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Congenital Foot Anomalies: a Study of 466 Cases in one Centre in Côte d'Ivoire

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Abstract

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Objective: To describe the epidemiological and clinical patterns of congenital foot anomalies seen in one hospital in Côte d'Ivoire.

Patients and Methods: This was a retrospective hospital-based study of all children aged 15 years and below who were seen with congenital foot anomalies from January 1, 2000 to December 31, 2006, at the paediatric surgery department of Yopougon teaching hospital in Abidjan, Côte d'Ivoire. Their charts were reviewed for maternal obstetrical history, patients2 demographic and biometric neonatal data, time intervals before for diagnosis, clinical and radiographic presentations, treatment undertaken and outcome.

Results: A total of 466 congenital foot anomalies (CFA) in 330 patients were identified among 1,490 congenital disorders in a period when the number of live births was 235,161. This resulted in a rate of 1.98 CFA per 1,000 live births. The age at diagnosis ranged from two to five years with a peak incidence at four years. The five most common of 11 patterns of congenital foot anomalies seen, were clubfeet in 206 (44.2 percent) cases, flat feet (16.7 percent) in 78, metatarsus varus (14.2 percent) in 66, equine foot (11.8 percent) in 55 and slope feet (4.9 percent) in 23. Bilateral involvement occurred in 126 patients (38.2 percent), while umbilical hernia was the most frequently associated anomaly (64.8 percent). Clubfeet were bilateral in 112 cases (54 percent), while Diméglio grades I and II, were predominant (74.3 percent). Treatment consisted of serial plasters for 180 patients (38.6 percent) which were combined with physiotherapy and surgical reduction in 143 (30.7 percent) and 25 cases (5.4 percent), respectively.

Conclusion: Congenital foot anomalies were frequent and their clinical expression was classical in our study.

Keywords: Congenital foot anomalies, club foot, conservative treatment.

Introduction

CONGENITAL foot anomalies (CFA) result from morphological or structural alterations of the foot during the course of intrauterine development and are determined by many factors including genetic and intrauterine. The incidence of these anomalies as reported after a 24-year Japanese study was estimated at 1.2 per 1,000 live births. [1] Conversely, there is still scarcity of data concerning the incidence of CFA in sub-Saharan Africa. The routine practice of prenatal diagnosis allows early detection and management in developed countries, in contrast to late referral/ presentation of cases in our areas. This retrospective study aims to assess the epidemiological and clinical features of CFA in order to quantify the magnitude of the problem and allow planning for the management of these anomalies.

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Patients and Methods

All children aged 15 years and below who presented with CFA at the paediatric surgical unit of Yopougon teaching hospital from January 1, 2002 to December 31, 2006, were retrospectively reviewed. Patients were referred from Abidjan city and its metropolitan area as well as from rural provinces in Cote d'Ivoire. Their charts were reviewed for maternal obstetrical history including mother2 s age, number of pregnancies, consanguinity, malformations in siblings, medications taken and exposure to irradiation during pregnancy. The biometric and demographic neonatal data including gender, age, weight and height at birth of the patients were also retrieved from their note cases, as were diagnosis time, clinical features, radiological findings, as well as the type and degree of foot anomaly and its reducibility. The radiographic evaluation was based on anteroposterior, lateral and oblique views, and where necessary on specific standing views. The scoring system of Diméglio[2] based on degrees of reducibility was used to grade the abnormalities because of its strong reliability.[3] Depending on the magnitude of the foot reducibility, the treatment combined serial plasters and/or manipulations followed when necessary by surgical releases.

Results

The number of births during the study period was 235,161 of which 7045 children were referred to our outpatient unit. A diagnosis of 466 CFA was made in 330 of them (31.3 percent), among a total of 1,490 congenital disorders, resulting in a hospital rate of 1.98 per 1,000 live births. The patients' mean age was 2.8 ± 7.4 years (range, 1 day - 15 years) at first contact (Table I), the male to female ratio was about equal (117 boys, 113 girls), while the initial diagnosis was made at ages two to five years in 72 percent, with a peak incidence at age four compared to 1.8 percent in newborns. A majority of the mothers were primigravid and were aged 17 to 41 years (mean age, 28.5 ±2.7 years). The CFA spectrum is summarised in Table II which shows a primacy of clubfoot in nearly half of the cases, while the next three common types were almost two to three times less frequent. Bilateral involvement occurred in 126 patients (38.2 percent) and unilateral in 214 cases (64.8 percent). The clubfoot incidence was 2.9 per 1,000 live births with bilateral involvement in 54 percent, and predominance of Diméglio grade I and II (Table III). Only 102 patients (22 percent) with severe clubfeet required X-ray evaluation. The treatment modalities employed are summarized in Table IV.

