Volume : 5 | Issue : 4 | April 2016 • ISSN No 2277 - 8179 | IF : 3.508 | IC Value : 69.48

Research Paper

Ultrasonographic Assessment of Regeneration of Achilles Tendon Post Ponseti Tenotomy For Equinus Correction in Infants

Medical Science

KEYWORDS : Ultrasonography, Achilles tendon, tenotomy, CTEV

Dr. Digember Peepra	Assistant Professor, Department of Orthopaedics, N.S.C.B. Medical College, Jabalpur, M.P.
Dr. Manish Singh Rajpoot	Senior Resident, Department of Orthopaedics, N.S.C.B. Medical College, Jabalpur, M.P.
Dr. A.P. Kushwah	Assistant Professor, Department of Radiodiagnosis, N.S.C.B. Medical College, Jabalpur, M.P.
Dr. H.S. Varma	Professor, Department of Orthopaedics, N.S.C.B. Medical College, Jabalpur, M.P.
Dr. Saurabh Khare	Resident, Department of Orthopaedics, N.S.C.B. Medical College, Jabalpur, M.P.
Dr. Ashish Sirsikar	Assistant Professor, Department of Orthopaedics, N.S.C.B. Medical College, Jabalpur, M.P.

ABSTRACT

Background:- In Ponseti method Achilles tendon tenotomy is often needed to correct a residual equinus deformity. According to Ponseti Achilles tendon tenotomy creates a gap that heals, eventually leaving the tendon in continuity. They observed clinically that the continuity of the Achilles tendon is restored within three weeks. In our study we have studied the ultrasonographic changes during the healing process of Achilles tendon after post ponseti tenotomy for equines correction in infants.

Material and methods:- This is an observational study in which those CTEV children in which Achilles tendon tenotomy was done in Ponseti method for the correction of equinus deformity. There were total 25 children with 34 clubfoot in them 9 were bilateral, 16 were unilateral. Out of which 11 were female and 14 were male. Achilles tendon tenotomy was performed after weekly serial casting.

Results:- In our study, we have done serial ultrasonographic study of pre and post ponseti tenotomy of Achilles tendon for the correction of residual equinus deformity. We have provided ulrasonographic picture of tendon before tenotomy and after tenotomy and how the tendon heals back.

Discussion:- Our finding of ultrasonography confirmed the restoration of continuity of tendoachilles in most of cases in three weeks. In our study we have provided objective evidence that a lesion that is still separated heals satisfactorily and that three week is sufficient for a post tenotomy cast.

Introduction:- The Ponseti method is a well-established treatment method for idiopathic congenital clubfoot deformity[1,2]. An Achilles tenotomy is often needed to correct a residual equinus deformity[2]. Most of the studies found that 85%-90% of Achilles tenotomies were performed by the Ponseti method[1,3-6]. Ponseti and others have described that a Ponseti-type Achilles tenotomy creates a gap that heals, eventually leaving the tendon in continuity[2,7]. They have observed clinically that the continuity of the Achilles tendon is restored within three weeks. Ultrasonography is reliable and reproducible in evaluating following Achilles tenotomy for congenital clubfoot[8,10,11]. It can be used for assessment of tendon regeneration. Very few studies have been published which show the ultrasonographic healing post tenotomy of achillis tendon[8-11]. In our study, we have focus upon ultrasonographic changes during the healing process of Achilles tendon after post Ponseti tenotomy for equinus correction in infants.

Material and methods:- Our study is a observational study done in the department of Orthopaedics with the assistance of department of radiodiagnosis. The cases being selected those CTEV children in which Achilles tendon tenotomy was done for the correction of equinus deformity. There were total 25 children with 34 clubfoot, out of which 11 were female and 14 were male, 9 were bilateral and 16 were unilateral. Achilles tendon tenotomy was performed after weekly serial casting. Average age of tenotomy was 12 week (1 – 6 month).

Degree of deformity was clinically assessed serially according to the Pirani scoring system. Pre-tenotomy ultrasound of tendoachilles was done then tenotomy was done under local anaesthesia with the help of 18 G needle and CTEV cast was applied in over correction. In follow-up, cast was changed at 1 week and USG was done, after that next ultrasound was done at 3rd week and 6th week. Cast was removed at 3rd wk and splint was provided.

Children were placed on mother's lap in prone position and the feet were dorsiflexed. Coupling gel was applied as the medium for ultrasound waves between the probe and patient. Ultrasound scan was performed over posterior aspect of the Achilles tendon. Dynamic and static ultrasonography was performed by same musculoskeletal imaging specialist before tenotomy, at 1 wk, 3rd wk and 6th wk after tenotomy. Scanner was used longitudinally to observe the characteristics of the tendon healing process after tenotomy. For each tendon, continuity, gliding and thickness were described. Imaging analysis was done by senior radiologist and orthopeadician.

Results:- In our study there are 25 children, total 34 feet were studied ultrasonographically for the union of tendoachilles. No patients were encountered with any complication after percutaneous needle tenotomy and in the follow up period. Pre-tenotomy tendoachilles tendon was examined clinically as well as ultrasonographically, the tendon was clearly depicted as a low echogenic region (fig-1). After one week of tenotomy the gap was measured by ultrasonography and mean gap was 1.11cm and gap was of mixed echogenicity (fig-2). After 3 week of tenotomy gap was filled with irregular hypoechoic tissue(fig:3) and

Volume : 5 | Issue : 4 | April 2016 • ISSN No 2277 - 8179 | IF : 3.508 | IC Value : 69.48

in 15 feet the gap did not separate even when the ankle was dorsiflexed gently and the tendon was seen gliding indicating continuity. After 6 week continuity and gliding of tendon were noted in all cases. United portion was swollen, with fibers arranged in a random manner.

