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## Long term outcomes of the management of ureterovaginal fistula after obstetric and gynecological procedures

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### SUMMARY

Between the year 2010 to 2021, 25 patients noticed involuntary leakage of urine from the vagina within 10-40 days after surgical procedures in obstetric (n=2) or gynecological (n=23) departments. The average age on the date of the surgical management of the women was 45.6 years (from 22 to 61). Operations in 15 of the patients were performed via laparotomic access, transvaginal approach was used in 3, and the remaining 7 underwent laparoscopic surgical procedures, and the most frequent operation was hysterectomy done in 20 (80.0%) cases. The patients were referred to the urology center under the department of Belarusian State Medical University for further examination and possible management. Investigation results revealed, that, all women had a combination of ureteral injury (UI) and uretero-vaginal fistula (UVF). Taking into account the clinic's experience in the treatment of such patients, their management was divided into 2 stages. At the first stage, two patients underwent reconstructive repair surgeries (ureteroneocystoanastomosis) via an open access within 1-2 days after admission into the urology hospital, 14 women had D-J stent insertion, percutaneous nephrostomy (PCN) was placed in 8 cases, and a D-J stent + PCN tube inserted in 1. Analysis during a follow up inpatient study after 3 months, revealed the 2 patients who underwent reconstructive repair surgeries and the 8 after removal of stents had a good treatment outcomes. Fifteen patients underwent operations in the 2nd stage: endoscopic management was carried out in 7 patients (dilation (bougienage) of ureteral stricture + D-J stent placement, endoureteroplasty with endotomic stent placement), and reconstructive repair surgeries (ureteroneocystoanastomosis) via open access in 8 patients. Long-term results were followed up in all patients within the period from 18 months to 4 years. Good management outcomes were achieved in 19 (76.0%) patients, and satisfactory outcomes in 6 (24.0%). Endoscopic treatment of patients of the study group showed high efficiency, its usage in 15 (60.0%) cases, helped in restoring ureteral patency and adequate urodynamics on the side of the injury using minimally invasive technologies. All patients after surgical treatment of UI and UVF need a long-term follow-up.

## INTRODUCTION

### Вступ

Ureteral injuries (UI) that occur during the surgical management of organs of the abdomen and the retroperitoneal space is relatively rare, however, if not timely detected and / or adequately treated, could lead to several other subsequent surgical management procedures, and may unfortunately lead to loss of the kidney (nephrectomy) on the side of the injury [2, 6]. The pelvic segment of the ureter is most often injured. Research shows that traumas to the ureter develop in approximately 0.5–2% of all cases during pelvic surgery (gynecology, oncology, urology, colorectal and vascular), with injuries to the ureter following obstetrics and gynecological surgeries constituting the bulk of the total number of injuries, which amounts up to 70–75% [8, 9]. In 10–15% of cases, an undetected ureteral injury during the primary obstetrics and gynecology surgeries, results in the formation of ureterovaginal fistula (UVF) in the postoperative period. UI with subsequent formation of UVF, in most often times occur in the course of hysterectomy [3, 4, 5]. Less often this happens during procedures on uterine appendages, myomectomy, colporrhaphy, sling placement procedures in patients with stress urinary incontinence and procedures on other organs of the genitourinary system [1, 4, 6]. Although very uncommon in obstetrics practice, UI with subsequent formation of UVF could occur mainly during caesarean deliveries (caesarean sections), especially if hysterectomy is required in the postpartum period [12].

