SIRENOMELIA – CASE REPORTS

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SYNOPSIS

We report three cases of sirenomelia. The major findings in all the three cases were skeletal anomalies, dysplastic kidneys and a single umbilical artery. Maternal diabetes mellitus was present in one case. Histology of the pancreas of one other showed islet cell hyperplasia, suggestive of maternal diabetes. Chromosome analysis was done in two cases and was normal. We suggest that early diagnosis and control of maternal diabetes may reduce the incidence of congenital malformations.

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CASE REPORTS

Case 1

Baby M, was born in June 1981, to a 28 year old white primigravida. The pregnancy was uneventful except for a history of questionable exposure to measles during the 4th month of gestation. The baby presented as a breech and was delivered at 37 weeks by caeserian section. The child died within 2 hours after birth. He was referred to Children's Hospital of Philadelphia (CHOP) for post-mortem examination.

Autopsy Findings

The child weighed 2200 grams. The crown-rump and crown-heel lengths were 30 cms and 45.5 cms respectively. The major external appearances (Fig 1) and pathological findings are given in Tables 1 and 2 respectively. Post-mortem radiography showed 13 pairs of ribs on either side, hemivertebrae at the 4th thoracic level and atresia of the pelvic outlet. The fused lower extremity had 2 femurs, 2 tibias and a single fibula. There were 7 toes. Culture of the skin fibroblasts showed 46xt karyotype.

Case 2

Baby S, was born to a 40-year old gravida 3, para 2 white mother in June 1982. The pregnancy was complicated by maternal hypertension. The labour started at the gestational age of 40 weeks. A caesarian section was performed for footling breech presentation. The Apgar scores were 1 and 3 at one and five minutes respectively. A clinical diagnosis of sirinomelia was made. An aortogram was performed, which showed no renal arteries or kidneys. The child died at the age of 13 hours. Post-mortem was performed at CHOP.

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Table 1.
EXTERNAL APPEARANCES IN 3 CASES OF SIRENOMELIA

External Appearance	Case 1	Case 2	Case 3
Face	Potter's facies	Potter's facies	Potter's facies
Upper limbs	Normal	Normal	Normal
External genitalia) Anal orifice)	Absent	Absent	Absent
Lower limbs	Fused 7 toes	Fused 3 toes	Fused 3 toes

Autopsy Findings

The baby weighed 2128 grams. The crown-rump and crown-heel lengths were 30 and 40 cms respectively. Tables 1 and 2 summarise the gross findings and pathology.

Post-mortem radiography showed malformed 5th lumbar vertebra on the left side, small sacrum. The pelvis was atretic. The single limb present had one femur which flared distally and showed 2 ossification centers. There was a single tibia, a few ankle bones and three metatarsals. Post-mortem arteriogram demonstrated absent renal arteries. There was a single umbilical artery arising from the anterior wall of the aorta. The vessels arising below this artery were small in caliber. There was a large patent ductus arteriosus.

Case 3

Baby E, was born in November 1987. The child was delivered by caeserian section at 36 weeks gestation for fetal distress. The mother was a 36-year old white woman who had gestational diabetes. No further history was available. The child died 3 hours after birth and was referred to CHOP for post-mortem examination.

Autopsy Findings

The baby weighed 1360 grams with crown-rump and crown-heel lengths of 23 and 39.5 cms respectively. External appearances and pathology (Fig 2) are given in Tables 1 and 2 respectively. The placenta was normal.

Table 2.
PATHOLOGICAL FINDINGS IN 3 CASES OF SIRENOMELIA

System	Case 1	Case 2	Case 3
Respiratory	Hypoplastic lungs	Hypoplastic lungs Bilobed left lung	Hypoplastic lungs
Cardiovascular	SUA arising from aorta Absent RA	SUA arising from aorta Absent RA Hypoplastic CIA Patient ductus arteriosus	SUA arising from aorta Absent RA Hypoplastic CIA
Gastrointestinal	Atretic distal bowel Anorectal agenesis Absent gall bladder	Tubular duplication of transverse colon with multiple stenosis Agenesis of sigmoid colon, rectum and anus	Atretic distal colon Anorectal agensis
Genitourinary	DRT in the wall of distal bowel Absent ureters and bladder Undescended testes	DRT in the wall of distal bowel Absent ureters and bladder Agenesis of uterine body, cervix and vagina	DRT in the wall of colon Absent ureters and bladder Agenesis of uterine body, cervix and vagina
Endocrine	Normal	Islet cell hyperplasia of pancreas	Bifid tail of pancreas
Nervous		Normal	Normal