Table I

Distribution of Patients by Age

Age	*Number*	*Percentage*
1 day - < 6 months	17	5.2
6 months - <1 year	36	10.9
1 - < 2 years	17	5.2
2 - < 3 years	53	16.0
3 - < 4 years	89	27.0
4 - <5 years	72	21.8
5 - < 15 years	46	13.9
Total	330	100.0

Mean age: 2.8±7.4 years; range, 1 day – 15 years

Table II

Types of Congenital Foot Anomalies

Types of Anomalies	*Number*	*Percentage*
Club foot	206	44.2
Flat foot	78	16.7
Metatarsus varus	66	14.2
Pes equinus	55	11.8
Pes calcaneus	23	4.9
Pes varus	20	4.3
Amniotic band	5	1.1
Convex foot	4	0.9
Syndactyly	4	0.9
Pes cavus	3	0.6
Polydactyly	2	0.4
Total	466	100.0

Table III

Degrees of Club Foot Reducibility according to Diméglio

Reducibility	*Number*	*Percentage*
Grade I	73	35.4
Grade II	80	38.8
Grade III	42	20.4
Grade IV	11	5.4
Total	206	100.0

Table IV

Distribution of Treatment Types

Type of Treatment	*Number*	*Percentage*
Orthopaedic [O]	180	38.6
Physiotherapy [P]	90	19.3
[O]+ [P]	42	9.0
Surgery [S]	11	2.4
[O]+ [P] + [S]	143	30.7
Total	466	100.0

Discussion

The incidence of CFA is not well known due to a lack of studies that give an overall rate as compared to those that deal with the types of anomalies. Our incidence rate was higher than that of 1.2 per 1,000 live births reported by Shighara *et al* [1] among a cohort of 669,214 births from 1973-1996 in Miyagi Prefecture, Japan. However, incidence rates are subject to variations in relation to definitions of anomalies applied, modes of their ascertainment, time of their observation and other genetic, ethnic, socioeconomic and environmental factors.

From a pathogenic viewpoint, CFA may result from defects of intrauterine development leading to major anomalies at the embryological stage, or to structural disorders in the early foetal period and thereafter, to positional deformities.[4] The high rate of primigravida in our series reinforces the intrinsic theory that makes intrauterine packing responsible for malpositions. In developed countries, CFAs are now mostly diagnosed at 18 - 20 weeks2 gestation by ultrasound with early referral to the paediatric orthopaedist.[5] Since prenatal diagnosis is not yet routinely applied in our part of the world, the diagnosis of CFA is still principally based on clinical assessment. Although these anomalies are recognizable at birth, a high proportion of affected children are referred late probably because of misdiagnosis due to lack of awareness by general practitioners as well as parental negligence.

With respect to the spectrum of CFA in this study, 11 types were identified in which five were most frequent. In keeping with findings by other workers, club foot constituted the commonest CFA with similar rates of 0.9 to 1 per 1000 live births in European and North American studies while higher rates of 2 to 4.5 per 1,000 live births were found in Black southern Africans and Asians.[6-9] The aetiology of this rigid triplanar deformity is unknown but may result from an arrested stage of foetal development under the influence of various factors. The present study confirms the usual citation in literature that CF is bilateral in up to 50 percent of cases (Fig.1).[4] Difficulties in predicting CF evolution explain the existence of a host of classification systems but the one proposed by Dimeglio[3] appears to be the most reliable.[3] The high rate of CF grades I and II in our series despite late referrals, may account for club-foot-like postural feet, which are fully reducible and so are not classified as true CF by some workers. Early treatment of CF, preferably soon after birth, is advised since deformities are easier to correct at that time due to their flexibility. Even if this cannot be planned for those referred late, they can still respond well to conservative treatment. The recent study by Bensahel *et al* [10] in 2006 has emphasized the efficacy of their functional method that provided good to excellent results in 77 percent of cases of CF irrespective of aetiology and degree of reducibility.

