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# Treatment of difficult-to-treat choledocholithiasis by cholangioscopy and laser lithotripsy: new technology for an old problem. A case report

## *Tratamiento de la coledocolitiasis de difícil manejo mediante colangioscopia y litotripsia con láser: nueva tecnología para un viejo problema. Reporte de un caso*

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**Keywords:** Cholangioscopy, SpyGlass DS™, lithotripsy.

***Palabras clave:*** *Colangioscopia, SpyGlass DS, litotripsia.*

**ABSTRACT**

**Introduction:** Endoscopic visualization of the biliary tract and the pancreatic duct has been performed for the past two decades. However, its application in daily practice in endoscopy units is infrequent. Modifications made to the cholangioscope in the past few years have greatly improved its operativity, and its combination with optical fiber now enables the treatment of difficult-to-treat calculi in both the biliary tract and the main pancreatic duct. This paper describes the first case treated with the SpyGlass™ DS (Boston Scientific) cholangioscopy system and laser lithotripsy in Mexico. Choledocholithiasis was resolved without complications. Improvements to this endoscope have led to superior functionality. Applying this technology offers a new therapeutic tool to safely resolve difficult-to-treat calculi, as shown in this case.

***RESUMEN***

***Introducción:*** *La visión endoscópica de la vía biliar y del conducto pancreático se lleva a cabo desde hace dos décadas. Sin embargo, su aplicación en la práctica diaria en las unidades de endoscopia es poco frecuente. Las modificaciones que se han realizado en los últimos años al colangioscopio brindan una mejoría muy importante en su operatividad, y en combinación con la fibra óptica, han permitido el tratamiento de litos de difícil manejo, tanto de la vía biliar como del conducto pancreático principal. Descripción del primer caso tratado mediante colangioscopia con SpyGlass DS (Boston Scientific) y litotripsia con láser en México. Resolución de la coledocolitiasis sin complicaciones. Las mejoras efectuadas a este endoscopio permiten una funcionalidad superior. La aplicación de esta tecnología brinda una nueva herramienta terapéutica en la resolución de los litos de difícil manejo con seguridad, como mostramos en este caso.*

## INTRODUCTION

Endoscopic visualization of the biliary tract has been performed worldwide for over two decades. However, endoscopes that were used for this purpose used to be fragile, not very functional and very expensive, besides requiring the coordinated work of two endoscopists.[1,2]

The first cholangioscopes had a single control in the control unit that only allowed deflection of the tip; vision was limited and dark, since they were made of optical fiber.[3]

In February 2015, the SpyGlass™ DVS by Boston Scientific (Natick, Mass.) was introduced into clinical practice. It was an improved cholangioscope, that solved many optical and functionality problems, allowing the successful

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treatment of difficult-to-treat calculi through laser fragmentation.

"Difficult-to-treat calculi" are defined as those biliary stones greater than 2 cm in diameter or whose triangular shape impedes their extraction, even with a sphincterotomy and previous balloon dilation of the duct.[4]

The new endoscope is designed to be used by a single endoscopist, and is coupled to the control unit of the duodenoscope *(Figure 1)*. It has better illumination, resolution and visibility angle, which translates into optimized vision; it also has two control units to move the tip in the four usual directions of an endoscope, and a working channel measuring 1.2 mm that allows the passage of an endoscopic forceps to obtain biopsies under direct visualization, or the optic fiber of the laser to perform lithotripsy, as well as an irrigation channel and double optical fiber for illumination.

The new system is connected to a single videoprocessing unit, and the image can be seen in the duodenoscope's monitor or separately, on another monitor *(Figure 2)*.[5,6]

## CASE REPORT

This was 73-year-old male patient with a history of open cholecystectomy twelve years before. Over the previous six months, he developed colicky abdominal pain in the right upper quadrant, reaching an intensity of 10 in the numerical pain scale, radiating to the ipsilateral lower ribs and scapula; the pain was triggered by fatty meals and associated with vomiting, jaundice and dark urine.

***Figure 1:*** *SpyGlass, in blue, coupled to the endoscope's shaft, is introduced through the working channel.*

***Figure 2:*** *SpyGlass, single-use cholangioscope by Boston Scientific.*

On examination, his vital signs were normal. The patient had a painful facial expression. with jaundiced sclera (++/++++). Cardiopulmonary examination revealed no abnormalities. An old right subcostal surgical scar was present. The abdomen was painful on deep palpation at the cystic point, but Murphy's maneuver was negative; the liver was not enlarged and peristalsis was normal. A liver and biliary tract ultrasound was obtained, as well as laboratory tests and MR cholangiography that showed absence of the gallbladder, dilation of the extrahepatic biliary tract to 15 mm in diameter and several images suggesting choledocholithiasis and measuring approximately 13 mm in diameter. Lab tests revealed hyperbilirubinemia with an obstructive pattern.

Based on these findings, an endoscopic cholangiography was performed twice, as well as a sphincterotomy and an attempt to remove the calculi from the biliary tract with an extraction catheter. The procedure failed, so a 10 French Amsterdam plastic stent measuring 10 cm was placed on both occasions.

