



Preaponeurotic endoscopic repair (REPA) of diastasis recti associated or not to midline hernias

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Abstract

Background Diastasis recti is a common pathology during pregnancy and puerperium, usually associated with midline hernias, with aesthetic and symptomatic problems. This approach allows us to restore the alba line, without entering the abdominal cavity.

Materials and methods Between April 2014 and July 2017, 50 patients underwent surgery, 94% female (mean age 38). Ultrasonography confirmed diagnosis. Recti diastasis was associated with midline defects in 100%. The preaponeurotic endoscopic repair is done with suprapubic approach and in both iliac fossae. A preaponeurotic new cavity was created with dissection of the subcutaneous cellular tissue and then recti plication with barbed suture was performed. The wall is reinforced with polypropylene mesh. Drainage is left systematically.

Results Diastasis recti < 50 mm (55.5%) was diagnosed, from 51 to 80 mm (29.6%), and > 81 mm (14.9%). Recti plication with bearded suture was performed. It was associated with external oblique release in 32% of patients, being unilateral (87.5%). Light/intermediate (90%) and heavy (10%) polypropylene meshes were placed, being fixed with absorbable (62%) and non-absorbable material (38%). Navel was reinserted using internal or external sutures. The average surgical time is 83 min. There are no intraoperative complications, but PO seroma finding 12%. The average hospital stay was 1.3 days, with pain level 3/10 according to AVS. The patients returned to their usual activities after 16.5 days. No complications or recurrences were observed by clinical and sonographic control at 18 months in 74% of patients. The patients were followed up at 39 months. Patient satisfaction was reported as 96%.

Conclusions Diastasis recti is a common pathology with aesthetic and symptomatic problems. Endoscopic surgery allowed us to resolve the parietal defect with plication of recti and placement of preaponeurotic reinforcement prosthesis, increasing the safety of the repair, without entering the abdominal cavity, with a short hospitalization and no complications or recurrence in 3 years.

Keywords Preaponeurotic endoscopic repair · Recti plication · Diastasis recti

Diastasis recti is a common and frequent pathology during pregnancy (3rd trimester) and puerperium, with a 30–70% [1] prevalence. It can be permanent in 15% of the patients, especially in multiparous women. It is usually associated to midline hernias (umbilical, epigastric, and incisional hernia). It represents an aesthetic and often symptomatic problem, such as low back pain, digestive disorders (constipation) and pelvic floor muscle alteration, and uro-gynecologic pathology (60%), thus affecting quality of life. A preaponeurotic

endoscopic approach allows us to resolve the parietal defect with the placement of a supraaponeurotic reinforcement prosthesis, which will reduce recurrence increasing plastic safety, without entering abdominal cavity, with good cosmetic and functional results [2].

Objective

The purpose of the study was to evaluate the results of preaponeurotic endoscopic repair of diastasis recti with or without associated midline hernias.

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Design

This is a prospective study.

Materials and methods

Between April 2014 and July 2017, 50 patients underwent surgery, 94% female of between 24 and 66 years old and an average age of 38. 100% of them consulted for pain and/or epigastric and/or umbilical tumor. The diagnosis was confirmed through abdominal wall echography. The location of the diastasis was epigastric in 50%, epigastric–umbilical 26% and epigastric–umbilical–infraumbilical 24%. Diastasis recti was associated with midline defects in 100% of cases. There was a prevalence of stress urinary incontinence in 60%, while low back pain was prevalent in 68%, with a > 28 body mass index (BMI) in 36%. Average number of pregnancies was 3. Anesthetic risk ASA I and II is 100%.

Step-by-step surgical technique

Under general anesthesia and endotracheal intubation, the patient is placed in dorsal decubitus with separated legs. The surgeon is placed between the legs; the assistant is located to the right or left according to preference. A 10-mm (0.39 in.) incision is made in the suprapubic midline; a preaponeurotic space is created; an optical trocar is placed, and the neocavity is insufflated with pressure between 8 and 10 mmHg, then the working trocars of 5 mm (0.20 in.) are placed in both iliac fossae under direct vision (Fig. 1A, B).

The dissection of the subcutaneous cellular tissue is then completed up to 3 cm beyond the bilateral costal margin and laterally to the anterior axillary lines. The control of

periumbilical perforating vessels and hemostasis is performed with monopolar energy with hook or scissor (Fig. 2).

