Original Research Article

Skeletal malformations in perinatal autopsy

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Abstract

Introduction :Congenital malformations are the fifth most common cause of perinatal morbidity and mortality in India, out of which skeletal malformations constitute about 20%. We conducted this study in our center to look various skeletal malformations in perinatal autopsy.**Materials and methods**:Present study comprises of 200 cases of perinatal autopsies from January 2018 to July 2019, out of which only 20 cases which had skeletal malformations were studied.**Results**:In total of 20 cases, 5 cases were of Anencephaly with spinal defect, 4 cases of Spina bifida, 2 cases of Sirenomelia, 2 cases of Potters Syndrome, 2 cases of lemon skull, 1 OEIS complex, 1 Edward Syndrome. Remaining 3 were of iniencephaly, club foot and club hand and short femur length. These 3cases presented as sole skeletal deformity.**Conclusion**:Nevertheless, skeletal malformations can be detected on antenatal screening; fetal autopsy helps to identify and study various skeletal malformations in detail and helps in preconceptional genetic counseling.

Keywords: Sirenomelia, Iniencephaly, Edward Syndrome, Potters Syndrome.

Introduction

Congenital skeletal disorders comprise a heterogenous group of abnormalities of the bones related to their growth, shape and integrity. They are present at birth or manifest during gestation causing abnormal development of fetal skeleton[1]. Affecting approximately 2.4- 4.5 of 10,000 births[2].While fetal skeletal abnormalities are generally recognized on prenatal ultrasonography, an accurate diagnosis of a specific skeletal disorder can be challenging due to its rarity, the spectrum of mechanisms associated with their formation and the variety of the causative genes[2].Our study provides information regarding the frequency of the various skeletal deformities detected perinatally and reinforces the importance of continued investigation and a multidisciplinary team in meticulously diagnosing the condition. Finding the diagnosis is pivotal for accurate genetic counseling and reproductive decisions[2].

Materials and methods

The present study comprises perinatal autopsies conducted in pathology department of tertiary care centre during January 2018 to July 2019.Ethical clearance was obtained from the Institutional Ethical Committee.Fetal autopsies were performed after taking informed consent of parents.Standard protocol was followed.

Anthropometric data and photographs were recorded for each fetus. External examination for skeletal deformity or any other deformities was done. Internal examination for gross organ anomaly was done by sectioning of each organ for histopathological examination.

Results

A total of 200 fetal autopsies were conducted from January 2018 to July 2019, out of which 20 cases were of skeletal deformities, which accounts for 10% of cases. All these cases were of intra-uterine death (induced or spontaneous).The age of fetuses ranged from 17-32 weeks of gestation. Most of cases where in the age group of 20-30 weeks [Table 1]. The weight of the fetus was in the range of 500gms to 3200gms with majority weighing from 1500 to 2000gms[Table 2]. Ten different anomalies were noted in this study and findings of which has been summarized [Table 3 and Figures 1-4]

Table 1: Gestational age and number of cases.

Gestational age(weeks)	No. of cases
0-10	0
10-20	4
20-30	11
30-40	5
Total	20

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Table 2: Fetal weight and number of cases.

Weight (gms)	No. of cases
500-1000	1
1000-1500	2
1500-2000	8
2000-2500	6
2500-3000	2
3000-3500	1
Total	20

Table 3:USG findings and Autopsy findings(Gross).

