LIMB-BODY WALL COMPLEX (LBWC) - A RARE FOETAL POLYMALFORMATION

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Abstract: Limb-body wall complex (LBWC) consists of a poly-malformation syndrome with a thoraco- and/or abdomino-schisis associated with an eventration of the internal organs and anomalies of the extremities. The present foetus with LBWC (limb-body wall complex) showed cranioplacental attachment with severe anomalies of craniofacial defects, absence of right upper limb and malrotation of right lower limbs, complete malrotation of the circulatory , respiratory and gastro-intestinal systems . The cerebral hemisphere is partially present. A rudiment of brain stem has been observed without any differentiation. The cerebellum and spinal segments were found to be completely absent. Postmortem foetography revealed irregularly arranged skeletal elements confined to the axial skeleton.

Key words: cranioplacentalattachment, gastroschisis, limb-body wall complex, malrotation.

INTRODUCTION

Limb-body wall complex (LBWC) is a rare fetal polymalformation of uncertain etiology, but it has been regarded as sporadic in nature with a low recurrence risk. Limb body wall complex is a rare syndrome with two distinct phenotypes described by Russo et al. (1993)[1], a form with a placento-cephalic attachment and another form with a placento-abdominal attachment. Diagnosis is based on various echographic signs. No case of postnatal survival is described. Limb body wall complex was described for the first time by Van Allen et al. in 1987[2] .Two of the three following anomalies must be present to establish the diagnosis:

1. Thoracic and/or abdominal celosomia.
2. Exencephaly or encephalocele with a facial cleft.
3. Anomalies of the extremities.

For certain authors the anomaly consists of a poly-malformation syndrome with a thoraco- and/or abdomino-schisis associated with an eventration of the internal organs and anomalies of the extremities. Jones KL. (1997)[3], Moerman P (1992)[4], Russo et al. (1993)[1] and later Cusi et al. in 1996[5] distinguished two different phenotypes according to the feto-placental relationships.

In the phenotype with the "cranio-placental attachment" a neural tube closure defect is associated with one or more complex facial clefts and an anterior coelosomy, whereas amniotic bands are inconstant and anomalies of the extremities, if any, touch primarily the upper limbs (Jones KL.1997[3], Moerman P1992[4], Cusi et al 1996[5], Deruelle Ph 2000[6]).

In the phenotype with the "abdomino-placental attachment" the authors describe:

1. A persistence of the cavity of the extraembryonic coelom containing the exteriorized abdominal organs. The sac connects the cutaneous edge of the parietal defect to placental surface. The umbilical cord is always localized on the wall of this bag; it is short, non-free and is incompletely covered by the amnion.
2. Urogenital anomalies and the persistence of the primitive cloaca.

Case report:

The present case is a female foetus of second trimester 18wks of age as per the report given by the gynaecologist who delivered a GIIPI woman of 29yrs

There was no previous history of any abnormal deliveries either on the paternal or maternal side. No history of consanguinous marriage.

RESULTS

Macroscopic observations:

The present foetus with LBWC (limb-body wall complex) showed cranioplacental attachment with severe anomalies of craniofacial defects, upper limbs and lower limbs, complete malrotation of the circulatory, respiratory and gastro-intestinal systems.

Post mortem foetography showed absence of all the skeletal elements in the axial region (fig.1). Right upper limb is absent and the left upper limb bones are located close to the lower limb bones. The lower limbs showed normal position of femur but

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right tibia is curved and twisted posteriorly so that entire foot is positioned posterior. Fibula is absent in both the lower limbs.

