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EARLY DIAGNOSIS AND TREATMENT OF THE POSTERIOR URETHRAL VALVE

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Abstract
Posterior urethral valves are the leading cause of urinary tract obstruction in children, associated with the risk of renal failure and bladder dysfunction. A review of the literature, including peer-reviewed sources and meta-analyses, discusses the early diagnosis and treatment of this pathology.

Keywords: Posterior urethral valve, urinary tract obstruction, early diagnosis.

Introduction

Topicality. Posterior urethral valves (LUTs) are the main cause of bladder obstruction (UBVD) in children and a life-threatening congenital pathology of newborns, leading to chronic kidney disease in 32% of patients in childhood and adolescence [1,8]. The incidence of SLDs is 1:7,000–8,000 live births, occurs only in boys with varying degrees of urethral obstruction, and is classified by Young as type I (the most common), type II (non-obstructive) and type III [7].

Congenital OVMP during organogenesis significantly affects the function of the kidneys and bladder. Severe OVMP in the fetus can cause oligo/angidramnion, pulmonary hypoplasia, and Potter syndrome. The consequences of LUT range from fatal in infancy to less severe forms with lower urinary tract symptoms (LUTS) in childhood, but late diagnosis may be a consequence of a missed diagnosis [4, 5].

Prenatal diagnosis, improved respiratory support for newborns, and understanding of bladder changes reduced mortality from 50% to 5% [3, 6]. Endoscopic ablation of LUT is effective in eliminating LUT, but the consequences for the lower (ANC) and upper (IPH) urinary tracts may persist and worsen in childhood and adolescence [3, 9,10].

A multidisciplinary approach (neonatologist, pediatric urologist, nephrologist) is needed as a standard of care and careful nephro-urological monitoring from birth to adolescence.

The purpose of the study: to review the literature, including peer-reviewed sources, meta-analyses and scientific publications on the topic.

Early diagnosis of SCC. Up to 46.9% of cases of CVD are detected by prenatal ultrasound, and suspicion before the 24th week of gestation is associated with an increased risk of perinatal mortality and kidney disease [11]. The main ultrasound signs of CVD are bilateral hydronephrosis, dilated bladder with a thickened wall (>3 mm), dilated posterior urethra ("keyhole"), possibly oligo/angidramnion [12]. The kidneys begin to produce urine at the 10th week of gestation, in the second trimester, urine is the main source of amniotic fluid (AMF). In OVMP and impaired renal

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function, a decrease in urine output can cause oligo/angidramnion, and the level of AS can be a prognostic factor for postnatal renal function [6,8]. The AJ index is normally 5–95 percentiles, but if ONMP is suspected, the 5th–25th percentile requires caution due to the risk of renal failure [14]. However, Pellegrino et al. indicate the absence of confirmation [15], and normal IAL does not always correlate with normal renal function. Additional ultrasound signs: perirenal urinoma, urinary ascites, bladder diverticula, renal hyperechogenicity (dysplasia) [6]. Fetal urinary components obtained by vesicentesis under ultrasound control may indicate renal function, but due to conflicting data, urine biomarkers do not reliably predict the risk of renal failure [2, 6, 14].

According to Pellegrino et al. [2], prenatal diagnosis of SCD is valuable for the early detection of ECD, but there is no system for a reliable prognosis of postnatal renal function. If KZU is suspected, parents can undergo an examination and consultation of the fetal team with genetic counseling, assessment of anatomical abnormalities. In some cases, fetal MRI is indicated to detect malformations or solve ultrasound problems due to maternal obesity or fetal position [7]. After consulting the parents, prenatal treatment is possible, more often a vesico-amniotic shunt to decompress the urinary system and protect the kidneys. However, an international multicenter randomized trial (PLUTO-trial) showed inconclusive results on long-term benefits for the kidneys, with complications ranging from 21% to 59%. Valve ablation by cystoscopy and vesicocentesis by open fetal surgery have been proposed, but both techniques are associated with high maternal and perinatal morbidity.