	Skeletal Malformations	No of Cases	USG Findings	Autopsy findings Gross
1.	Sirenomelia	2	• Hypoplastic lower limbs • Bilateral renal agenesis	• Fused lower limbs • Bilateral renal agenesis • Absent external genitalia
2.	OEIS Complex	1	Omphalocele	• Omphalocele • Spinal defect • Imperforate anus
3.	Iniencephaly	1	• Short spine with misalignment • Prominent lateral ventricle	• Absent anterior neck • Low hair line • Myelomeningocoele • Single umbilical artery
4.	Edward Syndrome	1	Hypoplasia of nasal bone (On CT Scan)	• Pointed frontal bones and flat occiput • Low set ears • Shield chest • Micrognathia • Rocker bottom foot
5.	Potter's Syndrome	1	Pulmonary hypoplasia	• Low set ears • Depressed nasal bridge • Depression below lower lip • Residing chin • Spade like hands • Bilateral renal cystic dysplasia
6.	Anencephaly with spinal defect	5	Anencephaly with spinal defect	• Anencephaly • Meningomyelocoele
7.	Spina bifida	4	Spina bifida	• Spina bifida • Myelomeningocoele
8.	Bilateral club hands and club foot	1	• Bilateral club hands and club foot • Hydrocephalus • Absent corpus callosum	Bilateral club hands and club foot
9.	Short femur length	1	Short femur length	Short femur length
10.	Lemon skull	2	-	Lemon skull

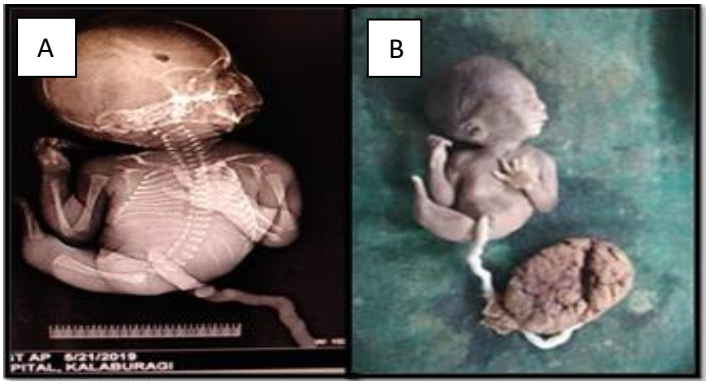

Fig 1:Sirenomelia (A) X-ray shows hypoplastic lower limbs (B) Fused limbs and absent external genitalia.

Fig 2:Iniencephaly (A) Absent anterior neck (B) Myelomeningocoele

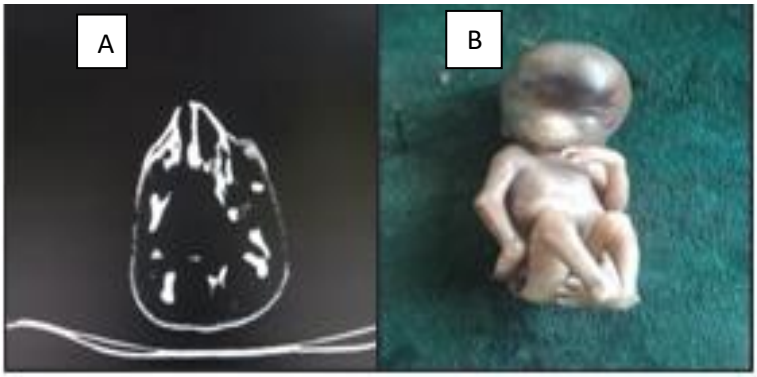

Fig 3:Edward Syndrome (A) CT Scan showing Hypoplasia of nasal bone (B) Pointed frontal bones and flat occiput, shield chest, rocker bottom foot.

