SKILL AND TALENT

Surgical technique for en bloc transurethral resection of bladder tumor with a Hybrid Knife®

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Received 13 September 2015; accepted 3 November 2015
Available online 19 March 2016

Abstract
Background: Bladder cancer is the second most common malignancy of the urinary tract and the 9th worldwide. Latin American has an incidence of 5.6 per 100,000 inhabitants per year. Seventy-five percent of newly diagnosed cases are nonmuscle invasive bladder cancer, and 25% of cases present as muscle invasive. The mainstay of treatment for nonmuscle invasive bladder cancer is loop transurethral resection. In 2013, the group led by Dr Mundhenk of the University Hospital of Tübingen, Germany, was the first to describe the Hybrid Knife® equipment for performing en bloc bladder tumor resection, with favorable functional and oncological results.
Objective: To describe the surgical technique of en bloc bladder tumor resection with a Hybrid Knife® as an alternative treatment for nonmuscle invasive bladder tumors.
Material and methods: A male patient was diagnosed by urotomography and urethrocystoscopy with a bladder tumor measuring 2 × 1 cm on the floor. En bloc transurethral resection of the bladder tumor was performed with a Hybrid Knife®.
Results: Surgery was performed for 35 min, with 70 W for cutting and 50 W for coagulation, resecting and evacuating en bloc the bladder tumor, which macroscopically included the muscle layer of the bladder. There were no complications.
Conclusion: The technique of en bloc bladder tumor resection with Hybrid Knife® is an effective alternative to bipolar loop transurethral resection. Resection with a Hybrid Knife® is a procedure

Keywords
Hybrid Knife®; En bloc transurethral resection of bladder tumor


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Técnica quirúrgica de la resección transuretral de tumor vesical en bloque con Hybrid Knife®

Resumen

Antecedentes: El cáncer vesical es la segunda malignidad más común del tracto urinario y la novena a nivel mundial, en Latinoamérica con incidencia de 5.6 por cada 100,000 habitantes por año. El 75% de casos nuevos diagnosticados son cáncer vesical no músculo invasivos y el 25% se presenta con invasión muscular. El pilar del tratamiento del cáncer vesical no músculo invasivo es la resección transuretral con asa. En 2013 el grupo del Dr. Mundhenk del Hospital Universitario de Tübingen, Alemania, fueron los primeros en describir el equipo Hybrid Knife® para realizar resección de tumor vesical en bloque con resultados funcionales y oncológicos favorables.

Objetivo: Describir la técnica quirúrgica de resección de tumor vesical en bloque con Hybrid Knife® como alternativa de tratamiento para los tumores vesicales no músculo invasivos.

Material y métodos: Varón con tumor vesical diagnosticado por urotomografía y uretrocistoscopía de 2 x 1 cm en piso, se realizó resección transuretral de tumor vesical en bloque con Hybrid Knife®.

Resultados: Se realizó cirugía, en 35 min, con 70 watts en corte y 50 watts en coagulación, rescatando y evacuando en bloque el tumor vesical incluyendo macroscópicamente capa muscular de la vejiga, sin complicaciones.

Conclusión: La técnica de resección de tumor vesical en bloque con Hybrid Knife® es una alternativa eficaz a la resección transuretral con asa bipolar. La resección con Hybrid Knife® es un procedimiento con escaso sangrado, buena visión quirúrgica, minimizando el riesgo de perforación vesical o implantes tumorales con mayor facilidad para lograr determinar positividad de proceso neoplásico, infiltración vascular e invasión a músculo vesical en estudio histopatológico.