During the dissection and creation of the supraaponeurotic space, the management of the subcutaneous nerves lacks importance, as it happens during the classic tummy tuck. Navel is disinserted. Plication of the rectus sheath with barbed suture is performed from the xiphoid appendix to 5 cm subumbilical (Fig. 3).

If necessary, release of the external oblique aponeurosis is made outside the outer edge of the rectus (Fig. 4), a situation that occurs when the diastasis exceeds 7 cm and can sometimes be bilateral, in order to perform a suture of the midline without tension.

Hemostasis control and neocavity wash are performed. Then a lightweight, macroporous polypropylene mesh of 22 cm long × 15 cm transversal (Fig. 5) or the appropriate size is placed to cover the area of the external oblique release, if it was made.

The prosthesis is fixed with trackers, straps or absorbable points. Navel was reinserted with internal or external

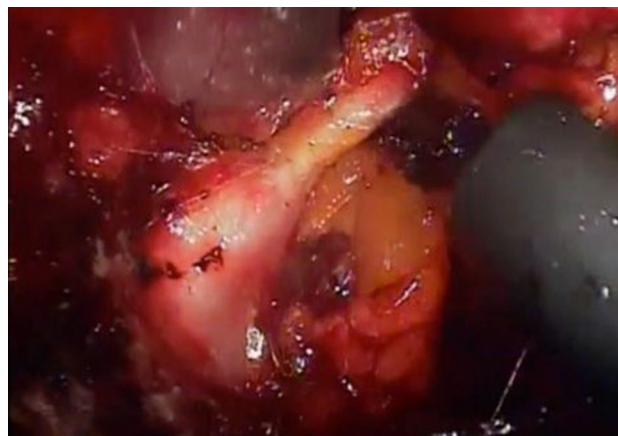


Fig. 2 Control of perforating vessels

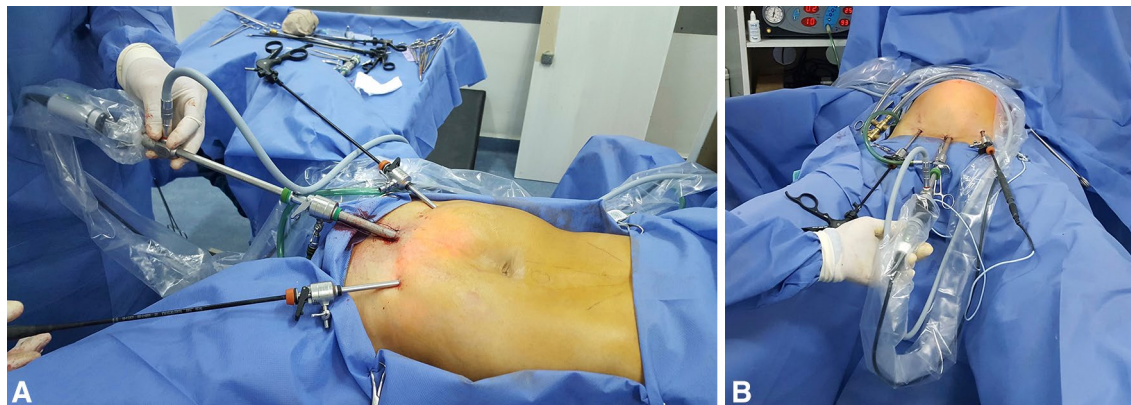


Fig. 1 Suprapubic and both iliac fossae approach. **A** Shows beginning dissection and **B** complete dissection



