите се третирани дополнително и со карлични остеотомии (иноминантна остеотомии по Салтер), варус деротативна остеотомии, валгус остеотомии, ресекција на проксимален фемур и транспозиција на големиот трохантер. Резултати: луксациите се со преминација кај женскиот пол и позастапени се левостраните луксацији во однос на десностраните луксацији и кај сите основен почетен третман е некрвава репозиција на колкот. 167 пациенти се третирани само со некрвава репозиција на колкот, а 3 со крвава репозиција на колкот. Останатите пациенти се третирани со некрвава репозиција и дополнителен оперативен зафат или пак крвава репозиција и дополнителен оперативен зафат. Од сите третирани пациенти, само кај 10 пациенти имало релуксација на колкот и тоа кај 7 пациенти од женски пол, 3 кај пациенти од машкиот пол. Кај две од нив повторно е направена некрвава репозиција, а кај една крвава репозиција на колкот. Средна возраст на третман кај пациентите е 21,5 месеци. Повеќето од случаите се дијагностицираат подоцна, стандардниот третман некрвава репозиција е успешен и после навршена прва година кај пациентите. Во зависност од резидуалната дисплазија на колкот, со цел да се постигне подобро конгруентност на зглобот се прават дополнителни оперативни зафати.

Introduction

Developmental dysplasia of the hip can be defined as abnormal hip development which includes bone structures such as acetabulum and proximal femur, labrum, capsule and other soft tissue. This includes a wide range of conditions such as subluxation, dislocation, hip instability, and teratological hip.¹ The causes of developmental dysplasia of the hip are unknown. Approximately one of 1000 children is born with a dislocated hip, while 10 out of 1000 children are born with a subluxated hip.² Dysplasia occurs in one out of 100 children; developmental dysplasia of the hip is more common in females (6:1), in 60% of the patients the left hip is affected.² Bilateral dislocation is found in only 20% of the cases.² Risk factors for developmental dysplasia of the hip are as follows: firstborn child, female sex, breech presentation, positive family history, oligohydramnios. The diagnosis is set with clinical examination, ultrasound examination and anterior-posterior view radiograph (AP). Clinical tests that are used during the examination are the Ortolani maneuver, the Barlow -maneuver and the Galeazzi sign. With the Ortolani maneuver we reposition the dislocated hip into the acetabulum. In infants who are more than 3 months old, the limited hip abduction (asymmetry in both hips abduction) is a sure sign of developmental dysplasia of the hip.

The study of Kotlarsky P et al., demonstrated that limited hip abduction after eight weeks of age is strongly associated with developmental dysplasia of the hip.³ Ad-

ditional characteristics are asymmetrical gluteal fold and lower limb-length discrepancy, standing or walking with external rotation of the leg in already walking patients.¹ Tpendelenburg sign can be seen in patients with dislocation who are already walking, while “waddling gate” can be seen in patients with bilateral dislocation, i.e., the child limps with both legs. In addition to the clinical examination, the ultrasound examination is also mandatory. According to the Graf method, the ultrasound finding includes static evaluation of the hip joint. The study of Dessi A. et al., indicates that ultrasound screening should be performed to all newborn babies aged 4–6 weeks, even when clinical signs or risk factors for developmental dysplasia of the hip are lacking.⁴

In cases when developmental dysplasia of the hip is diagnosed with ultrasound examination or it is diagnosed after 6-9 months of age, anterior-posterior view radiograph (AP) of the pelvis is done with central position of both knees. Another additional diagnostic is: arthrography, computed tomography and MRI scan. Computed tomography (CT) is performed more often in the assessment of the efficiency of the reposition after closed or open reduction of the hip. The efficiency of the closed reduction with standard anterior-posterior view radiograph (AP) cannot be assessed through the plaster cast immobilization. Computed tomography (CT) enables us to see the hips on the axial plane and thus confirm the reposition. By using low-dose radiation techniques, such as 1 mSv, we can obtain adequate radiation dosage for the hip radiography.⁵

The treatment of the developmental dysplasia of the hip depends in the age of the patient. According to Pavlik, the most suitable time for treatment with Pavlik harness are the first 8-9 weeks, while the acetabulum is still not filled with soft tissue structures. The repositioning and recentering of the femoral head in infants are much easier.⁶ If the treatment is unsuccessful or the patient is older than 6 months, closed reduction is performed with or without prior traction. If necessary, subcutaneous tenotomy is also performed on the m. add. longus. When the patient is above 2 years of age, i.e., the dislocation is diagnosed after the patient started walking, closed reduction is performed, and depending on whether there is subsequent dysplasia of the hip, surgical procedures follow.

