

A novel dissector device that separates anatomic structures during laparoscopic surgery

Un nuevo dispositivo disector que separa y limpia las estructuras anatómicas durante la cirugía laparoscópica

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Abstract

Objective: To describe a novel dissector device useful in laparoscopy, better definition of anatomic structures to have a better dissection, separation, and cleaning of the structures. **Method:** The endoscopic dissector DisePad was designed and developed at the experimental surgery department of Centro Médico Nacional 20 de Noviembre, and properly patented at Instituto Mexicano de la Propiedad Industrial (title 3512). **Results:** The tip of the device is the most important component, by its direct contact with the different tissues, consists of a cotton-polyester black cloth impregnated with a special gel immersed into a hot saline solution. Once soaked the tip maintains the solution temperature on itself. **Conclusions:** This device has been used in 364 laparoscopic procedures demonstrating, its utility to visualize, separate and clean anatomical structures without thermal lesion, tear, hemorrhage or visceral perforation.

Keywords: Laparoscopic surgery. Laparoscopic dissector. Separate structures.

Resumen

Objetivo: Describir un nuevo dispositivo disector en laparoscopia, con una mejor definición de las estructuras anatómicas para obtener una mejor disección, separación y limpieza de las estructuras. **Método:** El disector endoscópico DisePad fue diseñado y desarrollado en el servicio de cirugía experimental del Centro Médico Nacional 20 de Noviembre, y patentado ante el Instituto Mexicano de la Propiedad Industrial (registro n.º 3512). **Resultados:** El componente más importante del disector es la punta que tiene contacto con los tejidos: es una tela de algodón-poliéster negra impregnada en un gel (patentado) que, al ser sumergido en un termo con solución salina caliente, permite retener la temperatura. **Conclusiones:** Este dispositivo ha sido utilizado en 364 procedimientos quirúrgicos por vía laparoscópica y ha demostrado ser útil para visualizar, separar y limpiar estructuras anatómicas sin producir daño por lesión térmica, desgarro, hemorragia ni perforación visceral.

Palabras clave: Cirugía laparoscópica. Disector laparoscópico. Separación de estructuras.

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Date of reception: 13-02-2023

Date of acceptance: 16-05-2023

DOI: 10.24875/CIRUE.M23000634

Cir Cir (Eng). 2024;92(2):237-242

Contents available at PubMed

www.cirugiaycirujanos.com

Introduction

During laparoscopic surgery, it can be useful to have a tool, an endoscopic dissector, that helps visualize, separate, and clean anatomical structures without causing damage to tissues and organs from thermal injury, tearing, bleeding, or visceral perforation (Fig. 1). An endoscopic dissector can be useful in various surgical procedures, such as cholecystectomy^{1,2}, any fundoplication technique³, esophagocardiomyotomy⁴, colectomy⁵, appendectomy⁶, adhesiolysis, hysterectomy⁷, adrenalectomy⁸, etc. It is possible to improvise an endoscopic dissector with a small gauze ball held by a laparoscopic clamp attached to a long safety suture. Our group has used commercially available laparoscopic dissectors with sponge tips, manufactured by Ethicon and Fabco, and reported low efficiency in dissection; being white, they get saturated with blood, losing pixels on the monitor, and lack an ergonomic handle to facilitate their use (Fig. 2). There are laparoscopic dissectors patented in the United States of America, such as the Laparoscopic Surgical Gauze (USA Patent No. 5,817,121) and the Christoudias Endodissector (USA Patent No. 6,391,040), which are sophisticated instruments, complicated to assemble, sterilizable, and expensive (Fig. 3).

This article describes a new endoscopic dissector, the DisePad, designed and developed in the experimental surgery service of the Centro Médico Nacional 20 de Noviembre. The device was presented on September 23, 2014 to Instituto Mexicano de la Propiedad Industrial, and after analysis and a national and international search, it was determined to be a surgical innovation, granting it Utility Model Registration No. 3512 dated July 13, 2016, signed by the Divisional Director of Patents (Fig. 4).

The disadvantages of current laparoscopic dissectors are:

- Endostik® Bullet (Fabco): The dissector tip is made of white spun cotton, which tends to slide over tissues without achieving efficient dissection, and due to its white color, it quickly saturates with blood and loses pixels on the monitor. Additionally, it lacks an ergonomic handle.
- Laparoscopic Surgical Gauze: The dissector tip is made of cotton cloth, attached to a metal base that must be screwed onto a rod and discarded after the procedure. It also lacks an ergonomic handle. The metal rod must be cleaned and sterilized. It is expensive.