Fig. 3 Recti plication with barbed suture

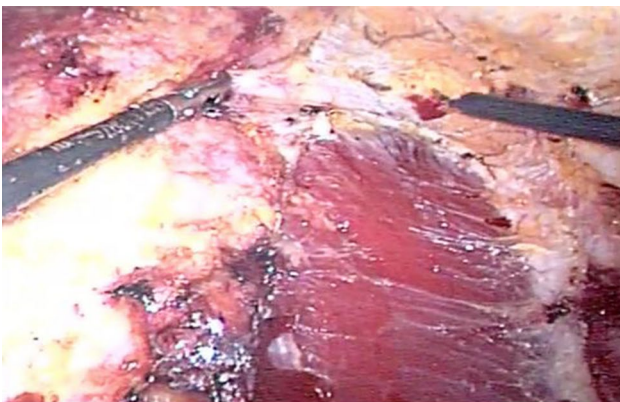


Fig. 4 External oblique release

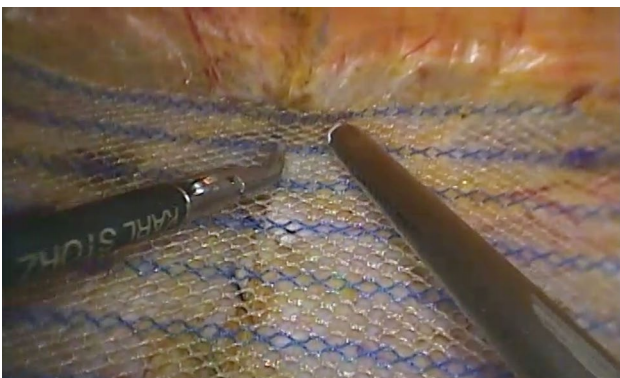


Fig. 5 Macroporous polypropylene mesh

sutures [2]. Suction drainages were placed systemically in 100% of cases, with a 3.68 ± 1.8 days permanence (Fig. 6). They were removed when the remaining was < 50 cc per day.

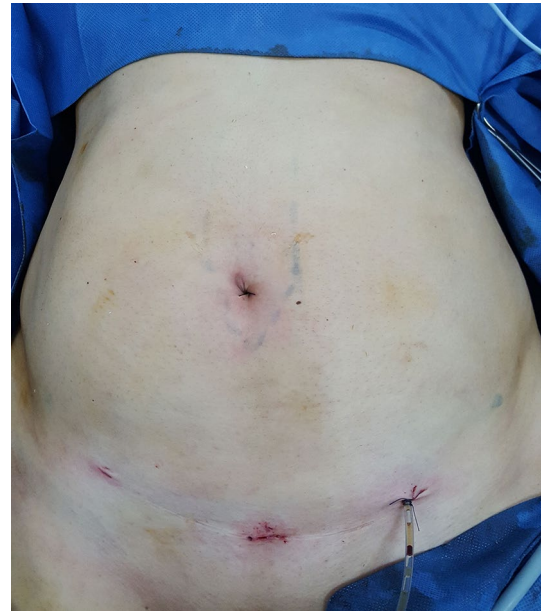
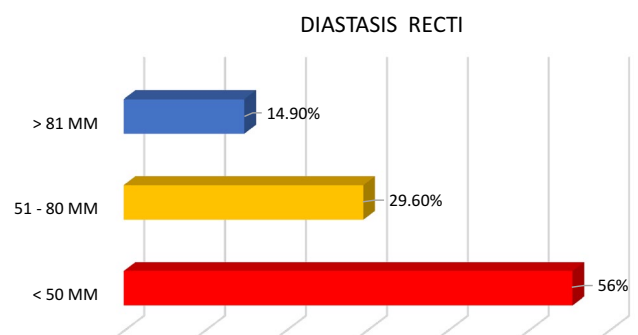


Fig. 6 Drainage



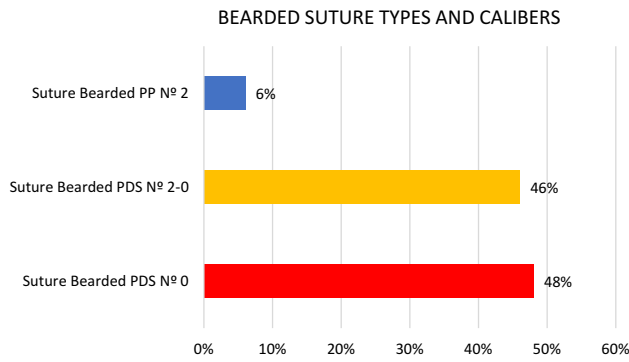
Graphic 1 Intra-operative findings of diastasis recti

Results

Diastasis recti < 50 mm—1.97 in. (55.5%), from 51 to 80 mm—2.01 to 3.14 (29.6%), and > 81 mm—3.18 (14.9%) was diagnosed (Graphic 1).

In 100% cases, diastasis recti is associated to some midline hernias (umbilical, epigastric, and/or incisional hernia). Recti plication with absorbable PDS bearded suture N° 0 (48%), absorbable PDS N° 2–0 (46%), and non-absorbable polypropylene N° 2 (6%) was performed. The type of material did not influence on the appearance of complications during the postoperative period, nor on the recurrence of diastasis of the recti (Graphic 2).

It was necessary to associate recti plication to an external oblique release in 16 patients (32%). When diastasis recti were bigger than 50 mm (generally 70 mm), it was



Graphic 2 Bearded suture types and calibers

unilateral (88%), and muscular release was bilateral (12%) when diastasis recti were bigger than 81 mm, with the purpose of making a non-tension midline closure (Graphic 3).

