European Journal of Molecular & Clinical Medicine
ISSN 2515-8260 Volume 7, Issue 07, 2020

EVALUATION OF CONGENITAL TALIPES EQUINOVARUS BY SONOELASTOGRAPHY

Dr. Sarthak Gupta[1], Dr. S.V.Deshpande[2], A.R.Narkhede[3]

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

Email– [1]sarthak.dec8@gmail.com

Type of Article: Study Protocol Funding – None
Conflict Of Interest- None

Abstract
Background: Congenital talipes equinovarus is a paediatric congenital deformity with an occurence 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.[1] CTEV / clubfoot is a mixed bone and soft-tissue disease. [2] The Ponseti [3] (conservative) procedure is commonly used as a method of treatment involving manual manipulation, serial casting, tenotomy of tendoachilles and bracing.[3] 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[4].

It is seen that the radiological assessment are difficult due to presence of non-ossified bones in the babies [5]. The real challenge is in positioning the baby's feet accurately during radiological evaluation by Xray , CT or MRI.[6,7]. The CT scan may be dangerous of a baby as it has radioactive emissions.[8] 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[9] are expensive procedures and cannot be done multiple times at each stage of intervention, and would require short anesthesia for the baby. [10]
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 1st in a supine position in the mothers 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 $\chi 2 \times N \times P(1-P)$ $[C2 (N-1)]+ \chi 2 \times P \times (1-P)$

A total of 30 unilateral clubfoot children who are less than 2 years old visiting the out patients 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 center 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 [11,12,13], diabetes [14,15,16] 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 [17,18]. Few evidences from Global burden of disease study also reflected on this type of entities [19,20].

REFERENCES:

[1]. Wynne-Davies R. Family studies and the cause of congenital club foot. The Journal of Bone and Joint Surgery. British Volume. 1964 Aug;46(3):445-63.

[2]. Meena S, Sharma P, Gangary SK, Lohia LK. Congenital clubfoot. Journal of Orthopaedics and Allied Sciences. 2014 Jul 1;2(2):34.

[3]. Lykissas MG, Crawford AH, Eismann EA, Tamai J. Ponseti method compared with soft-tissue release for the management of clubfoot: A meta-analysis study. World journal of orthopedics. 2013 Jul 18;4(3):144.
[4]. Lampasi M, Abati CN, Stilli S, Trisolino G. Use of the Pirani score in monitoring progression of correction and in guiding indications for tenotomy in the Ponseti method: Are we coming to the same decisions?. Journal of Orthopaedic Surgery. 2017 Jun 16;25(2):2309499017713916.
[5]. Herd F, Macnicol M, Abboud RJ. The need for biomechanical evaluation in the assessment of clubfoot. The Foot. 2004 Jun 1;14(2):72-6.
[6]. Ganesan B, Luximon A, Al-Jumaily AA, Yip J, Gibbons PJ, Chivers A. Developing a three-dimensional (3D) assessment method for clubfoot—a study protocol. Frontiers in physiology. 2018 Jan 4;8:1098.
[7]. Shiels WE, Coley BD, Kean J, Adler BH. Focused dynamic sonographic examination of the congenital clubfoot. Pediatric radiology. 2007 Nov 1;37(11):1118-24.
[8]. Gigante C, Talenti E, Turra S. Sonographic assessment of clubfoot. Journal of Clinical Ultrasound. 2004 Jun;32(5):235-42.
[9]. Solanki PV, Sheth BA, Poduval M, Sams SB. Effectiveness of modified ankle foot orthosis of low-temperature thermoplastics in idiopathic congenital talipes equino varus. Journal of Pediatric Orthopaedics B. 2010 Jul 1;19(4):353-60.
[10]. Smith PA, Kuo KN, Graf AN, Krzak J, Flanagan A, Hassani S, Caudill AK, Dietz FR, Morcuende J, Harris GF. Long-term results of comprehensive clubfoot release versus the Ponseti method: which is better?. Clinical Orthopaedics and Related Research®. 2014 Apr 1;472(4):1281-90.
[11]. Papalkar P, Kumar S, Agrawal S, Raisinghani N, Marfani G, Mishra A. Heterotaxy syndrome presenting as severe pulmonary artery hypertension in a young old female: case report. Official Journal of the Italian Society of Gerontology and Geriatrics. 2018 Jan 1:59.
[12]. Charan N, Choudhari M, Sonkusale M, Deshpande R. Anesthetic management of chronic thromboembolic pulmonary hypertension for pulmonary endarterectomy. Journal of Datta Meghe Institute of Medical Sciences University. 2017 Oct 1;12(4):289.https://doi.org/10.4103/jdmimsu.jdmimsu_40_17.
[13]. GaiKwad KB, JoShi NG, Selkar SP. Study of nitrosative stress in 'Pregnancy Induced Hypertension'. Journal of Clinical and Diagnostic Research: JCDR. 2017 Mar;11(3):BC06. https://doi.org/10.7860/JCDR/2017/23960.9396.
[14]. Bhinder HP, Kamble TK. The study of carotid intima-media thickness in prediabetes and its correlation with cardiovascular risk factors. Journal of Datta Meghe Institute of Medical Sciences University. 2018 Apr 1;13(2):79. https://doi.org/10.4103/jdmimsu.jdmimsu_58_18.
[15]. Khatib MN, Kirubakaran R, Gaidhane S, Shankar AH, Syed ZQ. Yoga for improving functional capacity, quality of life and cardiovascular outcomes in people with heart failure. The Cochrane Database of Systematic Reviews. 2017 Jul;2017(7).
[16]. https://doi.org/10.1002/14651858.CD012015.pub2.
[17]. Cladius S, Jadhav U, Ghewade B, Ali S, Dhamgaye T. Study of diabetes mellitus in association with tuberculosis. Journal of Datta Meghe Institute of Medical Sciences University. 2017 Apr 1;12(2):143. https://doi.org/10.4103/jdmimsu.jdmimsu_62_17.
[18]. Mundada G, Khan SM, Singhania SK, Gupta V, Singh PK, Khan S. Type-I monteggia with ipsilateral fracture of distal radius epiphyseal injury: A rare case report. Annals of African

Medicine. 2017 Jan;16(1):30. https://doi.org/10.4103/aam.aam_55_16.
[19]. Belekar V. A comparative study to evaluate the efficacy of butorphanol as an adjuvant to epidural analgesia for rib fractures. Journal of Datta Meghe Institute of Medical Sciences University. 2017 Jul 1;12(3):166. https://doi.org/10.4103/jdmimsu.jdmimsu_105_17.
[20]. Murray CJL, Aravkin AY, Zheng P, Abbafati C, Abbas KM, Abbasi-Kangevari M, et al. Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. The Lancet. 2020 Oct;396(10258):1223–49.
[21]. Vos T, Lim SS, Abbafati C, Abbas KM, Abbasi M, Abbasifard M, et al. Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. The Lancet. 2020 Oct;396(10258):1204–22.