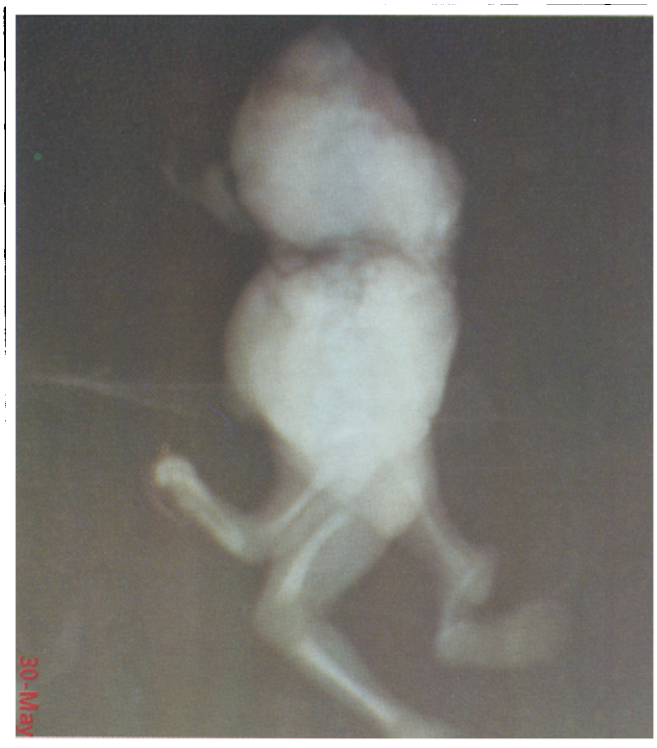

fig.1- showing foetogram of foetus with LBWC

Cranio-facial defects: Cranio-placental attachment (fig.2) and the amniotic membrane extending onto the thoraco-abdominal region, plastering the umbilical cord to the amniotic membrane is observed (fig.3). Presence of cyclopean eye , absence of nose , oral fissure and neck are observed (fig.4) .

