

Case report

Jarcho-Levin syndrome with multiple developmental anomalies

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Abstract

Jarcho – Levin syndrome is a clinico-radiological entity first described by Jarcho and Levin in 1938 at John Hopkins university. It is characterised by vertebro-costal segmentation defects. Present case is a 20 weeks aborted female foetus, obtained from the Dept. of Obstetrics and Gynaecology of our own hospital. The foetus was preserved in 10% formalin-glycerine solution, was X- rayed for bony anomalies and dissected meticulously. On observation the foetus had a short stature, absent neck, protuberant chest and abdomen, long arms and two meningocele sacs at the back of neck with talipes equino varus. The X-ray showed a ring of thoracic vertebrae on lateral side of the base of skull with ribs articulating. Lower rib formed a free lateral margin. Ribs were not covering the back & scapula seen rotated antero-laterally. The same was confirmed on dissection. The back was covered only by hip bones with cranio-iliac ligament. A large round defect of squamous temporal bone was seen with protruding meningocele. There was a huge diaphragmatic hernia on the left side of chest. Pancreas and horseshoe shaped kidney were seen in the abdomen with ectopic anal opening.

Key words – Jarcho-Levin syndrome, Cranio-Iliac ligament, Diaphragmatic hernia

Introduction

Jarcho-Levin syndrome is a clinico-radiological entity which was first described by Saul Jarcho & Paul M Levin in 1938, at Johns Hopkins University. Individuals with Jarcho-Levin syndrome, typically show short trunk and neck, comparatively long arms, protuberant abdomen and may show a spectrum of associated anomalies. It is subclassified into two types Spondylo-Costal Dysostosis (SCD) which is Autosomal Dominant disorder and Spodylo-Thoracic Dysplasia (STD) which is an Autosomal Recessive disorder.^[1] SCD is a heritable axial skeleton growth disorder having costo-vertebral segmentation defects. It shows malformations of the vertebral column & ribs, shortened neck & thorax with moderate to severe scolio-kyphosis and has intrinsic rib anomalies such as bifurcation, broadening or fusion of ribs.

STD is a more lethal form of Jarcho-Levin syndrome which shows predominant vertebral defects with typical Crab-rib or Fan like appearance having minimal or no intrinsic rib anomalies. Mohnish Suri et al stated that STD shows ‘crab like’ appearance of ribs whereas in SCD typical crab like appearance is not observed. Authors further state that STD is inherited as Autosomal Recessive disorder whereas SCD can be inherited as Autosomal Dominant or as Autosomal Recessive one.^[2] Thus Jarcho-Levin syndrome has both, Dominant & Recessive modes of inheritance.

Material and methods

A 20 weeks aborted female foetus was obtained, from Department of Obstetrics and Gynaecology of our own hospital, after proper written, informed consent from the parents. The foetus was injected with 10% formalin-glycerin solution for

preservation. The foetus was X-rayed to know the bony anomalies. Later it was meticulously dissected and studied. Photographs were taken from time to time.

Results

On inspection the foetus had Short/almost absent neck, protuberant chest & abdomen with Talipes Equino-varus. Two meningocele sacs seen on the back of neck. Ectopic anal opening seen in the coccygeal region.(JL-1a)

X-ray of the foetus showed Lumbar vertebrae articulating with base of skull. Thoracic vertebrae forming a ring of bones under the skull to which ribs were articulating. Typical crab rib appearance was absent. Sacrum seen as vertical strip of bone. (JL-1b)

The foetus was meticulously dissected. Following were the observations. A large round developmental defect was seen in squamous part of right occipital bone through which two meningocele sacs were seen protruding.(JL-2a)

A ring of thoracic vertebrae was seen just inferior to antero-lateral part of skull with ribs articulating. Total ribs present – 8 in number on both sides. 5th rib was fusing with 6th. Ribs were not covering the back of the foetus. Lower rib formed a free posterolateral margin hanging on the lateral chest wall.(JL-2c) Nonfusion of vertebral arches of lumbar vertebrae was observed just inferior to skull. A short spinal cord which was a continuation of brain stem was seen passing thro' foramen magnum into the open lumbar vertebral canal directly, & not thro' the ring of thoracic vertebrae. (JL-2b)

