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SIMULTANEOUS LAPAROSCOPIC BILATERAL NEPHROURETERECTOMY, CADAVERIC KIDNEY ALLOTRANSPLANTATION AND PERFORMANCE OF VESICOSTOMY IN A PATIENT WITH NEUROGENIC BLADDER

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We present a case of simultaneous laparoscopic bilateral nephroureterectomy, cadaveric kidney allotransplantation and performance of vesicostomy. This observation shows that patients with end-stage kidney disease, primarily caused by neurogenic bladder dysfunction, can be successfully treated via surgery. The course of early postoperative period and further rehabilitation did not differ significantly from that obtainable after standard kidney allotransplantation.

Keywords: kidney allotransplantation, vesicostomy, neurogenic bladder, chronic kidney disease, laparoscopic nephrectomy, immunosuppression.

INTRODUCTION

Neurogenic bladder dysfunction comprises a group of the bladder function disorders that occur in diseases of brain and spinal cord, as well as peripheral nerves and intramural plexuses. Many urinary dysfunctions, in particular those that can damage the upper parts of the urinary tract, are centered around the lack of coordination of the activities of detrusor, bladder neck or external sphincter. These disorders occur either separately or in combination and often cause an increase in intravesical pressure without obvious neurological underlying pathological processes [1]. Idiopathic hyperactive bladder (HAB) is a quite common syndrome with symptoms of urgency, increased urination and, in some patients, urinary incontinence. The clinical manifestations of HAB are not as dramatic as the manifestations of a neurogenic bladder.

The problem background is featured by the high prevalence: about 11 million people in Russia would notice similar symptoms [2]. There are many reasons for the lower urinary tract dysfunction (LUTD), which can be generally classified as congenital structural abnormalities (posterior urethral valve, vesicoureteral reflux and Eagle–Barrett syndrome), neurological disorders (spina bifida, pathological changes at the level of the basal ganglia of the brain, spinal canal stenosis, peripheral neuropathy, etc.) and those caused by neurological pathology (diabetes mellitus, bladder tuberculosis, benign prostatic hyperplasia, prostate cancer, retroperitoneal fibrosis, urolithiasis, etc.).

In patients with neural tube defects, the risk of dysfunction of the lower urinary tract which entailed renal failure is eight times higher, and in patients with paraplegia / tetraplegia this risk is five times higher compared to the general population. Neurogenic conditions compromise the safe, effective, and controlled urine retention and the urination process. Constant high intravesical pressure is the predominant factor in kidney damage. Intravesical pressure exceeding 35–40 cm H_2O is accompanied by vesicoureteral reflux (VUR), dilatation of the upper urinary tract and pyelorenal reflux leading to nephropathy.

Urinary tract infections and nephrolithiasis are additional damaging factors. Indications for surgical correction of the lower urinary tract are determined individually, with the aim of creating a urinary reservoir with low pressure and adequate function. Surgical treatment options include continent appendicostomy (Mitrofanoff stoma), augmentation cystoplasty, ileal conduit (Bricker operation) or ureterocystoneostomy. Despite surgery, many patients will eventually reach the terminal stage of chronic renal failure (CRF), thus needing renal replacement therapy and transplantation. A high incidence of bladder dysfunction in varying degrees is observed in patients with chronic kidney disease (CKD).

In this group of patients, the major problems are bladder hyperactivity, detrusor instability, and detrusor-sphincter dysinergy. Patients with end-stage renal failure are usually oligo- and anuric and more often do not have complaints against this background, although may still feel discomfort in the abdominal cavity and micturition urgency [3]. With a small bladder capacity and hyperactive symptoms, about a quarter of patients

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with end-stage renal disease (ESRD) showed moderate severity of IPSS – 21.3% of women and 26.6% of men, regardless of hemodialysis [4]. In Chen J.L. abnormal accumulation function was observed in 71% of ESRD patients, and obstructive in 51.6%, as well as chronic inflammation and urothelial dysfunction in 48.4% of patients with cystoscopy [5].

Silva D.M. observed vesicouotetral reflux 110 of 622 (17.5%) patients, and residual urine in 83 (13.6%), respectively [6]. Bladder augmentation or diversion is the only option for kidney transplantation in recipients with NBD, and satisfactory results of this surgical intervention were obtained in comparison with the general population of recipients with normal NMP function [7–9]. The patients with bladder dysfunction were widely believed not to be considered as candidates for kidney transplantation.

