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Observational study: the use of the Ventralight Echo PS (positioning system) prosthesis in the treatment of incisional hernia

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SUMMARY: **Observational study: the use of the Ventralight Echo PS (positioning system) prosthesis in the treatment of incisional hernia.**

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The treatment of incisional hernias, especially those that are multiple or recurring, has always represented important challenges for surgeons. An incisional hernia is a mechanical damage of the abdominal wall that can result in respiratory problems and alterations of splanchnic circulation, especially when in large size hernias.

The increasing availability of prostheses with greater resistance to infections and tension, lightness, biocompatibility, and reduced visceral adhesions has improved outcomes and minimized relapses. It is still important, however, to carefully choose the type of prosthesis and surgical technique, whether laparotomic or laparoscopic, correlated to the positioning site of the prosthesis.

In this observational study we report the results and outcomes of 50 patients surgically treated for incisional hernia in our hospital. The surgical technique used to repair the hernias was laparoscopic with the use of the Ventralight Echo PS. This prosthesis is equipped with a comfortable and innovative pneumatic system that facilitates its positioning during surgery. In our experience, it has brought undeniable advantages for the treatment of incisional hernias and for all patients with parietal defects who could benefit from laparoscopic treatment.

KEY WORDS: Incisional hernia - Laparoscopic technique - Ventralight Echo PS.

Use of Ventralight Echo PS prosthesis in the treatment of incisional hernias

Although special attention is currently given to the suture material, the choice of the incision, preparation of the patient, and to the reconstruction of the abdominal wall that respects its anatomy and integrity, incidence of incisional hernias still remains high. It ranges between 2 and 20% of patients who underwent abdominal surgery within 24 months (1, 2, 24, 25).

The laparoscopic approach in the treatment of abdominal surgical diseases is rapidly becoming the gold standard (3, 26). Laparotomic surgery is still performed, although it is estimated that at least 4% of patients undergoing this procedure will require subsequent repair of the incisional hernia (4, 27).

There are several potential risk factors for incisional hernias, including obesity (5, 28), poor general conditions, metabolic diseases, infections, old age, and type of incision (the median incision is burdened by a greater risk than the transversal one) (6). Incisional hernias are not only considered as aesthetic damage; sometimes they are well-tolerated, not subjected to surgical treatment, and are primarily considered as mechanical and pathological damage. When an incisional hernia reaches a large size, it can be responsible for alteration of respiratory dynamics and venous splanchnic circulation (7, 29). The treatment of incisional hernias smaller than 5 cm can take advantage of plastic surgery with direct suture, while those with greater defects, where the dissection and reconstitution of the muscle-aponeurotic planes are difficult or impossible without generating tension, can be treated using a prosthesis, as confirmed by several Authors (8, 9, 30). Several randomized clinical trials have shown that the repair of these defects with prosthesis has significantly improved outcomes over the

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long term, particularly by decreasing the number of relapses (10, 12, 31). Moreover, in the last 15 years, thanks to an increasing diffusion of laparoscopy, there have been improvements in results in terms of decrease of recurrences and complications associated with better patient comfort, especially in hernias with hernia doors not exceeding a 10 cm diameter (11).

The Ventralight Echo PS prosthesis was first described in 2013 in research on pigs and showed very promising results (13, 32). The purpose of this paper is to evaluate the results obtained in the repair of small and medium incisional hernias with laparoscopic technique using the C.R. Bard Ventralight Echo PS system prosthesis on a sample of 50 patients.

Patients and methods

From January 2014 to July 2017 at the Surgical Unit, University Hospital Polyclinic Vittorio Emanuele of Catania, we treated 50 patients between the ages of 27 and 65 for incisional hernias with the use of Ventralight Echo PS. Patients hernias occurred due to previous cholecystectomy and/or appendectomy surgery. Of the 50 patients, 36 females and 14 males suffered from median incisional hernia; 28 from umbilical incisional hernia. In 13 patients, the incisional hernia was in the epigastrium area; in 9 patients, the lesion was under the umbilical line. The incisional hernia dimensions in the umbilical area were between 2 and 5 cm in diameter, those in the mesogastric area were between 3 and 8 cm, and the hernias under the umbilical line were between 3 and 7 cm. The Ventralight Echo PS is composed of a permanent polypropylene (PP) fiber coknitted with an absorbable polyglycolic acid (PGA) fiber, producing a mesh with a PP side and a PGA side (2, 16). The PGA side of the mesh is subsequently coated with an absorbable hydrogel layer composed of sodium hyaluronate (HA), carboxymethylcellulose (CMC), and polyethylene glycol (PEG). The purpose of this absorbable HA/CMC/PEG layer is to minimize adhesion formation between the mesh and the viscera when the mesh is placed inside the abdomen (13, 33).

