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CASE REPORT

DANDY-WALKER MALFORMATION: A RARE CONGENITAL ANOMALY

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INTRODUCTION: Dandy Walker Malformation (DWM) is a congenital malformation involving the cerebellum and fluid filled spaces around it. A key feature of this syndrome is partial or complete absence of a part of brain located between two cerebellar hemispheres ie. cerebellar vermis.(1) Dandy walker malformation was originally described in 1887 by Sutton and further characterized by Dandy and Blackfan in 1914 followed by Tagart and Walker in 1942. Benda finally labeled this disease as Dandy Walker in 1954.(2) Since the original description, additional studies have reported on various morphological features of this syndrome. It is a genetically sporadic disorder that occurs one in every 30,000live births.(3) Because of its rarity, here we report a case of DWM, in a fetus in which the diagnosis was made prenatally on USG. Later on, MTP was done by expulsion. Fetus was sent for autopsy to rule out other associated congenital abnormalities.

CASE REPORT: A 29year old lady gravida2, para 1 with no live issue reported for routine antenatal checkup at 18 weeks of gestation. Her haematological and biochemical profile were within normal limits. Her blood group was O-ve. Her previous issue aborted spontaneously at 6weeks of gestation. No anti D was given at that time.

USG reported live18wk5d fetus in breech presentation with major congenital anomaly of DWM. There was a large posterior fossa cyst (Figure 1) with proximal ventriculomegaly in the brain. (Figure 2) The patient also had oligohydramnios (AFI 5.2). Fetal parameters on USG were:

BPD-4.9cm (20wk6d); HC-17.6cm(20wk1d); AC-12.0cm(17wk5d);FL-2.0cm(16wk2d);EFW-193gm+-28gm. Head parameters corresponded with 20weeks gestation which was abnormal.
HC/AC ratio-1.4; FL/HC ratio-12%; FL/AC-17% were reported abnormal.

Autopsy Findings: A dead male fetus was received weighing 185gm (Figure 3). HC was 16cm which was large for gestational age (Figure 3). Other parameters were CRL-18cms; CHL-23cms; Abd girth at umbilicus-10cms. Length of umbilical cord -3cms.Cut surface showed presence of three vessels.

Cut surface of brain showed markedly dilated ventricles forming a cystic cavity in the midline extending up to posterior fossa. Surrounding brain parenchyma was thinned out.(Figure 4) Outer surface showed prominent vessels.

No other apparent internal congenital abnormality was evident.

DISCUSSION: DWM is a rare congenital malformation that involves the cerebellum and fourth ventricle. It is characterized by agenesis or hypoplasia of cerebellar vermis, cystic dilatation of the fourth ventricle and enlargement of the posterior fossa. Other concomitant malformations may also be present along with but these three features define DW malformation.

Around 70-90% patients have hydrocephalus which develops postnatally. DWM may also be associated with atresia of foramen of Magendie and possibly foramen of Luschka.(4) Not until 1954did

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Benda first explain that atresia of cerebellar outlet foramina is not an essential feature of this condition and suggested the now widely accepted term Dandy- Walker Malformation.[5]

The term Dandy- Walker represents not a single entity but several abnormalities of brain development that coexist. These posterior fossa cystic malformations have been divided into DW Malformation; DW Variant; mega cisterna magna and posterior fossa arachnoid cyst. DW Malformation; DW Variant and Mega cisterna magna currently represent a continuum of developmental anomalies on a spectrum termed as DW Complex.[6]

DW malformation is characterized by enlarged posterior fossa; high position of the tentorium with upward displacement of lateral sinus; varying degrees of vermian aplasia or hypoplasia and cystic dilatation of the fourth ventricle that nearly fills the entire posterior fossa.

DW variant consists of vermian hypoplasia and cystic dilatation of fourth ventricle without enlargement of posterior fossa.

Mega cisterna magna consists of enlarged posterior fossa secondary to an enlarged cisterna magna with normal cerebellar vermis and fourth ventricle.[7]

Table: Associated Findings in DW Syndrome:

CNS Findings	Non CNS findings
Dysgenesis of corpus callosum	Orofacial deformities
Lipoma of corpus callosum	cleft palate
Holoprosencephaly	polydactyly
Porencephaly	Syndactyly
Dysplasia of cingulate gyrus	Cardiac anomalies
Schizencephaly	Urinary tract anomalies (polycystic kidneys)
polymicrogyria	Cataract
Cerebellar heterotopia	Retinal dysgenesis
Occipital encephalocoele	Choroid coloboma
Microcephaly	Facial haemagioma
Dermoid cysts	Hypertelorism
Malformation of cerebellar folia; inferior olivary nucleus	Meckel-Gruber syndrome
Hamartoma of tuber cinereum	Neurocutaneous melanosis
Syringomyelia	
Klippel-Feil deformity	
Spina bifida	
Lumbosacral meningocoeles	
Spinal Lipoma	

Dandy-Walker Syndrome (DWS) is one such disease considered to be a part of emerging class of diseases called Ciliopathies. Underlying cause may be a dysfunctional molecular mechanism in the primary cilia structure of the cell, organelles which are present in many cellular types throughout the human body. The cilial defects affect numerous critical developmental signaling pathways which are