There are publications with the results showing no difference in the graft survival rates and patient survival [10–12]. In controlled trials, patients with lower urinary dysfunction had a mortality and survival coefficient similar to the control group without bladder dysfunction; however, there is a high risk of MVP infection, which in turn is accompanied by minimization of immunosuppressive therapy and may lead to an unfavorable outcomes [13–16]. Renal transplant recipients with LUTD in history require special surgical techniques to form the urinary tract and ensure adequate outflow of urine which can be performed as a preliminary step or immediately with the kidney transplant. Depending on the specific situation, preparation may include creating an intestinal reservoir [17], a urinary subcutaneous fistula [18], and enlarging (augmenting) own bladder with an insert from the intestine or ureter [19]. Depending on the type of urine diversion, it is possible to use self-catheterization or a urine bag. Vesicostomy is considered more preferable. The vesicostomy techniques proposed by Blocksom (1958) and Lapides J (1961), in essence, consist in the formation of a vesicocutaneous fistula and today are widely used abroad [20] The vesicostomy disadvantages are complications rating from 5 to 20% [21]. Typical complications of the Blocksom technique are the bladder mucosa prolapse observed in 6–15% of patients, and stenosis of the vesicocutaneous anastomosis which occurs in 15–22% of cases. The disadvantages in the methodology of these techniques are the bladder capacity decrease and chronic cystitis. This category of patients is under a high risk of developing the urinary tract infections which requires appropriate prevention and / or treatment.

CLINICAL CASE

Patient, 22, diagnosis: abnormal urinary tract development, bilateral vesicoureteral reflux. Chronic pyelonephritis, latent course. (GFR 16 ml/min/1.73 m^2). CKD 4. Neurogenic bladder dysfunction. Detrusor-sphincter dyssynergia.

Anamnesis: at the age of 4, the first symptoms of the disease: febrile fever, acute urinary retention. 2000, at the same age: vesicoureteral reflux on the left. Surgery: plastic of the intramural part of the left ureter with antireflux protection. Irregular visits to a nephrologist, CKD gradually progressed. 2017: sent to the Research Institute of Urology of the National Medical Research Center of Radiology of the Ministry of Health of Russia to discuss the possibility of kidney allotransplantation.

Ultrasound: the shrunken kidney on the right, the dilated calices-pelvis system (CPS): calyx 0.6 cm, pelvis 1.3 cm, the upper ureter is not expanded. The left kidney: 60.0 cc volume, parenchyma – 1.4–0.9 cm. Dilated CPS: calices 0.8 cm, pelvis 1.7 cm, the upper ureter expanded to 0.4 cm. The bladder: 600 ml volume, distinct scalloped contours, diffusely thickened walls (1.0 cm).

Cystography (Fig. 1): contrast, 870 ml, no urge to urinate, the tower-shaped bladder with fuzzy, uneven contours. VUR right III–IV.

Complex urodynamics (Fig. 2): high-amplitude detrusor hyperactivity. Reduced bladder sensitivity, urination is not fixed on 800 ml.

Subsequently, an arteriovenous fistula of the left forearm was formed, and renal replacement therapy with programmed hemodialysis started. The patient is on the waiting list for the donor kidney.

2017: Research Institute of Urology, National Medical Research Center of Radiology of the Ministry of Health of Russia, laparoscopic bilateral nephrurethe-

Fig. 1. The cystoradiogram

rectomy, allotransplantation of a cadaver kidney on the right, formation of continental vesicostomy. Final stage of the operation, see Figs. 3. and 4.

Renal transplant ischemia – 11 h. Total surgery – 5 h 45 min.

Stable postoperative period. The primary function of the transplant. Standard immunosuppressive therapy. The postoperative drainage and urethral catheter were removed on the 2nd day after surgery, the vesicostomy catheter was removed on the 18th day after surgery with its prior clamping. Three weeks later, the patient began to self-catheterize after each urination. On the 26th day after surgery: vesicostomoscopy, cystoscopy, the internal stent of the transplanted kidney removed. Bladder trabecularity III – pronounced bladder dysfunction.

Control ultrasound of the graft: no CPS dilatation.

