

THE RISK OF URINARY INFECTION IN PRUNE-BELLY SYNDROME IN CHILDREN - CASE STUDY

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ABSTRACT

The author presents a case study on the evolution of three children enrolled in Prune-Belly syndrome. This syndrome is a complex dysplasia, a rare pathology in children, characterized by the triad - the classic - hypo- or aplasia of righteous abdominal, cryptorchidism, abnormality of the urinary tract; also, it can be associated with pulmonary, cardiac, digestive, osteoarticular, and other malformations.

Diagnostic criteria and etiopathogeny aspects are presented showing embryopathy and X-linked hereditary transmission theories as the most plausible. Analyzing therapeutic aspects, it is stressed that medical treatment precedes or follows surgery, which cannot resolve urinary infection unless dysplastic urinary reconstruction is performed. Serious forms of Prune-Belly syndrome have a development and poor prognosis. Intrauterine and neonatal mortality is 20% and 50% in the first 2 years of life. The risk of urinary infection and / or lungs burdens the patient's clinical condition, allowing further appreciation on evolution of the disease.

For cases solvable by plastic surgical reconstruction, as those who respond to medical therapy, differentiation will be monitored in territory and check-ups by the specialized consulting room from Policlinic Health Center. Urinary infection relapse danger is permanent, requiring differentiated supervision.

This three cases interest practitioners, by at least two aspects: the rarity of the disease, and complexity of dysplasia constituent, which has serious implications on the body economy.

KEYWORDS: urinary infection, prune-belly syndrome

Urinary tract infections in children rank third in the hierarchy of infectious morbidity after respiratory and digestive diseases. How shows Wineberg and Bergstrom, they are not a single disease but a group of disorders that share significant bacteriuria in titre. Prune-Belly syndrome, described by the anglo-saxon authors Frolich and Parker, is placed in dysplastic pathology of a child with polymorphic polarity, predominantly in the urinary tract. Symptomatic triad, which outlines the diagnosis, consists of: abdominal muscle hypoplasia or aplasia; abnormalities of the urinary tract; cryptorchidism.

Since the first descriptions of the disease in the 1839-1895 years, several cases were mentioned in the literature (over 400 currently).

Urinary tract anomalies, accompanying illness, are by their complexity, a permanent risk factor for recurrent and dragged urinary infections, with adverse effects on kidney function, calling into question the future of sick children. Our observations confirm the data.

Prune-Belly syndrome incidence is estimated at 1/40,000 babies born live; boys are more frequently affected in proportion of 95-97% of the total cases, compared with only 3-5% girls. It was also described a pseudo Prune-Belly syndrome, characterized by urinary tract dilation, but unaccompanied by the absence of abdominal wall and / or cryptorchidism. Most cases occur sporadically in children with normal karyotype.

Williams suggests, however, the association of chromosomal anomalies (Trisomy 18, Trisomy 21, Turner syndrome, and others), as well X-linked recessive

possibility of transmitting the disease; the latter would explain the greater incidence of disease in males than in the female .

Prune-Belly syndrome **etiopathogenesis** has not yet been fully elucidated, although several theories have been developed for this purpose. Thus, for example, *urethral obstruction theory* cannot explain the complex morphological abnormalities occurring in Prune-Belly syndrome. Mesoderm development deficit theory proposed by Stephens, suggest the intervention of an unknown contaminant that occurs in the mesoderm differentiation in weeks 6-10 of fetal life, resulting in the abdominal wall anomalies, genitourinary tract, and testes. *Embryonic theory, proposed also by Stephens also tries to explain the complexity of morphological abnormalities of Prune-Belly syndrome*; is, in turn, insufficient to elucidate the causes and mechanisms underlying abnormalities of the genital and upper urinary tract.

Study material was represented by three Prune-Belly syndrome clinical cases of hospitalized children, diagnosed and cared for in our service and we will present those cases below.

Observation no. 1

BO child, male, aged two weeks, from urban environment (Arad), was transferred to our Infants service department from Hospital of Obstetrics and Gynecology, for diagnostic clarification.