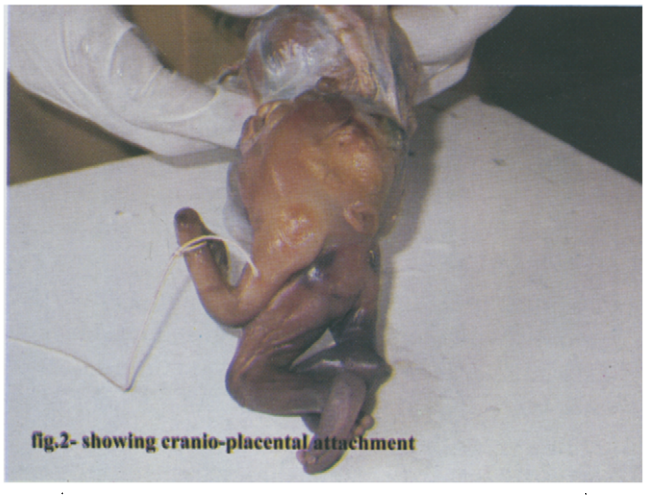

Fig. 2 : Showing Cranio-placental attachment

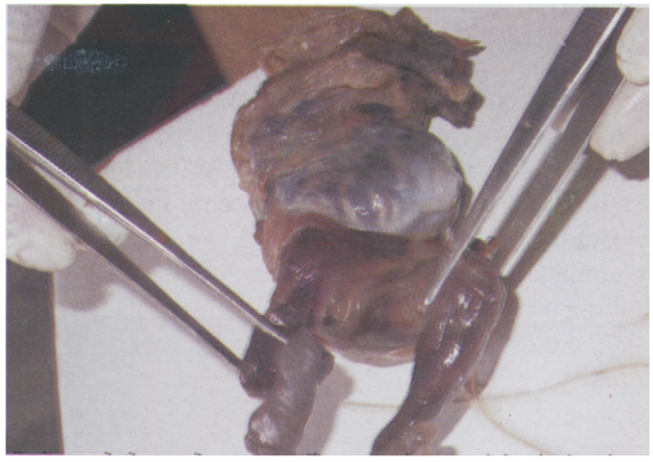

Fig 3 - Amniotic membrane extending onto thoraco-abdominal region

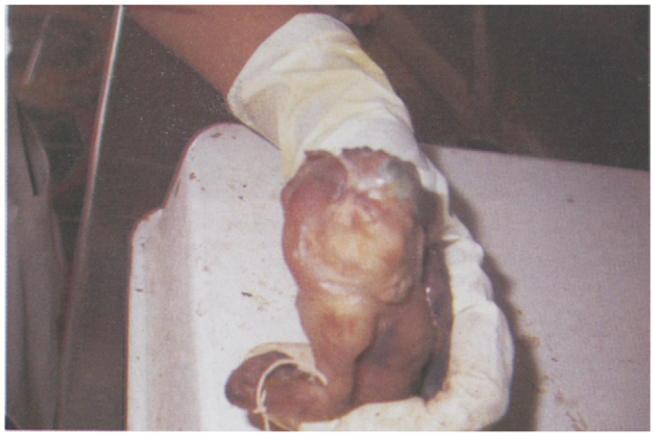

Fig 4 : Showing cyclopean eye, absence of nose, oral fissure and neck

After detaching the placenta cranial vault is found to be absent with persistence of brain tissue. Anterior wall of trunk is absent in the supra umbilical part covered by amniotic membrane and infra-umbilical part of anterior abdominal wall is normal. Coils of intestine are present in the cephalic pole of the trunk and liver is present in the caudal pole of the trunk. (fig.5)

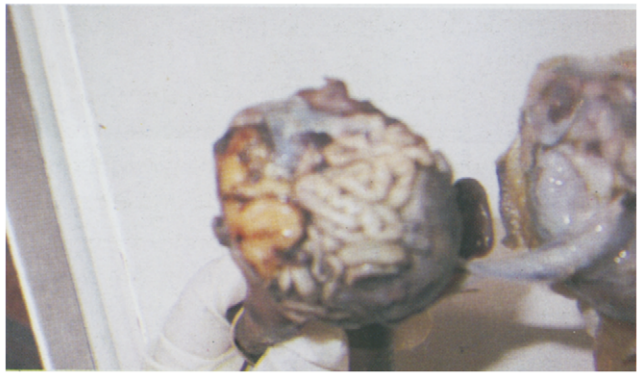

Fig 5 : Persistence of brain tissue, and exposed coils of intesine and liver

Cardio-vascular, respiratory and gastro-intestinal systems are completely malrorated. After dissection the liver, heart and lungs are exposed which occupied entirely the left side of the body in a linear position. As such, in this present case the lungs are termed as upper and lower lungs with respect to the position of the heart. The cardiac end and pyloric ends of the stomach are rotated upside down (fig. 6)

Fig 6 : showing malroration of Cardio vascular, repiratory and gastro-intestinal system

Kidney is unilaterally present on the right side and absent on left side with presence of bi-laterally placed supra-renal glands. Uterus is cord like with a streak like ovary on the right side. There is no ovary on the left side (fig.7). Karyotype of the foetus is
46, xx

Fig -6 : Showing agenesis of Kidney on the left side

Embryology:

It is well known that during 4th week the diaphragm that develops from septum transversum, pleuro-peritoneal membranes, dorsal mesentry of oesophagus and muscular components of body wall divides body cavity into thoracic and peritoneal cavities. Failure of both the pleuro-peritoneal membranes to close the pleuro-peritoneal canal results in the continuation of pleural and peritoneal cavities. This naturally allows abdominal viscera to herniate. In the present case the herniation is on the right side with intestinal loops occupying the right half of pleuro-peritoneal cavity and heart is compressed between the lungs that are cephalic and caudal in position with respect to the heart, which are present to the left side of pleuro-peritoneal cavity. Lungs are hypo plastic. (Saddler 2006)

Through research it was elicited that there is definite role of Hox genes in the development of limb buds. TBX genes-BX5 AND TBX4 are involved in various anomalies of limbs which are categorized in 7 prime types. In the present case failure of formation and differentiation are noticed.

