

ARTÍCULO ORIGINAL



Extraperitoneal technique compared to IPOM plus: Analysis of saved costs to optimize the management of ventral hernia by laparoscopy

Técnica extraperitoneal comparada con IPOM plus: Análisis de costos evitados para optimizar el manejo de la hernia ventral por laparoscopia

Juan Pablo Ruíz ¹ , Arnold José Barrios ² , Neil Valentín Vega ³ , Alejandro Lora ¹,
Gloria Stella Flórez ⁴, Fredy Orlando Mendivelso ⁵

¹ MD, specialist in General Surgery, Department of Surgery, Clínica Universitaria Colombia, Bogotá, D.C., Colombia.

² MD, FACS, specialist in General Surgery; Chief, Surgical Department, Clínica Colsanitas, Clínica Reina Sofía Clinic, Bogotá, D.C., Colombia.

³ MD, FACS, specialist in General Surgery; Department of Surgery, Clínica Reina Sofía, Bogotá, D.C., Colombia. Department of Surgery, Universidad de la Sabana, Chía, Colombia.

⁴ MD, resident of General Surgery, Fundación Universitaria Sanitas, Bogotá, D.C., Colombia.

⁵ MD, MPH, MSc, specialist in Epidemiology; FETP (Field Epidemiology Training Program); Director, Keralty Global Center for Evidence-Based and Informed Medicine. Clínica Reina Sofía, Bogotá, D.C., Colombia.

Abstract

Introduction. Costs in the extraperitoneal repair of ventral hernia by laparoscopy were analyzed from the perspective of the general health system of Colombia, in order to show the benefits of this approach and its economic impact, when compared with the most implemented technique, IPOM plus.

Methods. A cost-benefit economic analysis was performed from the perspective of the General Social Security System in Health (SGSSS) of Colombia, comparing the costs of ventral hernia repair with the extraperitoneal technique, TAPP or TEP, against IPOM plus. The reference costs were taken as established in the rate manual of the Social Security Institute. Data were analyzed with Stata v.15.

Results. Information from 109 procedures was collected and analyzed; 59 of the extraperitoneal group TAPP / TEP and 50 of IPOM plus group, carried out during the years 2015 to 2018, by the abdominal wall group of Clínica Colsanitas, identifying a saving of 69.8 % or cost-benefit results in favor of the extraperitoneal group.

Discussion. The extraperitoneal approach in ventral hernia repair was considered a high cost-benefit strategy for the health system, validated by the experience of the abdominal wall group of Clínica Colsanitas, when

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Correspondence: Fredy Orlando Mendivelso, Calle 127 # 20-78, Clínica Reina Sofía, Bogotá, D.C., Colombia. Telephone: 3043844102. Email: fmendivelso@colsanitas.com

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compared with the usual approach. Given that the inputs used for dissection do not change, the prosthesis used for each of the techniques represents an important cost to consider, both for the system and health institutions.

Keywords: ventral hernia; abdominal wall reconstruction; surgical procedures; surgical mesh; prostheses and implants; surgical wound infection.

Resumen

Introducción. Analizamos los costos en el reparo extraperitoneal de la hernia ventral por laparoscopia, desde la perspectiva del sistema general de salud de Colombia, con el fin de mostrar los beneficios de dicho abordaje y su impacto económico, al compararlo con la técnica más implementada, el IPOM plus.

Métodos. Se realizó un análisis económico de costo-beneficio, desde la perspectiva del Sistema General de Seguridad Social en Salud (SGSSS) de Colombia, comparando los costos del reparo de hernia ventral con la técnica extraperitoneal, TAPP o TEP, versus el IPOM plus. Se tomaron como costos de referencia lo establecido en el manual tarifario de Instituto de Seguros Sociales. Los datos fueron analizados con Stata V.15

Resultados. Se recolectó y analizo información de 109 procedimientos; 59 del grupo extraperitoneal TAPP/TEP y 50 del grupo IPOM plus, realizados durante los años 2015 a 2018, por el grupo de pared abdominal de Clínica Colsanitas, identificando un ahorro del 69,8 % o resultados de costo-beneficio a favor del grupo extraperitoneal.

