

Surgical Cooperation in Robot-Assisted Laparoscopic Ureteral Reconstruction with Buccal Mucosa Graft: Postprint

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Abstract

Purpose: To investigate the nursing coordination protocol for robotic-assisted laparoscopic ureteral reconstruction using oral mucosa. **Methods:** Clinical data were collected from 30 patients who underwent robotic-assisted laparoscopic ureteral reconstruction using oral mucosa between December 2020 and December 2021. Nursing experience was summarized and key nursing points were analyzed. **Results:** All 30 patients successfully completed the surgery, with an overall average success rate of 95.6%. Medical-nursing cooperation was satisfactory, and no postoperative complications occurred during short-to-medium-term follow-up. **Conclusion:** Adequate preoperative preparation, reasonable operating room layout, and proficient intraoperative cooperation help improve the surgeon's operative efficiency and constitute a critical component in ensuring successful completion of the surgery.

Full Text

Surgical Cooperation in Robot-Assisted Laparoscopic Ureteral Reconstruction Using Oral Mucosa Graft

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Abstract

Objective To explore the nursing cooperation process in robot-assisted laparoscopic ureteral reconstruction using oral mucosa graft. **Methods** Clinical data were collected from patients who underwent robot-assisted laparoscopic ureteral

reconstruction with oral mucosa graft between [dates missing]. Nursing experiences were summarized and key nursing points were analyzed, including intraoperative precision nursing cooperation and postoperative follow-up to ensure surgical success and patient safety during the perioperative period. **Results** All surgeries were completed successfully with an overall average success rate of [percentage missing]. The effect of medical-nursing cooperation was satisfactory, and no postoperative complications occurred during short- and medium-term follow-up. **Conclusion** Adequate preoperative preparation, reasonable operating room layout, and skilled intraoperative cooperation are critical factors for improving surgical efficiency and ensuring successful completion of the operation.

Keywords: da Vinci surgical system; laparoscopy; oral mucosa; ureteral reconstruction; surgical cooperation; sterile barrier system

Introduction

Ureteral stricture is a common urological condition with complex etiologies, including iatrogenic surgical injury, stone impaction, trauma, radiation, infection, peritoneal fibrosis, tumors, and tuberculosis, all of which can cause partial ureteral narrowing. Reconstructive repair of the ureter represents a challenging aspect of urological surgery. Treatment strategies vary significantly depending on the location of the stricture. For lower ureteral strictures, ureteral reimplantation is indicated when the stricture segment is relatively short. For longer strictures, psoas hitch or bladder flap procedures can treat strictures up to [length missing]. For middle and upper ureteral strictures, ureteroureterostomy is feasible when the stricture segment is [length missing]. However, when the stricture segment is too long or anastomotic tension is excessive, ileal ureter substitution or autologous renal transplantation is often selected. These procedures are highly invasive, complex, costly, and associated with numerous postoperative complications.

Recently, autologous tissue transplantation for ureteral repair has developed rapidly. Among these techniques, oral mucosa (buccal or lingual mucosa) grafting for ureteral stricture repair has gained urologists' attention due to its advantages of minimal surgical trauma, high success rate, lower cost, and fewer postoperative complications. Since [year missing], our hospital has introduced the da Vinci robotic surgical system. Trained surgeons operate the robotic arms, which not only filter out physiological tremors and prevent the impact of respiratory movements on surgery but also provide high-resolution three-dimensional imaging that allows surgeons to perceive depth in the surgical field. This enables more precise operations, greater surgical flexibility, shorter operative times, and reduced surgical complications. This article summarizes the nursing cooperation experience in robot-assisted laparoscopic ureteral reconstruction using oral mucosa graft.

1. Materials and Methods

Clinical data were collected from patients who underwent robot-assisted laparoscopic ureteral reconstruction with oral mucosa graft, including [number missing] male patients and [number missing] female patients, with a median age of [age missing] years. Preoperative examinations included ultrasound, antegrade urography, retrograde urography, CT urography, and intravenous pyelography to fully assess renal function. All patients were diagnosed with middle or upper ureteral strictures with a stricture length of [length missing].

1.1 Preoperative Preparation Psychological Care: During preoperative visits, the circulating nurse patiently explained the entire surgical procedure, its reliability, successful cases performed domestically and internationally, and the comprehensive technical level of the surgical team. The nurse emphasized patient complaints, understood their needs, alleviated anxiety, and enhanced confidence in surgery for both patients and their families.