The prevalence of UVF could be attributed to the surgical approach used the extent of the procedure, surgeon's expertise and the associated technical difficulties involved. Some risk factors such as the dense anatomical juxtaposition of organs of the genitourinary system, uncontrollable heavy intraoperative hemorrhage, some definite transformations (fibrotic and adhesive processes), which are sequelae of lengthy inflammation, previous surgical procedures, radiation therapy and other disease conditions of these organs, which contribute to the higher possibility of trauma to the ureter following procedures in obstetrics and gynecology [5, 7, 13]. UI in very often cases occur in the region of the infundibulopelvic ligament, where the distal third of the ureter is in close proximity to the uterine vessels and the pelvic brim. The left ureter is more often injured, owing to its anatomical proximity to the broad ligament, and the ratio of unilateral and bilateral injuries is 6:1 [1, 7]. For the staging of UI, the American Association for the Surgery of Trauma (AAST) classification has now global recognition [10].

Intraoperative detection of UI is difficult, which even during laparoscopic procedures may be confirmed in only less than 10% of cases. Postoperative diagnosis of UI could be made based on analysis of the surgical history, clinical presentations, and adjuvant investigations [1, 11]. On that note, a high index of suspicion and appropriate considerations is vital for obstetricians and gynecologists due to delayed diagnosis of UI, and any suspected indication for UI [3, 11, 13].

Given the diverse risk factors for the underlying pathology in the individual cases, the type of ureteric injuries are different, mechanisms which may include kinking, laceration, contusion, suture-ligation, application of clips, electrotrauma or thermal injury, transection, and devascularisation [1, 2, 6].

In recent decades, due to the increasing indications and the volume of surgical interventions, especially for radical surgeries in patients with malignant tumors in gynecological practice, as well as the widespread introduction of laparoscopic methods of management, the frequency of UI following obstetrics and gynecological procedures has increased [4, 7, 9]. Thus, patients with an established diagnosis of UI, who were expecting a speedy recovery prior to the obstetrics or gynecological procedures, may face more severe complications than the primary surgical procedure itself.

Purpose of the study. To evaluate the long term outcomes of the management options, following the analysis of the possibilities and effectiveness of the usage of endoscopy in urology, in the diagnosis and treatment of UVF after obstetrics and gynecological procedures.

## MATERIALS AND METHODS

### Матеріали і методи дослідження

In the period between 2010 to 2021, 114 women with UI incurred during surgical procedures in obstetrics or gynecological departments, underwent inpatient management at the urology center, in the three urological departments, under the department of urology of the Belarusian State Medical University, in the 4th hospital named after Savchenko N.E., in the city of Minsk.

Of these 114 women, following observations, examinations, investigations and analysis, 25 (21.9%) patients had a combination of UI and the presence of UVF, and all 25 women were included in the study group. The average age of the patients on the date of their primary hospitalization was from 22 to 61 years ( $45.6 \pm 12.0$  years on the average). In all cases, trauma to the ureter was in the distal third of the ureter, and the average distance from the ureteral

orifice to the lower point of stricture or obliteration was  $5.3 \pm 0.6$  cm, which corresponded to the level of intersection of the ureter with the uterine artery. Unilateral damage to ureter was noticed in 23 of the 25 women (15-left and 8-right), while two patients had bilateral injuries.

Patients included in the study group were made up of women whose UI were not diagnosed intraoperatively during the primary obstetrics and gynecological surgeries, and who were admitted into the urological hospital only after establishing the diagnosis – ureteric injury, or a suspected UVF formation in the postoperative period. Patients' inclusion was done after discreetly carrying out analysis of patients' discharge summary notes, records of past and present inpatient and outpatient medical histories, protocols of primary obstetrics and gynecological procedures, X-ray results, other radiological and endoscopic studies, verifying UI and UVF. Also, to collect and analyze information, a special registration booklet in hard copy and soft copy was developed, into which information about each patient was entered for the entire period of observation in the hospital.