Discusión. El abordaje extraperitoneal en el reparo de hernia ventral se consideró una estrategia de alto costo-beneficio para el sistema de salud, validado por la experiencia del grupo de pared abdominal de Clínica Colsanitas, al compararla con el abordaje habitual. Teniendo en cuenta que los insumos utilizados para la disección no cambian, la prótesis utilizada para cada una de las técnicas representa un costo importante a considerar, tanto para el sistema como para las instituciones de salud.

Palabras clave: hernia ventral; reconstrucción de pared abdominal; procedimientos quirúrgicos; mallas quirúrgicas; prótesis e implantes; infección de la herida quirúrgica.

Introduction

The presence of an incisional hernia represents a growing problem in public health, due to its impact in quality of life, personal image of patients, the requirement for surgical management and its high incidence, estimated in 10-20% after a laparotomy¹. It is estimated that a quarter of the world population has a ventral hernia throughout its life; increase consistent with what is published in the literature, where the reports increase in direct proportion to the number of laparotomies performed, representing the pathological condition most valued by the surgeons².

The laparoscopic approach to ventral hernia was first described by LeBlanc and Booth, with the implantation of a poly-tetrafluoroethylene mesh, was adhered to the abdominal wall in order to cover the hernia defect³. This technique ushered in a new era in its management, notably

decreasing the morbidity from the surgical wounds in comparison with the open approach, but exposing the complications of the prosthesis in intraperitoneal position, such as migration of the mesh, chronic pain, infection of the operative site, and high costs, what represents a limiting factor for the implementation of this surgical technique. At the same time, it has generated scientific interest for the use and creation of new techniques and approaches, with the aim to achieve an adequate correction of the defect, with lower recurrence rate and complications⁴.

In the search for the right technique to ventral hernia repair several important points have been studied, among them the method of fixation, mesh type, primary closure of the defect and position of the prosthesis; within the latter, the places used in the implantation of the meshes are supra-aponeurotic, bridge, retro-rectal,

preperitoneal and intraperitoneal onlay mesh, or IPOM⁴.

One of the innovative techniques described is the extraperitoneal repair, both TAPP (transabdominal preperitoneal) as well as TEP (total extraperitoneal), initially applied for the inguinal hernias and extrapolated to the management of the ventral hernia, that show some advantages including the convenient position of the prosthesis, which is covered by the peritoneum, associated with a lower adhesions formation rate, and therefore fewer complications associated with the mesh, and minors costs due to the supplies used, especially to the need of a mesh separator from the tissue in the intraperitoneal technique, with a high cost compared with standard meshes⁵.

The aim of the study was to assess the difference between two laparoscopic alternatives used in the repair of ventral hernia, comparing mesh and fixation supplies, and the costs of both alternatives.

Methods

This is an economic analysis of cost-benefit from the perspective of the Colombian health. The costs were defined according to the rate manual of the Social Insurance Institute (ISS), which contains the Unique Code of Procedures in Health (CUPS) for surgical procedures, using as reference the value assigned according to the site or anatomical region, kind and name of procedures, and definition of the process of interest (i.e. Repair of ventral hernia). The procedures analyzed for the base case correspond to a retrospective cohort study performed by the Department of Surgery in two third-level institutions in Bogotá (Clínica Reina Sofia and Clínica Universitaria Colombia).

Population

Adult patients with a diagnosis of ventral hernia and whose repair was carried out by laparoscopic extraperitoneal or by IPOM plus technique were enrolled. The procedures were scheduled and performed by surgeons of the Department of Surgery of two high-complexity institutions

of Bogotá, D.C. The clinical data, the surgical procedure information and costs according to the ISS manual, were collected for each procedure performed during the period of study (2015-2018). The data were systematized in Excel files for analysis.

Statistical analysis

The data analysis included the calculation of frequency measures and central trending. The categorical variables are presented in tables, using the percentages calculation. The evaluation of the normality distribution function of the variables of interest was determined through the test of Shapiro-Wilks. The economic analysis were performed through an expected cost generalized linear model for the repair of ventral hernia, with the use of independent predictors, as the costs associated with the use of meshes and devices from fixation, building the hierarchical model by the effects of the surgical technique, age of the patient, body mass index (BMI), size of the hernia and volume or number of procedures in average in each center, through the next function:

$$Y_i = f(x_i^{(1)}, \dots, x_i^{(k)}) + \xi_i$$

The costs were taken in Colombian pesos (COP) and was modeled with a temporal time of 5 years.