Scapula was seen rotated anterolaterally. Hip bones were attached to base of skull by a thick ligament, (cranio-iliac ligament) passing lateral to the lumbar vertebrae covering the back.(JL-2b)

A large developmental defect was seen in the Respiratory Diaphragm on the left side. Only

anterior rim was seen. A huge diaphragmatic hernia, with stomach, intestines & half of liver seen passing through the defect, on the left side of chest, shifting heart & lungs to right side.(JL-3a) Part of colon and rectum was seen in the abdomen, forming an ectopic anal opening at the coccygeal region.(JL-3b)

A multilobulated Horseshoe shaped kidney seen just under the diaphragm. Ureters were seen passing from lower part of horseshoe kidney. Pancreas seen in the 'c' of kidney.(JL-3b) After removing the Pancreas, Horseshoe kidney was observed as right kidney forming an open 'c' & left kidney as closed 'c'.(JL-3c)

Discussion

Jarcho-Levin syndrome is a rare genetic disorder characterized by spinal column abnormalities, skeletal dysplasia & short trunk.^[1] Whittock NV et al had earlier reported DLL3 mutations at 19q13.1 locus. Later he reported in two siblings of a consanguineous family, mutation in MESP2 gene at 15q21.3-15q26.3 locus.^[3] Jarcho-Levin syndrome has been described as Spondylothoracic(STD)/spondylocostal dysostosis(SCD) with multiple segmentation defects of vertebrae, short neck, short trunk, protuberant thorax and abdomen, with multiple vertebral as well as costal anomalies. Patients with SCD are known to have mutations in the Delta-Like3 (DLL3) gene on chromosome 19.^[4] Cornier AS et al reported MESP2 mutation in a case of STD.^[5] Onay OS et al reported a case of Jarcho-Levin syndrome with cong. Diaphragmatic hernia and cong. Heart disease.^[6] Inguino scrotal hernia has also been reported with Jarcho- Levin syndrome^[7] Recently it is known that autosomal recessive spondylocostal dysostosis is caused by mutations in DLL3 as well as several other members of Notch signaling pathway.^[8] Peter D Turnpenny et al reported mutation of DLL3, MESP2, LFNG and HES7

genes in Autosomal recessive SCD for identification of its subtypes.^[9]

Present case is a 20weeks female foetus having SCD with multiple developmental defects. External defects seen are a short/almost absent neck, protuberant chest and abdomen, meningocele, ectopic anal opening with talipes equinovarus. X-ray showed anteriorly displaced thoracic vertebrae forming a ring at the anterolateral side at the base of neck. On meticulous dissection the X-ray finding was confirmed. This has been reported for the first time. Also a big developmental defect was seen in the squamous part of temporal bone through which the two meningocele sacs were protruding. 8 ribs were present on each side. 5th rib fusing with 6th. The ribs were articulating with the thoracic vertebrae. Last rib formed a free posterolateral border, not covering the back. Instead, hip bones with a thick cranio-iliac ligament was seen covering the back completely. This has been observed & reported for the first time. A large diaphragmatic defect on the left side with a huge hernia & a mediastinal shift has been observed. Horseshoe shaped kidney and ectopic anal opening also has been observed. Thus Spondylo-Costal Dysostosis with multiple developmental defects observed by dissection made it the rarest of the rare cases. Prenatal diagnosis is important to provide appropriate genetic counseling.^[7]

Conclusion

Jarcho-Levin syndrome is a rare anomaly described as having two types. Spondylo-thoracic dysostosis and spondylocostal dysostosis. Present case is a 20 wks. female foetus obtained from our own hospital. X-ray showed a ring of cervico-thoracic vertebrae on the lateral side of neck with 8 ribs articulating. Ribs were not covering the back, instead hip bones with cranio-iliac ligament covered the back. This has been observed and reported for the first time. Also a defect in the

squamous temporal bone with meningocele was seen. A diaphragmatic defect with huge hernia on the left side of chest was observed. In addition horse-shoe shaped kidney and ectopic anal opening was present. Thus here is a rare case of spondylo-costal dysostosis type of Jarcho-Levin syndrome, being reported which may be autosomal dominant or autosomal recessive in nature, known to be having DLL3 mutations.