Fig. 1 : Bilateral congenital clubfoot showing the typical features of heel inversion, ankle equinus and metatarsus adductus.

There is no accurate definition of flat foot (FF) but it can be described basically as the collapse of the medial longitudinal arch of the foot; it affects approximately 20-30 percent of the paediatric population.[11] It is the second most frequent CFA in this series with 16.7 percent of cases. A similar rate of 18.3 percent was found by Mittal *et al* [12] in school children of Patiala city, India. The aetiology of FF is usually benign familial laxity which allows the ligament support of the arch to stretch under weight-bearing loads. At clinical assessment, painless, tolerable and correctable deformities were found in all patients corresponding to the common flexible FF. Because the natural history of this form shows complete regression with age in most cases, the diagnosis was based on inspection alone and

treatment did not go further than functional exercises including standing and walking on tiptoes. However, it must be distinguished from the rare pathological PF caused by tight Achilles tendon, accessory navicular, and ligament hyperlaxity, which were not encountered in this series.

Metatarsus varus (MTA) is a varus deviation of the forefoot leading to convexity of the lateral border of the foot. It is thought to result from intrauterine positioning but genetic factors are also implicated. According to Chotel *et al*,[4] its neonatal incidence varies from 4 to 13 percent of cases, consistent with our rate of 14.6 percent. In our series, the deviation was passively correctable partially or entirely and full reduction was achieved in all patients either spontaneously or after serial cast treatment. However, the natural history of MTA which is usually benign, with 87 percent of resolution at age six and 95 percent at skeletal maturity, explains the generally good prognosis.[15] However, early soft tissues releases,[3] or late midfoot osteotomies have reportedly been carried out for some severe, resistant MTAs.[3] These may require careful screening in order to eliminate other conditions that can simulate MTA such as congenital epiphyseal bracket of the first metatarsal, in which a growth plate anomaly results in a short hallux with varus deformity.

The pes equinus (PE) deformity describes a frozen plantar flexed foot which can result from a wide variety of causes; subsequently any patient with PE deserves a careful evaluation for an underlying cause. Its incidence of 11.8 percent reported in this study is difficult to analyze due to a lack of comparative data, since literature does not give an overview rate of this deformity. Most patients in our study were referred at walking age for an isolated bilateral involvement. In terms of aetiology the absence of associated neuromuscular manifestations in these patients was suggestive of an idiopathic toe walking syndrome, for which the pathogenesis is still controversial. In fact, the definition of congenital anomalies includes conditions thought to be of prenatal origin whether or not they were manifest at birth, so that it is not entirely clear whether this syndrome should be considered as congenital or acquired.

Pés talus (PT) depicts an 2 2 up and out2 2 appearance with the dorsal forefoot practically touching the outer leg. It is a positional deformity which is said to occur in about five percent of all newborns,[16] a rate that compares favourably with one of 4.9 percent in the present series. The good prognosis in most of our patients attests to the excellent natural history of PT which usually resolves spontaneously. However, one must differentiate flexible banal sloped foot from PT in which plantar flexion is limited to 10 degrees. Also, a variant of PT called pes calcaneovalgus because it is associated with valgus deviation, can be confused with congenital vertical talus, also called convex pes valgus or 2 2 rocker bottom foot2 2 . This rare deformity, which is characterized by a fixed dorsal talonavicular dislocation was seen in 2.8 percent of cases in our series.

Conclusion

The incidence of CTA in this series was 1.98 per 1,000 live births and maternal primigravida is suspected to be a risk factor favouring their occurrence. Congenital clubfoot was the commonest anomaly in nearly half of the cases followed by flat foot and metatarsus varus. Most deformities can be diagnosed easily by physical examination alone, but some may require special expertise for early detection and require timely corrective treatment by a paediatric orthopaedist. We conclude that this hospital based study should be expanded to other hospitals and also to traditional birth attendant practices in order to establish through a national register of congenital anomalies, their true incidence in Côte d'Ivoire.

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