Anamnestic information reveals the following: the baby comes on first pregnancy carried to term; in the

7th week of gestation, the mother had a flu status. The birth took place in the natural way, in a breech delivery, resulting in a child weighing 3200 g, length 51 cm and Apgar score of 7-1', with good response to resuscitation maneuvers (clearing airways, heat, oxygen).

At the first clinical examination, strikes: enlargement of the abdomen (abdominal area of 38 cm at birth); abdominal muscle aplasia; presence in flanks and hypogastrium of bosselated, flexible and mobile tumors; cryptorchidism; congenital clubfoot; abnormalities of the ear pavilions.

At 14 days of life, in motherhood unit is detected hematuria and bacteriuria in titer significantly and semi-

consistent stools appear, with halo fluid - so it is sent in the service of Pediatrics.

Clinical examination reveals (Fig. 1): a newborn in 2 weeks old, weighing 2900 g, poor general condition, with peeling skin and visible multiple congenital malformations; abnormal ear pavilions; a left parasternal II / III degree heart murmur, congenital clubfoot, cryptorchidism. The abdomen is distended, bosselated, with perimeter of 40 cm, with anterior wall muscles aplasia and abdominal drawing content expressed. By palpation, there are detected multiple tumor formations, mobile, flexible, distributed in flanks, in renal lodges and hypogastrium.



Fig. 1. - New-born with Prune-Belly syndrome

Laboratory analysis revealed: normal blood count, serum urea 0.4 g‰, serum creatinine 1.3 mg%, serum sodium levels 145 mEq/l, serum potassium 4.1 mEq/l; urinary urea 3 g%, natriuria 56 mEq/l, chloride 20 mEq/l. Urinalysis reveals a cloudy urine, with a density of 1005, thick cloud of albumin, significant pyuria, haematuria and posters of leukocytes; bacteriological test reveals the presence of strains of Klebsiella (over 100,000 germs to millilitre of urine), sensitive to gram-negative, ampicillin, gentamycin, biseptol. Stool was negative; in pharyngeal exudate culture, streptococcus viridans was evident.

Laboratory investigations were performed with diagnostic role. ECG shows the heart's electrical path in sinus rhythm with a ventricular rate of 150 beats per minute and the QRS axis, -150°, as of right predominantly elements. *Radiograph of the chest* shows the lungs and heart look normal for age. Instead, *the empty abdominal radiography* shows a flabby abdominal wall and dilated, with homogeneous opacities in the right flank and lower floor.

Ultrasound, both kidneys appear enlarged, globular, with medulo-cortical differentiation lost through increased echogenicity of Malpighi pyramids. The

parenchyma is visualized with small transonic images, round-oval, thin walled, clearly delineated (cysts). It is obvious sinus-parenchyma differentiation, drawing pielo-pelvis is uneven, there is basin stasis. Both ureters are visualized throughout their length; their sinuous paths are dilated and pleated (megadolicoureter). Bladder of normal size for age, has thickened walls, more ecogen.

By vein **uro-tomography**, urinary tract highlight loosely, tardy and partly; contrast substance appears in 180 minutes, and only on computed tomography. Ureters are more narrow and elongated, dilated, occupying the entire abdominal cavity. Pyelocaliceal anatomy is not individualized. Described appearance, of megadolicoureter, persists even after 24 hours.

The presence of righteous abdominal aplasia, cryptorchidism, of urinary tract abnormalities and congenital club foot, say Prune-Belly syndrome **diagnosis**. Assigning also bacteriuria in significant titer and syndrome of nitrogenous retention completed biological diagnosis with urinary infection and kidney failure.

Etiological **treatment** was **instituted**, according to antibiogram (gentamicin associated with ampicillin,

parenteral); endovenous perfusion; adjuvants; continued natural diet. *Disease* progression was unsatisfactory; newborn clinical condition worsens, appears oliguria, intravascular disseminated coagulation installing and the patient dies in the 9th day after admission at the age of 27 days.



