Prune-belly syndrome associated with extra-abdominal abnormalities in a 7-year-old boy

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SUMMARY: Kabakuş N, Serhatlıoğlu S, Akfırat M, Kazez A, Aydınoğlu H, Özercan İ, Aygün AD. Prune-belly syndrome associatedwith extra-abdominal abnormalities in a 7-year-old boy. Turk J Pediatr 2000; 42: 158-161.

Prune-belly syndrome (PBS) is an association of abdominal wall deficiency, genitourinary anomalies, and in males, cryptorchidism. Other congenital anomalies are associated with PBS, particularly musculoskeletal deformities and gastrointestinal tract anomalies. In this report, a seven-year-old boy with PBS had mega cisterna magna variant, microcornea, aortic stenosis with bicuspid aortic valves, cholelithiasis, and Hirschsprung's disease. Coexistence of these abnormalities with PBS supports the concept of PBS being caused by an early disturbance of not only mesodermal development but also of the other germ layers. There was maternal ingestion of drugs in the 1st month of gestation. All cases with PBS should be evaluated throughly for extra-abdominal abnormalities resulting from disturbances of ectodermal and endodermal development. Even though disturbances related to ectodermal and endodermal development may be asymptomatic, early diagnosis of the disturbances may help in preventing possible future problems.

***Key words:** prune-belly syndrome, microcornea, aortic valve stenosis, bicuspid aortic valve, cholelithiasis, Hirschsprung's disease, mega cisterna magna variant.*

Prune-belly syndrome (PBS), also called abdominal muscle deficiency or Eagle-Barett syndrome, occurs in approximately 1/30,000-1/50,000 births[1,2]. PBS is defined as the association of abdominal muscle deficiency, genitourinary abnormalities, and in males, cryptorchidism. Other congenital abnormalities are also associated with PBS, including musculoskeletal deformities, and gastrointestinal tract and cardiac abnormalities. In both sexes, expression of the disease is often variable and prognosis depends upon the specific abnormalities present[1-5].

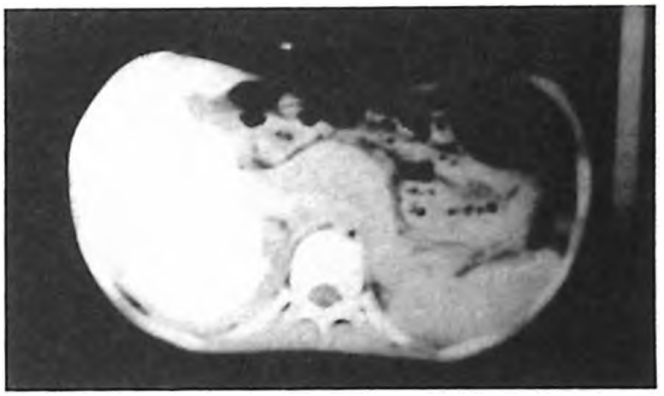
Our patient had underdeveloped muscles in bilateral anterior abdominal wall associated with cerebral, ophthalmic, cardiac, gastrointestinal and genitourinary abnormalities that ranged from mild to severe. This case with PBS was unusual, consisting of several abnormalities, such as mega cisterna magna variant and microcornea, that result from disturbance of ectodermal development. There was maternal exposure to teratogens during the first month of pregnancy that might have contributed to early disturbances of ectodermal and mesodermal development[4,5].

Case Report

A seven-year-old boy, who previously had gastrointestinal and urinary system complaints (abdominal pain, fever, pain during micturition, chronic constipation) for five months, developed anuria and abdominal distension. His mother had used oral contraceptives and salicylic acid in early pregnancy to induce an abortion. His weight and height were at the third to tenth percentile. Body temperature was 39 °C. The patient was in great pain with right upper quadrant tenderness and a 'potbelly'. He had deficient tone of abdominal muscles and globe vesicale. He had left microcornea (8 mm) and left cryptochidism. There was a grade II/VI systolic ejection murmur at the right upper

sternal border radiating to the neck, and a systolic ejection click at the apex. His mental status was slightly retarded. Other physical findings including neurological examination were normal.