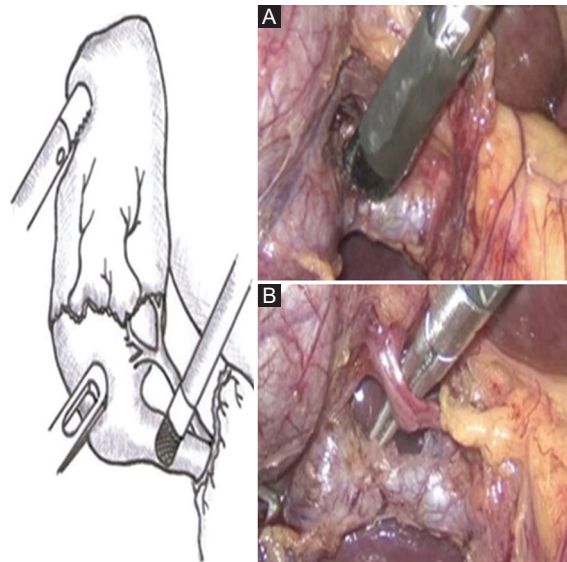


Figure 1. DisePad endoscopic dissector in laparoscopic cholecystectomy. **A:** dissection of the cystic duct. **B:** critical view of dissection with the DisePad.

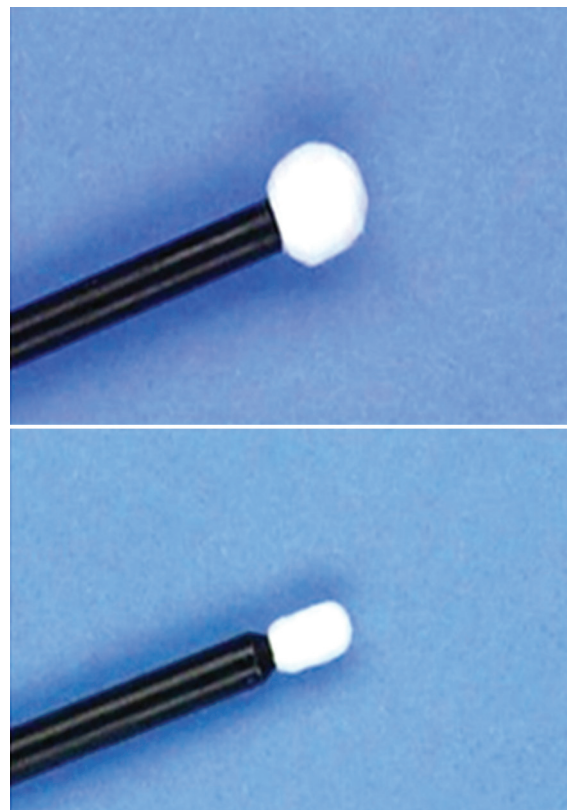


Figure 2. Available and patented laparoscopic dissectors.

- Christoudias Endodissector: The disadvantage of this type of dissector is that the instrument technician must prepare the dissection tip with gauze

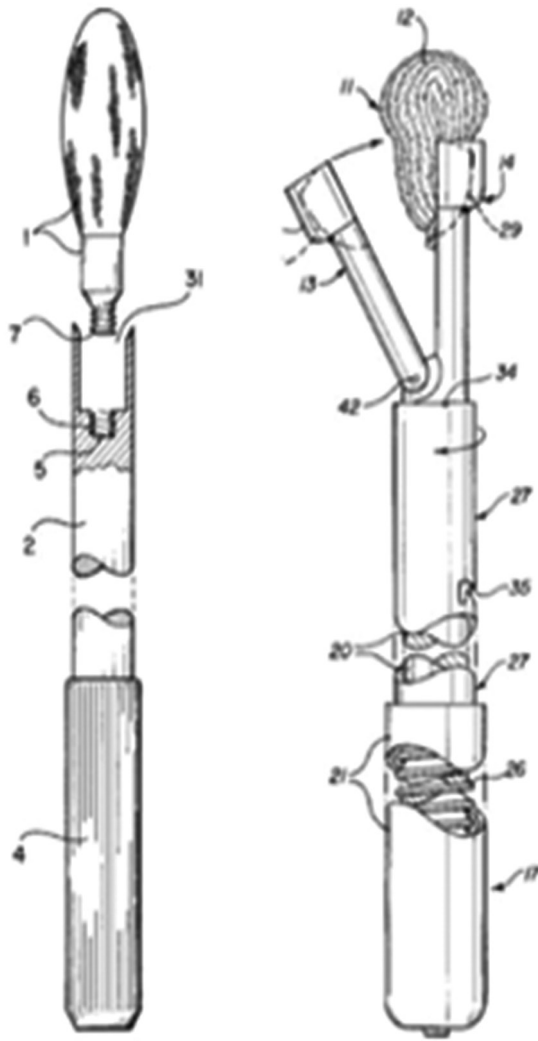


Figure 3. Patented, sophisticated, and high-cost instruments.

and place a suture at the base. This dissection tip is introduced into the tip, which is closed with a clamp. It is cumbersome to prepare and expensive.

