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The New Device and Method for the Treatment of Congenital Clubfoot in Infants

ABSTRACT

A new method for correction of congenital clubfoot without surgery in the infants, developed and used in the practice of Department of orthopedics and Traumatology, Pediatric Center RH №1 - NCM Yakutsk in 2012i is presented in the article.

The technique is based on the anatomical features of nerve pathways in children of the first months of life and constant multiplanar foot traction by new device with a functional effect on certain muscle groups. This method eliminates the main drawback of conservative treatment of congenital clubfoot such as possible necrosis of the skin and soft tissues due to the lack of control over soft tissue located under the circular plaster cast.

The proposed method and device can be widely used in outpatient service.

Keywords: clubfoot, a device for the treatment of clubfoot, multiplanar traction, foot correction, sleeve, leather orthosis, rubber tourniquet.

INTRODUCTION

Clubfoot is a complicated congenital complex foot deformity. It manifests itself in the following variations: plantar flexion of the foot in the ankle joint (equinus), the outer edge of the foot lowering (supination), adduction, torsion of leg bones of the foot and contracture of foot joints.

Congenital clubfoot is one of the most common birth defects in children. From one to three out of 1.000 live births have this deformity. Pathology can be seen on ultrasound at 3 months of pregnancy.

Treatment of congenital clubfoot is complex and the not completely solved problem of modern orthopedics. Conservative treatment of congenital clubfoot is known more than 2000 years, from the time of Hippocrates, his tactics and methods have passed through a long evolution. Modern principles of conservative treatment are based on studies of J.H. Kite (1932), Ignacio Ponseti (1950), V.A.Shturm (1956), V.Ya. Vilenskij (1973), M.V. Volkov (1983) and et al. It means a gradual, phased correction of clubfoot components, beginning from the deformation of the forefoot, and ending it on equinus with the fixation of the limb with gypsum casts. To fix the

limb in the treatment of congenital clubfoot it is recommended to use the traditional longuet - circular plaster bandage from the fingertips to the upper one-third of the thigh at the angled 90^0 in the knee joint of the shin (Fig. 1).

Fig. 1. Phased plastering

It should be noted that the use for the treatment of true congenital clubfoot of truncated plaster casts and bandages with recesses and voids in the foot is unacceptable (Fig. 2).

Fig. 2. Improper application of a plaster cast

At the present time in modern orthopedics, there are only two main methods of conservative treatment of infants with congenital clubfoot: the Ponseti method and phased plastering by Volkov.

The main disadvantage of these methods is possible necrosis of the skin and soft tissues, due to the lack of control over soft tissues located under the circular plaster cast. Using plaster

casts eliminates at the long term possibility of therapeutic exercises, massages, baths and physiotherapy as well as significantly worsens the tone and trophism of leg and foot muscles. These techniques were associated with a significant prolongation of treatment and pretty frequent complications from skin and soft tissues (Fig. 3). Caring for a child in a cast requires parents’ patience and a lot of attention.

a

b

Fig. 3. Complications of the skin and soft tissues

New method of treatment of congenital clubfoot in infants with the use of device for multiplanar, dynamic, permanent extension of the foot in position of correction.

The new device consists of a removable sleeve made of 3 mm thick Polivik (Fig. 4). The sleeve (2) fixes the thigh and shin by two Velcro (1) in flexion of the knee angle of 90^0; since at the bent knee joint calf muscle attachment points become closer and foot, freed from the pull of muscles, is easier to correct.