## RESULTS AND DISCUSSION

### Результати та їх обговорення

Trauma to the ureter with subsequent UVF formation of the 25 patients in the study group were established between 10 to 40 days (24.1 days on the average) following the primary gynecological (n=23), and obstetrics (n=2) procedures. The women were previously operated upon for the following diseases or emergencies: uterine fibroids – in 11 patients, non-metastatic cervical cancer – 4, non-metastatic cancer of the uterine body – 3, non-metastatic ovarian cancer – 3, benign ovarian tumor – 1, intra-abdominal endometriosis, and endometrioid infiltration of the lesser pelvis – 1, and uterine hemorrhage following a Caesarean section – 2. The UI were sustained during the following obstetrics and gynecological surgical procedures: conventional transabdominal hysterectomy with their appendages via an open access was used in 10 patients, and hysterectomy without their appendages in 3 (12%); transvaginal total hysterectomy with their appendages in 2 (8%), and cesarean delivery converted to a total hysterectomy with the fallopian tubes, following a massive hemorrhage was used in 2 (8%) patients. The remaining 8 patients, who had primary gynecological surgeries carried out via laparoscopy had: hysterectomy with their appendages done in 6 (24%) women, cystectomy – 1 (4%), the 1 (4%) patient left had excision of endometriosis and

infiltrating endometriotic tissues in the true (lesser) pelvis.

Routine and complex examinations and investigations were carried out on the patients after admission into our hospital, aiming at confirming the diagnosis, establish the causes, type, location and extent of the injuries, and formulating a management plan. On the date of admission to the urological hospital, the clinical presentations of the suspected UIs were carefully studied. The main clinical symptoms of the women in the study group in the early postoperative period were: leakage of fluid from the vagina or from wound drains (in 24), abdominal and / or loin pain on the side of the alleged injury (19), hematuria (17), increased body temperature (22), reduced daily urine output (14 patients), inflammation of soft tissues in the suprapubic region in patients operated upon using transabdominal route (9). Timing of the onset of the obstructive symptoms usually suggest the cause of the UI. If the ureter is obstructed due to suture-ligation or application of clips, the obstructive symptoms manifest earlier in hours or days after the obstetrics and gynecological procedure. Clinical presentations of UI manifested 12 days after in cases of electrotrauma (thermal injury), which was experienced in one patient.

The main clinical presentations of the women with UVF were continuous involuntary urinary discharge from the vagina, having an adequate urge to urinate and in the process of micturition. In order to carry out differential diagnosis and rule out other pathologies such as vesicovaginal fistula, neurogenic bladder with urinary incontinence and etc., we studied the storage and emptying functions of the bladder 2 times using a simple technique. For this reason, patients were advised not to empty the bladder until there is an imperative urge to urinate. Upon reaching the task, the patient urinated into a graduated container, and the duration of urination was determined using a stopwatch. The information obtained from the results of this technique, showing the average physiological capacity of the bladder and the volumetric urinary flow rate, made it possible to objectively and reliably exclude all other above mentioned pathologies and confirmed the presence of UVF.

We started the complex investigative procedures with a routine ultrasound examination of the urinary system, retroperitoneal space and pelvis so as to evaluate state of the renal pelvicalyceal system (PCS) and the ureter, and assess if there is any urinary leaks outside the urinary system. This method was of great diagnostic importance on the basis of available history that, it was carried out on all patients of the study group before the procedures, which means they were aware of the presence or

absence of urological diseases that can be established or suspected with its use. Dilation of the calyces up to 12–15 mm in diameter, and the pelvis up to 25 mm was considered moderate, and obvious if these figures were exceeded. In 8 patients with copious discharge of urine from the vagina, PCS dilation on the side of the injury was found to be minimal. Unlike X-ray radiological studies, it is very vital that this method can be carried out, if necessary, repeatedly to study the dynamics of restored of ureteral patency on the side of injury or the dynamics of expected associated complications.

In all patients, on admission into the urological hospital after a biochemical blood test, underwent enhanced intravenous pyelogram (IVP) or computed tomography of organs of the abdominal cavity, retroperitoneal space and true pelvis. The choice of the X-ray radiological investigative method depended mainly on the ultrasound results (the degree of dilation of the PCS, the presence of urine in the retroperitoneal space and true pelvis, the presence of free fluid in the abdominal cavity), as well as from the clinical presentations of the injury. The pathognomonic sign of the UI is the spread of the contrast agent outside the urinary tract.