The advantages of the DisePad laparoscopic dissector are:

- It features a black cotton-polyester fabric impregnated with a patented gel that retains temperature when immersed in hot sterile solution in a thermos, thus making tissue dissection easy, with minimal bleeding and greater efficiency and safety.
- The black color of the fabric prevents pixel loss on the monitor, unlike white tips.
- It has an ergonomic handle that allows easy and comfortable manipulation by the surgeon.

- The second version of the dissector has the same cotton-polyester fabric tip impregnated with the patented gel on a Thermofit adhesive tape, with the great advantage that it can be quickly placed on any laparoscopic clamp without affecting the instrument. This second version is less expensive and more environmentally friendly. (See on YouTube: Dise-Pad Dissector Tip placement in reusable dissector forceps. Luis Padilla MD.)



Our group has used the DisePad in 246 patients undergoing various laparoscopic surgery procedures and observed the assistance and safety it offers during dissection. We are developing a comparative study in the laparoscopic cholecystectomy procedure with and without the device, assessing the time to achieve a “critical view” with the cystic duct and artery perfectly dissected and visible before placing the clip on each anatomical structure. With evidence from comparative videos, the results will be the subject of a future publication.

Method

The laparoscopic dissector comes in 2 versions. Version #1 uses a solid aluminum rod with a 4.5 mm diameter and a 35 cm length. One end is reduced to a 3 mm diameter and a 2 cm length. The other end has an ergonomic handle made of polylactic acid (PLA), a biodegradable material, measuring 7 cm along the horizontal axis and 10 cm along the oblique axis. On the reduced end of the aluminum rod, a black cotton-polyester fabric treated with a patented gel that retains high temperature for greater efficiency in tissue dissection is placed. To secure and retain the fabric on the aluminum rod, a black heat-shrink tube (Thermofit) made of olefinic-polyethylene polymer is used, resulting in a dissector tip 1 cm in length and 5 mm in diameter (Fig. 5). Version #2 consists only of the black cotton-polyester fabric tip treated with the



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TÍTULO DE REGISTRO DE MODELO DE UTILIDAD NO. 3512

Titular(es):	Luis PADILLA SÁNCHEZ		
Domicilio:	Mayorazgo 130, Cons. 803, Col. Xoco, 03330, Deleg. Benito Juárez, Distrito Federal, MÉXICO		
Denominación:	DISECTOR ENDOSCÓPICO QUE SEPARA Y LIMPIA LAS ESTRUCTURAS ANATÓMICAS DURANTE LA CIRUGÍA ENDOSCÓPICA		
Clasificación:	Int.Cl.8: A61B17/32		
Inventor(es):	LUIS PADILLA SÁNCHEZ		

Número:

MX/u/2014/000462

Fecha de presentación:

23 de septiembre de 2014

Hora:

10:33

País:

México

Fecha:

23 de septiembre de 2014

Número:

3512

Vigencia: Diez años

Fecha de Vencimiento: 23 de septiembre de 2024

El registro de referencia se otorga con fundamento en los artículos 1º, 2º fracción V, 6ª fracción III, y 59 de la Ley de la Propiedad Industrial.

De conformidad con el artículo 29 de la Ley de la Propiedad Industrial, el presente registro tiene una vigencia de diez años improrrogables, contada a partir de la fecha de presentación de la solicitud y estará sujeta al pago de la tarifa para mantener vigentes los derechos.