Fig. 2. - Necroptic appearance of a newborn with Prune-Belly syndrome (megadolicoureter, dysplastic kidney)

Necroptic examination (Fig. 2) highlights the increased kidneys with multiple cortico-medullary cysts and basins filled with pus. Ureters are elongated, dilated, folded, wearing a megadolicoureter look. Bladder is normal, normal heart. *Histologically*, the structure of the kidney is largely wiped, cortico-medullary disseminated microcrystals occurs, mononuclear inflammatory infiltrates in vessels and the interstitium, glomerular and tubular atrophy, dilated calice, interstitial fibrosis with chronic inflammation aspect. Pathology diagnosis was confirmed as Prune-Belly syndrome associated with chronic pyelonephritis and acute urinary infection.

Observation no. 2

BD child, male, aged 8 months, from rural areas (Bocsig) was transferred to our service territory Ineu Hospital with the diagnosis of as intestinal obstruction.

Anamnesis: infant was admitted to Ineu hospital for 15 days with interstitial pneumonia, acute pyelonephritis diagnostic. First, progress was good, respiratory phenomena have improved. After 14 days of hospitalization, however, appear vomiting, abdomen - big from birth - has a visible draw pattern with peristalsis movement expressed, and by palpation is detected a tumor in the hypogastrium. The next day, the patient was sent to our emergency department.

By *clinical examination* it is found (**Fig. 3**): infant of eight months, febrile, with Mongolian typology (epicanthus, hypertelorism, macroglossia), pale, with bulky abdomen, abdominal muscle hypoplasia,

cryptorchidism; in hypogastrium and flanks multiple elastic tumor felt by palpation.

Laboratory analysis revealed a mild hypochromic anemia; urinalysis examination, initially normal, points at repeat albuminuria, red blood cells and leukocytes in the sediment. The urine culture, it highlights the bacillus coli bacteria over 100,000 per millilitre of urine, sensitive to ampicillin, colistin, negram.



Fig. 3. - Infant with Plums-belly syndrome

Of *laboratory investigations*, chest X-ray reveals an aspect of interstitial pneumonia and *abdominal radiography on empty abdomen* - dilated with batrachian appearance, with homogeneous opacities in the hypogastrium. The barium passage outline megasigmoid aspect.

Ultrasound, comes with right kidney hypoplasia, with deletion of differentiation between sinus and parenchyma. Left kidney has a slightly lower parenchymal index and a more echogen parenchyma; there is a transonic picture surrounded by other images, bullous, round, transonic, thick-walled, echogen, intercommunicating with basin aspects. In basin echoes appear fine, floating - image of hydro-pyo-nephrosis. Basin continues with bilateral tubular image, transonic, with a size of 2-3 cm and 3-4 cm for supravescical upper portion, with sinuous paths (ureter). They occupy all the lower abdominal, wearing a megadolicoureter look. Bladder is enlarged, with thickened walls with increased echogenicity without diverticula formations.



Fig. 4. - Radiological Prune-Belly syndrome appearance (bilateral megadolicoureter, megabladder)

Uro-tomography (10, 20, 30, 40 and 60 minutes) shows moderate left renal area increased with basin dilated and small hypotrophic right kidney with rudimentary pyelocaliceal image, barely sketched.. Up to 60 minutes nor ureters or bladder not emerges, but only a diffuse opacity, mild, not contured, in the small basinet. At 150 minutes a bilateral monstrous dolicomegaureter image is viewing ,with multiple folds what gives it an enteriform aspect for higher segments and sacciform supravescical look. Post-mictional, the entire urinary tract is discharged, with residue in the right hydronephrotic basin.

In conclusion, uro tomographic appearance is left hydronephrosis and right renal hypertrophy, bilateral megadolicoureter, mega bladder (Fig. 4).

Righteous abdominal hypotrophy, cryptorchidism, renal and urinary dysplasia, megasigma and significant bacteriuria support the diagnosis of Prune-Belly syndrome and urinary infection with bacillus coli.

It was established etiologic treatment (ampicillin and colimicin associated, with the usual doses) and adjuvants.

