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Physiotherapeutic treatments in infants with congenital hip dysplasia

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Abstract

Congenital dysplasia is the most common congenital orthopaedic defect in children. Its occurrence is estimated at 2-4% of newborns (1:400), where majority of cases concern girls (85%). This disease was observed in greater numbers in people living in Central, Southern, Eastern Europe and the Sami people. This distortion may be caused by genetic and mechanical factors or incorrect prophylaxis during childcare processes. Treatment depends on the degree of damage, the age of the child and the speed of diagnosing the disease. Surgical, conservative and prophylactic treatment is used, and in each one of these physiotherapy plays an important role. Physiotherapy in the treatment of hip joints is used in form of

kinesiotherapy, massage and the selection of appropriate orthopedic equipment to correct the defect and maintain the therapeutic effect obtained during surgical treatment. It also allows and helps in maintaining proper function of limbs.

Aim

The aim of the study was to present scientifically supported knowledge on the methods of prevention and treatment of congenital hip dysplasia as well as orthopedic supply and physiotherapy.

Keywords: dysplasia, hip joint, conservative treatment, surgical treatment, prophylaxis

Introduction

In fetal life the skeletal system is one of the last to develop in the human body. Bone limbs buds are formed in the embryonic period and their ossification begins around the 12th week of fetal life. Bone development and its length depends largely on the cartilage tissue, which gradually cures and disappears. Bones in addition to their length are also ossified on the periphery. During this period there are numerous changes leading to the perpetuation of congenital defects within the skeletal system [1,2].

Hip development

Both factors, those responsible for the shape of the acetabulum and those responsible for the development of the proximal femur affect the development of the hip joint. [2,3]. The development of the first structure is influenced by the presence of the femoral head on its surface. Without its presence the pan becomes shallow and shows no developmental changes. Another factor is the development of interstitial articular cartilage is adhering and ossification of the peritoneal pelvic bone [2,9,10]. In contrast factors that affect the development of proximal femur are morphological factors such as the cervico-axillary angle and the size of the antetorsia angle. The values of the first one depend on: age, physical activity, blood supply to the proximal femur. Cervico-medial angle is between the central axis of the femoral neck and the central axis of the femur. Its size changes with age [2,3,4,5,11].

Hip dysplasia

Dysplasia of the hip joints can be both developmental and innate, it depends on the time and factors that contributed to its arise. If the dislocation of hip joint occurred in the first weeks of life, they are considered to be innate dislocations, whereas if this happens later in fetal life or after birth we speak of developmental dislocation [4,6,17,18]. The dislocations of the hip joint occur most often in 3rd month of fetal life. It's then when the hip joint begins to perform its first moves. Dislocation in the joint may occur unilaterally because every joint in the human body has its own time of neuromuscular development, which is why they develop independently of each other. After the dislocation of the bone that has not yet fully developed the bone elements continue to grow in wrong position [2,6,14]. Another risk period is estimated at about 4.5 month of fetal life. The movements then become larger and more extensive, which is why the lower limb can be blocked by the chin or upper limb of the child, which leads to easy displacement on the hip joint and distortions of its structure [2]. The final period of hip development is are the last weeks of fetal life. The abnormalities in the development of the hip joint are affected by uterine compression forces and mechanical factors. During this time, damage to the joint is not substantial but may lead to joint instability. Dysplasia that arises during the last weeks of pregnancy characterizes with hypertrophy of the femoral head ligament, loosening of the joint capsule and excessive antetorsia angle (above 50°) [2].

Treatment

Treatment of congenital dysplasia is largely dependent on the child's age. However, the sooner we implement corrective actions, the greater the probability of complete, finished treatment. The later it is detected the more difficult it is to achieve satisfactory treatment effects. This is due to increasingly reduced plasticity and susceptibility to deformation of the acetabulum and the proximal end of the femur. Initially, the child is subjected to conservative treatment. On the other hand, surgical treatment is the last resort [2,5,15,17]. During the early treatment of the joint its ability to correct the existing disorders is used. The stimuli that are the most often used for treatment are: pressure, pulling and movement stimulation. The conservative treatments is mainly about reconstructing and maintain the proper anatomical position is the hip joint. This treatment is based on eliminating the resistance of the contorted adductor muscles of the hip joint. The most common devices used are: Pawlik's suspenders, Frejka's cushion with wedges, Koszli's rail, over-head, conservative positions, Wieckert's