Dynamic nephroscintigraphy was one of the mandatory investigative methods prior to treatment in the urological wards. From its outcomes, functions of both kidneys were determined, as well as fact and degree of spread of the radiopharmaceutical medium beyond the ureter on the side of the UVF. Data obtained on renal function were among the main and mandatory criteria in assessing the outcome of the treatment of patients in the long-term postoperative period.

Regardless of the degree of injury to the ureter, in accordance with the AAST classification, which we assumed based on the outcomes of previous studies, the following two methods were mandatory and vital in all patients, which were retrograde ureteropyelography and ureteroscopy. Retrograde uretheropielography was carried out to verify the tightness of the ureter at the level of its injury, in order to ascertain the volume, and area of extravasation of urine beyond its perimeter. In all cases, X-ray shots were taken twice: immediately after the introduction of the contrast medium, and 10–20 minutes later under the control of an electronic optical transducer in the anterior-posterior and lateral positions of the patient. All women underwent ureteroscopy on the day of admission with attempts at inserting Double-J (D-J) stent. Uretheroscopy was simultaneously used to assess the state of the ureter: its integrity, extent and nature of the damage, presence of stenosis, ligatures, length of ureteral diastasis, and etc.

Subsequent analysis of all the information gotten, including the outcomes of dynamic nephroscintigraphy and all radiological investigative methods, made it possible to objectively determine the structural and functional state of the kidneys and upper urinary tract on both sides, and determine the individual treatment plan, including preoperative preparation and management of the patient in the early and long-term postoperative period after the urological procedures. The determining criteria used while choosing methods of the surgical treatment of UVF of patients in the study group were: the extent of the UI according to the AAST classification, the origin of the injuries, the number of days elapsed after the primary obstetrics or gynecological procedures, the activeness of pyelonephritis, if any, the activeness of local inflammation of the tissues surrounding the damaged segment of the ureter.

In two of the 25 cases, taking into account outcomes of ureteroscopy, retrograde ureteropyelography, and the short period after their obstetrics and gynecological procedures, underwent an immediate reconstructive repair surgery – ureteroneocystoanastomosis via an open access.

The remaining 23 women were divided into subgroups A, B and C. Minimally invasive management methods were used in all 23 women in the first stage of treatment.

Included in subgroup A were 8 of the 23 patients, who had a grade II degree UI according to the AAST classification. Ureteroscopy, the passage of hydrophilic guide wire, and the subsequent placement of the D-J stent was done without difficulties in these eight women. Foley's urethral catheter was passed into the urinary bladder to prevent reflux pyelonephritis, restoration of ureteral patency and adequate urinary flow in the region of the injury. Outcomes of ultrasound scan (USS) of the genitourinary system after 24 hours and three days later, confirmed the absence of dilation of the PCS in the ipsilateral side of the injury. In the short term, good management outcomes were noted in all the patients, as evidenced by the cessation of involuntary leakage of urine from the vagina  $2,13 \pm 0.8$  days after the procedures. They were discharged home for outpatient observation and management, and their average inpatient hospital stay was  $7,25 \pm 1.7$  days.

Subgroup B (n=6) patients comprised those with III degree UI according to the AAST classification in whom endourological procedures were done with some technical difficulties. In two of them we noticed the presence of ureteral strictures in the region of the distal edge of the injured ureter, which prompted for carrying out ureteral bougienage (dilation) and subsequent D-J stent placement. We were only able

to pass the guide wire into the renal PCS, and subsequent D-J stent placement, following repeated attempts under the guide of ureteroscopy, retrograde ureteropyelography and the use of X-ray imaging, after which urethral Foley's catheter was passed into the urinary bladder. Ascertaining the position and function of the D-J stent was done similarly to what was obtainable with the subgroup A patients. Involuntary vaginal leakage of urine stopped after 3–5 days. All patients were discharged home satisfactory conditions. Average inpatient bed stay of the patients was  $10,3 \pm 3.8$  days.

