MALTA CONGENITAL ANOMALIES REGISTER

http://www.magnet.mt/services/health/mcar1.htm

HALF YEARLY REPORT JANUARY - JUNE 1999

CONGENITAL DIAPHRAGMATIC HERNIA

Congenital diaphragmatic hernia (CDH) is a malformation characterised by herniation of abdominal contents into the thorax through a defect in the diaphragm.

The diaphragm develops from four separate structures that grow and fuse by the eighth week of life. CDH results from failure of one of these structures to grow or fuse. The resulting defect allows free communication between thoracic and abdominal cavities. When abdominal organs enter the chest through such a defect, lung development may be impeded, the heart may be displaced and vascular structures may be distorted. These alterations cause pulmonary hypoplasia and hypertension and cardiac abnormalities with resulting neonatal morbidity and mortality[1].

HISTORY[2]

The first CDH was recorded in 1679 by Riverius as an incidental post mortem finding in a 24 year old man. The first paediatric account of CDH in English literature was recorded in 1701 by Holt as he described the clinical and post mortem findings of a 2 month old with CDH. In 1761, Morgagni described various types of diaphragmatic hernias, including anterior diaphragmatic hernia which bears his name. Laennec in 1826 described various causes of diaphragmatic hernias and he was the first to propose the possibility of surgical repair, however the first actual attempt at surgery occurred nearly 60 years later.

In 1827, Cooper, a celebrated British surgeon, described in detail two cases of CDH presenting at birth. He went on to hypothesise the anatomic and developmental consequences of CDH that led to the death of these patients. Bowditch in 1947 presented the first comprehensive collected series of diaphragmatic herniae. He was the first to make a bedside diagnosis of CDH, he also expanded on the classification system suggested by Cooper and further categorised individuals with CDH into three groups: those who die at birth or immediately after; those who live for a few months or years in a state of constant ill-health; and those who live to adult age and are able to perform many of the duties of life. Bowditch also queried the possibility of surgical treatment of CDH. In 1848, Bochdalek, whose name would eventually become an eponym for CDH, described the more common form of CDH occurring through posterolateral diaphragmatic defects.

The first attempt at surgical repair occurred 60 years after it was suggested by Laennec. It was performed in 1888 by Nauman of Sweden on a 19yr old. The first repair of CDH in an infant was on a 3½ yr old and was performed by Dwyer in New York in 1889.

By the turn of the 20th century, surgical repair proved only occasionally successful. The first successful repair was reported in German literature in 1905 in a 9 yr old boy; that for an infant was reported in American literature in 1929 in a 3½ mth old girl. In the 1930's through 1950's there were increasing reports of successful operative management of CDH. Controversy existed as to the timing of operation (early or delayed) and the best surgical procedure to adopt (thoracic, abdominal or thoraco-abdominal).

Presently, operation is advised after a period of resuscitation. The feasability and benefit of in utero surgical repair of CDH is being studied, however this procedure is still in the research phase.

EPIDEMIOLOGY

CDH is an important cause of perinatal death; and the immediate treatment and management of chronic problems is expensive. It thus constitutes a public health problem both in terms of financial as well as social and psychological costs.

The quoted prevalence of CDH ranges from 0.08 to 0.45/1000 births[3]. These variations are accounted for by the different methodologies of diagnosis and reporting adopted at different centres. Furthermore many cases of CDH may present after the newborn period and will fail to be included in certain registries. EUROCAT (European

Compiled by: Dr. Miriam Gatt, Department of Health Information; Tel: 2595 1596; e-mail: miriam.gatt@magnet.mt

Registration of Congenital Anomalies, 1997) reports an overall incidence of 0.35/1000 births (range: 0.16 - 0.58)[4].

CDH may be an isolated defect (in 2/3 of cases) or may occur as part of multiple anomalies or recognisable syndromes/sequences. The most commonly associated anomalies are cardiac defects[5]. CDH are mainly posterolateral defects (Bochdalek hernias), most commonly left sided, while anterior (Morgani) and par sternalis hernias are uncommon and usually considered separately.

The results of male:female distribution of the condition vary in different studies. It appears that there is no significant difference in gender distribution[3,6].