Patient management. All newborns with prenatal suspected SCC are followed up by a multidisciplinary team to assess urinary tract malformations, postnatal renal function, and respiratory support if necessary. Less commonly, CVR is diagnosed later due to symptoms: UTI, urinary incontinence, weak jet, enuresis, with a possible better prognosis for the kidneys [5]. Vasconcelos et al. found no difference in long-term outcomes between early and late diagnosis, except for more frequent UTIs at postnatal diagnosis. Shields et al. Worse prognosis is reported with late diagnosis due to prolonged exposure to high kidney pressure. The controversy is explained by the spectrum of severity of CVD: antenatal diagnosis is useful for early nephro-urological management in moderate/severe forms of OVMP, but the prognosis may not change in mild forms. The relationship between antenatal diagnosis and long-term outcomes remains unclear [11].

Urological management: Drainage of the bladder. In a newborn with suspected SCC, the primary urological task at birth is to drain the bladder by inserting a transurethral catheter, usually a small feeding tube (without a balloon). A fusion cystourethrography (MCUG) should then be performed to confirm the diagnosis of SCC and assess the correct position of the catheter in the bladder [10]. If transurethral placement is not possible, a suprapubic catheter should be inserted [7].

Endoscopic ablation/incision. Once the patient has stabilized (from a systemic, respiratory, and renal perspective), cystoscopy can confirm the results of MCUG, and endoscopic ablation or valve resection should be performed [9]. Neonatal cystoscopes allow endoscopic treatment even in very

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young patients. Valve ablation in the first months of life is associated with better long-term outcomes in terms of urodynamics, vesicoureteral reflux (VUR), and improvement or resolution of hydroureteronephrosis [9, 11]. Some newborns are poor candidates for early ablation, even with the use of neonatal instruments, due to the small caliber of the urethra. For such patients, the technique of gradual dilatation of the urethra by inserting catheters of increasing caliber can be used. The valves are dissected at the 5 and 7 o'clock positions, and sometimes at 12 o'clock. Techniques change over time and are applied depending on the surgeon's preferences: electrocoagulation incision, cold knife incision, or laser incision/fulguration. Several series have been published suggesting the holmium: YAG laser as a safe and effective alternative technique [2]. Complications (5–25%): urinary extravasation, hematuria, urethral stricture; Incision, rather than ablation, is preferred to reduce strictures [4]. After treatment, a catheter is left, and in case of thick valves, a suprapubic catheter is retained [16].

The efficacy of endoscopic treatment should be confirmed by improved renal function, ultrasound, MCUG, and/or endoscopic control [10]. Some authors recommend early (and temporary) administration of oxybutynin after endoscopic valve ablation in infants to improve hydronephrosis and vesicoureteral reflux [1].

Vesicoureteral reflux. VUR in UR occurs in 48–66% of cases, but resolves spontaneously in 27–79% of cases 2 weeks to 1 year after valvular ablation [11, 15]. VUR and recurrent UTIs do not worsen renal outcomes [4,2]. Deterioration of renal function is associated with antenatal renal abnormalities and OVMP [30]. EAU–ESPU guidelines recommend antibiotic prophylaxis for high-grade UUR and UTC [10]. Circumcision may also be effective for the prevention of febrile UTIs [17]. Surgery (ureteral reimplantation, urine diversion) is indicated in severe cases (recurrent febrile UTIs, progressive renal failure), taking into account the complications of reimplantation (45–67%) [3].

Conclusion

Posterior urethral valves are a leading cause of urinary tract obstruction in children, threatening kidney and bladder function, including the risk of chronic renal failure. Prenatal diagnosis (ultrasound signs: hydronephrosis, thickening of the bladder wall, keyhole) allows for the detection of pathology and treatment planning. Despite a decrease in mortality due to improved neonatal support and understanding of bladder changes, long-term outcomes depend on the degree of obstruction and time of diagnosis. Endoscopic valve ablation is effective but requires nephro-urological follow-up during childhood and adolescence due to the lingering sequelae. A multidisciplinary approach (neonatologists, pediatric urologists, nephrologists) is the standard of care. Prenatal interventions, including vesico-amniotic bypass grafting, are experimental and require multicenter studies. UR in CU requires a conservative approach up to 3 years, surgery in severe cases. Urine diversion (vesicocentesis, ureterocutaneostomy) is used when ablation is impossible, the choice of method is individual, taking into account complications.

Our experience confirms the importance of treating CDU in large children's centers using modern technologies. The lack of parameters for predicting renal function and conflicting data on the impact of diagnostic time highlight the need for research. Multicenter clinical trials of prenatal and

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postnatal interventions, as well as long-term outcomes, are a priority for improving the quality of life of patients with KZD.

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