If the closed reduction is unsuccessful, open reduction of the hip is performed. Depending on the condition of the dislocated hip and the subsequent dysplasia, several surgical treatments are sometimes needed in order to obtain a congruent joint.¹ There are many complications that can arise from the treatment of developmental dysplasia. One of the most serious complications is avascular necrosis (AVN)

of the femoral head in children who are inadequately treated with maximal hip abduction. AVN is most often caused iatrogenically.⁵

The main iatrogenic causes of AVN are disorders of the circulation of the head, necrosis of the head due to pressure thereon, traction, the force with which the reposition is performed, the position of the immobilization after the “frog leg position” reposition, the ossification of the nucleus and the position of the femoral head, as well as the use of the Hilgenreiner brace.⁷

The aim of this paper is to present the treatment of developmental disorders of the hip at the Clinic for Orthopedic Diseases in Skopje.

Materials and methods

In the period 2009-2018, a total of 242 patients were included and treated in our study, whereas 44 male and 198 female patients were noted. The patients were treated at the Clinic for Orthopedic Diseases in Skopje.

Results

The average age of the treated patients was 21.5 months. The youngest patient was 2 months old, and

Table 1. Distribution of developmental disorders in patients by the conditions and gender.

Diagnosis	Female	Male	Total
Dislocations	183	41	224
Bilateral dislocations	67	8	75
Right-side dislocations	48	15	63
Left-side dislocations	60	18	78
Subluxations	9	/	9
Right-side subluxations	5	0	5

Left-side subluxations	6	2	8
Single-side subluxation with dislocation of the other hip	12	1	13
Dysplasia (without dislocation or subluxation)	5	/	5
Dysplasia with subluxation or dislocation	26	6	32
Bilateral dysplasia	12	2	14
Left-side Dysplasia	10	0	10
Right-side Dysplasia	11	3	14

the oldest patient was 153 months old (12 years and 9 months).

Developmental disorders of the hip are most common in Skopje – 70 patients, followed by Kumanovo – 30,

Tetovo – 14, Veles – 12, Gostivar – 12, Strumica – 10, Stip – 6, Prilep – 4, Kriva Palanka – 4, Kavadarci – 4, Radovis – 3, Debar – 3, Gevgelija – 2, Struga – 2, Negotino – 1, Sveti Nikole – 1, Kratovo

Table 2. Distribution of developmental disorders in patients by the conditions and gender.

RNS without other intervention	RS without other intervention
167	3
RNS + tenotomy of add. muscles (RNS- Closed reduction)	31
RNS+ tenotomy of add. muscles +salter innominate osteotomy	1
RNS+ salter innominate osteotomy	2
RNS+pemberton osteotomy	1
RNS+ Pemberton osteotomy+derotative osteomy	1
RNS+derotative osteotomy	1
RNS+ tenotomy of add. muscles +derotative osteotomy	2
RNS+derotative osteotomy+Transposition of the greater trochanter distally	1
RNS+VRDO	1
RS+ tenotomy of add. Muscles (RS- Open reduction)	2
RS+ derotative osteotomy.	3
RS +tenotomy of add. muscles +derotative osteotomy	3
RS+ derotative osteotomy+Salter innominate osteotomy	1
RS+ tenotomy of add.muscles +Salter innominate osteotomy	1
RS+resectio femoris (shortening) +derotative osteotomy	5
RS+VRDO	1
Proximal Valgus osteotomy	1

VRDO (Varus Derotation Osteotomy)	2
Derotation osteotomy+Salter innominate osteotomy	2
Salter innominate osteotomy	12
Extractio OSM (there is no data on the type of the performed operation)	10

- 1, Bitola - 1, Kichevo - 1, Kochani - 1 patient.