The aetiology of CDH is unknown. Familial cases of CDH have been reported suggesting the possibility of genetic factors, however these account for less than 2% of all CDH. There is as yet no direct evidence for a teratogenic aetiology which may allow for prevention of the condition. However, certain epidemiologic and experimental data suggest that certain drugs (including nitrofen, thalidomide quinine and phenometrazine) and environmental conditions may be implicated[6].

MORTALITY AND MORBIDITY

Of all cases of CDH diagnosed, it has been reported that up to 8% result in in utero demise[7]. Infant mortality also remains high (between 30-50% of liveborns dying) despite advances in neonatal care and surgery which have improved outcome[3,8]. Death is mainly due to pulmonary hypoplasia and prescence of associated anomalies. Survival rates for infants with isolated anomalies are significantly better than for infants with associated anomalies[3,8]. Survival has not been proved to be significantly affected in the event of prenatal diagnosis of isolated defects [8].

The major predictors of mortality are quoted as being associated I) polyhydramnios, ii)major mediastinal shift and iii) presence of an intra-thoracic stomach[7,10].

PRENATAL DIAGNOSIS

CDH may be diagnosed by antenatal ultrasound average age at diagnosis has been reported at 26.2 (±6.6) weeks[3]. Hydramnios is often present[7]. Once a diagnosis of CDH is made, it is necessary to look for associated anomalies and syndromes that may affect outcome and the further management of of the pregnancy. Early antenatal diagnosis before 25 weeks gestation is associated with anomalies that are more severe and life threatening[5,9].

In countries where termination of pregnancy is practiced, a mother with a prenatal diagnosis of CDH may be offered a choice of abortion. In countries like Malta where termination of pregnancy is not an option and in the case of many families where abortion would be unacceptable, prenatal diagnosis is also beneficial. Advance knowledge allows for timing, mode and place of delivery to be planned; the prescence of key personnel to be present in the delivery room; and the availability of adequate resucitation facilities, to minimise the child' s morbidity and mortality. Prenatal knowledge of the condition may also allow for informed counselling of the family preferably by a multidisciplinary team including obstetrician, paediatrician, paediatric surgeon ethicist/clergy and social worker [8]

The possibility of prenatal diagnosis provokes an increased interest in in-utero therapy for the condition. However, this still experimental surgery subjects both mother and infant to a major surgical procedure with uncertain outcome[7,8].

MALTA DATA

In Malta from 1993-1998 there were 18 cases (9 males; 9 females) of CDH reported. This gives a prevalence rate of 0.62/1000 total births. All were livebirths, 11 died during the first week of life, while the others survived their first year of life. Five of the babies were diagnosed by antenatal ultrasound, although routine ultrasound was performed for all mothers. All babies diagnosed antenatally died within 1 week of life.

10 babies (56%) had associated anomalies and 5 of these died. Of the 10 babies with associated anomalies, 3 were associated with a chromosomal abnormality (two had trisomy 21 and one had partial trisomy 9).

References:

1 Wenstrom KD et al. A five year statewide experience with congenital diaphragmatic hernia. Am. J. Obstet Gynaecol, 1991; 165: 838-42

2 Irish MS et al. Congenital Diaphragmatic Hernia - A Historical Review. Clinics in Perinatology, 1996; 23:4:625-653

3 Langham MR et al. Congenital Diaphragmatic Hernia - Epidemiology and Outcome. Clinics in Perinatology, 1996; 23:4:671-688

4 A EUROCAT Working Group. 15 years of Surveillance of Congenital anomalies in Europe 1980-1994 EUROCAT Report 7. Belgium, Scientific Institute of Public Health Louis Pasteur, 1997 pp 10-149

5 Fauza DO et al. Congenital Diaphragmatic Hernia and Associated Anomalies: Their Incidence, Identification, and Impact on Prognosis. J. of Paed. Surg, 1994 29:8: 1113-17

6 Tibboel T. et al. Etiologic and genetic factors in Congenital Diaphragmatic Hernia. Clinics in Perinatology, 1996; 23:4:689-699.