Consequently, a cholangioscopy with lithotripsy was decided upon. Prophylactic antibiotics and 100 mg rectal indomethacin were given. Under general anesthesia, with

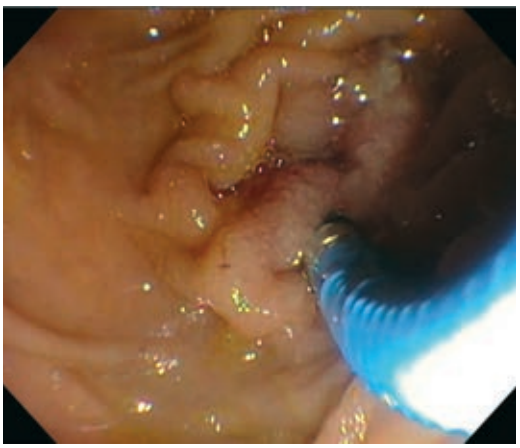

***Figure 3:*** *Cholangioscope exiting the working channel of the duodenoscope and cannulating Vater's ampulla.*

endotracheal intubation and monitoring by the Department of Anesthesiology, with the patient in the left lateral position, an Olympus model TJF-Q 180 duodenoscope was introduced and then, with the patient in the ventral position, it was advanced to the second portion of the duodenum. The Amsterdam stent was removed with a polypectomy snare and the biliary tract was deeply cannulized with a 0.025-mm Jagwire™ guide to mount the SpyGlass endoscope upon it, using the cholangioscope's working channel to facilitate access to the biliary tract. The endoscope was introduced proximally into the biliary tract, bile was aspirated and the area was profusely irrigated; the endoscope was gradually withdrawn to visualize the intrahepatic biliary tract, the junction, the common hepatic duct, the cystic remnant and the common bile duct. Seven calculi were observed, measuring around 2.0 cm in diameter, that were sequentially divided with the holmium laser at 11 watts until all of them were fragmented *(Figure 3)*. The cholangioscope was withdrawn to introduce a balloon catheter and clear any remnants of the calculi; the biliary tract was patent, with no residual stones. Placement of a plastic stent was not necessary. As with all therapeutic endoscopic procedures at our hospital, the patient was hospitalized for 24 hours for follow-up with serum amylase and lipase tests, as well as complete blood count, which were all normal. The patient's course was favorable, with no pain or jaundice one month after the endoscopy *(Figure 4)*.

## DISCUSSION

The two major applications of cholangioscopy are to establish the differential diagnosis of strictures of the biliary tract and the main pancreatic duct, and the endoscopic treatment of difficult to treat calculi in the biliary tract and pancreas.

Cholangioscopy with the use of the new SpyGlass DS cholangioscope has been shown in previous studies to be highly sensitive and specific in the diagnosis of indeterminate stenosis of the biliary tract. With the endoscopic image alone, sensitivity was 90% and specificity was 95.8%, with a positive predictive value of 94.7% and a negative predictive value of 92%. When adding a biopsy obtained under direct visualization, sensitivity was 85%, with a specificity of 100%, a positive predictive value of 100% and a negative predictive value of 88.9%.[7-9]

As for treatment, in previous studies in 31 patients, calculus fragmentation in laser lithotripsy was successful in 100% of cases, 74.2% of which had undergone at least one failed cholangiography using a

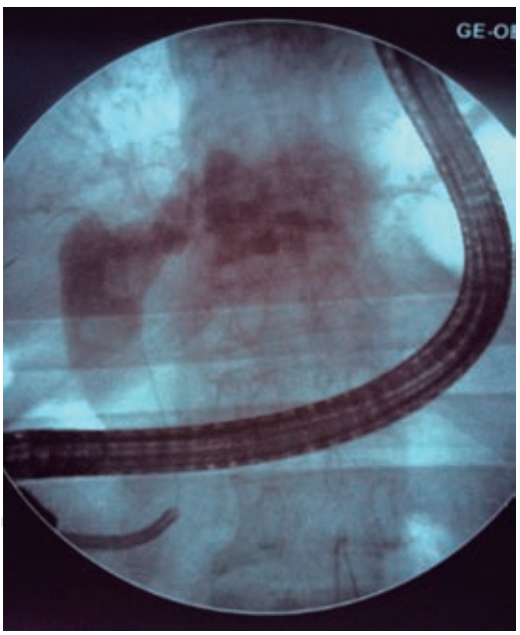

***Figure 4:*** *SpyGlass DVS cholangioscope exiting the duodenoscope and entering the biliary tract; choledocholithiasis.*

basket or balloon catheter. Resolution of choledocholithiasis in a single session occurred in 87.1% of patients.[10-14]

The main potential complications of this procedure are acute pancreatitis and cholangitis. In the literature, their incidence is reported as less than 3%, a figure comparable to that reported in the literature for endoscopic retrograde cholangiopancreatography. In fact, some of the complications result from the previous papillary sphincterotomy, required for SpyGlass DS access, and are not directly attributed to the SpyGlass itself.[15-20]

In our case, the application of this new technology for the first time in our hospital and in Mexico was highly useful, since it allowed us to solve a difficult-to-treat case of choledocholithiasis with two previously failed endoscopic cholangiographies. An elderly patient was spared an open surgery, a longer hospitalization, and the need for a T-drain for an average of five weeks.

## CONCLUSIONS

Improvements in the design of the new SpyGlass DS by Boston Scientific have conferred superior vision and functionality to the device; thus, cholangioscopy is now a new therapeutic tool complementing endoscopic cholangiography in the diagnosis of indeterminate biliary stenosis and in the management of difficult-to-treat calculi lodged in the biliary and pancreatic ducts. Applying this resource will facilitate the endoscopist's daily practice (after the appropriate learning curve of the technique), and provide a most useful therapeutic option to the general surgeon.

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