SUA = Single umbilical artery
RA = Renal arteries
CIA = Common iliac arteries
DRT = Dysplastic renal tissue

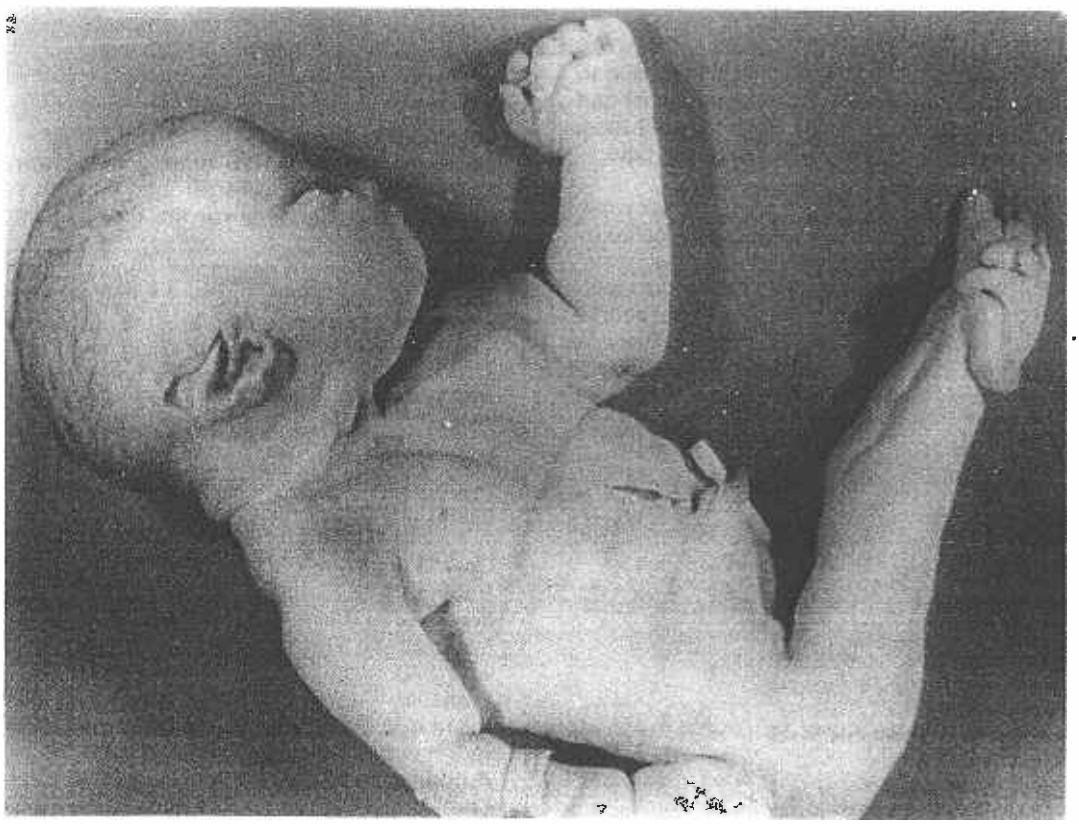

Fig.1. Shows Potters facies and fused lower limbs

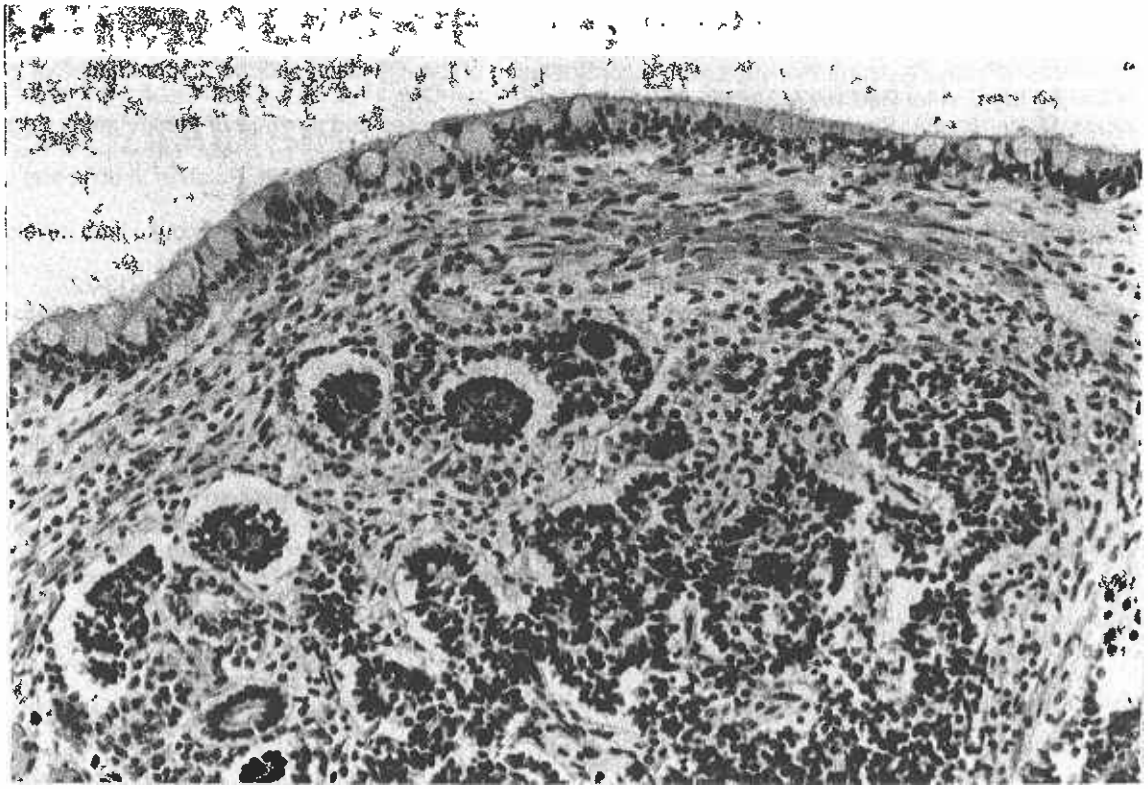

Fig. 2. Normal colonic mucosa. The wall is replaced by glomeruloid structures typical of dysplastic renal tissue (H&E X200).

The umbilical cord had a single artery and a vein. Post-mortem radiography showed 8 ribs on the right side and 11 on the left. Ribs 5, 6 and 7 on the right side were fused at their vertebral heads. The sacrum was absent with fusion of the iliac bones. The lower extremity had a single femur with 2 distal epiphyseal centers, single tibia, no fibula and three metatarsals. Culture of the skin fibroblasts showed a 46xx pattern.

DISCUSSION

Sirenomelia is a congenital malformation, characterised by lower limb defects and visceral anomalies mainly in the urogenital system and lower intestinal tract. Kampmeier (1) in a report of his cases and a literature survey between years 1542 and 1927 found 166 cases of sirenomelia. A further 80 cases have been reported between 1928 and 1987 (2). The 3 cases in our study showed characteristic features of sirenomelia.

Although it is well known that the embryological injury in sirenomelia occurs between 28 and 32 days of life and the site is at the caudal mesoderm, the etiology is still not known (2). In an experimental study in mice and hamsters, the administration of retinoic acid (3) and cyclophosphamide (4) during the pregnancy produced limb defects including sirenomelia, but exposure of human mothers of sirenomelic infants to those drugs has not been recorded. There is an increased risk of congenital malformations in diabetic pregnancies. A large controlled study showed that the risk