Clinical evolution was marked by the presence of a prolonged febrile syndrome with constant positive urine

culture, an oscillating weight curve and poor general condition. Transferred to the pediatric surgery clinic in Timisoara, has undergone radical surgery, ureteral plasty. Evolution was favorable after surgery, but at age 11 and a half months the infant developed a severe bronchopneumonia, resulting in death at home.

Observation no. 3

CO child, male, aged 6 months and half, from urban environment (Arad), was admitted to our department for fever, cough, moderate dyspnea, perioral cyanosis.

From history, note that the infant has been hospitalized from the age of 3 months and a half to four months and a half, with a diagnosis of bronchopneumonia, during which it revealed a systolic murmur grade III left parasternal, in II and III left intercostal space. A non-cyanogen congenital heart malformation was suspected, ventricular septal defect type.

During the current admission, **physical examination** revealed an infant weighing 8100 g and length 69 cm, pale, with generalized muscle weakness, lumbar kyphosis, flared at the base thorax, relaxed abdomen, abdominal muscles with hypoplasia and cryptorchidism. Physical functioning and lung syndromes are associated, suggestive of bronchopneumonia. At the heart, it shows

a systolic murmur with the same characters as previous hospitalization. Lower edge of the liver is felt 3 cm below the costal edge, spleen at 2 cm.

Laboratory analysis revealed a hypochromic anemia, urinalysis examination is normal, urine culture, initially positive for hemolytic *Staphylococcus Aureus* (less than 10,000 germs in ml) is then negative constant.

Of **laboratory investigations** on the *electrocardiogram* shows a sinus rhythm of 130 beats per minute; QRS axis at -120° incomplete right bundle branch block,

predominantly right elements. **Radiological** appearance of the chest is typical of bronchopneumonia.

Ultrasound (Fig. 5), right kidney parenchymal index is preserved with caliceal hypotonia, while the left kidney is normal aspect. Right ureter is visible intramural and near vesical area as in the left does not get visible. Bladder wall is supple, full size, without protrusion or diverticula formation.

Uro tomography shows right urethral dilatation without changes in basin and pelvis, and normal bladder. Urography is not conclusive for a reno-ureteral dysplasia.

