EVALUATION OF CONGENITAL TALIPES EQUINOVARUS BY SONOElastography

Dr. Sarthak Gupta¹, Dr. S.V. Deshpande², A.R. Narkhede³

¹Junior Resident, Department of Orthopaedics, Jawaharlal Nehru Medical College, Datta Meghe Institute Of Medical Sciences, Sawangi (Meghe), Wardha
²Professor, Department of Orthopaedics, Jawaharlal Nehru Medical College, Datta Meghe Institute Of Medical Sciences, Sawangi (Meghe), Wardha
³Professor, Mechanical Engineering, Yeshwantrao Chavan College of Engineering, Nagpur

Email – ¹sarthak.dec8@gmail.com

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Abstract
Background: Congenital talipes equinovarus is a paediatric congenital deformity with an occurrence of 1 in 1,000 live births, it is distinguished with the development of equinus and varus deformity in the hind foot, cavus in the middle of the foot, forefoot adduction. Clubfoot assessment is essential to assess the initial severity of the clubfoot, to monitor treatment progress and to identify relapses. Currently, there is no measurement tool available to measure the extent of the deformity or control the treatment and it is difficult to do so using measures such as Pirani scoring and Dimeglio classification, as observer bias is susceptible. With Real Time Sonoelastography we can test changes in the properties of CTEV-affected Soft tissues.

Objective: 1) To evaluate initial properties of the tendons of Tibialis Anterior and Tendo Achilles by real time sonoelastography in CTEV. 2) To compare changes in tendon substance of Tibialis Anterior and Tendo Achilles with Real time elastography in patients with Clubfoot after serial Ponseti’s cast correction. 3) To evaluate sonoelastographic properties of normal Tibialis Anterior and Tendo Achilles in cases of unilateral club foot.

Methods and Material: A total of 30 unilateral clubfoot children who are less than 2 years old visiting the out patients department of AVBRH would be recruited. In this study, we will use a Real time sonoelastography, Real time sonoelastography will be performed using the (Hitachi Aloka; Model: Arietta S 70) and the ultrasound probe (MSK liner probe 12 to 18 MHz).

Results – The result will be compiled after the results of elastography, in well tabulated manner.

Conclusion – The conclusion will be based on the findings for study. Keywords: Congenital,
**Talipes Equinovarus, Sonoelastography**

1. **INTRODUCTION**

Congenital talipes equinovarus is a paediatric congenital deformity with an occurrence of 1 in 1,000 live births, it is distinguished by the development of equinus and varus deformity in the hind foot, cavus in the middle of the foot, forefoot adduction. CTEV / clubfoot is a mixed bone and soft-tissue disease. The Ponseti (conservative) procedure is commonly used as a method of treatment involving manual manipulation, serial casting, tenotomy of tendoachilles and bracing. There is currently no examination or methodology available to measure the extent of the deformity or to control the treatment and it is difficult to do so with classification systems (Pirani scoring, Dimeglio classification) because they are prone to observer bias.

It is seen that the radiological assessment are difficult due to presence of non-ossified bones in the babies. The real challenge is in positioning the baby’s feet accurately during radiological evaluation by Xray, CT or MRI. The CT scan may be dangerous of a baby as it has radioactive emissions. On the other hand, MRI imaging methods can be used to visualize the soft tissue structure, bone ossification, misalignment of bones and changes in tendons around the ankle joint and in the foot but MRI and CT are expensive procedures and cannot be done multiple times at each stage of intervention, and would require short anesthesia for the baby.

Real Time Sonoelastography is a simple investigation that can assess the stiffness and changes in strain of soft tissue, muscle and tendons. A radiologist with experience about musculoskeletal diseases will be assessing the Region of interest(ROI) i.e. the Achilles tendon and tibialis anterior tendon in both axial and longitudinal plane. An indicator in the screen provides real-time input to the user about the correct amount of electrogram deformation. The total volume of deformation used to calculate the electrogram of the strain is the estimate of the patient's natural, or physiological, motion plus the transducer's external compression. It shows instantaneous or momentary deformation of the tissues. The elastosonogram analysis will give us strain index. The colors in the ROI vary from blue to red to demonstrate the relative hardness and softness of areas within the ROI. The probe is held manually in place while the patient is in a state of rest. For every patient the entire test takes approximately 10 minutes. Position of the two same circle ROI, called 1 and 2, measuring 4 mm in diameter, will be analysed. The reference ROI 2 was placed in the bone tissue, while the ROI 1 was placed in the distal tendon region, measuring the strain index (SI = ROI1 / ROI 2).

2. **ASSESSMENT**

The child will be positioned in a supine position in the mother's lap. The tibialis anterior tendon will be marked with marker pain. The radiologist would be asked to perform sonoelastography of the tibial anterior tendon between anterior ankle joint line to its entrance in mid foot. Similarly Tendo Achilles tendon is marked with temporary mark and sonoelastography would be done at 2 different locations (i) at the insertion and (ii)2-5 cm proximal to insertion. The assessment will be done at the time of presentation and after the completion of 5-6 cast application.

3. **METHODS AND MATERIAL:**

**Duration of study:** August 2019 –August 2021

**Place of study:** Department of Orthopaedics, JNMC, AVBRH, DMIMS, Wardha
**Study design:** Prospective observational study

**Sample size:**
Sample size = 30 was calculated by using the following formulae $\chi^2 \times N \times P(1-P)
\left[\frac{C^2 (N-1)}{}\right] + \chi^2 \times P \times (1-P)

A total of 30 unilateral clubfoot children who are less than 2 years old visiting the outpatient department of AVBRH would be recruited.

**The criteria of inclusion include:**
(a) Idiopathic congenital clubfoot.
(b) Both genders.
(c) Unilateral/Bilateral clubfoot.
(d) Untreated/Treated clubfoot.

**The criteria of exclusion include:**
(a) Neurological conditions leading to clubfoot
(b) Clubfoot related with various syndromes.
(c) Traumatic club foot
(d) Muscle dystrophies
(e) Infection.
(f) Connective tissue disorders
(g) Metabolic diseases
(h) Tendon injuries
(i) After any surgery around leg, ankle or foot
(j) Endocrine disorders.
(k) Congenital skeletal limb deficiencies.
(l) If parents are not willing to get enrolled in the study

4. **EQUIPMENT/MEASUREMENT TOOLS**

We will be using a Real time sonoelastography. Real time sonoelastography will be performed using the (Hitachi Aloka ; Model: Arietta S 70) and the ultrasound probe (MSK liner probe 12 to 18 MHz).

5. **EXPECTED RESULTS:**
The study will be conducted for a period of 2 years and all the observations will be depicted in a well tabulated master chart and conclusion will be drawn. RTE is a cheap and easy technique for determining the tendon material in clubfoot.

6. **DISCUSSION:**

Study from different centers showing the role of Sonoelastography in evaluation of club foot are available. A study was done in 2012 by Salvatore Masala with the aim to assess the real time sonoelastography (RTE) as a primary investigation for the evaluation of tendon substance in patients affected by clubfoot. Systemic disorders like hypertension, diabetes also affect healing and treatment of these underlying entities needs to be addressed properly. Few of the other related studies on bone and joint disorders are available. Few evidences from Global burden of disease study also reflected on this type of entities.

**REFERENCES:**


[16]. https://doi.org/10.1002/14651858.CD012015.pub2.