Laboratory tests: hemoglobin 10.7 g/dl, hematocrit 32%, white blood cell count 13,200/mm^3 with 62% neutrophils, platelet count 304,000/mm^3, and erythrocyte sedimentation rate 50 mm/hour. C-reactive protein was strongly positive. Urine specific gravity was 1015. The sediment contained leukocyte casts. Urine culture yielded E. coli, sensitive to ceftazidime. Biochemical tests: blood urea nitrogen 62 mg/dl, creatinine 2.1 mg/dl, uric acid 9 mg/dl, phosphorus 6.3 mg/dl. Glomerular filtration rate (GFR) was 40 ml/min. Chromosomal studies were normal. Abdominal ultrasonography showed bilateral megaureter, bilateral grade III hydronephrosis, bilateral grade V vesicoureteral reflux, anteriolateral displacement of the right ureteral orifice, left cryptorchidism and cholelithiasis (Fig. 1). These ultrasonographic findings were confirmed by voiding cystourethrogram (VCUG) and intravenous pyelography. Absence of an obstructing lesion of the urethra was revealed by VCUG. Computed tomography (CT) revealed underdeveloped anterior abdominal muscles and rotational abnormality of the left kidney (Fig. 2). The axial CT and magnetic resonance imaging (MRI) showed mega cisterna magna variant (Fig. 3). Valvar aortic stenosis and bicuspid aortic valves were demonstrated by echocardiography. Twenty-four-hour delayed X-ray films with barium enema increased suspicion of Hirschsprung's disease (Fig. 4), and rectal suction biopsy demonstrated the absence of ganglion cells in the bowel wall. Initial treatment included temporary drainage procedure (by urinary



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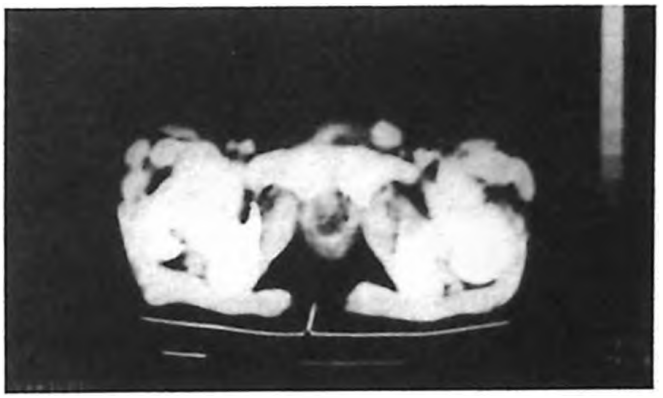


(b)

Fig. 2a. Computed tomography showing hypoplastic anterior abdominal wall muscles associated with right hydronephrosis, and Fig. 2b. showing left cryptorchidism.

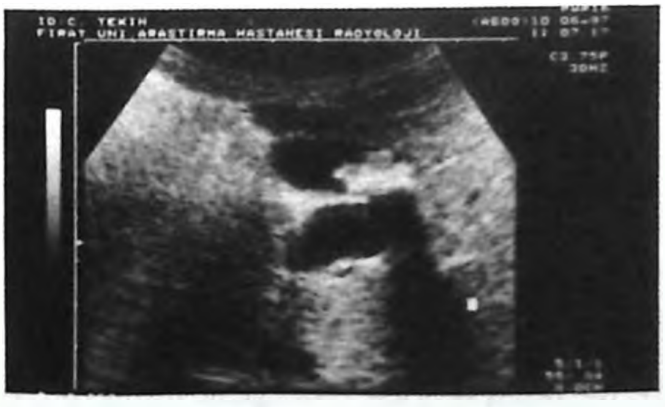
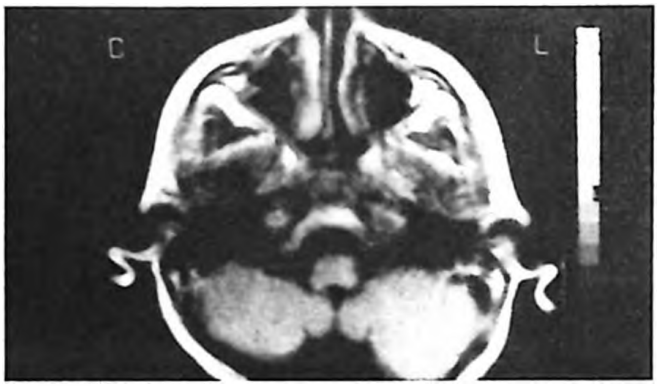


Fig. 1. Ultrasonographic image showing multiple stones within gallbladder.