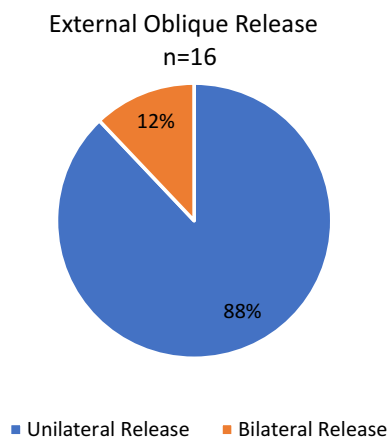
After repair of midline defect, the new cavity is washed with saline solution in order to remove fat devitalized tissue and clots, thus reducing the risk of postoperative infection.

Then, different sizes of polypropylene mesh were used at the plication level and in the external oblique release area, in order to reinforce abdominal wall.

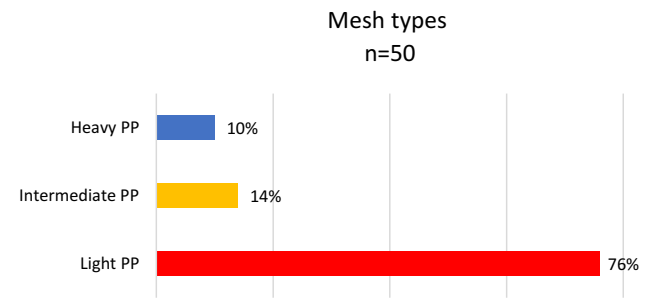
The most commonly used were the light macroporous polypropylene prostheses (76%), followed by intermediate (14%) and heavy ones (10%) (Graphic 4).

The size of the prosthesis used depended on the plication, either was a single one, or with Unilateral or Bilateral external oblique release (Table 1).

For prosthesis right choice, the following factors were considered: diastasis size, weakness level of abdominal wall, BMI and daily physical activity. In patients with small (< 50 mm—< 1.97 in.) and intermediate diastasis (51–80 mm—2.01–3.15 in.), low BMI and low physical activity, a light polypropylene mesh was used. On the other



Graphic 3 External oblique release



Graphic 4 Used polypropylene mesh types

hand, in patients with bigger diastasis (> 81 mm—> 3.18 in.), overweight and high physical activity, intermediate and heavy polypropylene meshes were used.

Once the prosthesis was placed, fixation elements were used: absorbable tacks or straps (56%), non-absorbable tacks (38%), and polyglactine 910 sutures (6%). The use of different fixation materials had no relevance in the clinical evolution or recurrence of diastasis of the recti (Graphic 5).

Surgical time was 83 ± 20.8 min (DS). Unilateral muscular release was made in 4.5 ± 1.5 min (DS).

No intraoperative complications were observed. The only postoperative complication was seroma (12%), which was evidenced between 20 and 50 days postoperatively. They were evaluated by clinical and ultrasound examination. These were of the same laminar collection characteristics and they were reabsorbed spontaneously by day 65.

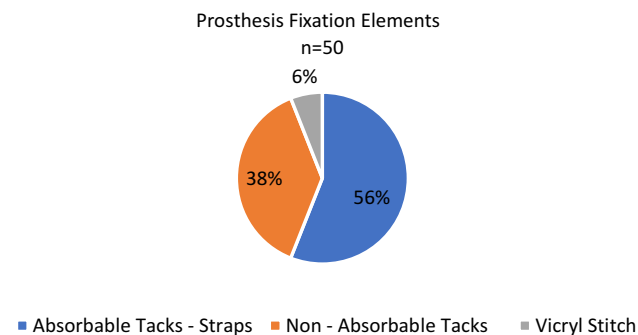
One patient needed drainage and rubber layer placement for suprapubic incision due to its magnitude (600 cc) 25 days after surgery. There was no infection. Hospital stay was from 1 to 2 days (average: 1.3 days). Pain level was 3/10 according to VAS (visual analogical scale) at the moment of hospital discharge. The patient returned to his usual activities was 16.4 ± 5.1 days (DS) after surgery. No complications or recurrence at 18 months were observed by clinical and ultrasound control in 74% of the patients. The distance between both rectum borders observed was not significant. The postoperative follow-up was between 6 and 39 months with an average of 23 months. Recurrence is considered when the distance between the inner edge of both recti is > 15 mm at the supra and infraumbilical level and > 25 mm at umbilical level. Patient satisfaction was reported as 96% regarding cosmetic outcomes, and postoperative pain at 18-month follow-up.