According to the outcomes of the study, all patients ( $n=9$ ) of subgroup C were diagnosed with grade IV–V UI. Retrograde D-J stent placement was not possible in any of the women, and they had percutaneous nephrostomy (PCN) tube insertion done. The results of the simultaneously carrying out retrograde ureteropyelography and antegrade pyeloureterography in addition to other investigative methods, helped to objectively ascertain the extent of damage to the ureter according to the AAST classification. After the PCN tube insertion in all patients of this subgroup, an attempt was made at passing the guide wire using realignment retrograde/antegrade stenting technique. To do this, we inserted a guide wire into the injury site via the PCN tube, and using the ureteroscope from beneath to grasp the guide wire down out via the urethra. Thereafter, a D-J stent is passed along the guide wire and over the injury. Only in one case, we managed to install a D-J stent using this technique. Further, urethral Foley catheter was passed into the bladder, with the nephrostomy tube still in place. Going forward, against the background of good functioning of the nephrostomy tube, the leakage of urine stopped after 2–4 days. The average hospitalization of these patients was  $10.7 \pm 4.4$  days.

Therefore, we had a good outcome in the short term at the first stage of management in all patients evidenced by: the complete stoppage of the involuntary leakage of urine from the vagina, obstructive symptoms were eliminated, and the activeness of urinary tract infections were minimal.

After an average of 3 months, all ( $n=25$ ) patients were invited for an inpatient follow-up examination to assess the outcome of the first stage treatment. On the date of admission, conditions of all patients following assessment were satisfactory. Some special investigative methods used, included USS of the urinary system, isotope renogram in all patients, and antegrade pyeloureterogram for patients in subgroup C.

Following analysis of results of examinations and investigations, the two patients who underwent primary reconstructive repair urological procedures

were noticed to have good outcomes, and they were discharged home.

In all patients of subgroups A and B ( $n=14$ ), their general conditions were actively monitored and assessed 1–2 days after the removal of the D-J stents, by way of analysis of complaints, obligatory USS of the upper urinary tract every 12–24 hours. The USS findings showed moderate dilatation of the PCS and ureter in 8 of the 14 cases, however, there were no clinical manifestations suggestive of upper urinary tract infection nor obstruction, and they were discharged home. However, in the other 6 patients, there were marked pyelocalicectasis and ureteral dilatation above the site of injury, and there was also an associated gradual onset of renal colic the next day. An excretory urography was ordered and done for them, outcomes which precipitated a D-J stent insertion in three of the cases, ureteral stricture bougienage (dilation) with subsequent D-J stent placement done in two, and the one patient left underwent ureteroscopy and endoureteroplasty followed by a D-J endotomy stent placement.

Subsequent hospital admission and examination of the patients was carried out another 3–6 months later, where the D-J stents were removed, and outcomes of treatment were evaluated. The women were later discharged home for outpatient management, and included into a special group of patients for active outpatient observation and follow up. None of them subsequently required additional urological interventions. Thus, we believe that stenting of the ureter contributes to the elimination of paraureteral leakage, adjoining the edges of the damaged ureter to each other, which is the basic condition for subsequent epithelialization, healing of the damaged segment and prevention of stricture in the area of injury.

An entirely different scenario was recorded among patients of subgroup C after the next 3 months of follow-up. We only managed to insert a D-J stent in one case at the 1st stage, and it was not necessary to subsequently carry out a reconstructive repair surgery. After removal of the stent in this patient and clamping of the nephrostomy tube, she experienced pain in the loin. An antegrade ureteropyelogram done revealed a ureteral stricture of 0.5 cm in length, in the area of the previously established UI. Bougienage and repeated stent insertion were carried out to restore ureteral patency and normal urodynamics. The D-J stent was later removed after 3 months later. The remaining 8 patients underwent ureteral reimplantation repair surgeries via an open route after complex examinations and investigations.