Results

Information of 109 procedures (59 TAPP/TEP and 50 IPOM plus) was collected during the period of 2015-2018 (table 1). In both groups, the majority of the surgeries were performed in women (62%) and the presence of baseline risk was 44%, especially due to high blood pressure and other cardiovascular diseases. The procedures were performed in the adult population, with an average age of 58 years, and based on the reference values of the BMI provided by the World Health Organization (WHO), most of the patients were in state of pre-obesity (BMI = 25 to 29.9 kg/m²).

The incidence of infection at the surgical site (ISO) and relapses during the postoperative

Table 1. Clinical characteristics of the population included in the analysis.

Variable	TAPP/TEP	IPOM plus
	(n= 59)	(n=50)
	Frequency (%)	Frequency (%)
Gender		
Female	40 (67,8)	31 (62,0)
Male	19 (32,2)	19 (38,0)
Presence of comorbidities		
No	17 (28,8)	28 (56,0)
Yes	42 (71,2)	22 (44,0)
Type of comorbidity		
Arterial hypertension	18 (30,5)	-
Cardiovascular disease	12 (20,3)	-
Others	10 (17,0)	12 (24,0)
Hypothyroidism	9 (15,2)	-
Cancer	9 (15,2)	5 (10,0)
Diabetes	6 (10,2)	11 (22,0)
Age in years, mean (SD)	58 (13)	61 (13)
BMI (kg/m ²)	28,2 (4,2)	29,4 (3,8)
Default size (cm ²)	29,2 (54,4)	25 (48)
ISO	1(1,6%)	4 (8%)
Enterotomy	1(1,6%)	2 (4%)
Recurrence	1(1,6%)	2(4)

* SD: standard deviation; BMI: body mass index; ISO: Operative site infection

period was significantly lower in the extraperitoneal group (TAPP/TEP). The sizes of the wall defect were greater in patients taken to ventral hernia repair with extraperitoneal technique (TAPP/TEP) than those managed with IPOM plus technique.

When comparing the difference between two laparoscopic alternatives (TAPP/TEP versus IPOM plus) in ventral hernia repair was analyzed the average cost of the mesh and the average cost of the fixation in Colombian pesos (table 2). A significant difference was found between the two techniques were compared, with a cost in favor of the extraperitoneal techniques of the 69.8% under the equivalence course and no variation in the basal terms in the compared groups (figure 1).

Table 2. Global analysis of costs avoided in meshes and fixation devices comparing extraperitoneal techniques versus IPOM plus.

Variable	TAPP/TEP	IPOM plus
	(n= 59)	(n=50)
Mesh cost	18.500.000	126.500.000
Fixation cost	27.650.000	26.500.000
Total cost*	45.150.000	153.000.000

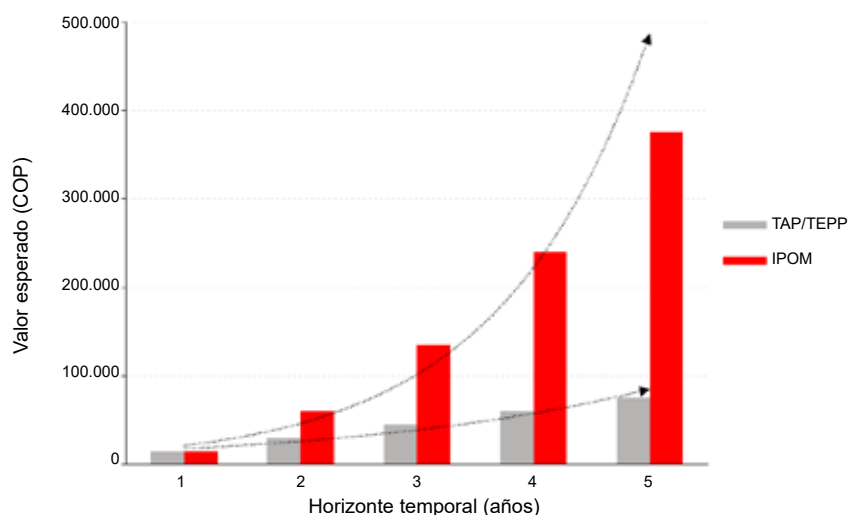
(*) Values in Colombian pesos.