Fig 4:Anencephaly with spinal defect: (A) Anencephaly (B) Meningomyelocoele

Discussion

In the present study, total of 200 cases of perinatal autopsies, conducted during January 2018 to July 2019 were studied.Out of which 20 were having rare skeletal malformations. Most common skeletal malformations were Anencephaly with spinal defect accounting for 5 cases.Remaining cases were of Sirenomelia, OEIS Complex, Iniencephaly,Edward Syndrome, Potter's Syndrome, Spina bifida, bilateral club hands and club foot, Short femur length and lemon skull. In the study done by A.G Tomatir et al, a total of 183 perinatal autopsies were done, out of which skeletal malformations accounts for 14%[3].In the present study, there were 2 cases of Sirenomelia. One was associated with single femur and single tibia (Fig 1 A). Other case is of single femur and absent tibia (Fig 1 B). Both associated with bilateral renal agenesis. This condition is found in approximately one out of 100,000 live births[4].OEIS Complex is seen in one case, having omphalocele, spinal defect, and imperforate anus. It may represent the most severe manifestation of a spectrum of birth defects, the extrophy-epispadias sequence. The OEIS Complex affects 1 in 200,000 to 400,000 pregnancies[5].Iniencephalyis a lethal congenital neural tube malformation. It is characterized by occipital bone defect, severe lordosis of cervicothoracic spine and fixed retroflexion of fetal head. In this study, one case of it is seen, associated with absent anterior neck,low hair line, myelomeningo coele and single umbilical artery(Fig 2A and B). Incidence ranges

from 0.1 to 10 in 10,000 live births[6].In the present study, there was one case of Edward Syndrome (Trisomy 18) associated with pointed frontal bones and flat occiput, low set ears, shield chest, micrognathia and rocker bottom foot(Fig 3B). It is the second most prevalent autosomal aneuploidy after trisomy-21. Incidence ranges from 1:3600 and 1:8500 of live births[7].Potter's Syndrome is a rare condition affecting one in 2000-5000 individuals. Classic Potter's Syndrome occurs in setting of bilateral renal agenesis along with pulmonary hypoplasia. The condition is always fatal. In our study, there was one case of Potter's Syndrome. It was associated with low set ears, depressed nasal bridge, depression below lower lip, residing chin, spade like hands, bilateral renal cystic dysplasia and pulmonary hypoplasia[8]. In our study, maximum cases were of Anencephaly with spinal defect accounting for 5 cases. Cases were associated with meningo myelocoele (Fig 4 A and B). Anencephaly is a lethal neural tube defect, resulting from failed closure of the anterior neuropore. It occurs in1.4-4.7/10,000 deliveries[9].In the study done by C Panduranga et al, male: female ratio was 0.33 :1 which was corresponding with our study[10].Spina bifida is birth defect in which the vertebral column is open (bifid) often with spinal cord involvement. Clinically most significant is myelomeningocele in which the spinal neural tube fails to close during embryonic development. It occurs in 1 per 1000 births. In the present study there are 4 cases of spina bifida with myelomeningocele[11]. In the study done by Camillla et al, spina bifida accounts for 22.2% of anomalies which is closely relating with this study[12].

In this study, one case had bilateral club hands and club foot. It is a common congenital birth defect, with incidence of 1 per 1000 live births. It is seen as part of known syndromes. It can occur secondary to bilateral renal agenesis and neural tube defects. Male preponderance was seen with male: female ratio of 2.4:1[13].

Short femur length is defined as femur length less than 5th percentile for gestational age. There is 1 case of short femur length in our study. A short femur length may indicate incorrect pregnancy dating or could be the marker for aneuploidy, skeletal dysplasias, congenital malformations, or early-onset fetal growth restrictions. It may also be an early marker of placental dysfunction[14].There are 2 cases of lemon skull in our study. It is a feature when there appears to be an indentation of the frontal bone (similar to that of a lemon). It is typically seen as a sign of a Chiari II malformation and also seen in majority(90-98%) of fetuses with spina bifida.It can also be associated with encephalocele,Dandy Walker malformations, Thanatophoric dysplasia and Cystic hygroma[15].

Conclusion

Even though the prenatal ultrasonogram reasonably predicts the malformations, fetal autopsy is essential to look for additional malformations and to confirm the diagnosis. Proper antenatal checkups, maternal nutrition,and preconceptional genetic counselling plays a vital role in reducing the congenital malformations and future recurrences.

Conflict of Interest:Nil
Source of support:Nil

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