All 25 patients subsequently underwent several inpatient examinations and investigations in the urological hospital or outpatient examinations

followed by a consultation in the urology clinic. Some of the women (n=10), occasionally had indications for emergency hospital admission, due to inadequate functioning of the D-J stent or nephrostomy tube and exacerbation of chronic pyelonephritis. This further confirms the significance of dynamic follow up observation. In general, final management outcomes for patients in the study group were evaluated within  $2.7 \pm 1.8$  years. Good outcome (n=19) in the long term after completion of urological treatment was established, evidenced by the absence of complaints characteristic of obstruction of the upper urinary tract, the absence of clinical symptoms and laboratory findings suggesting chronic pyelonephritis, improvement or stability in the morpho-functional state of the kidney compared with findings on the date of the first admission into the urological hospital, and the absence of dysuric symptoms and leakage of urine from the vagina. In the patients (n=6) with satisfactory outcomes, there were improvements in the anatomical and functional state of the kidney and ureter on the side of the injury. We noted a significant decrease in the degree of dilation of the PCS and ureter when compared with findings prior to the urological procedures, down to a moderate pyelocaliectasis state, there was moderate impairment in the excretory function of the kidney depicted by isotope renography or dynamic nephroscintigraphy, with the initial thickness of the renal parenchyma preserved. Findings from blood and urine laboratory investigations confirm the lack of evidence of urinary tract infections. None of the 25 patients had the need to undergo a nephrectomy over the years of follow-up.

## CONCLUSIONS

### Висновки

The manifestations of symptoms we noted in patients who previously underwent surgical operations in obstetrics or gynecological hospitals, which were mainly pains in the region of the abdomen and / or loin on the side of the supposed injury, fluid from the vagina or through drainage from postoperative wound site, hematuria, fever, reduced daily urinary output, swelling of soft tissues in the suprapubic region in patients operated upon using transabdominal access may be indicative of UI, leading to UVF formation, requiring a compulsory search for the causes of these manifestations. Analysis of the outcomes of examinations, investigations and management of patients in the study group showed a high efficacy of minimally invasive techniques using endourological access in solving the given tasks. D-J stent placement carried out in 15 (60%) of

patients, helped in closing up the fistulas, restore ureteral patency and urodynamics without reconstructive repair surgeries. The main criteria to be taken into account while drawing up patients' management program should be, findings from results of uretheroscopy, retrograde ureteropyelography and antegrade pyeloureterography if there is a nephrostomy tube. All patients with UI and UVF are in need of a long-term dynamic follow-up after urological treatment.

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**РЕФЕРАТ****Віддалені результати лікування сечовідно-піхвових нориць після акушерських та гінекологічних втручань**