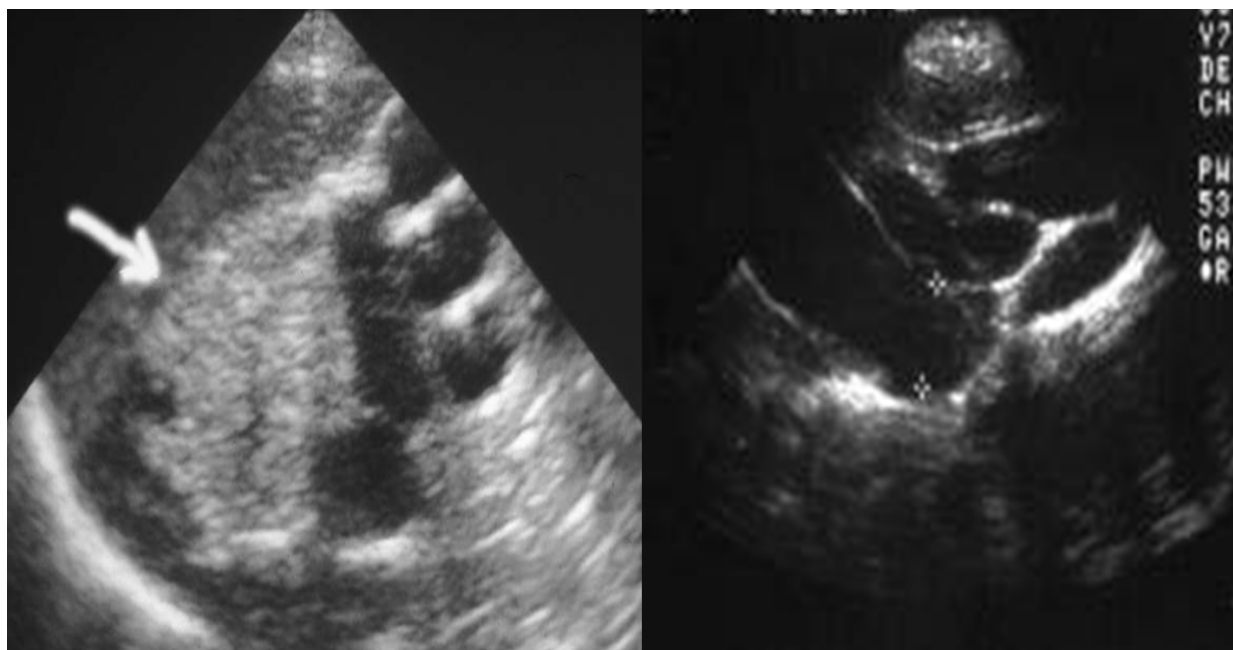


Fig. 5 – Ultrasound appearance in an infant with Prune-Belly syndrome

The presence of abdominal muscle hypoplasia, cryptorchidism, and congenital heart directs the diagnosis to Prune-Belly syndrome, mild form, as associated with bronchopneumonia.

Etiologic treatment (combination of oxacillin + kanamycin), symptomatic and adjuvant solved pulmonary disease. Urine examination, repeatedly failed to reveal bacteriuria. The patient was followed in **development** until the age of 1 year; during this period has been hospitalized twice more for lung type bronchopneumonia, while urine remained negative constant. It is not known evolution of the case after 1 year of age.

DISCUSSION

Our observations show that Prune-Belly syndrome is a rare and complex dysplasia. Diagnostic orientation is based on association of righteous abdominal hypoplasia with cryptorchidism; paraclinical explorations (echography and urography) complete diagnosis.

Although described for over 150 years, Prune-Belly syndrome etiopathogenesis has not yet been elucidated; there are numerous theories that seek to explain the complexity of dysplastic variations characteristic of disease.

Thus, for example, Obrinski shows the role of circulatory disorders appeared during urinary and abdominal muscles forming. Swenson, in turn, supports the involvement of *autonomic nervous system abnormalities*, unconfirmed by electronic microscopy.

Hormonal Theory assigns an important role for estrogen hormone, able to generate changes characteristic for reno-uretero-genital disease.

Embryopathy theory states the presence of suffering of the embryo between weeks 6 and 12 of intrauterine life, during which time it occurs from mesoblast the development of somites and side blades - precursors of muscular system, excretory system, muscle and connective tunic of the viscera. *Hereditary theory*, shows the role of chromosomal abnormalities in X-linked transmission (Lattimer).

Williams and Nunu, conducting dynamometric studies (measuring the pressure gradient developed by bladder detrusor and the urethral resistance) concludes that in 15-20% of cases of Prune-Belly syndrome exists an organic obstruction, low, with important role for retrograde dilation in the whole vesico-uretero-renal system.

The multitude of theories do not explain yet issued Prune-Belly syndrome etiopathogenesis or favorite impairment of male (sex ratio = 18:1) or girls predisposition to develop weakened forms of the disease. Perhaps these issues are due to X-linked recessive transmission of the disease.

With regard to the Clinic and Pathology aspects, Prune-Belly syndrome is defined by the following:

1. **Abdominal muscles malformation**, present at birth, may take one of two clinical forms:
 - a. *complete form*, with abdominal wall consists only of fat and fascia;
 - b. *incomplete form*, by involving the longitudinal muscle, transverse and oblique, in compliance with the upper part of the abdomen.

Histologically, muscles are characterized by aplasia or hypoplasia, with local normal innervation.

2. **Urinary abnormalities**, particularly important for diagnosis: uretero-hydro-nephrosis, mega bladder, permeable urachus, cervical bladder and urethra abnormalities, as stenosis type barrier.

In most cases, is present bacteriuria with leucocyturia, hematuria, cylindurs; in cases with progression to renal failure, increased serum urea and acid-base and fluid-electrolyte imbalances occur.

