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A SURVEY OF CLUBFOOT PATIENTS IN ODISHA

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ABSTRACT: In the survey of 34 patients of clubfoot, 20 were unilateral cases and 14 were bilateral. The ratio of unilateral: bilateral was 1.42:1. As per Kawashima and Uthoff classification, with this study 36 feet (75%) to be flexible and 12 feet (25%) to be rigid out of total 48 feet considered. The rigid foot was relatively smaller as compared to the flexible ones. The flexible feet were pliable on manipulation; but rigid feet were not amenable to correction by serial manipulation. Deep creases were more prominent in rigid feet.

KEYWORD: Club foot, Survey, Odisha.

INTRODUCTION: Clubfoot is a complex deformity of the foot occurring in various planes with multiple bones and joints involved. It is a birth defect in which the foot is inverted/twisted and pointed downwards. Without treatment, children born with this defect often appear to walk on their side ankles or sides of the feet.^[1] It was first described by Hippocrates in 400 B. C. Nicholas Andry in 1743 described it as Pades Equinal i.e. resembling the foot of a horse.^[2] Clubfoot is also known as "Talipes equinovarus" which comes from Latin.

"Talipes" is derived from the word "Talus" meaning "ankle bone" and "pes" means foot, thus describing the deformities around foot and ankle. "Equinus" means a "horse", used in context to describe how children affected with clubfoot walk on their toes with foot pointed downwards, analogous to how horses walk on their toe nails.^[2-4] About 1.2 per 1000 live birth is born with club foot each year.^[5] For clinical purpose, clubfoot is categorized in two groups: i) clubfoot associated with other congenital deformities, ii) idiopathic clubfoot.

The pathogenesis and biomechanics of clubfoot are not well known till now. Various theories have been postulated to explain its cause like otogenic theory or theory of arrested development, embryonic theory, neuromuscular theory, primary germ defect etc. Although, much progress has been made since then regarding its diagnosis, treatment and management, but still today there remains a lot of confusion and divergence of opinion regarding its gross anatomical changes, pathological anatomy and role of radiography in its treatment procedures for this condition.

Till date there is no data available about the dermatoglyphic patterns of club foot patient in Odisha state. Therefore this work was carried out in this particular region of India. This study sought to survey cases of clubfoot presented for clinical examination in the department of anatomy in collaboration with the dept. of orthopaedics using a representative sample of cases at Department of Anatomy, SCB Medical College, Cuttack District, Odisha, India. The main objectives of this study were:

- i. Defining clubfoot and the various deformities associated with this condition.
- ii. To find out age incidence, sex ratio associated aetiological factors and any associated congenital anomalies.
- iii. To compare the normal and affected foot by utilizing foot prints and radiographs.

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- iv. To classify the clubfoot patients on the basis of various deformities.
- v. To find out the main anatomical structures involved like ligaments, tendons, capsules, joints etc. (as studied during surgery).

Hence, the study aimed in extending the understanding of clubfoot for its prognosis to plan its management to optimal level.

MATERIALS AND METHODS: A total number of 34 clubfoot patients (14 bilateral cases) were selected randomly in the Department of Orthopaedics, SCB Medical College, Cuttack District, Odisha, India. All the patients were within the age group up to 4 years. Detailed maternal history, clinical examination, paedograms and gross anatomical study (during surgery) were carried out.

I) MATERNAL HISTORY: Detailed maternal history regarding age, parity, gestational periods, and occurrences of infection during pregnancy and previous obstetrical history with complications (if any) were taken into account.

II) CASE HISTORY: All patients of clubfoot were examined and a detail case history recorded including age, sex, parents name, address, date of reporting, age at presentation, any prior treatment history etc.

III) CLINICAL EXAMINATION:

- A. **INSPECTION:** A through general examination was carried out on every patient including: i) unilateral or bilateral involvement, ii) the position of the sole of the foot and its borders, iii) condition of the foot skin and skin creases, iv) malleoli, tendoachilles, great toe entire foot etc., v) other associated congenital malformations like Spina bifida, Arthrogryposis Multiplex Congenita, Polydactylism/Syndactylism etc.
- B. **PALPATION:** The talus, calcaneum, the malleoli, tendoachilles and tendon of tibialis posterior were palpated.
- C. **MOVEMENT OF THE FOOT AND ANKLE:** Both active and passive movements were found out.