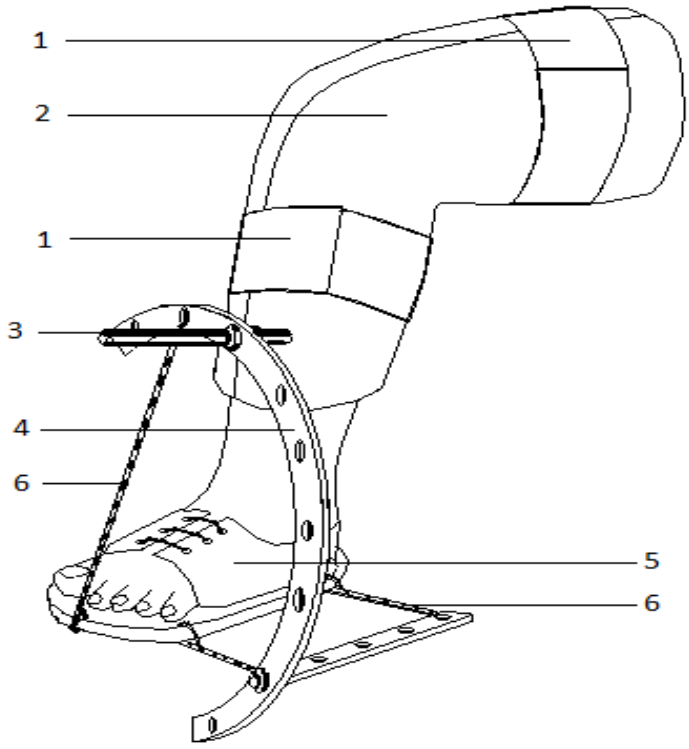

Fig. 4. The device for the treatment of congenital clubfoot

In the shin segment at the sleeve bottom part (3) rod is installed up to 8 - 10 cm length threaded on the entire length with screw - nut to "10" key. Into the rod semicircle with several holes with a diameter of 100 to 120 mm is mounted (4). The installed semicircle is adjustable in length, width and height depending on the degree of deformity.

We put on leather orthosis with a hard sole on feet (5). The brace must strictly match the size of the foot, as there should be free space inside.

Next, multiplanar traction with a rubber band (6) behind of the brace taking into account components of the foot deformities (equinus, adduction, supination, torsion) is done. The

diameter and strength of the tension of the rubber band are selected depending on the severity of the deformity and the child's age.

We have developed this method of correction of congenital clubfoot without surgery for the first time and it is used in practice in the Department of Orthopedics and Traumatology Pediatric Center RH №1 - NCM Yakutsk in 2012.

We obtained two patents of the Russian Federation to the device and method for the treatment of congenital clubfoot. The positive results of the formal examination are received.

Podiatrists are already not at risk to carry out phased corrections with plaster bandages from the first days of life due to severe complications such as necrosis of the skin and soft tissues, impaction by circular plaster bandage of the entire limb.

The new technique is based on the anatomical features of nerve pathways in children of the first months of life and the use of permanent multiplanar extension by new device, which is functionally acting on certain muscle groups.

Starting treatment of clubfoot by our method is recommended as soon as possible after birth. The earlier treatment is started, the better and faster the correction of a deformed foot.

After installing the device orthopedist with parents gradually make redressing towards deformity correction under the control of the muscular sense, stretching the soft tissues and ligaments of the foot. Passive corrective exercises are performed without pain and violence. This device is not only capable of holding the foot in position of obtained correction, but also constantly works to eliminate deformation. Periodically, parents can withdraw device by their own to control and care for the skin condition of the limb and receiving child warm baths and physiotherapy.

The above-described device is applied to the period from 1 to 2 months. As the baby grows up - the sleeve is changing, the strength and direction of traction are regulated.

Results of the study. We have treated 7 patients. Treatment was started at the age of 5 days to 2 weeks. There were no girls among patients. All the children were diagnosed with bilateral clubfoot, severe degree. The results of treatment in all cases were assessed as "excellent". Complete elimination of the deformation took 3 to 4 months (Fig. 5). After the

deformation eliminating the foot retention was conducted using another device in order to fix the foot.

a

Fig. 5. Patient K.: a - before treatment

b

b- after installation of multiplanar, dynamic, permanent extension of the foot during treatment;

c - side view;

d

e

d, e - after treatment

CONCLUSIONS:

1. The proposed in the article treatment of congenital clubfoot does not have the above mentioned disadvantages of the treatment of congenital clubfoot by phased gypsum plasters (by Volkov, Ponseti).

2. The use of this device and the method of treatment ensure the restoration of normal support ability of the limb to walking start of the child.

3. Treatment of congenital clubfoot by means of by our suggested method should be started from the first day of birth.

4. This device and method of treatment allows in a short time to correct foot deformities and get an excellent functional result without complications.

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