7 Neerhof MG et al. Congenital Diaphragmatic Hernia - In Utero Therapy and Ethical Considerations. Clinics in Perinatology, 1996; 23:3:465-472

8 Wilcox DT et al. Prenatal diagnosis of Congenital Diaphragmatic Hernia with predictors of mortality. Clinics in Perinatology, 1996; 23:4:701-709

9 Cannon C et al. A population-based study of Congenital Diaphragmatic Hernia in Utah: 1988-1994. Obstet Gynaecol 1996; 87:959-963

10 Dommergues et al. Congenital Diaphragmatic Hernia: Can Prenatal ultrasonography predict outcome? Am J Obstet Gynaecol, 1996; 174:1377-81

This report includes congenital anomalies diagnosed and confirmed in infants/fetuses born during the period January to June 1999 in Malta and Gozo and having been reported to the registry by September, 1999. All major anomalies as defined according to EUROCAT (European Registration of Congenital Anomalies) guidelines are included. Minor anomalies are reported only when they occur in combination with major anomalies.

Total number of infants/fetuses diagnosed with major congenital anomaly

Hospital		Total births*		With Congenital anomaly	
		Livebirths	Fetal Deaths	Livebirths	Fetal Deaths
St. Luke' s Hosp.	M	861	6	37	2
	F	819	9	23	3
Gozo Gen. Hosp.	M	82	0	1	0
	F	87	0	1	0
Private Hosp.**	M	113	0	2	0
	F	97	0	0	0
Total		**2059**	**15**	**64**	**5**

*Data from National Obstetric Information System (NOIS), WHO-OBSQID project, Malta; hospital records & National Mortality Register

** Private Hospitals include: Capua Palace Hospital, St. James' Hospital and St. Philip' s Hospital.

Distribution of infants/fetuses according to number of major anomalies

Anomalies	Number of infants/fetuses
Isolated major anomaly	44
Two or more major anomalies of same system	8
Major anomalies involving two different systems	5
Major anomalies involving three or more different systems	3
Chromosomal anomalies	6
Other congenital malformation syndromes and malformations NEC	3
Total	**69**

Distribution of infants/fetuses with major congenital anomalies according to system/s involved

ICD code	System	Number of infants/fetuses			Fetal deaths
		Total	Males	Females	
Q00-Q99 Congenital malformations, deformations and chromosomal anomalies					
Q00-Q01	Neural tube defects	4	1	3	2
Q02-Q07	Other nervous system defects	3	1	2	-
Q10-Q18	Eyes, ears, face and neck	0	0	0	-
Q20-Q28	Cardiovascular	25	12	13	-
Q30-Q34	Respiratory	0	0	0	-
Q35-Q37	Cleft palate and lip	2	1	1	-
Q38-Q45	Digestive system	2	0	2	-
Q50-Q56	Genital organs	5	5	0	-
Q60-Q64	Urinary	0	0	0	-
Q65-Q79	Musculoskeletal deformities	9	7	2	-
Q80-Q85	Skin & Integument	0	0	0	-
Q86-Q89	Other congenital malformation syndromes and malformations NEC	3	3	0	-
Q90-Q99	Chromosomal anomalies	6	4	2	1
	Two different systems	5	4	1	1
	Three or more different systems (not recognised as a syndrome or sequence)	3	3	0	1
Other Anomalies*					
EEE		1	1	0	-
PPP		1	0	1	-
	Total Infants with anomalies	**69**	**42**	**27**	**5**

* These anomalies are not tabulated in EUROCAT reports

The table overleaf gives a breakdown of all the major anomalies registered in babies born between July and December 1998. In this table: - Hydrocephaly occurring with spina bifida is not included

- Spina bifida occulta is reported only if there are complications or when it occurs in combination with major defects
- Confirmed glandular / coronal / 1st degree hypospadias is not registered unless in combination with major defects.
- Skin tags, naevi, angiomas, hemangiomas, glomus tumors, lymphangiomas and birthmarks less than 4 cms^2 are not registered unless in combination with major defects.

Other minor anomalies as defined by EUROCAT guidelines are also not registered unless in combination with other major

Anomalies registered for infants born from January - June '99 (as reported by September '99)

