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# New Method To Prevent Contamination In Minimal Invasive Surgery: Usage Of Endoprotector

## Minimal İnvaziv Cerrahide Kontaminasyonu Önlemek İçin Yeni Yöntem: Endoprotektör Kullanımı

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### ABSTRACT

**Objective:** To reveal the use of a material called endoprotector designed to prevent contamination in minimally invasive abdominopelvic surgery.

**Methods:** Endoprotector is formed by giving a circular shape to the transparent polyurethane material and passing around it in the form of a pürse-string with a surgical suture. This material, which is used in minimally invasive surgeries by inserting it into the abdomen through a trocar hole and laying it on the floor of the operating area, has been in the patent process.

**Results:** It is characteristic that it is a new product, called endoprotector, and the use of a laparoscopic protective drape is a new technique. At the end of the procedure, the extension of the suture shrinks by pulling from the trocar, and the formed pouch is taken out of the abdomen together with the trocar. Difficulty in removing the trocar from within is the only known shortcoming of the technique.

**Conclusion:** Endoprotector is designed to prevent contamination in minimally invasive surgery. It reduces peritonitis and intra-abdominal infections, the need for irrigation, and the use of drains, thus shortening postoperative ileus and hospital stay; and predicted to reduce outcomes such as tumor implantation.

**Keywords:** Minimally invasive surgery, intra-abdominal contamination, endoprotector

### ÖZ

**Amaç:** Minimal invaziv abdominopelvik cerrahilerde kontaminasyonu önlemek için tasarlanmış endoprotector adlı gerecin kullanımını ortaya koymak.

**Yöntemler:** Endoprotektör şeffaf poliüretan malzemeye dairesel bir şekil verilerek etrafından cerrahi dikişle kese ağzı şeklinde geçilmesiyle oluşturulur. Minimal invaziv ameliyatlarda trokar deliğinden karın içine sokularak ameliyat bölgesinin zeminine serilen bu gereç, ulusal patent sürecindedir.

**Bulgular:** Endoprotector adı verilen başlı başına yeni bir ürün olması ve laparoskopik koruyucu örtü kullanımının yeni bir teknik olması karakteristiktir. İşlem sonunda süturun uzantısı trokardan çekilerek hazne haline gelen gereç, batın dışına alınır.

**Sonuç:** Endoprotector minimal invaziv cerrahilerde kontaminasyonu önlemek için tasarlanmıştır. Peritonit ve intra-abdominal enfeksiyonları, irigasyon ihtiyacını ve dren kullanımını azaltıp, böylece postoperatif ileusu ve hastanede kalış süresini kısaltması; ve tümör implantasyonu gibi sonuçları azaltacağı tahmin edilmektedir.

**Anahtar Sözcükler:** Minimal invaziv cerrahi, intra-abdominal, kontaminasyon, endoprotektör

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## INTRODUCTION

Contamination of materials such as intestinal contents and bile into the abdomen causes peritoneal irritation and other infectious complications; minor or major contamination may occur during surgery, sometimes unintentionally as iatrogenic, and sometimes mandatory as required by the method applied. This contamination was controlled by irrigation and aspiration of the abdomen with physiological saline and placement of a drain in the operating area. When there is a possibility of contamination of luminal contents, such as during segmental intestinal resection in invasive abdominal surgeries, it is attempted to prevent contamination of surrounding tissues by covering the procedure area with sterile compresses before the procedure (1,2,3). In minimally invasive surgeries, for the contamination with intestinal contents occurring during the period between segmental bowel resection and performing intra-abdominal anastomosis, as well as in cases with a high probability of perforation, such as acute cholecystitis, and intra-abdominal transmission, such as appendiceal and ovarian tumors with mucinous component; today, there is no known application other than irrigation with physiological saline and placing a drain after the procedure; there is no barrier application to take precautions before contamination occurs. To not contaminate the incision line used during removal of the piece from the abdomen only after the resection is performed, specimen bags called endobags and wound protective rings called alexis are tools known to be used (4,5,6). In addition to the fact that these and similar materials do not have the features of preventing contamination into the abdomen; in minimally invasive surgeries, it is not easy to find foreign bodies such as dispersed stones, lost needles, etc. under minimally invasive conditions, and it is turned into an open area in order to provide adequate exploration; it is known that irrigation with physiological saline, wound protection rings, and specimen bags are useless in these cases, and even if these procedures and tools are tried, the time wasted can compete with the benefit (7). In invasive abdominopelvic surgeries, similar to the application of laying protective barrier covers such as sterile compresses on the area before procedures that will cause contamination such as bowel resections, during minimally invasive surgeries, before resection or before intervening in tissues-organs with a high perforation possibility, to prevent intraabdominal contamination or to prevent contamination such as needles, in surgical procedures where small sized foreign bodies are expected to be needed intensively; before starting the process, a protective barrier cover mechanism is designed around the process area that can be laid on the ground. The aim of this study was to present an invention called endoprotector, which is predicted to provide many benefits, such as minimizing infectious complications, such as postoperative peritonitis, intra-abdominal infection, and abscesses, and reducing the need for drain placement.