Oral Preparation: Since lingual mucosa graft harvesting is required, patients were instructed to perform oral preparation starting [duration missing] before surgery. They used mouthwash [dosage missing] after each meal three times daily to reduce oral flora. Patients with oral ulcers or infections used furacilin solution for post-meal rinsing [frequency missing] or applied iodine glycerin to ulcer sites. Surgery was performed only after ulcer healing.

Nurse Preparation: Robotic surgery coordination nurses must receive systematic professional training for da Vinci robotic procedures, mastering performance parameters, operating procedures, daily maintenance, and care of robotic surgical equipment. They must pass certification and possess experience in both open and laparoscopic surgery coordination. The robotic coordination nurse completes all preoperative examinations and preparations and actively communicates with surgeons to make appropriate preparations.

Equipment Preparation: Laparoscopic instruments, robotic instruments, robotic instrument arms, robotic lenses, instrument arm covers, camera arm covers, calibrators, oral surgery instruments, barbed sutures, Hem-o-lok clips, sutures, double-J stents and guidewires, and absorbable hemostatic materials were prepared.

1.2 Intraoperative Cooperation Operating Room Layout: A dedicated robotic surgery suite was used with rational arrangement of all equipment. The robotic imaging system was positioned near the foot of the operating bed on the patient's right side outside the sterile field, the high-definition endoscopic monitoring system on the patient's left side, and the surgeon's console outside the sterile field where the surgeon could directly see both the patient and assistants. The circulating nurse connected all power supplies and performed system checks.

Circulating Nurse Cooperation:

Anesthesia and Positioning: Patients received general anesthesia via nasotracheal intubation and were placed in a [degree missing] oblique lateral decubitus position with the affected side up, ensuring safe position transitions. Appropriate chest pillows were selected based on patient height and body type to support the thorax and avoid axillary vessel compression. Both arms were secured on arm boards in an embracing position. The hip was fixed with a support, and the knee was secured with a restraint strap. Soft pillows were placed between knees and ankles to reduce pressure on bony prominences. The affected leg was extended while the healthy leg was flexed to maintain comfort and stability.

Scientific Equipment Placement: The da Vinci robotic system has complex instrumentation, and any equipment failure during surgery can cause problems, affect normal progression, and impact surgical outcomes. All power and data cables must be correctly connected with good contact. Room traffic should be minimized to avoid stepping on or compressing cables. The surgeon's console should be relatively fixed to reduce equipment movement.

Intraoperative Monitoring: The circulating nurse closely monitored the condition, adjusted pneumoperitoneum pressure based on blood gas analysis and airway pressure, and adjusted the position of the bedside mobile system according to surgical needs. The operating room temperature was maintained at [temperature missing] °C, with comprehensive warming measures (such as forced-air warming devices) and continuous temperature monitoring to ensure stability. The circulating nurse closely observed urine color, characteristics, and volume, recorded findings, promptly informed surgeons of urine output, and coordinated with anesthesiologists to adjust fluid infusion rates and medications.

Instrument Nurse Cooperation:

Sterile Field Preparation: The instrument nurse scrubbed [duration missing] minutes early, arranged oral surgery instruments and robotic instruments on separate tables, covered instrument arms with sterile protective covers, raised and secured instrument arms to prevent contamination, and together with the circulating nurse prepared and calibrated the camera system.

Assisting with Pneumoperitoneum and Port Placement: The instrument nurse assisted the surgeon in establishing pneumoperitoneum. A blade was passed to insert a Veress needle [distance missing] cm from the umbilicus. After CO₂ insufflation, a [size missing] mm trocar was placed for the robotic endoscope to inspect for organ injury. Additional trocars were placed at the midclavicular line below the costal margin, [distance missing] cm medial to the anterior superior iliac spine on the anterior axillary line, and above the pubic symphysis to create robotic and laparoscopic ports.

Exposing the Stricture: The instrument nurse passed monopolar scissors and bipolar forceps. The colon was mobilized medially to expose the ureteral stricture segment. Typically, the ureter dilates proximal to the stricture. The

stricture segment and [length missing] cm of normal ureter above and below were completely mobilized while preserving feeding vessels and ureteral sheath. A double-J stent was placed.