		Total	Male	Female
Q00-Q01	**Neural Tube defects**	**4**	**1**	**3**
Q00.0	Anencephaly	3	0	3
Q01.2	Occipital encephalocele	1	1	0
Q02-Q07	**Other anomalies of nervous system**	**5**	**4**	**1**
Q02	Microcephaly	1	1	0
Q04.3	Other reduction deformities of brain	2	2	0
Q05.7	Lumbosacral spina bifida	1	1	0
Q05.9	Spina bifida, unspecified	1	0	1
Q10-Q18	**Anomalies of the eye, ear, face and neck**	**3**	**3**	**0**
Q17.3	Other misshapen ear	1	1	0
Q18.1	Preauricular sinus and cyst	1	1	0
Q18.9	Congenital anomaly of face and neck NOS	1	1	0
Q20-Q28	**Anomalies of cardiovascular system**	**42**	**21**	**21**
Q20.5	Transposition of great arteries	1	0	1
Q21.0	Ventricular septal defect	14	10	4
Q21.1	Atrial septal defect	13	4	9
Q21.3	Tetralogy of Fallot	1	1	0
Q22.1	Congenital pulmonary valve stenosis	4	1	3
Q23.0	Congenital stenosis of aortic and mitral valves	1	0	1
Q23.1	Congenital insufficiency of aortic valve	1	1	0
Q23.3	Congenital mitral insufficiency	1	1	0
Q25.0	Patent ductus arteriosus	6	3	3
Q30-Q34	**Anomalies of respiratory system**	**0**	**0**	**0**
Q35-Q37	**Cleft lip and cleft palate**	**5**	**3**	**2**
Q35.3	Cleft soft palate	1	1	0
Q35.5	Cleft hard palate with cleft soft palate	1	0	1
Q37.5	Cleft hard and soft palate with cleft lip	1	0	1
Q37.8	Unspecified cleft palate with cleft lip, bilateral	1	1	0
Q37.9	Cleft palate with cleft lip NOS	1	1	0
Q38-Q45	**Anomalies of digestive system**	**4**	**2**	**2**
Q38.8	Other congenital malformation of pharynx	1	0	1
Q40.0	Congenital hypertrophic pyloric stenosis	2	1	1
Q41.2	Congenital abscence, atresia and stenosis of ileum	1	1	0
Q50-Q56	**Anomalies of the genital organs system**	**10**	**10**	**0**
Q53.1	Undescended testicle (assoc. with other defects)	1	1	0
Q54.1	Hypospadias, penile	6	6	0
Q54.4	Congenital chordae	2	2	0
Q55.6	Other congenital malformations of penis	1	1	0
Q60-Q64	**Anomalies of the urinary system**	**3**	**3**	**0**
Q60.0	Renal agenesis, unilateral	1	1	0
Q62.0	Congenital hydronephrosis	1	1	0
Q64.3	Other atresia and stenosis of urethra and bladder neck	1	1	0
Q65-Q79	**Deformities of the musculoskeletal system**	**17**	**14**	**3**
Q66.0	Talipes equinovarus (structural)	3	3	0
Q66.8	Other congenital deformities of feet	1	0	1
Q68.1	Congenital deformity of hand	1	1	0
Q69.0	Accessory finger(s)	4	3	1
Q70.3	Webbed toes	3	3	0
Q71.8	Other reduction defects of upper limb(s)	1	1	0
Q74.8	Other specified congenital malformations of limbs	1	1	0
Q75.3	Macrocephaly	2	2	0
Q79.0	Congenital diaphragmatic hernia	1	0	1
Q80-Q85	**Congenital anomalies of the skin & integument**	**2**	**1**	**1**
Q80.2	Collodian baby, lamellar ichthyosis	1	0	1
Q82.5	Congenital non neoplastic naevus (>4cm^2)	1	1	0
Q86-Q89	**Other congenital anomalies / multiple anomalies**	**4**	**4**	**0**
Q87.0	Malformation syndromes affecting facial appearance	2	2	0
Q87.2	Malformation syndromes predominantly affecting	1	1	0
Q89.2	Congenital malformation of other endocrine glands	1	1	0
Q90-Q99	**Chromosomal anomalies**	**6**	**4**	**2**
Q90.0	Down syndrome/Trisomy 21, meiotic nondisjunction	4	3	1
Q90.9	Down syndrome/Trisomy 21 NOS	1	1	0
Q91.0	Trisomy 18, meiotic nondisjunction	1	0	1
Other major anomalies registered		**5**	**3**	**2**
D18.0	Haemangioma any site (>4cm^2)	1	0	1
E03.1	Congenital Hypothyroidism	1	1	0
E83.3	Disorders of phosphorus metabolism	1	1	0
K07.0	Micrognathism	1	1	0
P35.8	Other cong. viral diseases (maternal varicella zoster)	1	0	1