## MATERIALS AND METHODS

The endoprotector, which is designed for use in minimally invasive surgeries, consists of a transparent polyurethane surface and a surrounding suture. The camera is used by placing the trocar and camera in the abdomen and after exploration, inserting it into the abdomen through the trocar hole and laying it on the appropriate surface. This material, which aims to prevent contamination in cases where there is a possibility of contamination such as the emergence of luminal contents during surgery, to safely remove foreign objects such as needles from the abdomen in cases where they are used, and to prevent these foreign objects from falling on a safe floor in case of possible loss, preventing both contamination, waste of time, and unnecessary laparotomy; it is used in cases where measures are required to be taken at the discretion of the surgeon. After the surgical procedure is completed, the suture material surrounding the drape is withdrawn by means of its extension outside the abdomen, and the transparent polyurethane dressing, which is widely laid, is brought to the shape of a pouch by shrinking, and the trocar is removed from the abdomen from the trocar site without any intra-abdominal contamination. At the design stage, this material has production features similar to those of tools produced from polyurethane material known as organ removal bags and wound retractors or wound protective rings, which enable the removal of resection specimens in laparoscopic surgeries on the market. Therefore, endoprotector, which can be easily produced professionally by all kinds of laparoscopic surgical equipment manufacturing institutions and organizations that produce using polyurethane; it can also be prepared in existing facilities. When it is produced in operating room conditions, the floor of the material can be prepared by cutting the camera sheath, which is a transparent structure and indispensable for every laparoscopy, in suitable sizes and giving it a circular shape. To complete the mechanism, the surgical suture material is passed around the prepared circular structure with suturing all around the pürse-string. After this procedure, which is performed under sterile conditions at the beginning of the operation, the appropriate folding process is performed and it is folded so that it can be easily inserted into the abdomen through the trocar hole and kept ready for use until the surgeon wants to use it (Figure 1). To ensure its original

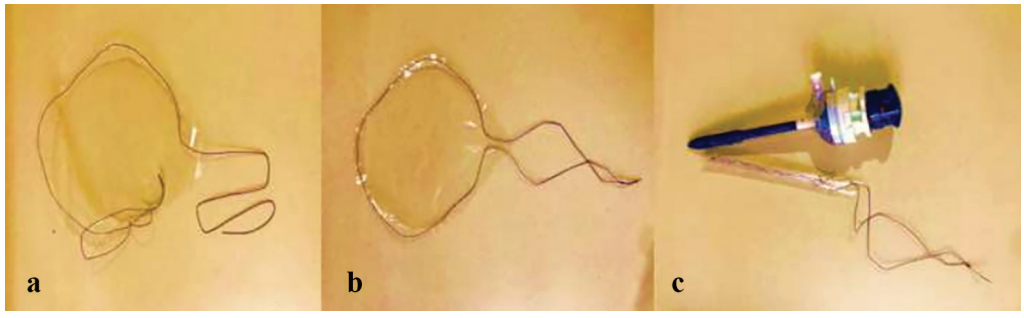


**Figure 1.** Preparation of Endoprotector (a,b). Transparent polyurethane circular structure and circumferential passage with suture material (c). After sthe suturing process, the appropriate folding process is performed, and the appearance is made ready for use by being folded in such a way that it can be easily inserted into the abdomen through the trocar hole.

production and safe reproduction, Endoprotector, which is in the national patent process with the application number 2021/015846, upon the application made by us to the Turkish Patent and Trademark Office on 1.10.2021, has proven to be safe in minimally invasive surgeries until its legal production. It is prepared in operating room conditions using available facilities, such as camera sheaths and surgical suture materials. Ethics committee approval was obtained for the use of the tool IUC-Clinical Research Ethics Committee, (approval number: E-83045809-604.01.01-340386, date: 01.03.2022). Surgery is performed after informed consent of each patient.