IV) FOOT PRINTS (PEDOGRAPHY): Non weight bearing foot prints of both the feet were taken in case of all the patients, irrespective of unilateral or bilateral involvement. Assessment of the deformities and comparison of total foot length and fore-foot adduction angle was done from them.

The foot-print length was measured as the straight distance between the highest point on the 1st and 2nd toe (whichever was bigger) and the lowest point on the margin of the heel. The angle of medial inclination of the lateral border of the forefoot in relation to the hind foot was measured. It was the fore foot adduction angle (FFA).

V) GROSS ANATOMY: All the cases of club foot requiring surgery for correction were observed during the surgical procedure in Orthopaedics O.T. The structures involved were identified and after release or lengthening them individually, the resulting amount of correction was assessed.

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RESULTS: General observations: Out of the 34 patients studied in the series, we found 22 to be males and 12 to be females (Figure. 1). The male: female (M: F) ratio was found to be 1.83:1. Out of the 34 patients of clubfoot studied, more than 80% were found to report to the orthopaedics OPD within the age group of < 2 years or 24 months (Figure. 2). Only approximate 11% were found to be above the age group of 2 years. The treatment given to these patients varied according to the age of the patient and the severity of the condition.

CLINICAL EXAMINATIONS: Out of the 34 patients of clubfoot, we found out that 20 were unilateral cases and 14 were bilateral (Figure. 3). The ratio of unilateral: bilateral was 1.42:1. As per Kawashima and Uthoff classification (1990), we found 36 feet (75%) to be flexible and 12 feet (25%) to be rigid out of total 48 feet considered (Figure. 4) [6]. The rigid foot was relatively smaller as compared to the flexible ones.

The flexible feet were pliable on manipulation; but rigid feet were not amenable to correction by serial manipulation. Deep creases were more prominent in rigid feet. We found that most of the affected feet were smaller than the normal feet, especially more so in case of rigid feet. The sole was generally directed downwards and medially, in extreme cases it faced upwards and medially. The whole of the foot was in inversion with the forefoot adducted upon the hind foot. The heel was pulled up and looked like a knob.

The medial borders were shorter and concave with lateral borders longer and convex. The skin over the middle of the medial border was thrown into creases while that along the lateral border looked thin and stretched. In older children, callosities were present along the lateral border. Medial malleoli looked flattened while the lateral ones looked prominent. In many cases tendoachilles could be palpated as a taut cord in the leg. The whole foot as such looked smaller with atrophy of the calf in many cases.

FOOT PRINTS: Using the foot prints, the foot lengths were measured (in cm) in our series, both for unilateral and bilateral cases. In 20 unilateral cases (Figure. 5), we found the foot length variations (in cm) between the normal foot and affected foot to be between 1.6cm to 2.0cm in 15 cases and < 1.5cm in 5 cases. Fifteen out of twenty unilateral cases of our series showed the foot length variation between 1.6 to 2.0cm.

Thus, from our series and also by comparisons with the work of above authors, we can conclude the foot length variation in unilateral clubfoot cases is < 2.5cm or 1 inch. The foot lengths were also measured in the 14 bilateral cases. The foot lengths of both the feet were found to be almost of equal length with maximum foot length variation of < 0.5cm.

Besides the foot length, the foot prints were also utilized to measure the forefoot adduction angle (FFA). It is the angle of medial inclination of the lateral border of the forefoot in relation to the hind foot. It was measured in both unilateral and bilateral cases. Out of the 48 feet in our series, was found the FFA to be between 10 to 30 in 28 feet or in 58.33% of the feet studied (Figure. 6).

ANATOMICAL EVALUATION: All the patients of the series, who underwent surgery, were observed in the operation theatre and the soft tissues involved were noted. The contracture of tendoachilles tendon along with the involvement of posterior capsule of the ankle joint and subtalar joint, were the constant features in all these cases observed. Besides this many muscles e.g. tibialis posterior, flexor

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digitorum longus and flexor hallucis longus, capsules e.g. talonavicular capsule, ligaments e.g. spring ligament, posterior talofibular ligament and plantar fascia were found to be involved.