abduction underpants, Gruca's playsuit, Dennis-Brown rail. The position of the child's hip joints in most of these instruments corresponds to the natural position of the lower limbs i.e. the flexion in the joint of approximately 100° and the abduction to 50° [1,2]. In newborns up to 6 months of age, rigid devices that may disrupt blood supply to the hip joints should not be used, as they may eventually lead to necrosis of the proximal femur. Therefore, there is no use of the Busbar's rail and Frejka's cushions with a hard insert. In the case of the Frejka's cushion with soft pillow usage, the hip joints will be turned to the outside. Treatment with this method lasts about 3 to 4 months. At this time, correction and growth in the hip joints occurs. In the case of incomplete treatment of the hip joints, we can also additionally use the Ortolani's rail [2,14]. However, Pawlik's suspenders are the most widespread. Used up to 6 months, after this period their effectiveness gradually decreases. They are used for proper stabilization of joints and protect against subluxation and extension of the lower limbs. The use of suspenders should take place for 6 weeks. This method, in its effectiveness is estimated at 85-89% in the case of hip joint dislocation and 95-100% in the case of subluxation [2,9]. Mistakes in the use of braces may result from several factors i.e. errors from the person who is treating the dysplasia (incorrect tips given to parents, errors in treatment), mistakes made by the parent (failure to follow the advices of the attending physiotherapist), the mobility of the child (turning sideways or trying to get up despite wearing suspenders) and wrongly selected suspenders. Suspenders differ from each other for example, in material. Too large suspenders give greater freedom of movement and less stability. On the other hand, too small limit the movements of the child's joints. They can also cause abrasions if they are too narrow. The main contraindications to using Pawlik's suspenders are: instability of joints due to increased or decreased muscular tonus (micodysplasia, MPD or arthrogryposis) and excessive joint limpness. Pawlik's suspenders can also cause a number of complications such as lower hip joint dislocation, femoral nerve palsy, paralysis of the brachial plexus (which is transient), sterile osteonecrosis of the femoral head [14,18]. In the event that the conservative methods fail, the so-called closed simple reposition is carried out. In this situation, the child is put to sleep and if necessary anesthetized. The maneuver that is performed during this procedure is: gentle distraction with simultaneous flexion of the limbs in the hip joints. The femoral head is inserted into acetabulum of the joint. Immediately after performing the reposition as confirmation of the correct setting, X-ray should be performed and plaster should be placed to stabilize the lower limb in correct position ($100-110^\circ$ of flexion and $40-50^\circ$ of abduction) – resembling fetal position. In case of children whose hip dysplasia was poorly treated or not

detected promptly, the final form of conservative treatment is the lower limb lift over-head with the stabilization. It is a method that can protect a child from surgery. It was first used in 1955 by Craing. Indication for the use of the limb lift are determined on the basis of the radiological image and the age of the child. This method is used in children between 7 and 21 months of age. It is usually used to obtain reposition by gradually loosening the adductor muscles of the hip and the ilio-lumbal muscle. It also reduces the risk of femoral head necrosis. Children treated with this method are placed in the back with hips in 110° flexion with a gradual increase in the degree of abduction. The goal is to increase the angle to 70° and to reduce the restriction of movement in the hip joints. The limb lift is used for about 4 weeks and is completed when the closed reposition in the joint is obtained. Another conservative way to treat hip dysplasia is to use the device with the Denis-Brown rail. This device has the task of keeping the limbs in the position of abduction and internal rotation. Most often used in treatment of children who are starting to walk. This rail is used during the night and – with shoes – during the night. [14,17,18]. In the absence of efficiency of conservative treatment, surgical treatment is applied [2,5]. It aims to completely remove any deviations in the joint, obtain proper stability, full range of motion and the correct, both radiological and anatomical image. The aim of surgical procedures in the case of joint dysplasia is to achieve the correct depth and proper acetabular inclination. As an indication for surgical treatment the following are mentioned: increased anteversion of the femoral neck, the high slope of the acetabular ceiling in adults and adolescents (to prevent degenerative changes and dislocations) [15,16,17,18].

Physiotherapy

In the case of children with congenital hip dysplasia both kinesiotherapy and physical therapy are used.

Kinesiotherapy

Kinesiotherapy is used in treatment of children with congenital hip dysplasia before and after surgery (additionally as a form of prevention). Rehabilitation during conservative treatment is usually used at the moment when the child has an over-head lift. Exercises are used then as such: active shoulder ring and upper limbs exercises, breathing exercises, isometric belly muscles exercises, active gluteal muscle exercises, active ankle muscles exercises [17,19]. However, rehabilitation after the surgery is aimed at eliminating contracture and general improvement of the child. The next task of kinesiotherapy is to restore the proper positioning

of lower limbs. Gentle active movements in the joints are performed with addition of: breathing, flexion and abduction in hip joints, water exercises, balance exercises, exercises aimed to strengthen the back and abdominal muscles, walk learning (correction of the wrong posture pattern), learning how to properly spread the weight on lower limbs, massage with plaster. Massage is performed to improve blood supply to the tissues and reduce muscular tonus. It can be performed in two positions: lying down (classical massage of lower limbs and abdominal wall) or lying front (buttock and back massage). Manual therapy and stretching of tissues within adductors are also used [19].

Physical therapy

Physical therapy often uses thermal treatments during or before massage to reduce pain. Such treatments include among others fango. The other physical treatment that we can apply is high-frequency electrotherapy.

Prevention

Improper development of the child's hip may also be prevented by appropriate care i.e. proper carrying , diaper changing or laying of the child. In the case of prevention of defects, posture positions are used immediately after birth which prevent restraint of the movements of the lower limbs i.e. holding the child in a safe chair position (where the legs hang free), carrying the child in the side laying down (bean position) [12,14,18]. An important element is also changing diapers. During this operation the child's feet should not be lifted too high. The correct positioning of the child's limbs is a slight flexion and abduction in the hip joints without pressing to the abdomen [12].

Summary

Children with congenital hip dysplasia have a greater chance of returning to normal development the faster the defect will be detected. Orthopedic aids as well as preventive measures of parents or a doctor help in preventing or worsening a defect. Neglecting this problem can lead to deepening of the defect, which consequently results in the use of final treatment measures i.e. surgery.

Conclusion

After analyzing the literature of the subject it can be concluded that physiotherapy is an indispensable element of prophylactic action at every stage of treatment of congenital hip

dysplasia. Due to the insufficient number of randomized controlled trails, further clinical management should be carried out taking into account all forms of prevention as well as modern orthopedic equipment.

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