## RESULTS

The invention is a protective cover that can be laid on the floor before the procedure in minimally invasive surgeries, and its main feature is that it is a new product on its own called an endoprotector. The circularly structured transparent polyurethane dressing can be formed into a pouch by shrinking using the suture surrounding this structure. In order to do this, first, in minimally invasive surgeries, after trocar entry, pneumoperitoneum creation, and surgical exploration, the area where the procedure will be performed and the risk of the surgery in terms of contamination are determined. Then, in cases where precautions should be taken before contamination occurs, the Endoprotector is rolled up in the form of a roll and left to the abdomen through the trocar hole, but taking care that the entire suture does not go into the abdomen, its extension is ensured to remain outside the trocar. The nylon floor, which is folded in the form of a roll, is placed on the floor of the area to be treated by being straightened using laparoscopic hand tools after the patient is positioned appropriately on the operating table. Protective cover that works in case of contamination during the procedure or when resection is performed without major contamination; at the end of the procedure, the extension of the suture outside the trocar is pulled, and it is contracted into a pouch shape. The contaminating material is pooled in this pouch. When the resection material is left on the floor after resection, conditions such as tumoral implantation and cellular transplantation will be prevented in the future. However, this material may not always fit in the pouch of the Endoprotector due to its dimensions. In this situation, it may be necessary to use other organ removal bags in the market to remove the resection material from the abdomen. When the procedure is completed, the material, which takes the shape of a pouch by shrinking through the suture, is removed from the abdomen by pulling it together with the trocar from the trocar entrance hole. Although no complications have been encountered in clinical trials in cases in which this material is used, it does not pose a known risk. In addition to its main objectives, such as preventing contamination and planting, it is expected to shorten the operation time and reduce the need for abdominal irrigation and drain use. However, for the purposes of preventing tumoral implantation and reducing infectious complications, this approach is not expected to provide significant additional benefits to patients with already known conditions, such as malignant ascites, diffuse intraabdominal abscess, and peritonitis. When considered in the direction of purpose-result, the main patient group for which this material will be used should be the patients who do not have these conditions.

## DISCUSSION

Although postoperative infectious complications, such as surgical site infections, intraabdominal abscess development, wound dehiscence, and catheter-related complications, are less common than invasive surgeries, they continue to be a serious cause of morbidity in minimally invasive surgeries; peritoneal irritation, paralytic ileus, biliary peritonitis, anaphylaxis, and tumoral implantation may result in secondary manifestations (8). Although the use of perioperative abdominal compresses and lavage applications are known to prevent contamination in invasive surgeries; it is seen that some tools, such as wound protection rings and organ removal bags, used in minimally invasive surgeries do not provide a fully countermeasure mechanism (9,10). It is expected that the use of a material that will perform the same function as compresses laid on the floor in invasive surgeries will reduce contamination and complications, but it is hoped that this material will not cause harm. For this purpose, the endoprotector is designed to be produced from a transparent material in a size that does not hinder the manipulation of the surgeon and does not obscure the field of view. With the use of endoprotectors, it is expected that the use of intra-abdominal irrigation and drains will also decrease, along with a decrease in contamination. It is predicted that this will reduce postoperative prolonged ileus and other problems, such as drain-related infectious complications, prolonged hospitalization, and the need for antibiotic treatment (11,12). When resection is performed, the floor covering is expected to prevent contamination and cellular implantation; however, this material may not always fit in the pouch of the endoprotector due to its dimensions. In this situation, it may be necessary to use other organ removal bags on the market or other methods applied for this purpose in order to take the resection material from the abdomen (7,13,14). This is a prescribed situation, and the main use of the material is to prevent contamination; organ removal is only possible with small-sized resection materials, which is considered as one of the later features of the material that provides ease of use in selected cases.

## CONCLUSION

The material, which aims to prevent the spread of the contamination material to the abdomen, is brought into the shape of a pouch by shrinking using a suture at the end of the process to achieve this. This structure is taken out of the abdomen by pulling together with the trocar from the trocar entrance hole. The only known shortcoming of this technique is the difficulty of removing the material from the trocar without contamination when it is in a shrunken structure. However, this situation is already known to exist in organ removal bags on the market, and no complications have been reported in the literature. However, this situation is expected to be overcome when professional production is achieved.

### *Ethics*

**Ethics Committee Approval:** Ethics committee approval was obtained for the use of the tool IUC-Clinical Research Ethics Committee, (approval number: E-83045809-604.01.01-340386, date: 01.03.2022).

**Informed Consent:** Surgery is performed after informed consent of each patient.

### *Footnotes*

### *Authorship Contributions*

Concept: B.G., Design: B.G., Material: B.G., E.Ö., Data Collection or Processing: E.H., K.S.Ş., Analysis or Interpretation: Literature Search: S.E., Writing: B.G., S.S.U., Critical Review: B.G., S.S.U.

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