А.Н. Джеремайя

У період з 2010 до 2021 р. мимовільне підтікання сечі із піхви протягом 10–40 діб після оперативних втручань в акушерських (n=2) або гінекологічних (n=23) відділеннях відмічено у 25 пацієнок. Середній вік на дату хірургічного лікування склав 45,6 року (від 22 до 61). Операції у 15 пацієнок виконані з лапаротомного доступу, у 3 – трансвагінального, у інших 7 – лапароскопічного, а найбільш частою операцією була гістеректомія у 20 (80,0%) випадках. Пацієнтки для подальшого обстеження переведені до клініки урології Білоруського державного медичного університету. Результати досліджень показали, що у всіх жінок було поєднання пошкодження сечоводу (ПС) та сечовідно-піхвова нориця (СПН). Із урахуванням досвіду клініки у лікуванні таких пацієнок їх вели у 2 етапи. На першому – протягом 1–2 діб після переведення 2 пацієнткам проведено уретеронеоцистоанастомоз (УНЦА) відкритим доступом, 14 – встановлено JJ стент, у 8 – черезшкірна пункційна нефростома (ЧПНС), у 1 – JJ стент + ЧПНС. При контрольному стаціонарному дослідженні через 3 місяці встановлено: у 2 пацієнок після реконструктивно-відновних операцій та у 8 після видалення JJ стентів отримано добрий результат. У 15 пацієнок проведені операції 2-го етапу: ендоскопічне лікування (діляція (бужування) стриктури сечоводу + установка JJ стента, ендуретеропластика з установкою ендотомічного стенту) – у 7, реконструктивно-відновлювальні операції (уретеронеоцистоанастомоз) відкритим доступом – у 8. Віддалені результати прослідковані у всіх пацієнок в строки від 18 місяців до 4 років. Гарний результат лікування досягнуто у 19 (76,0%) пацієнок, задовільний – у 6 (24,0%). Ендоскопічне лікування пацієнок у дослідній групі показало високу ефективність: у 15 (60,0%) закрито СПН та відновлено уродинаміку на боці травми завдяки використанню малоінвазивних технологій. Усі пацієнти після хірургічного лікування ПС і СПН потребують багаторічного диспансерного спостереження.

**Ключові слова:** пошкодження сечоводу, сечовідно-піхвова нориця, малоінвазивне хірургічне лікування, уретероскопія, стентування сечоводу, черезшкірна пункційна нефростома.

**РЕФЕРАТ****Отдаленные результаты лечения мочеточниково-влагалищных свищей после акушерских и гинекологических вмешательств**

А.Н. Джеремайя

В период с 2010 по 2021 г. непроизвольное подтекание мочи из влагалища в течение 10–40 дней после оперативных вмешательств в акушерских (n=2) или гинекологических (n=23) отделениях отмечено у 25 пациенток. Средний возраст на дату хирургического лечения составил 45,6 года (от 22 до 61). Операции у 15 пациенток выполнены из лапаротомного доступа, у 3 – трансвагинального, у остальных 7 – лапароскопического, а наиболее частой операцией была гистерэктомия в 20 (80,0%) случаях. Пациенты для дальнейшего обследования переведены в клинику урологии Белорусского государственного медицинского университета. Результаты исследования показали, что у всех женщин имелось сочетание повреждения мочеточника (ПМ) и мочеточниково-влагалищный свищ (МВС). С учетом опыта клиники в лечении таких пациентов их ведение было разделено на 2 этапа. На первом – в течение 1–2 суток после перевода у 2 пациенток проведен уретеронеоцистоанастомоз (УНЦА) из открытого доступа, у 14 – установлен JJ стент, у 8 – чрезкожная пункционная нефростома (ЧПНС), у 1 – JJ стент + ЧПНС. При контрольном стационарном исследовании через 3 месяца установлено: у 2 пациентов после реконструктивно-восстановительных операций и у 8 после удаления JJ стентов получен хороший результат. У 15 пациенток проведены операции 2-го этапа: эндоскопическое лечение (дилатация (бужирование) стриктуры мочеточника + установка JJ стента, эндуретеропластика с установкой эндотомического стента) – у 7, реконструктивно-восстановительные операции (уретеронеоцистоанастомоз) из открытого доступа – у 8. Отдаленные результаты прослежены у всех пациентов в сроки от 18 месяцев до 4 лет. Хороший результат лечения достигнут у 19 (76,0%) пациенток, удовлетворительный – у 6 (24,0%). Эндоскопическое лечение пациенток в исследуемой группе показало высокую эффективность: у 15 (60,0%) закрыты МВС и восстановлена уродинамика на стороне травмы удалось с использованием малоинвазивных технологий. Все пациенты после хирургического лечения ПМ и МВС нуждаются в многолетнем диспансерном наблюдении.

**Ключевые слова:** повреждение мочеточника, мочеточниково-вагинальный свищ, малоинвазивное хирургическое лечение, уретероскопия, стентирование мочеточника, чрескожная пункционная нефростомия.