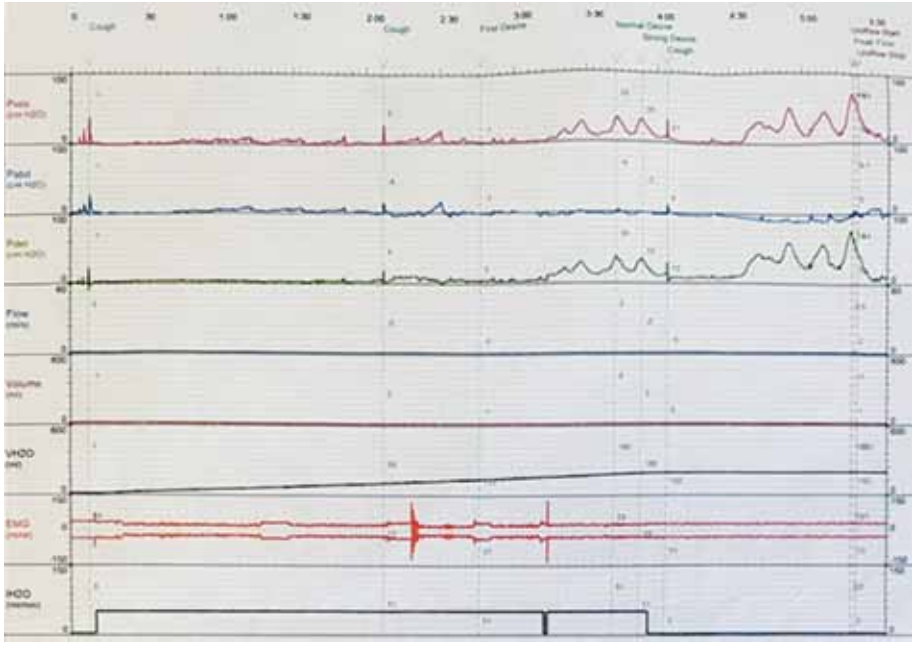

Fig. 2. Complex urodynamic examination

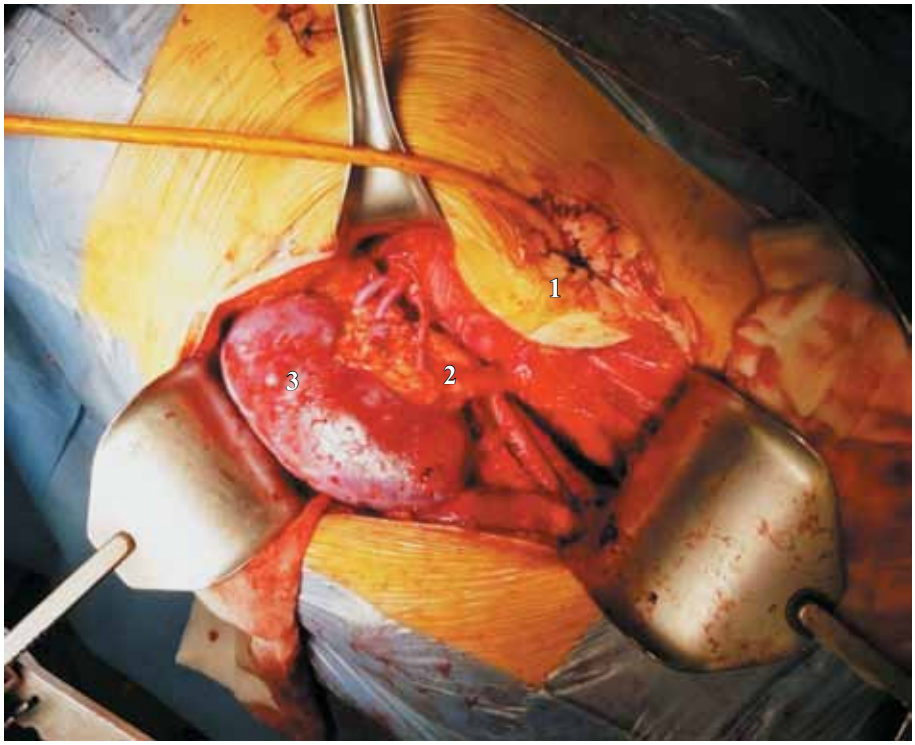

Fig. 3. Surgical field at the final stage: 1 – the excluded vesicostoma on the anterior abdominal wall; 2 – ureter of the kidney transplant; 3 – kidney (transplantate)

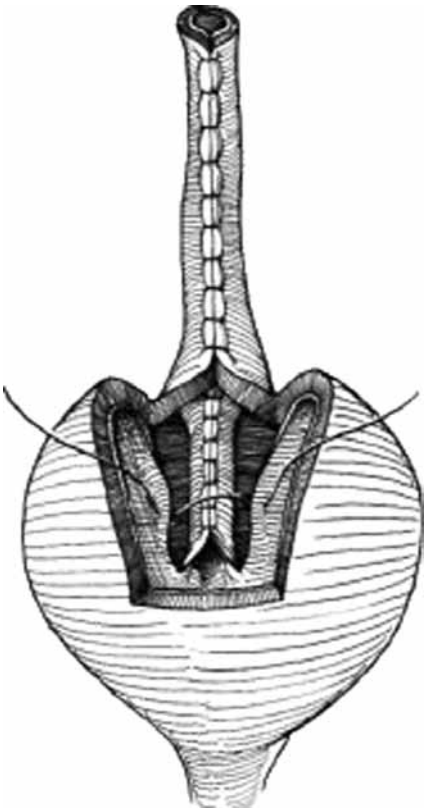

Fig. 4. The scheme of formation of a vesicostomy

Fig. 5. The cystoradiogram after surgery

Follow-up, 19 months: monthly outpatient observation, urination with catheterization through vesicostomy (6 times a day), spontaneous urination. One episode of acute urinary tract infection.