Fig. 3. Twenty-four-hour delayed X-ray films with barium enema showing dilated colon and delayed evacuation.



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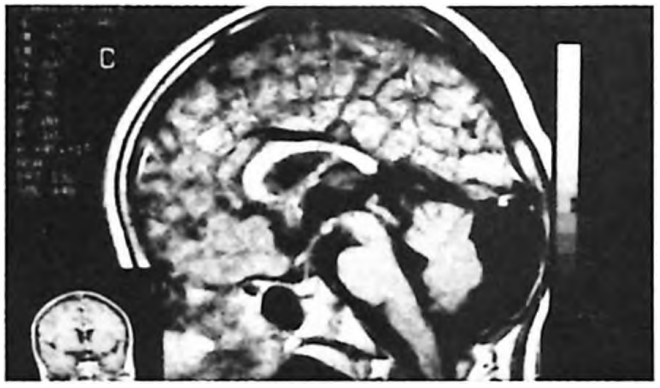

(b)

Fig. 4. MRI showing mega cisterna magna variant. 4a. Axial plane after gadolinium administration and 4b. sagittal plane.

catheter), cholecystectomy (by laparoscopy) and intravenous antibiotherapy (with ceftazidime). On day 10, the patient's renal function and clinical course improved; blood urea nitrogen, creatinine and GFR were 50 mg/dl, 1 mg/dl, 55 ml/min, respectively. The patient was discharged in a stable condition with the urinary catheter. He was well with no severe symptoms over the following six months.

Discussion

Prune-belly syndrome comprises a variable constellation of abnormalities, although the causes remain unproven and controversial[7]. Several theories have been proposed to explain the embryogenesis of PBS. The more tenable theory is that the muscular deficiencies of both the abdominal wall and urinary tract result from an early disturbance of embryogenesis. The postulated teratogenic insult could be a disturbance of mesodermal development in the third week of gestation, which would account for all parts of the triad[1,8,9]. There is no definite genetic influence, although PBS cases in twins and PBS cases associated with trisomy of the long arm of chromosome 1 have been reported[10,11].

There appear to be subgroups of PBS. The first group has an obtructing lesion of the urethra, while the more common second group has functional abnormality of bladder emptying, but no obstruction. In the first group, most infants die shortly after birth, while patients in the second group survive the neonatal period and have chronic urinary tract problems later. In the first group, the problem usually is urethral atresia, and associated abnormalities include malrotation of the intestine, intestinal atresia, imperforate anus, skeletal abnormalities, specific congenital heart disease, Hirschsprung's disease, and congenital cystic adenomatoid malformation. In the second group, associated congenital abnormalities do not occur. It has been suggested that there may be a deficiency in the autonomic innervation of the urinary tract[1,8].

Our patient had features of both subgroups with involvement of extra-abdominal organs including aorta (valvar aortic stenosis and bicuspid aortic valves), cornea (microcornea), brain (mega cisterna magna variant), and autonomic innervation (Hirschsprung's disease). In addition to PBS, urinary tract infection (UTI), renal failure secondary to urinary tract obstruction and findings of cholelithiasis were the dominant clinical features.

To our knowledge, only a few cases with PBS including brain and eye abnormalities have been reported[1]. Our patient's mother had used some medications including oral contraceptives and salicylic acid during the first month of pregnancy. This history might explain development of PBS, because in a trilaminar embryo such remedies may have teratogenic effects[13].

Interlobular bile ducts with PBS have been reported[11], but there is no information about cholelithiasis. In our patient, biochemical tests for cholelithiasis were normal. In our view this condition may be explained by coexistence of the other gastrointestinal abnormalities, such as Hirschsprung's disease, in which the enterohepatic circulation rate is increased.

In conclusion, these observations indicate that: 1. PBS and other coexistent abnormalities could be the result of some teratogenic insult to the embryo or fetus. 2. Abnormalities associated with PBS may originate from disturbance of

ectodermal as well as mesodermal development. 3. All cases with PBS should be examined thoroughly for extra-abdominal abnormalities including disturbances of the other germ layers, even though these may be asymptomatic. 4. History of prenatal exposure to teratogens during the first trimester should be sought. This approach may help to detect and treat future possible problems like mega cisterna magna variant manifesting with a mass effect or seizures[3,4]. It will contribute to the understanding of the pathogenesis of PBS.

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