Quien suscribe el presente título lo hace con fundamento en lo dispuesto por los artículos 6ª fracciones III y 7ª bis 2 de la Ley de la Propiedad Industrial (Diario Oficial de la Federación (D.O.F.) 27/06/1991, reformada el 02/08/1994, 25/10/1996, 26/12/1997, 17/05/1999, 26/01/2004, 16/06/2005, 25/01/2006, 06/05/2009, 06/01/2010, 16/06/2010, 26/06/2010, 27/01/2012 y 09/04/2012); artículos 1º, 3ª fracción V inciso a), 4ª y 12ª fracciones I y III del Reglamento del Instituto Mexicano de la Propiedad Industrial (D.O.F. 14/12/1999, reformado el 01/07/2002, 15/07/2004, 26/07/2004 y 7/09/2007); artículos 1º, 3º, 4º, 5ª fracción V inciso a), 16 fracciones I y III y 30 del Estatuto Orgánico del Instituto Mexicano de la Propiedad Industrial (D.O.F. 27/12/1999, reformado el 10/10/2002, 29/07/2004, 04/08/2004 y 13/09/2007); 1º, 3ª y 5ª inciso a) del Acuerdo que delega facultades en los Directores Generales Adjuntos, Coordinador, Directores Divisionales, Titulares de las Oficinas Regionales, Subdirectores Divisionales, Coordinadores Departamentales y otros subalternos del Instituto Mexicano de la Propiedad Industrial (D.O.F. 15/12/1999, reformado el 04/02/2000, 29/07/2004, 04/08/2004 y 13/09/2007).

Fecha de expedición: 13 de julio de 2016

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MX/2016/08774

Figure 4. Registration certificate No. 3512, signed by the Divisional Director of Patents, Mexico.



Figure 5. To secure and retain the fabric on the aluminum rod, a black heat-shrink tube (made of olefinic-polyethylene polymer) is used, resulting in a dissector tip 1 cm in length and 5 mm in diameter.

same patented gel that retains high temperature and, also, includes the double black Thermofit adhesive tape. The advantage is that it can be placed on any laparoscopic clamp and discarded after the surgical procedure without affecting the tool (Fig. 6). To fix the dissector tip on the clamp, the scrub nurse should immerse the tip in the same thermos with hot saline solution used to defog the laparoscopic lens whenever the surgeon requests the instrument. (See on YouTube: DisePad – Dissector tip placement in reusable dissector forceps). There are 2 calibers available: one for a 10 mm trocar and another for a 5 mm trocar.

Results

From the first prototype used on September 23, 2008, in a laparoscopic cholecystectomy until now, our group has successfully used the DisePad in 246 laparoscopic cholecystectomies, 114 laparoscopic funduplications, and 4 laparoscopic colectomies. (See on YouTube: Laparoscopic cholecystectomy with DisePad, Laparoscopic Nissen fundoplication with



Figure 6. Version #2 is only the black cotton-polyester fabric tip treated with the same patented gel that retains high temperature, with the double black adhesive tape, and has the advantage that it can be placed on any laparoscopic clamp and discarded after the surgical procedure without affecting the instrument.

DisePad, Laparoscopic sigmoidectomy with DisePad, and Laparoscopic Right Colectomy with DisePad.)

Discussion

The device, when heated in a saline solution to 70°C, dissects and separates tissues more easily and with less trauma, achieving better visualization of structures such as blood vessels, ducts, or intra-abdominal organs. The dissector tip, being black, prevents the red color of blood from causing pixel loss on the monitor, as happens with white gauze impregnated with blood. It features an ergonomic PLA handle that allows easy manipulation through the trocar and easy dissection movement while being firmly attached to the aluminum rod. It is easy to manufacture, economical, disposable, and can also be used as a surgical traction instrument. Version #2 is only the dissector tip placed on a laparoscopic clamp, having all the previous advantages but with a greater environmental care concept by not having to discard the rod and handle.

Conclusions

This device, designed and patented by the experimental surgery service of the Centro Médico Nacional 20 de Noviembre, meets the objective of dissecting and separating tissues more easily and with less trauma, achieving better visualization of structures such as blood vessels, ducts, and intra-abdominal organs. Version #1, which has an ergonomic handle, facilitates manipulation when entering through the trocar and performing firm dissection movements within the abdominal cavity. Version #2 has the same efficiency in dissection but adds the advantage that, being just a dissector tip adaptable to a reusable laparoscopic clamp, it simplifies its use, is more economical, and protects the environment by not having to discard the aluminum rod and PLA handle of version #1. It is a safe and easy-to-use device, and we believe it can achieve better visualization and dissection of structures. We are developing a comparative study in laparoscopic cholecystectomy with and without the device, assessing the time to achieve the “critical view” with the cystic duct and cystic artery perfectly dissected before clipping. With evidence from comparative videos, the results will be the subject of another publication.

Funding

None declared.

Conflicts of interest

None declared.

Ethical disclosures

Protection of human and animal subjects. The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Confidentiality of data. 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.

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