Discussion

Treatment of diastasis recti associated or not to midline hernias was always made conventionally with supra-umbilical or supra-pubic medium incision combined with or without

Table 1 Different mesh sizes depending on type of plication (single or associated to unilateral or bilateral OE release)

Mesh size	Single plication	Plication with unilateral EO release	Plication with bilateral EO release
Longitudinal/transversal	22 cm × 15 cm (8.66 in. × 5.91 in.) (72% of cases)	22 cm × 24 cm (8.66 in. × 9.84 in.) (24% of cases)	24 cm × 30 cm (8.66 in. × 11.02 in.) (4% of cases)

**Graphic 5** Prosthesis fixation elements

an associated abdominoplasty [3]. In 2009, Bezama Murray published in Chile his supra-umbilical access technique with heavy polypropylene mesh placement at preperitoneal level, with epidural anesthesia, having good cosmetic and low-cost outcomes [4, 5]. This technique would be recommended for patients with a < 3 cm diastasis recti. Later, with laparoscopic surgery arrival, there were new different surgical approaches for midline closure with intra-body or trans fascial stitches [6–8]. In bigger linea alba defects where edges apposition is difficult, the endoscopic component separation becomes a good surgical option [9, 10] for a non-tension midline closure, reinforcing plastic with an intraperitoneal mesh (IPOM PLUS). Using this technique, we assume risks such as: laparoscopic access and use of intracavitary prosthesis and its fixation media (like intestinal lesions, adhesions and intestinal obstruction), postoperative neuralgias [11], and in many cases the patient feels unsatisfied because of the cosmetic results at the immediate postoperative period. Preaponeurotic endoscopic approach seems to be the right therapeutical option, described by Bellido Luque Spain in 2015 [12], allowing us the exposition of the whole anterior abdominal wall, thus showing midline defects (epigastric and umbilical hernias, incisional hernias or Pfannenstiel incision bulges) associated to diastasis. In 2016, Juárez Muas presented in Argentina and published in Spain in 2017 his technique, Preaponeurotic endoscopic repair with prosthesis reinforcement, allowing to fix midline parietal defect with recti plication using bearded sutures. This could be associated to an external oblique muscle release, unilateral or bilateral in order to avoid a tension suture [2], reducing postoperative pain and in cases of + 10 cm diastasis,

to reduce postoperative abdominal compartment syndrome [3]. In all cases, we placed a reinforcement preaponeurotic polypropylene mesh which is safer and reduces the risk of recurrence [2]. Not entering the abdominal cavity as in laparoscopic surgery, we avoid mesh complications reducing its high cost. In our experience of a 39-month follow-up, with 18 months in 74% of the patients, there were no thermal skin lesions or postoperative ischemia complications, even in slim patients with a < 25 BMI. Nor were there any difficulties relating mesh use such as haematomas, postoperative superficial infections or skin reflections due to mesh retraction [2]. Neither was a higher seroma percentage than in repairs without prosthesis, nor were important seroma differences comparing mesh placement at supraaponeurotic or preperitoneal level [13]. Endoscopic surgery allows us to perform a dissection with exhaustive hemostasis, control of perforating vessels, washing and aspiration of devitalized fat tissue before placing the prosthesis. The systematic use of drainages, the use of local girdle and ice from the operating room significantly decreases postoperative seromas. Avoiding mesh contact with skin, and using antibiotics before and after surgery, we reduce infection risks. Low back pain disappeared in 100% of patients between 7 and 30 days postoperatively. A disappearance of stress urinary incontinence was evidenced in 70% (33) of the patients. This motivated us to carry out a prospective work together with the urogynecology service with preoperative and postoperative urodynamic studies which are still ongoing. Hypoesthesia is a manifestation that occurs in 100% of patients in the immediate postoperative period, the total recovery of skin sensitivity occurs from the periphery to the umbilical region between 2 and 6 months after surgery, without any sequelae. With regard to constipation, we did not observe changes in the postoperative period.

We indicate the endoscopic preaponeurotic surgery (REPA) in patients with diastasis of the recti > 3 cm, associated or not with a hernia of the midline. We recommend this for symptomatic patients with midline defects (umbilical, epigastric, and incisional hernia) associated to diastasis, that refer low back pain, stress urinary incontinence or aesthetic alteration of the abdominal wall that desire to undergo such repair. We suggest this procedure for patients who have indication of the abdominoplasty, but reject it. We always keep in mind that the main goal of this surgical procedure is the permanent repair of hernias, restoring the

anatomical midline, prioritizing the functional aspect over the aesthetic one. A large proportion of these patients are postpartum women.