According to our experience, the position of the patient on the operating bed is supine with arms along the body and legs slightly lowered so as to incline and better orient the applicators of the clips. The first trocar, the Hasson, is always introduced with open technique on the right side, while the others, which are 2.5 mm in size, are introduced in the subcostal region and in the right iliac fossa. If after the exploration of the abdominal cavity we have the necessity of a possible resection of omentum portions incarcerated in the incisional hernia sac or around the ligament portion that can make the prosthesis positioning difficult, we prefer to introduce a 10-mm trocar in the left subcostal region, which makes it easier to get rid of what is being resected. The randomized meta-analysis study of Cochrane showed an actual decrease in postoperative hospitalization, fever, and wound infection and a significant decrease in the relapse rate in subjects undergoing laparoscopic affixing of the prosthesis rather than the correction of the defect by laparotomy. As in open surgery, we usually explore the entire abdominal cavity in laparoscopic surgery to highlight unknown diseases. Then we proceed to the identification of the defect or wall defects. After the possible adhesiolysis and the complete reduction of the herniated content, great care is taken to reduce the pneumoperitoneum, which guarantees an accurate measurement of the hernial gate and allows us to position the prosthesis with adequate overlap of the tissues that, in our experience, must be not less than 5 cm. Data reported in the most recent literature agree with this. After all the trocars are positioned, we introduce the Ventralight ST prosthesis through the optical trocar. It is premoistened with physiological solution that makes passage through the trocar easy. Once inside the abdominal cavity, the prosthesis is oriented, and we proceed to inflate the pneumatic device, which quickly and easily completes the opening and spreads the prosthesis.

The correct positioning of the prosthesis is guaranteed by the introduction of the Reverdin needle. It is inserted from the outside into the center of the parietal defect, positioned exactly in the center of the prosthesis, and intercepts the device for inflating the system. Therefore, the outside of the abdominal wall is withdrawn, and, after having established the most suitable volume of the pneumoperitoneum, about 10 cc of air is injected into the Echo System. Once the prosthesis has spread out perfectly on the internal side of the abdominal cavity and the complete covering of the defect has been ascertained, it is fixed with a double crown of nonabsorbable clips. In particular, we usually fix the outer crown with clips of the Covidien Protack auto suture 5 mm, while for the inner ring we prefer to use absorbable clips, like the Sorbafix 5 mm/36 cm clips, to limit the use of foreign materials. All of this, as is also evident

from the literature data, is mainly aimed at reducing postoperative pain and improving patient comfort. The post-laparoscopy surgical incisions are sutured using a continuous monofilament suture. At the end of anesthesia, we usually recommend a belly band.

All of the patients we treated underwent general anesthesia without opioids. A tap-block local-type analgesia was performed at the end of the procedure by blocking the neural afferents of the abdominal wall and introducing a local anesthetic, levobupivacaine hydrochloride, in the neurofascial line between the internal oblique muscle and the transversus of the abdomen. The anesthetic allows the blocking of the afferent dermatomes of the intercostal nerves from T7 to T11, the subcostal nerve T12, and the ilioinguinal, iliohypogastric, and cutaneous branches of the nerves from L1 to L3 (24, 34, 35). This procedure allows for the reduction or elimination of painkillers in the 24 hours after surgery. All patients received postoperative therapy according to protocol that provided the use of ketorolac tromethamine as needed or, alternatively, paracetamol (acetaminophen) during hospitalization and at-home recovery.

Results

Our research showed no mortality and very low morbidity. We never had to use intra-abdominal drainage. Instead, we usually put a compressive dressing with a pad in place over the incision to reduce the formation of any seromas. All patients presenting umbilical hernias were treated in day surgery. Those remaining with major defects were hospitalized for 48 hours. Follow-up was performed with outpatient check-ups at three, six and twelve months, and subsequently by telephone check. Although some patients showed important risk factors, such as obesity or advanced age, the presence of relapses was zero.

Discussion

The randomized, meta-analysis study by Cochrane showed decreases in postoperative hospitalization, fever, and wound infection, and a significant decrease in the relapse rate of subjects who underwent laparoscopy hernia repair surgery rather than correction of the defect by laparotomy. This work, together with others, demonstrates the greater efficacy and validity of the laparoscopic technique through the use of the Ventralight Echo prosthesis (17, 18, 19, 36).

Many Authors, such as H. Eker Heniford, confirmed that prolapses depend on the type of fixation that is used to stabilize the prosthesis. Transfascial sutures have the lowest relapse rate, while the placement of a single clip ring could cause a higher percentage of postoperative complications. The affixing of double-crowned clips has been described by many Authors as the gold standard and has shown a 5% recurrence rate. Although the study by Hasan Eker showed an 18% recurrence in the first year of follow-up (14, 37), Cochrane's meta-analytic study reported a relapse rate of about 5% (15). The best result was in the Heniford study, in which the recurrence was only 4.7% (16, 38).

Another important aspect of this type of surgery is the choice to use a prosthesis instead. In several studies developed on prostheses, the percentage of recurrence remained low (20, 21), which again confirms the usefulness of using prosthetics rather than simply closing the hernial defect. However, more recent studies have shown maximum maneuverability and effectiveness of the Ventralight Echo PS, in particular its adhesiveness and capacity of contraction during inflammatory response (22, 23), both fundamental factors that could cause a recurrence.

Conclusions

The use of prostheses, such as the Ventralight Echo PS, in the treatment of large incisional hernias, regardless of location, is currently the most effective method for avoiding recurrence in the long term. The Ventralight Echo PS prosthesis, which has successfully been used in our hospital ward, is an excellent presence in the field of next-generation prosthetics because it has better resistance to tension and adhesiveness. Also, thanks to the Echo PS system, laparoscopic positioning of the prosthesis is extremely simple. Incisional hernia prosthesis repairing by laparoscopy widens the fields of mininvasive approach for pathologies that were previously exclusively treated by laparotomy (39-57).

Consent statement

Written informed consent was obtained from the patients for the publication of the patients's clinical details and/or related images.

Competing interests

No competing interests were disclosed.

Grant information

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