Laboratory analyses at the time of the last observation:

CBC: Hb 120 g/dl, RBC 3.2 × 10^{12}/l, PLT 147 × 10^{9}/l, ESR 4 mm/h. Blood biochemistry: creatinine 115 μmol/l, urea 6 mmol/l, K 4.3 mmol/l, Na 144 mmol/l, Ca 1.2 mmol/l. UA: specific gravity 1,016, no protein, RBC 0–1 /hpf, WBC 0–1 /hpf.

Transplanted kidney ultrasound: 12.1 × 5.3 × 5.3 cm, up to 180 cm^3 volume; parenchyma thickness of up to 1.8 cm; adequate blood flow; R_i 0.70, CPS is not dilated, the ureter is not dilated.

To exclude vesicoureteral reflux, cystography was performed through vesicostomy. 250 ml of X-ray contrast; no vesicoureteral reflux (Fig. 5).

Urodynamics: reduced bladder sensitivity, the urge to urinate is fixed at 270 ml volume.

DISCUSSION

The described case of simultaneous laparoscopic bilateral nephroureterectomy, cadaver kidney allotransplantation, and performance of vesicostomy proves the successful simultaneous complex surgery with the subsequent satisfactory rehabilitation.

The decisive role in the simultaneous surgical intervention was played by a stable predialysis condition, intact renal excretory function of the kidneys which ensured constant bladder filling, which in turn contributed to the formation of vesicostomy with good volumetric capacity and functionality. At the terminal stage of chronic renal failure, hemodynamic, excretory, and endocrine functions are supported. The conclusion in numerous studies is that bilateral nephrectomy, as a separate type of surgical intervention before kidney transplantation, is featured by a significant risk of mortality and morbidity, so it is not the method of choice in LUTD patients with high bladder capacity [22, 23]. At the same time, simultaneous kidney transplantation with bilateral nephrectomy has a higher level of urological complications, blood loss and the need for blood transfusion than bilateral nephrectomy as the first stage [24, 25].

Bladder dysfunction can provoke a urinary tract infection which can affect renal transplant survival. Thus, close attention must be paid to the symptoms of LUT dysfunction after a successful kidney transplant. Few studies have studied lower urinary tract dysfunction and lower urinary tract symptoms (LUTS) in recipients. Experimental and clinical studies have repeatedly shown that the restoration of diuresis leads to manifestations of LUTS and urinary dysfunction. When this happens, repeated urinary infections or other pathological changes in the bladder can lead to structural rearrangement of all LUT layers and serious morphological and functional

abnormalities, such as a bladder contraction with minimal capacity. After successful kidney transplantation, dysfunction and LUTS can be detected along with all their negative consequences. Anuria and oliguria are the most important risk factors for urological complications after kidney transplantation [26, 27]. The transplant team should be wary of possible sources of infection [28, 29]. In patients with neurogenic dysfunction, an adequate form of urine derivation should be performed. The stages of assistance and the types of derivation of urine should be determined individually [30]. The choice of the formation of a vesicostomy in a patient consisted of a large bladder with a volume of up to 1000 ml, which made it possible to freely form a stoma from the tissue of the bladder. In the early and late postoperative periods, the vesicostomy carried out and ensures complete drainage of the bladder, which is the prevention of vesicoureteral reflux into a transplanted kidney, which in turn can lead to transplant reflux nephropathy or the urosepsis development.

CONCLUSION

At this time, there are no clear recommendations for renal transplant recipients. It is necessary to screen for LUTD symptoms, since this pathology can cause vesicoureteral reflux, induce urinary tract infections, and further complications associated with the above. Comprehensive urodynamics assessment before kidney transplantation is important as a mandatory examination of recipients as it will reveal existing dysfunctional disorders of urination and / or bladder, which will help to avoid further allograft dysfunction. Urodynamic examination after transplantation is necessary depending on the degree of dysfunction.

Simultaneous laparoscopic bilateral nephroureterectomy, cadaver kidney allotransplantation, and the formation of vesicostomy can be the operation of choice in patients with ureterohydronephrosis of their kidneys, neurogenic bladder dysfunction, leading to terminal renal failure.

The authors declare no conflict of interest.

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