Vertebral anomalies i.e, agenesis of vertebral column cardiac defects, renal anomalies and limb defects are found in the present case and are part of VACTERL association described by Saddler T W (2006)[7].

Renal agenesis encountered in the present case may be due to defect in the interaction between metanephric mesoderm and ureteric bud. Genes that are responsible are SALL1, PAAX2 AND EYA1. There is no defect in the development of external genitalia. However the uterus is cord like with streak like right ovary and agenesis of left ovary. The master gene for development of ovary is WNT4 may be mutated or inexpressive leading to the above situation.

DISCUSSION

Many authors, in their studies of limb - body wall complex reported cranio-placental attachment with craniofacial defects, gastroschisis and anomalies of limbs. But they have not reported in any of their cases with malrotation of systems. Hence, Limb-body wall complex with malrotations of multiple systems has been taken up for the present study and it is a rare foetal polymalformation of uncertain etiology, but has been regarded as sporadic in nature with a low recurrence risk.

Second-trimester diagnosis of limb-body wall complex with literature review of pathogenesis has been studied in three fetuses having limb-body wall complex (LBWC) with craniofacial defects and 9 fetuses having LBWC without craniofacial defects at Mackay Memorial Hospital during the period January 1990 - May 2006. Cases of LBWC with craniofacial defects showed severe anomalies of the upper limbs,

craniofacial defects, constrictive amniotic bands and cranioplacental attachment, (Chen, C-P; Lin, C-J; Chang, T-Y; Hsu, C-Y; et al, 2007[8])

H. Saadi, K. Sfakianoudis, D. Thomas (2007[9]) in their study of Limb body wall complex associated with placenta previa accreta reported an anterior body wall defect that was the predominant feature of sonographic examination with evisceration of the heart, stomach and bowel which were found floating in the persistent extraembryonic coelom, Skeletal anomalies included hypoplasia of the left forearm with only one bone fragment being present, hypoplasia of the hand with absence of fingers and apparent kyphoscoliosis . The present study is in agreement with the above authors with an additional abnormality of malrotation of multiple systems.

The following theories have been proposed limb body wall complex syndrome after thorough investigation.

1. Exogenic theory this is based on amnion early rupture leading to amniotic bands that interrupt embryogenesis is resulting in deformation of already formed foetal structures (Torpin et al. 1965)[10].

2. Vascular theory described by Van allen (1987) according to this theory an ischemic accident between 4 and 6 weeks is the origin of the disease leading to significant loss of foetal tissue, impairment of foetal development, abdominal wall disclosure and adhesion of amnion to the necrotised foetal parts.

3. Streeter's theory- it is developed by Hartwig (1989)[12] and the assumption of an impaired folding process of embryo, an anomaly of development of embryonic pedicle and secondarily a disruption in the caudal and lateral folds which take place later than 32nd day of gestation. These anomalies lead to abdominal wall defects, anomalies of cord, placenta and membranes and persistence of primitive cloaca.

Not withstanding with the theories propounded as above Mastroiocova et al (1992)[13] suggested that the limb body wall complex need to be diffentiated into the entity with a) placento-cranial original and b) placento-abdominal also called body stalk syndrome. Cantrell propounded his own theory as Cantrell's pentology which is a rare congenital malformation characterized by an anomaly of sternum, diaphragmatic defect ,an anomaly of pericardium, cardiac ectopia, intra cardiac anomalies and a supra umbilical abdominal defect. The cause is related to sex chromosomes as well as trisomy 13 (Martin RA Cunnif et al 1992)[14]

CONCLUSION

Limb body wall complex is a syndrome with multiple malformations of unknown etiology with possible genetic mutations can now a days be established early and precisely to the fascinating sonographic technology. Previously the present case associates limb body wall complex and cranio-facial placentation with multiple abnormalities with foetal annexable tissues.

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