We excluded patients with diastasis of the rectum and skin flap or those with extreme laxity of the abdominal wall (“defeated abdomen”) after the postpartum year, to whom we indicated abdominoplasty, considering that they would have a greater aesthetic benefit. This technique allowed us to restore midline even in large size diastasis, minimizing parietal morbidity, with good cosmetic outcomes. The defect correction improves the aesthetic and functional part of the abdominal wall, increasing the patient’s self-esteem and improving the quality of personal and social life from the psychological point of view. It is essential to remark the importance of physical therapy and manual lymphatic drainage after 30 days, postoperatively, which allows a better tolerance to daily physical activity and physical exercises, faster recovery of skin sensitivity, less sensation of swelling, and better postoperative comfort referred by the patients.

Conclusions

Rectus diastasis is a common pathology. It is an aesthetic and symptomatic problem. Endoscopic surgery allowed us to resolve the parietal defect with plication of recti and placement of preaponeurotic reinforcement prosthesis, increasing the safety of the repair, without entering the abdominal cavity. It also allowed a short hospitalization, without complications or recurrence in 3 years with undisputed benefits of minimally invasive surgery.

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Compliance with ethical standards

Disclosures Derlin Marcio Juárez Muas has no conflict of interest or financial ties to disclose.

References

- Mota P, Pascoal AG, Sancho F, Bø K (2012) Test-retest and intrarater reliability of 2-dimensional ultrasound measurements of distance between rectus abdominis in women. *J Orthop Sports Phys Ther* 42(11):940–946
- Juárez MD, Verasay G, Garcia Walter M (2017) Reparación endoscópica prefascial de la diástasis de los rectos: descripción de una nueva técnica. *Rev Hispanoam Hernia* 5(2):47–51. <https://doi.org/10.20960/rhh.33>
- Moreno-Egea A (2016) Abdominoplastía y reparación de hernia incisional: lo que un cirujano general debe saber. *Rev Hispanoam Hernia* 4(1):5–12
- Bezama Murray J, Debandi LA, Haddad AM, Bezama UP (2009) Diástasis de los rectos. Técnica quirúrgica original. *Rev Chilena de Cirugía* 61(1):97–100
- Bezama Murray J (2017) Técnica quirúrgica para reparar la diástasis de los rectos asociada a hernia umbilical. Diez años de experiencia. *Rev Hispanoam Hernia* 5(2):52–56. <https://doi.org/10.20960/rhh.34>
- Daes J (2016) Evolución de la reparación laparoscópica de las hernias ventrales y del sitio de la incisión. *Rev Hispanoam Hernia* 4(3):83–85
- Bittner R, Bingener-Casey J, Dietz U, Fabian M, Ferzli GS, Fortelny RH, et al (2014) International Endohernia Society. (IEHS) guidelines for laparoscopic treatment of ventral and incisional abdominal wall hernias (International Endohernia Society. (IEHS). Part 1. *Surg Endosc* 28:2–29
- Palanivelu C, Rangarajan M, Jategaonkar PA, Amar V, Gokul KS, Srikanth B (2009) Laparoscopic repair of diastasis recti using the “Venetian blinds” technique prosthetic reinforcement: a retrospective study. *Hernia* 13(3):287–292
- Daes J (2014) Endoscopic subcutaneous approach to component separation. *J Am Coll Surg* 218:1–4
- Rosen M (2014) Separación endoscópica de componentes. Atlas de Reconstrucción de la Pared Abdominal, vol 11. Elsevier, Philadelphia, pp 185–201
- Daes J (2016) Evolución de la reparación laparoscópica de las hernias ventrales y del sitio de la incisión. *Rev Hispanoam Hernia* 4(3):83–85
- Bellido Luque J, Bellido Luque A, Valdivia J, Suárez Grau JM, Gómez Menchero J, García Moreno J, Guadalajara Jurado J (2015) Totally endoscopic surgery on diastasis recti associated with midline hernias. The advantages of a minimally invasive approach. Prospective cohort study. *Hernia* 19(3):493–501. <https://doi.org/10.1007/s10029-014-1300-2>
- Timmermans L, de Goede B, van Dijk SM, Kleinrensink GJ, Jeekel J, Lange JF (2014) Meta-analysis of sublay versus onlay mesh repair in incisional hernia surgery. *Am J Surg* 207(6):980–988