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Introduction

Bladder cancer is the second most common malignancy of the urinary tract and the ninth worldwide, with 357,000 new cases and 145,000 deaths per year.¹ In Latin America, it has an incidence of 5.6 per 100,000 inhabitants per year. In Mexico, it is in the fourth place of presentation, with 14.4% of tumors diagnosed, with a male:female ratio of 3.8:1.² 75% of newly diagnosed cases are non-muscle invasive bladder cancer with a high rate of recurrence and progression despite local therapy. 25% present with muscular involvement and need radical surgery, radiotherapy, systemic therapy, or combination of them, with poor cancer prognosis in their follow-up.³

The best differentiated risk factors are hereditary genetic predisposition and external exposure to carcinogens like cigarette smoke.⁴ The first intervention is essential for the diagnosis and prognosis having as the main oncological objective complete micro and macroscopic resection.⁵ The most important variables to predict recurrence are: (a) multiplicity; (b) primary rate of recurrence, and (c) size of the tumor.⁶

The base of treatment of non-muscle invasive bladder cancer is loop transurethral resection. For invasive cancer, radical cystectomy is the treatment of choice, associated with urinary diversion.⁷ With conventional transurethral resection (TUR-BT), the oncologic block resection principle cannot be achieved in most bladder tumors, due to the limitations of the resection loop, the tumor can only be resected in several fractions.

The prognosis of non-muscle invasive disease is excellent, the estimated 5-year survival is reported in up to 94%.⁷ This study will help describe a new technique for treating non-muscle invasive bladder cancer as an alternative using monopolar electrode Hybrid Knife®, technology commonly used in endoscopic gastrointestinal surgery for resection of polyps and masses of the digestive tract.

In the urological field, Mundhenk et al., in the Department of Urology, University Hospital of Tübingen, in Tübingen, Germany, in 2013, were the first to describe the Hybrid Knife® equipment for resection of bladder tumor en bloc with favorable functional and oncological results, where 16 patients were operated without major complications (Clavien I), without significant loss of hemoglobin, with pathology reports of 4 benign, 3 Cis, 7 pT1a, 2 p T1, and 1 pT2a.⁸

Our aim was to describe the technique of transurethral resection of bladder tumor en bloc with Hybrid Knife®,
performed in the Central Military Hospital in Mexico City.

**Material and method**

It is a male patient in the eighth decade of life, severe chronic smoker, presented to outpatient urology referring clot forming macroscopic hematuria without hemodynamic or hematologic impact. Within its diagnostic approach, laboratory and image studies are sent; within renal ultrasound without impact of upper urinary tract and in bladder ultrasound bladder tumor is evident in bladder floor, confirming by urotrography the presence of bladder tumor of approximately 2 × 1 cm, located on the floor. Surgical management is decided by transurethral resection of en bloc bladder tumor resection with Hybrid Knife®.

Previous preoperative evaluations, the patient underwent peridural block and lithotomy position; usual STORZ 22 Fr laser urethrocystoscopy with continuous flow was carried out; finding arboriform bladder tumor of 2 × 1 cm approximately, located on the floor; using monopolar electrosurgical equipment VIO 300 ERBE (Tübingen, Germany) coupled to console ERBEJET 2 for waterjet probe Hybrid Knife® I-Type (7 Fr) with parameters of 70 W of cutting and 50 W of coagulation, with bags of glycine solution for irrigation, located 50 cm above the bladder and connected to cystoscope and with outlet drain with continuous flow system.

Under direct vision of bladder tumor, Hybrid Knife® I-Type (7 Fr) probe is externalized through STORZ (22 Fr) cystoscope (7 Fr), comprising a high-frequency electrode at the distal end whose hollow shaft is also used as a water jet nozzle. Subsequently, by using monopolar electrosurgical equipment VIO 300 ERBE, circumferential safety margin of resection is marked with punctiform coagulation spaced 5–7 mm of tumor (Fig. 1); then Hybrid Knife® I-Type (7 Fr) probe is placed on peritumoral bladder mucosa and with ERBEJET 2 waterjet application is performed at an angle of 20°, a waterbed under the bladder tumor causing hydrodissection, accumulating a waterbed in the collagen fibers of the submucosa (Fig. 2).