Harvesting Oral Mucosa (Lingual Mucosa Example): A mouth retractor was passed to open the oral cavity. The face and oral cavity were disinfected with 5% povidone-iodine. Traction sutures were placed at the tongue tip. The lingual mucosa was marked on one side of the ventral tongue surface. Normal saline was injected submucosally along the marked line. A #15 blade incised the mucosa along the markings. Traction sutures were placed at one end of the incised mucosal strip. The mucosa was dissected in the plane between mucosa and submucosal fat to obtain an oval lingual mucosa graft. The harvested graft was placed in sterile saline at [temperature missing] °C to maintain moisture. Excess fat and muscle tissue were trimmed. The graft was sent into the abdominal cavity to cover the stricture segment with the mucosal surface facing the lumen. Using barbed sutures, the oral mucosa was anastomosed to the incised ureter in a side-to-side fashion without tension. The omentum was wrapped around the grafted ureter segment and fixed with absorbable sutures. The wound was irrigated, a drainage tube placed, and the incision closed.

Reconstructing the Ureter: The trimmed oral mucosa was anastomosed to the incised ureter in a side-to-side fashion using barbed sutures. The omentum was wrapped around the grafted segment and fixed with absorbable sutures. The wound was irrigated, a drainage tube placed, and the incision closed.

Establishing Sterile Barrier: Applying sterile protective covers to instrument and camera arms is a critical step in establishing the sterile barrier, performed jointly by instrument and circulating nurses. Following manufacturer markings and specifications, covers were applied while ensuring the instrument nurse faced the arms to prevent back contamination. Arms were retracted to minimal area for sterile readiness. After system positioning, the circulating nurse secured the robot.

1.3 Postoperative Cooperation During robot removal, the surgeon first straightened all instrument arm joints and released clamped tissues. Assistants and the instrument nurse promptly removed instruments. The circulating nurse disconnected Patient Cart from trocars, removed mechanical arms and camera arm sterile covers, folded all joints to storage positions to avoid collision, disconnected cables, and returned equipment to designated locations. Instruments were cleaned, disinfected, and maintained by specialized supply room staff trained by the da Vinci specialist nurse. Postoperative robot instrument handover records were completed promptly.

2. Results

All patients successfully completed surgery with an overall average success rate of [percentage missing]. Medical-nursing cooperation was satisfactory, and no postoperative complications occurred during short- and medium-term follow-up.

3. Discussion

Oral mucosa is smooth, hairless, easily harvested and regenerated, and maintained in a warm, moist environment with thick epithelial tissue. It contains high levels of elastic fibers, a thin lamina propria, and high capillary density, which promote revascularization. Unlike intestinal mucosa, oral mucosa does not reabsorb urinary metabolites, avoiding metabolic disturbances, urinary tract infections, and intestinal obstruction. After transplantation, the graft survives well with good patency, effectively preventing graft retraction, necrosis, and urinary leakage.

The key to robot-assisted laparoscopic ureteral reconstruction with oral mucosa graft is protecting the ureteral adventitia and sheath integrity, which is crucial for successful anastomotic healing. The “ureteral bed” containing blood supply should be preserved as much as possible, allowing the autologous tissue to be embedded and anastomosed, which promotes graft survival.

The da Vinci robot expands the surgeon’s vision and capabilities, offering clear three-dimensional visualization, delicate movements, and tremor filtration, significantly improving surgical precision. However, this breaks traditional surgical cooperation patterns and presents higher demands for operating room nursing, requiring new challenges in coordination methods, personnel, and objects, representing a new horizon, perspective, technology, and breakthrough for nursing staff. Robotic surgery success heavily depends on 默契 cooperation among surgeons, anesthesiologists, and nurses. Unlike conventional surgery where surgeons and instrument nurses share the same field of view, the robotic surgeon experiences 3D imaging while the team views 2D imaging, creating different depth perceptions. Therefore, instrument nurses must constantly communicate with surgeons to dynamically adjust robotic arms and avoid conflicts. All team members should enhance their professional competence and foster collaborative teamwork to ensure smooth robotic surgery.

Robot-assisted laparoscopic ureteral reconstruction using oral mucosa graft offers advantages of minimal trauma, rapid recovery, and short hospital stay. Compared with conventional laparoscopy, the robot’s three-dimensional visualization platform, multi-angle wrist articulation, and superior ergonomics improve the precision and efficiency of intracorporeal suturing in ureteroplasty, warranting broader clinical application.

Conflict of Interest Statement: The authors declare no conflict of interest.

References

[References listed in original text, numbered and formatted according to journal style]

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