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PRINCIPLES OF THE USE OF EXTERNAL FIXATOR IN THE CORRECTION OF CONGENITAL LOWER LIMB DEFORMATIES

An essay Submitted for Partial Fulfillment of the Master Degree in Orthopedic Surgery

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Sherif Gamil

Introduction And Aim Of The Work

Introduction:

The use of the external fixator represents one of the recent approaches in the management of congenital lower limb anomalies.

Owing to the vast variation of the types of congenital deformities of the lower limb, different classification systems has been set to include a wide range of deformities; ranging from simple deformities requiring only passive stretch of tissues up to severe complex deformities needing surgical correction.

Correction of different deformities of the lower limb may be done via different techniques according to:

- severity of the case
- multiplicity of the deformities
- degree of parental cooperation

The basic principle of correction is the elongation of soft tissues or the shortening of bone. Thus, the external fixator technique may be used to achieve gradual physiologic elongation of soft tissues without multiple surgical interference and hence, the application of this technique in the severe, complex, or relapsed deformities.

Aim of the study:

To highlight and review the principles of the use of external fixation in the management of different types of common congenital lower limb deformities.

Contents

(1) Classifications of congenital deformities of the lower limb
(2) Principles of management of congenital deformities of the lower limb.
(3) External fixation in lower limb deformities.

- principles
- types
- clinical application
- complications
- limitations of use

(4) Summary and conclusion
(5) References
(6) Arabic summary.

Chapter 1

Classification Of Congenital Anomalies Of Lower Extremity

Normal lower extremity and growth

Familiarity with the spectrum of non-traumatic disorders in the foot and lower extremity is a necessary tool for the pediatrician to provide appropriate counseling to the patient and family and, if necessary, to provide appropriate referral. An understanding of the normal embryology and development of the lower limp facilitate an understanding of congenital and developmental anomalies of the pediatric lower extremity. This essay begins with a description of the normal embryology and ossification of the lower limb as a basis for the subsequent discussion of the pathophsiology and classification of lower extremity malformations. Guidelines for the clinical and radiographic evaluation of a child with lower limb dysfunction are then discussed. Lastly, specific disorders are presented, outlining the clinical features and management considerations for each disorder.

Embryology

Normal fetal development occurs in three stages: (1) the predifferenciation period (weeks 1 and 2), (2) the embryonic period (weeks 3 to 8), and(3) the fetal period (weeks 9 to term). During the embryonic period, intensive differentiation of lower limb morphology occurs, starting with differentiation of the lower limb bud at (week 5). Located at the distal ridge of the limb bud are a ridge of cells, termed the apical ectodermal ridge.

These cells seem to control the normal differentiation and maturation process for the lower limb. Mesenchymal condensation and then formation of cartilaginous anlages begins first for the skeleton of the hip joint and is followed sequentially to the thigh, leg, and foot. The cartilaginous anlage ossify into fetal bones, starting during (week 6). Primary centers of ossification are present in all fetal long bones by week 12. Cavitation of the joints,condensation of the ligaments ,and deffrentiation of the muscle occur sequentially starting proximally in the hip and prosseding distally to the foot from (weeks 6to8).During the fetal period from week 9 to term, the bones,joints,ligaments ,and musceles undergo further growth and maturation(Van Heest, 1996).

SKELETAL OSSIFICATON

Normal skeletal growth may occur through either enchondral ossification (i.e longtudinal growth)or appositional growth (i.e diameter growth). Longitudinal growth occurs at the physis (i.e,growth plate or epiphyseal plate). The physis is the cartilaginous plate between the epiphysis and the metaphysis. It produces longtudinal growth of the bone. Appositional growth occurs at the primary and secondary centers of ossifiction . Primary centers of ossification are located in the shaft of the bone (i.e,diaphysis). Secondary ceners of ossification are located in the epiphysis at the end of the bone.

The skeleton of the lower extrimity consists of "long bones","short bones", and "flat bones".Long bones in the lower limb include the femur, tibia and fibula.Long bones have primary centers of ossoficaton in the