Discussion

Hernia represents an area of special interest to general surgeons, and within this group, ventral hernia correction is a topic that one seeks to master. The incidence of the primary ventral hernia maintains the same level, while that from the incisional hernias increases progressively, due to the great number of laparotomies performed during the 20th century⁶, with a reported rate of 3-20% in United States⁷.

For the surgical management of ventral hernias, different techniques and approaches have been described, which have been refined over time⁸, due to the high recurrence rate described at the beginning of their implementation, where the primary repair may have a recurrence rate of 50% at 3 years and the repair with mesh up to 25%¹. The above has led to the incorporation of new techniques and methods, such as laparoscopic approaches and the use of different positions of the prosthesis, in order to avoid not only recurrence, but also most of the associated complications, and at the same time, direct and indirect costs of this procedure.

Laparoscopic repair of ventral hernias has increased its' popularity due to the reduction in morbidity and hospital stay compared to the open approach; nonetheless, it is not an approach free of complications, such as mesh migration, seroma, adhesions, fistulas, need to remove the prosthesis, and recurrence of a secondary hernia⁹. In order to decrease the incidence of postoperative chronic pain (occurring



COP: Colombian pesos expressed in millions of pesos.

Figure 1. Avoided costs in ventral hernia repair by estimating the gradient attributable to the expected cost in meshes and fixation devices, controlling for patient cofactors, total volume of procedures at the center and each surgical procedure.

between 1.3% and 14.7%), which is directly related to the need of a mandatory fixation of the prosthesis, and complications associated to the mesh, which are present up to 20%¹⁰, new techniques have been described, such as the extraperitoneal (both TAPP and TEP). They have been gaining ground, as they seek to reduce the possibility of intestinal fistulas and adhesions, related to intraperitoneal meshes^{11,12}.

At present, there is still no consensus on what can be the “gold standard” for ventral hernia repair. Much has been written about advantages of intraperitoneal techniques, such as IPOM plus, but extraperitoneal techniques play an important role now, because of the advantages described.

To choose the right technique to use, one must have into account, both the characteristics of the patient and the preferences and abilities of the surgeon. On the other hand, the fact that each decision directly influences in costs to the health system, then the importance of economic studies appears to compare the surgical techniques. In the literature search, there is only one publication describing a cost analysis by More-

no-Egea and collaborators¹³, prospective study, of seven patients with hernia of Spiegel taken to extraperitoneal management, without identify complications or recurrences. The authors carry out a statistical study comparing TEP and IPOM, identifying lower cost from this last one, directly related to the use of the balloon used to create the extraperitoneal space necessary in all cases of TEP approach.

Conclusions

The extraperitoneal approach in ventral hernia surgical repair is a driving innovative force, with multiple benefits provided, not only because of the minimally invasive approach, but also because of the position of the mesh on the abdominal wall, what has shown adequate results in terms of operative time, recurrence and complications¹⁴. In our experience as surgical group, extraperitoneal repair of laparoscopic ventral hernia represents an alternative with multiple advantages, what avoid the utilization of coated meshes and its invasive fixation, what make their costs lower. Under the comparison

model using data from two institutions with high surgical volume, an avoided cost of 69.8% with the extraperitoneal techniques was found, which demonstrates that this kind of techniques are superior, based on their benefits, so much for the patient that can avoid the visceral complications of the intraperitoneal mesh, the chronic pain, and the infection, as much as for the health system, lowering an impact in costs in the approach of this frequent pathology.

Compliance with ethical standards

Informed consent: This study corresponded to an investigation without risk based on resolution the agreement with the resolution No. 08430 from 1993 of the Ministry of Health of Colombia, no requiring informed consent. The Committee of Institutional Ethics and the Research Committee from both institutions, Fundación Universitaria Sanitas and Clínica Colsanitas, approved the design and methodology of the study.

Conflicts of interest: None declared by the authors.

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