Histological examination reveals dysplastic kidney changes with important fibrosis; glomerulo-tubular unit can be normal or may appear as like embryonic cyst. Renal parenchyma may be reduced to a thin blade. In the conductor system, uretero- bladder-ureteral, can be observed absence of muscle fibers, fibrosis and calcification areas. Assumption of local ganglionic system anomaly, issued by Henle in 1953, was not confirmed.

3. **Cryptorchidism**, present in 90% of sick children, may be associated histologically to normal or atrophied testicles.

A number of associated anomalies can be find, such as: congenital club foot (equin), congenital hip dysplasia, some congenital abnormalities of heart, ear, eye, intestinal (megadolicocolon), skull-face, etc.

Some recent work also indicates damage concomitance of Prune-Belly syndrome to lungs (pulmonary hypoplasia, cystic adenomatosis, atelectasis), and even the absence of characteristic renal abnormalities. The presence of functional respiratory syndrome in these patients might be due to failure of righteous abdominal pressure or flabby abdomen.

It seems that in future attempts to define Prune-Belly syndrome, *lung damage* will be the fourth diagnostic criterion, along with classical triad of *abdominal muscle malformation - Renal and urinary abnormalities - cryptorchidism*.

Evolution and prognosis of patients with Prune-Belly syndrome is severe, it is considered in this regard that 20% of affected children are born dead (Burke) or die within the first month of life. Mortality up to 2 years of age amounts to 50% of all cases. Have been reported, however, in medical literature, patients who reached the age of 60-70 years.

Complications accompanying Prune-Belly syndrome typically are: kidney failure, urinary tract infections induced by train and recurrent and chronic respiratory failure due to pulmonary disease and / or absence of abdominal press, flabby diaphragm, chest deformations.

Prune-Belly syndrome have medical and surgical **treatment**, following certain steps to be individualized on a case by case. Medical treatment is establish for urinary and respiratory infections; mainly antibiotics are administered (according to antibiogram) and the results are usually good, even better than the surgery. Surgery treatment, take precautionary measures for reconstruction, to improve urinary flow dynamics; mention of these: ureter plasty, reimplantation, cystoplasty, pyeloplasty.

The three cases we presented are integrated in Prune-Belly syndrome. The first two meet all the diagnostic triad, the complete forms, major illness, and their evolution and response to therapy confirms the classical observation. The third case combines two of the positive clinical diagnostic criteria, righteous hypoplasia and abdominal cryptorchidism; remains questionable ureter abnormalities. Are present instead a congenital heart and repeated lung disease, which according to some authors (Wilson and Alford), may be another diagnostic criterion for Prune-Belly syndrome. The absence of dysplasia and urinary infections is certainly for benefit of patients, characterizing mild forms of disease.

The first case observed by us, presents clinical aspects of a severe progressive disease, with death in 30 days of life. Reno-ureteral dysplasia magnitude, the constant presence of urinary infections with profound and progressive alteration of renal function are elements that characterized the evolution and prognosis of the disease and of these patients. Surgical correction is not possible in such cases.

In the latter case, although with a major illness, surgery was possible to solve, because the renal and urinary changes are located below an obstacle (such as bladder neck disease). Once restored urinary flow dynamics, infection and stasis could be mastered and further development of the patient was good. The loss of this child at the age of 11 months and half, due to a

severe pneumonitis treated at home, made it impossible an appreciation over years of evolution.

The third case developed without urinary infections, but with two acute pneumopathies and congenital heart disease clearly outlined; unknown status of that child after the age of 1 year.

In conclusion, we can say that:

1. Prune-Belly syndrome is a rare complex dysplasia, with damage to the predominantly male (90%) and vital prognosis reserved.
2. Urinary and pulmonary infections significantly burdens the patient's clinical condition. Death occurs due to major biohumoral disturbances induced by renal and / or respiratory failure.
3. Some congenital anomalies of association may endanger patient lives themselves.
4. Therapeutic possibilities are limited, they vary from case to case, but generally low forms of disease with obstruction benefit from radical surgical treatment or plastic ureter. No indication of surgery for cases receiving medical treatment.

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