Discussion

The papers of Sewell, Clarke N. M et al., show that the ultrasound examination is the most reliable method for describing the anatomical characteristics of the hips of the children under 3 months of age.^{8,9} Screening is crucial for the early diagnosis and treatment of the developmental disorders of the hip, and it should begin in the maternity ward where clinical examination must be performed and advice for orthopedic examination must be given. AP radiography is important in diagnosing and confirming the diagnosis in children above 3 months of age; it is not necessary before the age of 3 months due to the fact that ossification nuclei of the femoral head begin to appear at the age of 4-6 months.¹⁰ Acceptable manner of treatment of developmental dysplasia of the hip in the literature is graded from the least invasive treatment to increasing the invasiveness of the treatment.² Pavlik harness remains the most acceptable and the most used method in children with developmental dysplasia under 6 months of age, with a high success rate. Should the Pavlik harness fail to provide stability of the hip, the next step is closed reduction of the hip under general anesthesia and placement of abduc-

tion plaster cast with flexion in the hips with or without arthrography.¹⁰ The safe zone of Ramsey is the range between maximal passive abduction of the hip and the angle of abduction where the femoral head becomes unstable. Immobilization must not be placed in maximal abduction, because this increases the chances of AVN of the hip.^{3,11} The plaster cast immobilization is placed in 90-100 degrees of hip flexion and controlled abduction which is less than 70 degrees.³ If the safe zone of Ramsey is wide, the hip is considered stably repositioned, while if greater abduction and internal rotation greater than 10-15 degrees are required to keep the hip in the acetabulum, it is considered unstable repositioning.¹¹

In order to increase safe zone that would allow greater abduction, an open or closed tenotomy of m. adductor longus was performed depending on the size of the adductor contracture.¹¹ After the successful closed reduction, the residual dysplasia of the hips, when necessary, is usually treated with Salter innominate osteotomy and, less frequently, with Pemberton osteotomy or Dega acetabuloplasty.

Varusderotationosteotomyis performed in cases of severe femoral anteversion.¹² If the closed reduction failed, then the next solution was open reduction of the hip, if necessary, with pelvic osteotomy or femoral osteotomy.¹⁰

The purpose of the treatment of developmental dysplasia of the hip is to keep the reduced hip in order to obtain a concentric shape of the femoral head for better congruence of the joint which will reduce the risk of early AVN which leads to early osteoarthritis of the joint.¹⁰ The rate of osteonecrosis of the femoral head after treatment with Pavlik harness ranged from 1% to 30% in the study of Al-Essa's. S. R et al.¹⁰

The risk of developing osteonecrosis is high in Graf type IV hips or in patients where the dislocation was proven with an anterior-posterior view radiograph (AP). Initial treatment above 3 months of age, delay in ossification of femoral head at the beginning of the treatment, prolonged treatment accompanied by strong adductor contracture of the hip are risk factors for development of AVN of the femoral head. The rate of development of osteonecrosis of the contralateral healthy hip in cases where the dislocation is unilateral and that are treated with Pavlik harness is 2.9%.⁶ According to the literature, after beginning to walk, i.e., above 2 years of age, direct open reduction of the dislocated hip should be performed.

The metacentric study of Morina C et al. shows results from 15 centers where a total of 222 cases were treated with closed reduction in the last 20 years. In 5.3% of patients the reduction was unsuccessful, 8% of the had recurrent dislocation or subluxation, and 4.7% of them had post-reduction osteochondritis. Successful open reductions of the hip were performed on 120 patients. 7% of them had recurrent dislocations and subluxations and 13% of them

had post-reduction osteochondritis.¹² The study of Hayazi M Al Shehri et al. shows that the successful closed reduction in congenitally dislocated hips within the recommended age (4-15 months of age) results in improved acetabular development, i.e., formation of the acetabulum within a minimum of 12 months after the closed reduction.¹³

Screening as a method of choice is confirmed by the fact that if abandoned, the rate of late detection will increase and there will be a significantly increased expected risk of avascular necrosis of the hips and less successful results, because the surgical treatment, i.e., the open reduction of the hips will be more common.

Conclusion

By presenting the cases within a period of 10 years in this study, we can conclude that most of the cases are diagnosed later, but also that the standard treatment of closed reduction is successful even in patients above one year of age. Surgical procedure of the acetabulum and the proximal femur is used to correct residual dysplasia. Open reduction can give rise to complications such as avascular necrosis of the femoral head (AVN).

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