was about twice normal (5). Soler et al (6), reported that 3 (5.3%) of 57 infants with congenital malformations, born to diabetic mothers, had sacral dysgenesis. Miller et al (7), noted that diabetic mothers of fetuses with major malformations had higher initial levels of haemoglobin A_{Ic} ($Hb_{A_{Ic}}$) than diabetic women with infants who did not have major malformations. He suggested that hyperglycemia in early pregnancy is teratogenic in some way. High plasma dehydroascorbic acid and low intracellular ascorbic acid occur in hyperglycemia which alter normal mitosis and are theoretically teratogenic (8). In our study, case 3 had maternal gestational diabetes. Histology of the organs may provide additional information as noted in case 2. Although the history of maternal diabetes was not available in case 2, the histology of pancreas which showed islet cell hyperplasia and a eosinophilic infiltrate was highly suggestive of maternal diabetes (9). We suggest that careful history and investigation for diabetes in mothers of sirenomelic infants may be useful. Early control of maternal diabetes may prevent congenital defects.

An interesting observation in our cases is the presence of a single umbilical artery. Stocker (2) reported that umbilical arteries were examined in 53 cases of sirenomelia, of which 49 had a single umbilical artery. Stevenson et al (10) dissected the abdominal vessels in 11 cases of sirenomelia. The common feature in their study was the presence of a single large artery assuming the function of umbilical arteries. Arteries below the level of this steal vessel were hypoplastic. He concluded that the underdevelopment of the vessels is responsible for the deformities in the caudal structures leading to sirenomelia.

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