



## Original article

# Robotic Resection of the Liver Caudate Lobe: Technical Description and Initial Consideration<sup>☆</sup>



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## A B S T R A C T

**Background:** First described in 2002, the use of robotic liver surgery has not spread widely due to its high cost and the lack of a standardized training program. While still considered a technique ‘under development’, it has the potential to overcome the traditional limitations of the laparoscopic approach in liver surgery.

**Methods:** We analyzed the postoperative outcomes of 10 patients who had undergone robotic partial resection of the caudate lobe (Spiegel lobe) from March 2014 to May 2016 in order to evaluate the advantages of the robotic technique in the hands of a young surgeon.

**Results:** The mean operative time was 258 min (150–522) and the estimated blood loss 137 ml (50–359); in none of the cases was blood transfusion required. No patients underwent conversion to open surgery; the overall morbidity was 2/10 (20%), and none of the complications (biliary fistula and pleural effusion) required surgical revision. At histological examination, the mean tumor size was 2.63 cm, and we achieved an R0-resection rate of 100%. The 90-day mortality rate was null. The 1-year overall and disease-free survival rates were 100% and 80%, respectively.

**Conclusions:** Despite several concerns regarding cost-effectiveness, fully robotic partial resection of the caudate lobe is an advantageous, implementable technique that provides promising short-term postoperative outcomes with an acceptable benefit–risk profile.

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## Resección robótica del lóbulo hepático caudado: descripción técnica y consideraciones iniciales

## R E S U M E N

**Introducción:** La cirugía hepática robótica descrita por la primera vez en 2002 no se ha extendido ampliamente debido a su alto costo y a la falta de un programa de entrenamiento

## Palabras clave:

Técnica quirúrgica

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Cirugía robótica  
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estandarizado. Aún siendo considerada como una técnica de “desarrollo en progreso”, tiene, sin embargo, potencial para superar las limitaciones tradicionales del abordaje laparoscópico en las intervenciones hepáticas.

**Métodos:** Se analizaron los resultados postoperatorios de 10 pacientes sometidos a resección robótica de lóbulo caudado (lóbulo de Spiegel) desde Marzo de 2014 hasta de Mayo 2016 para evaluar las ventajas de la técnica robótica.

**Resultados:** El tiempo medio de operación fue de 258 min (150-522) y la pérdida estimada de sangre 137 ml (50-359), en ninguno de los casos una transfusión de sangre fue necesaria. Ningun paciente se sometía a una conversión a cirugía abierta; la morbilidad global fue de 2/10 (20%) y todas las complicaciones (fístula biliar y derrame pleural) fueron clasificadas como menores. En el examen histológico, el tumor diámetro medio fue de 2.63 cm y se logró realizar la resección R0 en 100% de casos (10/10). La tasa de mortalidad a los 90 días fue nula. Las tasas de supervivencia general y de supervivencia libre de enfermedad a 1 año fueron de 100% y 80%, respectivamente.

**Conclusiones:** A pesar de varias preocupaciones con respecto a la rentabilidad, la resección robótica del lóbulo caudado es una técnica ventajosa y aplicable, que proporciona prometedores resultados postoperatorios a corto plazo con un perfil de riesgo-beneficio aceptable.

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## Introduction

Firstly described in 1992, the introduction of minimally invasive surgery (MIS) for liver resections has been slower than in other surgical fields. An impressive meta-analysis including 31 publications and 2473 patients<sup>1</sup> has demonstrated superior results of the laparoscopic approach for hepatic procedures in terms of estimated blood loss, transfusion rate, post-operative pain, shortened length of hospital stay and enhanced cost-effectiveness in comparison to open approach with similar morbidity and mortality rates showing similar findings as previously published by other authors.<sup>2,3</sup>

These advantages can be potentially beneficial with regard to the overall survival ensuring a faster postoperative return to normal activities and faster adjuvant chemotherapy start time.<sup>4,5</sup>

Considering serious clinical and surgical challenges in patients presented with hepatocellular carcinoma (HCC), the potential advantages of MIS technique in liver interventions are even more significant with regard to an opportunity to preserve the abdominal wall integrity and the function of diaphragm. In fact, by this approach a better collateral venous drainage is maintained leading to a less risk of postoperative ascites and lower number of post-operative adherence.<sup>6,7</sup>

Despite no oncologic disadvantages of MIS with respect to open technique in terms of resection margin infiltration, local recurrence, 5-year overall survival and mortality,<sup>8,9</sup> the implementation of the above approach is still confined to highly specialized centres.

However, while the number of worldwide laparoscopic resections reported per year increased from 1471 procedures in 2009 to 1908 in 2014, the rate of complex hepatectomies performed in a minimally invasive fashion still remains low.

It is worthy of note that the use of the laparoscopic equipment is hampered by the presence of many already well-

known drawbacks: the compromised dexterity, the limited degrees of motion (only 4) and the fulcrum effect associated with a physiological tremor. The mentioned features are potential deterrents to the widespread adoption of the minimally invasive laparoscopic liver surgery.<sup>10</sup>

Laparoscopic isolated caudate lobectomy is considered a particularly risky and difficult procedure that has been reported rarely. In fact, only few case series of S1-resection have been described, mainly in the context of technically dyshomogeneous series.<sup>11-13</sup>

Caudate lobe liver resection is a challenging procedure because of the unique and complicated anatomy of the lobe (deep location and proximity to great vessels due to the position between the major vascular structures with the IVC posteriorly, the portal triad inferiorly and the hepatic venous confluence superiorly). Furthermore, the variability of portal and arterial flow as well as the complex venous and biliary drainage system oblige surgeons to perform a meticulous vascular control.

Even though the isolated robotic resection of hepatic segment I has been reported in a context of small series, there is still a lack of systematic robotic technical descriptions of the procedure provided along with the analysis of postoperative outcomes in the literature.

The aim of this work is to describe our technique for robotic isolated partial caudate lobectomy (Spiegel lobe resection) by left-sided approach and our initial experience as well as technical considerations in a series of patients, providing a retrospective analysis of our case-series short-term outcomes associated with the above surgery.

## Methods

Between March 2014 and May 2016, 10 consecutive patients underwent robotic isolated partial caudate lobe resection. A

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