Discussion:- Our finding of ultrasonography confirmed the restoration of continuity of tendoachilles in three week[1,2,12]. Healing of the tendon has been classically described as involving extrinsic or intrinsic factor or a combination of two. In an extrinsic process, the gap is invaded by fibroblasts, and the repair leads to the formation of a fibrous scar with adhesions that favor the blood supply[13] but may interfere with the sliding mechanism, and may also represent a mechanical shortcoming. In an intrinsic repair process, a cascade of cellular and biochemical events takes place; fibroblast migration tends to proceed in an orderly fashion, and thus tendon tissue is regenerated in a fetal-like process[14,15]. A predominantly intrinsic mechanism is responsible for the formation of a normal or near-normal tendon. The results of our study showed that gap heals spontaneously and rapidly within three week after tenotomy. In our study we have provide an objective evidence that a lesion that is still separated heals satisfactorily and that three weeks are sufficient for a post tenotomy cast. Our study is an observational one in which we observe the change occur during the healing process of tendoachilles after post ponseti tenotomy. This type of study was rarely done in Indian scenario. In conclusion, sequential changes in Achilles tendon healing for up to 6 week after tenotomy for equinus correction in clubfoot in infants were observed ultrasonographically..

Fig:1 Pre-tenotomy USG : showing the continuity of TA, tendon is clearly depicting as a low-echo region

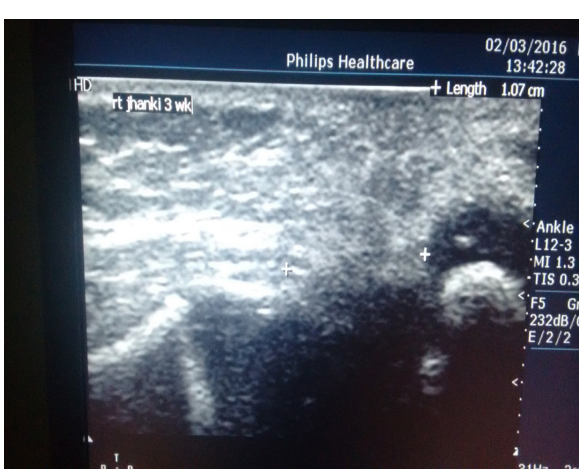

Fig:2 : 1 week after tenotomy showing there is a gap between proximal and distal portion of TA

Fig:3: 3 week after tenotomy , gap is filled with the hypoechoic tissue

Refrences :-

1. Herzenberg JE, Radler C, Bor N. Ponseti versus traditional methods of casting for idiopathic clubfoot. J Pediatr Orthop. 2002;22:517–21.
2. Ponseti IV. Congenital clubfoot: fundamentals of treatment. New York: Oxford University Press; 1996. p. 140.
3. Morcuende JA, Abbasi D, Dolan LA, Ponseti IV. Results of an accelerated Ponseti protocol for clubfoot. J Pediatr Orthop. 2005;25:623–6.
4. Bor N, Herzenberg JE, Frick AL. Ponseti management of clubfoot in older infants. Clin Orthop Relat Res. 2006;444:224–8.
5. Bor N, Coplan JA, Herzenberg JE. Ponseti treatment for idiopathic clubfoot. Minimum 5-year followup. Clin Orthop Relat Res. 2009;467:1263–70.
6. Dobbs MB, Rudzki JR, Purcell DB, Walton T, Porter KR, Gurnett CA. Factors predictive of outcome after use of the Ponseti method for the treatment of idiopathic clubfeet. J Bone Joint Surg (Am). 2004;86:22–7.
7. de Gheledere A, Docquier PL. Analytical radiography of clubfoot after tenotomy. J Pediatr Orthop. 2008;28:691–4.
8. Baker SL, Lavy CB. Correction of clinical and ultrasonographic findings after Achilles tenotomy in idiopathic club foot. J Bone Joint Surg (Br). 2006;88:377–9.
9. Niki H, Watanabe G, Hirano T, Tanaka T, Okada H, Beppu M, Nakajima H. Ultrasonographic observation of the healing process after Achilles tenotomy in congenital clubfoot: a preliminary report. J Jpn Soc Surg Foot. 2008;29(2):104–8 (in Japanese).
10. Maranho DA, Nougueir-Barbosa MH, Simao MN, Volpon JB. Ultrasonographic evaluation of Achilles tendon repair after percutaneous sectioning for the correction of congenital clubfoot residual equines. J Pediatr Orthop. 2009;29(7):804–10.
11. Mangat KS, Kanwar T, Johnson K, Korah G, Prem H. Ultrasonographic phases in gap healing following Ponseti-type Achilles tenotomy. J Bone Joint Surg (Am). 2010;92:1462–7.
12. Scher DM, Feldman DS, van Bosse HJ, Sala DA, Lehman WB. Predicting the need for tenotomy in the Ponseti method for correction of clubfoot. J Pediatr Orthop. 2004;24:349–52.
13. Potenza AD. Critical evaluation of flexor-tendon healing and adhesion formation within artificial digital sheaths. J Bone JointSurg (Am). 1963;45:1217–33.
14. Lin TW, Cardenas L, Soslowsky LJ. Biomechanics of tendon injury and repair. J Biomech. 2004;37:865–77.
15. Ingraham JM, Hauck RM, Ehrlich HP. Is the tendon embryogenesis process resurrected during tendon healing? Plast Reconstr Surg. 2003;112:844–54.