But the involvement of these structures varied on individual basis according to the age of the patient, the severity of the condition and any prior treatment. Thus, we can conclude from above that although many soft tissues are involved in clubfoot cases, the contracture of tendoachillies with posterior capsule of ankle joint and subluxation of talo-navicular joint was the constant feature in all these cases.

DISCUSSION: A true clubfoot is a malformation, in which various bones, joints, muscles and vessels of the concerned limb are abnormal. This deformity is difficult to treat in children because of complex pathological anatomy of the growing bones. Children with this condition should be referred to an orthopaedic surgeon, for a complete evaluation and planned treatment. Many theories have been suggested even though the etiology of clubfoot remains controversial.

Hence, this study is a comprehensive attempt to look into the demography, clinical aspects, the study of the foot prints (foot length variation and forefoot adduction angle) and gross anatomical changes in clubfoot. We observed clubfoot to be more common in males than females i.e. almost twice more common in males (male: female=1.83:1). Somewhat similar results have been reported by other authors. Grahama Apley and Louis Solamen in system of 'Orthopaedics and Fractures' (1993) quote that clubfoot is twice more common in males than females.^[7]

Ignacio V. Ponseti and Eugene N. Smoley (1963) in their study "Congenital Clubfoot: the result of treatment" reported the ratio to be 1.8:1.^[8] Ellen Sobel and Renato Giorgini (2002) in their study "Identification and management of clubfoot in infants" reported the M:F ratio to be 2:1.^[9] The ratio of unilateral: bilateral was observed to be 1.42:1 i.e. one and half times more commonly, it occurs as unilateral condition.

The ratio of unilateral: bilateral was 1.42:1. Dalai (1976) in his work 'The results of surgical treatment of congenital Talipes equinovarus' reports the ratio of unilateral: bilateral to be 1.77:1.^[10] Ellen Sobel and Renato Giorgini (June 2002) found in their study that 50% of all clubfeet were bilateral.^[9] Foot prints help in assessing this deformity by using foot length variation and forefoot adduction angle. The clinical examination of the study group revealed that in clubfoot the sole was directed upwards and medially, heel was pulled up and looked knob like, medial border of the foot was shorter and concave while the lateral ones were longer, convex and callosities were present on the pressure bearing areas in older children.

Similar findings have been reported by Sobel and Giorgini (2002) and have also been quoted in Mercer's 'Orthopaedic Surgery' Duthie and Bentley (2003) and Apley's 'System of Orthopaedic and fractures' Turek (1998).^[9,11,12] The foot prints were used to measure the foot length (in cm for both unilateral and bilateral cases) and forefoot adduction angle (FFA). In 75% of the unilateral cases (15 cases) the foot length variation was found to be 1.6cm to 2.0cm and in the rest 25% of unilateral cases (5 cases) it was found to be < 1.5cm. Almost 59% of the cases showed the FFA to be between 16 to 30.

The role of the anatomical study of clubfoot (gross and radiological) is of paramount importance to the wholesome management of clubfoot. It definitely acts as a good adjunct to plan different modalities of treatment. The gross anatomical findings have implications for the operative procedure.

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They help the surgeon in deciding the procedure that will produce optimum correction in an individual case. Hence, emphasis should be made over different anatomical aspects of clubfoot. Our examination of gross anatomical structures in clubfoot cases revealed the contracture of tendoachilles with the involvement of the posterior capsule of ankle joint, the capsule of subtalar joint and talonavicular joint being the most common features observed. Besides them many other soft tissues like tibialis posterior, flexor digitorum longus, flexor hallucis longus, ligaments of the foot, plantar fascia etc. were also found to be involved but their involvement varied on individual basis. These observations tallied with the work of Stewart (1995), Fried (1959), Handelsman and Issac (1977), Dalai (1976) and Howard et al. (1993).^[10,13-16]

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Fig. 1: Relation between sex and clubfoot incidences

Fig. 2: Age of reporting of clubfoot patients

Fig. 3: Type of Affection of clubfoot cases

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Fig. 4: Clinical classification of clubfoot cases as per Kawashima and Uhtoff (1990)

Fig. 5: Foot length variation in unilateral clubfoot cases

Fig. 6: Fore Foot Adduction angle (FFA) of observed clubfoot patients

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