Subsequently, an incision is made on the hydrodissected mucosa with Hybrid Knife® I-Type (7 Fr) probe with parameters of monopolar electrosurgical equipment VIO 300 ERBE in 70 W of cutting and 50 W of coagulation following the contour of the initial circumferential mark, making resection of the tumor lesion in a single block including bladder muscle layer with negligible bleeding, evacuating it with Elick device (Fig. 3); finally clotting of the surgical site is performed (Fig. 4) to the satisfaction of the surgeon and 3-way urethral catheter is placed with continuous flow irrigation with saline at 0.9%, ending surgery without complications according to Clavien Dindo modified classification. The resection product of the bladder tumor en bloc is sent to histopathology study.

The patient recovered from anesthesia passes to the hospitalization room, removing the irrigation 8 h after surgery, properly evolving and being discharged the next day with urethral catheter, removed after 7 days. He is valued the following week in outpatient consultation and the histopathological report is reviewed with low-grade non-muscle invasive urothelial carcinoma, pT1aN0M0.

**Results**

The total operating time of the procedure was 35 min, the time of the 4 stages of work (marking, elevation, incision/dissection, and coagulation) without requiring any
transfuse the patient, with a postoperative hospital stay of 24 h without development of electrolyte disturbances and with average time carrying urethral probe of 7 days. From the oncological point of view, a single block of bladder cancer was analyzed including muscle layer, reporting non-muscle invasive urothelial carcinoma, with negative vascular permeation.

Discussion

Bladder tumors are one of the most common oncological pathologies that the urologist faces. Most bladder non-muscle invasive tumors are treated with transurethral resection using a loop electrode with conventional mono or bipolar energy. However, depending on the technique used and the surgeon’s experience, some specimens resected conventionally are inappropriate for histopathological evaluation due to disorientation and fragmentation, occasionally leading to inconclusive pathology reports regarding muscle tumor invasion, thus causing uncertainty and delays in definitive treatments for patients.

This surgical technique is a promising attempt to implement the oncological principles of single block resection of the tumor in the endourological treatment of bladder tumors. Among its advantages, it was noted that it is a procedure that from the technical point of view is easy to perform, simplifies the technique by not needing to change the instrument during the procedure, which shortens the time thereof, where the submucosal water pillow remains intact during dissection and resection, but being able to dynamically add additional liquid if necessary to ensure its protective function throughout the entire procedure, also because the blood vessels are compressed by the fluid cushion it is achieved that surgery can be performed with little bleeding and a good view of the target area. Also, the submucosal waterbed forms a safety margin with the muscle layer providing protection against the thermal damage of that layer, getting to minimize like that the risk of bladder perforation or tumor implants due to zero fragmentation of the tumor. Finally, the Pathology department reported macroscopically and microscopically greater ease to get to determine positivity of neoplastic process, vascular infiltration, and invasion to bladder muscle.

Among its disadvantages detected, the cost exceeds conventional transurethral resection surgery, in bladder tumors with diameters larger than 2 cm, located in bladder dome or muscle invasive it is complicated to conduct hydrodissection and resection of the block mass meriting serial partial resections, resulting in a complex pathologic evaluation and final report with less certainty.

Conclusions

Finally, we can establish that en bloc transurethral resection with Hybrid Knife® is a safe alternative and with adequate functional and oncological postoperative results for patients, suggested in patients, with bladder tumors suspected non muscle invasive and with diameters smaller than 2 cm, being able to be conducted in patients with coagulopathy.

changes of the instrument and achieving transurethral resection of bladder tumor en bloc with Hybrid Knife® was 35 min, including muscle layer without presenting bladder perforation or significant bleeding, without the need to
Resection of bladder tumor with a Hybrid Knife®

Ethical responsibilities

People and animal protection

The authors state that for this investigation no experiments in humans or animals were carried out.

Data confidentiality. The authors declare that no patient data appear in this article.

Right to privacy and informed consent. The authors declare that no patient data appear in this article.

Funding

No sponsorship of any kind was received to carry out this article.

Conflict of interest

The authors declare that they have no conflict of interest.

References