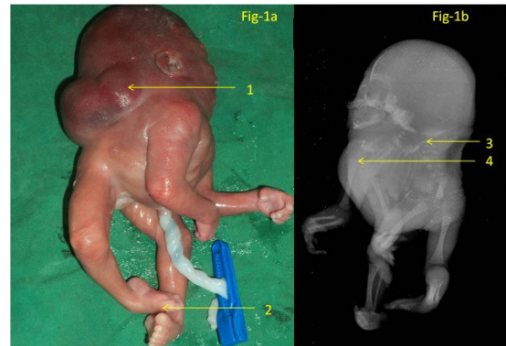


Fig.1 a – 1. meningocele sacs.

2. Talipes equino varus.

Fig.1 b – X-Ray of foetus

3. A ring of cervico-thoracic vertebrae, ribs articulating.

4. Anteriorly rotated scapula

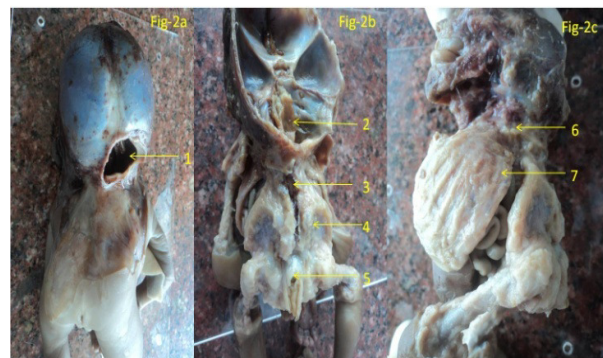


Fig.2 a – 1. A defect in right squamous Occipital bone

Fig.2 b – 2. Brain stem through foramen magnum

3. Entering the lumbar part of vertebral column.

4. Hip bones attached to the base of skull by cranio-iliac ligaments.

5. Ectopic anal opening

Fig.2c – 6. Ring of cervico-thoracic vertebrae.

7. Lower rib forming posterior free margin. Ribs not covering the back.

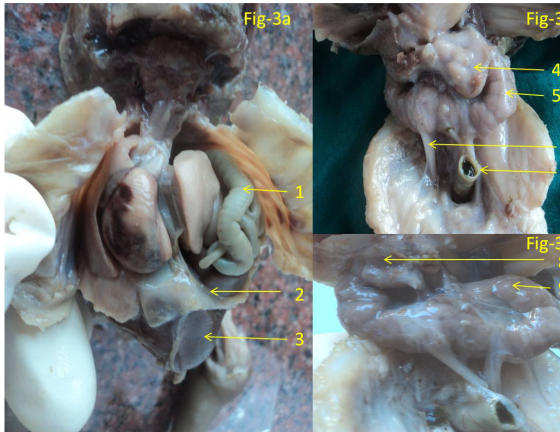


Fig.3a – 1. Diaphragmatic hernia

2. Anterior rim of diaphragm.

3. Lower part of liver

Fig.3b – 4. Pancreas in the ‘C’ of horse-shoe shaped kidney.

5. Horse-shoe shaped kidney.

6. Ureters seen from lower part of kidney

7. Rectum & anal canal.

Fig.3c – 8. Right kidney as open ‘C’.

9. Left kidney as closed ‘C’.

Acknowledgements-The authors are grateful to Dr. B.B. Thind for helping for an X-Ray of the foetus.

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