



## SKILL AND TALENT

# Nephroscopy with carbon dioxide in combination with laparoscopy in the treatment of urinary stones<sup>☆</sup>

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### KEYWORDS

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### Abstract

**Objective:** Laparoscopy in combination with nephroscopy is rarely used for the treatment of complex urinary stones or anatomical abnormalities with difficult access to stones. During the nephroscopy, in an opened renal pelvis, large amount of fluid leaks and collects in the peritoneal cavity and can be a drawback. In these cases, the nephroscopy with use of carbon dioxide (CO<sub>2</sub>) can be an alternative. We present our experience in with this technique.

**Material and method:** We performed surgeries using the 3-port transperitoneal technique. Five patients with urolithiasis were included. Three patients had concomitant ureteropelvic junction (UPJ) stenosis, one with stones in ectopic kidney, and the third had a large stone impacted in the proximal ureter. Patients were treated by pyelolithotomy or ureterolithotomy combined with flexible nephroscopy using CO<sub>2</sub> and dismembered pyeloplasty was performed in appropriate cases. A flexible cystoscope was passed through a port and guided laparoscopically through the opening in the renal pelvis. The gas cannula was connected to the irrigation channel of the endoscope to insufflate CO<sub>2</sub> and calculi were extracted with a nitinol basket.

**Results:** Median age was 45 years (24–58). Mean operative time of nephroscopy was 22.4 minutes (range 15–48). Mean intra-operative blood loss was inestimable. There were no complications or conversion. Residual lithiasis requiring ureteroscopy was present in one patient.

**Conclusions:** Flexible nephroscopy using CO<sub>2</sub> in combination with laparoscopy is a feasible and effective technique for the treatment of urinary stones in selected cases to avoid accumulation of fluid in the peritoneal cavity.

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**PALABRAS CLAVE**

Riñón;  
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Pielolitotomía

## Nefroscopia con uso de dióxido de carbono en combinación con laparoscopia para el manejo de la litiasis urinaria

**Resumen**

**Objetivos:** La laparoscopia en combinación con nefroscopia se ha usado en raras ocasiones para el tratamiento de litiasis urinarias complejas o con anomalías anatómicas que presentan cálculos de difícil acceso. Con la pelvis renal abierta, la fuga del líquido de irrigación hacia cavidad peritoneal puede ser inconveniente. La nefroscopia empleando dióxido de carbono (CO<sub>2</sub>) es una alternativa en estos casos. Nuestro objetivo es presentar nuestra experiencia con dicha técnica.

**Material y métodos:** Empleamos abordaje transperitoneal con tres trócares. Cinco pacientes con litiasis urinaria fueron incluidos. Tres casos presentaban estenosis de la unión pielo-ureteral, un caso tenía riñón pélvico y un último caso tenía un cálculo grande impactado en el uréter proximal. Se les realizó pielolitotomía o ureterolitotomía laparoscópica en combinación con nefroscopia flexible empleando CO<sub>2</sub> y pieloplastia laparoscópica en los casos correspondientes. Se insertó un cistoscopio flexible a través de un trocar y se dirigió hasta las cavidades renales. La manguera del gas se conectó al canal de irrigación del endoscopio para insuflar el CO<sub>2</sub> y se realizó la extracción de los cálculos con cesta.

**Resultados:** La edad promedio de los pacientes fue 45 años (24-58). El tiempo operatorio promedio de la nefroscopia fue 22,4 minutos (15-48) y el sangrado intraoperatorio fue inestimable. No se presentaron complicaciones ni conversión. Un paciente presentó litiasis renal residual que precisó ureteroscopia.

**Conclusiones:** La nefroscopia flexible empleando CO<sub>2</sub> en combinación de laparoscopia es factible y efectiva para el tratamiento de la litiasis urinaria en casos seleccionados, ya que evita la acumulación de líquido en la cavidad peritoneal.

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**Introduction**

In current clinical practice, laparoscopic surgery is rarely used to treat urinary stones, because most of the calculi are eliminated successfully using endourological techniques or by shock waves.<sup>1,2</sup>

The combination of laparoscopic procedures with endourological techniques has been described, and it offers significant benefits for the management of complex lithiasis with anatomical abnormalities. The removal of the stones during laparoscopic pyelolithotomy can be performed with laparoscopic atraumatic forceps; however, it can be difficult and traumatic to reach some calyceal stones with rigid instruments. Inserting a flexible nephroscope guided by laparoscopic assistance allows for a systematic inspection of all renal cavities and the stones can be removed in their entirety.<sup>3-5</sup>

Flexible nephroscopy combined with laparoscopy may have some disadvantages because of irrigation with saline solution. The problem occurs because the renal pelvis is open, as the fluid may leak into the peritoneal cavity. Furthermore, the interphase between the liquid and gas from the pneumoperitoneum can alter intrarenal vision. Mason and Hoening described the technique of flexible nephroscopy using CO<sub>2</sub> in combination with laparoscopy in the treatment of urinary stones in order to avoid irrigation with saline solution.<sup>6</sup>

We present our experience on the feasibility and effectiveness of nephroscopy with use of CO<sub>2</sub> in combination with laparoscopy for the management of the urolithiasis.

**Patients and methods**

A total of 5 patients with urolithiasis underwent laparoscopic surgery in combination with nephroscopy using CO<sub>2</sub>. Of these, three had multiple pyelic lithiasis together with stenosis of the UPJ with indication for surgical treatment. They underwent laparoscopic pyelolithotomy, flexible nephroscopy with use of CO<sub>2</sub> and Anderson-Hynes laparoscopic pyeloplasty. The fourth case is a patient with calyceal stones in a pelvic kidney who underwent laparoscopic pyelolithotomy and flexible nephroscopy with CO<sub>2</sub>. The last case is a patient with a large calculus impacted in at the level of the proximal ureter, which during laparoscopic ureterolithotomy shifted to the renal pelvis and required CO<sub>2</sub> ureteronephroscopy. In all the patients, informed consent was obtained for the surgical procedures suggested. All the patients underwent preoperative imaging studies (intravenous urography and/or computerized axial tomography).

The indications for laparoscopic surgery for urinary tract stone disease are well established and are as follows: when both calculi with anatomical abnormalities coexist (ectopic kidney, horseshoe kidney, renal malrotation, etc.), or in situations with anatomical changes following a surgical procedure such as renal transplantation; symptomatic stones in diverticula of the renal pelvis that cannot be managed by endoscopic techniques; very hard, impacted, and large calculi (>15 mm) mainly in children; when both nephrolithiasis with another renal disease that requires laparoscopic surgery, such as laparoscopic pyeloplasty in the stenosis of the UPJ, coexist; and when there is an economic

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