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essential to cerebellar development and thus offers a plausible hypothesis for multi syndrome nature of large set of syndromes and diseases in DWS.[8]

DWM occurs as an autosomal dominant inherited disorder with a frequency of about 1 in 25000 -35000 pregnancies.[9] The gene locus for DWM is 3q24 and the presence of multiple congenital defects associated with it shorten the life span.[1] It has been reported most often in people with trisomy 18 but can occur in people with trisomies 13, 21, 9 also. Additionally DWS has been reported in fetus or newborns with triploidy too.[10]

Darbo et al found mutations in extracellular matrix genes N1D1 and LAMC1 causing autosomal dominant DWM and occipital cephalocoeles in a family by performing whole exome sequencing. Structural modeling of N1D1-LAMC1 complex demonstrated that each mutation disrupts the interaction. These findings implicate ECM in pathogenesis of DW spectrum disorders.[10]

Cases of DWM are reported more in females [11] whereas our case was a male fetus. Various predisposing factors have been reported such as Intrauterine infections, cranial trauma, chronic disturbances in CSF pressure, persistence of embryonic tissue, vascular lesions, teratogens, rubella, alcohol and maternal diabetes.[9]

DWM is best diagnosed with the help of Ultrasound and MRI.[7] Ultrasound is routinely used in antenatal period as a screening modality. Prenatal diagnosis of DWM should not be made before 18th week of gestation because cerebellar vermis may be incomplete at that time.[7]

Although great variability exists in intracranial findings in fetuses, sagittal measurement exceeding 10mm helps confirm the presence of DW cyst. In our case the biparietal diameter on USG was 4.9cm and Head circumference was 17.6cm which was more than the gestational age.

Syndromes associated with DWM include PHACE syndrome (posterior fossa abnormalities, haemagiomas, arterial anomalies, coarctation of aorta, cardiac defects and eye abnormalities) and Ellis-Van Creveld Syndrome.[12]

Historically, DWM was found incidentally or on autopsy.[13] Nowadays different neuroimaginary techniques have enabled the diagnosis to be made prenatally as was done in our case.

CONCLUSION: Dandy Walker Malformation is a condition which can be effectively diagnosed by imaging modalities, especially in antenatal period with a proper antenatal checkup and sonography. If diagnosed prenatally, the couple can be advised for MTP as the morbidity and mortality associated with this condition are high. Further genetic counseling and care in subsequent pregnancies can be taken up.

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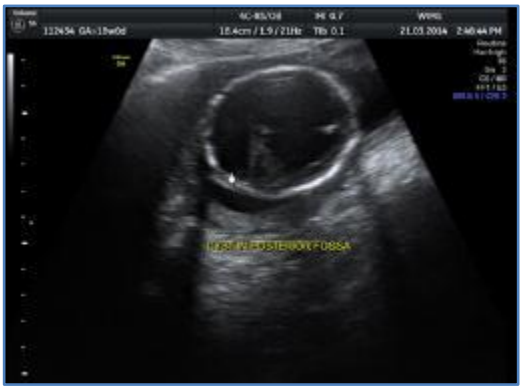

Fig. 1: USG showing posterior fossa cyst

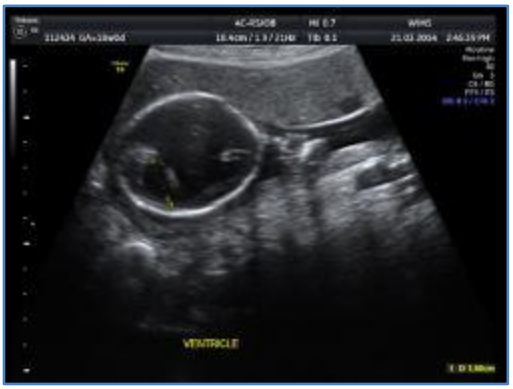

Fig. 2: USG showing ventriculomegaly

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Fig. 3: Gross specimen of fetus with enlarged head (large for gestational age)

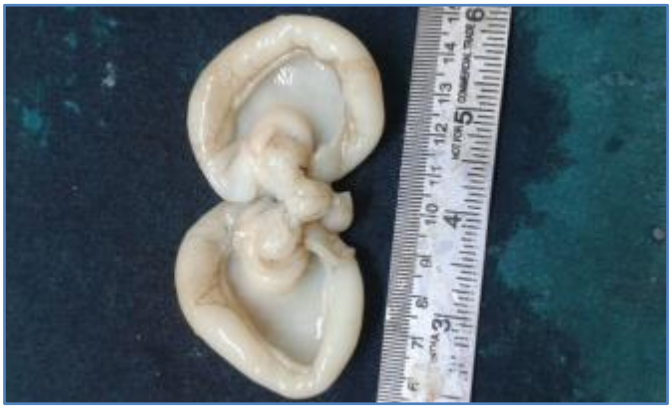

Fig. 4: Gross specimen of fetal brain showing markedly dilated ventricles with thinned out parenchyma

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