CASE REPORT – OPEN ACCESS

International Journal of Surgery Case Reports 41 (2017) 99–104

Contents lists available at ScienceDirect

International Journal of Surgery Case Reports

journal homepage: www.casereports.com

Component separation of abdominal wall with intraoperative botulinum A presents satisfactory outcomes in large incisional hernias: a case report

Lucas Torres Oliveira[a,*], Felipe Futema Essu[a], Gustavo Heluani Antunes de Mesquita[a], Yuri Justi Jardim[a], Leandro Ryuchi Iuamoto[a], Fábio Yuji Suguita[a], Diego Ramos Martines[a], Fernanda Nii[a], Daniel Reis Waisberg[b], Alberto Meyer[b], Wellington Andraus[b], Luiz Augusto Carneiro D'Albuquerque[b]

[a] Faculdade de Medicina FMUSP, Universidade de Sao Paulo, Sao Paulo, SP, Brazil
[b] Departamento de Gastroenterologia, Hospital das Clínicas HCFMUSP, Faculdade de Medicina, Universidade de Sao Paulo, Sao Paulo, SP, Brazil

ARTICLE INFO

Article history:
Received 1 September 2017
Accepted 5 September 2017
Available online 12 October 2017

Keywords:
Incisional hernia
Hernioplasty
Liver transplantation
Component separation
Botulinum A toxin

ABSTRACT

PURPOSE: Transplantation patients have a series of associated risk factors that make appearance of incisional hernia (IH) more likely. A number of aspects of the closure of large defects remain controversial. In this manuscript, we present the repair of a large IH following liver transplantation through the technique of posterior components separation combined with the anterior, together with the intraoperative use of botulinum toxin A and the placement of mesh. As a secondary objective, we analyze the incidence of IH following liver transplantation in our service.
METHODS: Between the years 2013 and 2016, 247 patients underwent liver transplantation in the Liver Transplantation Service at the Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo, Brazil. We analyzed the incidence of IH in these patients. One of these cases operated in March 2017 presented a defect in the abdominal wall of $22 \times 16.6 \times 6.4$ cm in the median and paramedian regions. We present the details of this innovative surgical technique.
RESULTS: The total operating time was 470 min. During the postoperative phase the patient presented ileus paralysis, without systemic repercussions. Resumption of an oral diet on the fifth postoperative day, without incident. Hospital discharge occurred on the 12th postoperative day, with outpatient follow up.
CONCLUSION: In our service, the incidence of incisional hernias following liver transplantation is 14.5%. We described a successful approach for selected patient group for whom there is no established standard treatment. Given the complexity of such cases, however, more studies are necessary.

1. Introduction

The development of incisional hernias is a common complication of organ transplantation surgery. Transplantation patients have a series of associated risk factors that make their appearance more likely. The literature shows an incidence rate of up to 35% among liver transplantation patients [1–5]. In Brazil, 1816 liver transplantations were carried out in 2015. In other words, there is a significant number of patients susceptible to developing this complication [6].

The success of therapeutic correction of the hernia depends on a variety of factors, among them, the technique employed and the patient's characteristics such as the size of the hernial defect. The European Hernia Society (EHS) defines large incisional hernias (W3) as those with a diameter of 10 cm or larger [7].

The bigger the hernia, the more difficult it is to repair without tension, which is fundamental for myofascial closure of the abdominal wall and reducing the risk of recurrence. Large hernial defects treatment are related to postoperative complications, including compartment syndrome; this is a concern for the surgeon because of the difficulty of treatment, as well as high rates of recurrence after surgical correction [1,8–11].

In this context, there are many techniques applied to achieve a first incisional hernial repair without tension. The posterior component separation of the abdominal wall increases the size and guarantees fascial closure; it was described recently in the treatment of large ventral hernial defects [11–13].

In some cases, the anterior or posterior components separation alone is not sufficient to guarantee the closure of the hernial defect. Other treatment options may be necessary for the repair

* Corresponding author.
E-mail address: lt.oliveira92@gmail.com (L.T. Oliveira).

https://doi.org/10.1016/j.ijscr.2017.09.037

Fig. 1. Image of the computed tomography of the abdomen. Incisional hernia is in the median and paramedian region of the abdominal wall, measuring 22 × 16.6 × 6.4 cm, resulting in herniation of the left hepatic lobe and the stomach, bowel loops, loops of the small intestine, without signs of acute complications.

of incisional hernias with a lower risk of complications, such as progressive preoperative pneumoperitoneum and the placement of expanding tissues on the abdominal wall [12].

With the same logic, a recent proposal is the preoperative application of botulinum toxin A (BTA) for hernial correction, in order to relax and stretch the musculature [12,14,15].

BTA has been widely used in medical practice for treatment of a variety of conditions because of its capacity to provoke a sustained and reversible flaccid muscular paralysis. Its preoperative application, as well as aiding the closure of the abdominal wall, can help to lower the recurrence rate. The benefits of intraoperative BTA application for incisional hernioplasty, however, are not well established in the literature [10,14,16].

The objective of this study is to present the repair of a large incisional hernia (W3) following liver transplantation through the technique of posterior components separation combined with the anterior, together with the intraoperative use of BTA and the placement of mesh. As a secondary objective, we analyze the incidence of incisional hernias following liver transplantation in our service.

2. Materials and methods

2.1. Data collection and patient selection

Between the years 2013 and 2016, 247 patients underwent liver transplantation in the Liver Transplantation Service at the Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo, Brazil. Of these, 36 developed incisional hernias as a postoperative complication, indicating an incidence of 14.5% in the service.

According to the classification of incisional hernias by the EHS, 30.5% of these patients (n = 11) presented large incisional hernias (W3) [7]. One of these cases operated in March 2017 presented a defect in the abdominal wall of 22 × 16.6 × 6.4 cm in the median and paramedian regions (Figs. 1 and 2). The primary surgery was carried out without intraoperative complications, and details are presented here of this innovative surgical technique, for selected patient groups for whom there is no established standard treatment. This study has been reported in line with PROCESS criteria [17].

2.2. Surgical technique

Antibiotic prophylaxis (cephazolin 2 g) was used during induction of anasthesia, according to the protocols of the center in which it was carried out. Surgery begun with accessing the abdominal wall, making an incision along the scarring from previous liver transplantation. Dissection was carried out to expose the abdominal wall defect components and contents.

Hernial contents were reduced through the abdominal cavity. An important retraction of the abdominal wall was noted to the right, with muscular atrophy of the ipsilateral abdominal rectus. We explored and identified the three muscle groups of the right abdominal wall. The external, internal and transversal oblique muscles of that side were dissected and separated.

The posterior components of the left abdominal wall were identified and separated, combined with a vertical relaxing incision made in the anterior aponeurosis of the abdominal muscles. As a result, we were able to free up the posterior sheath of the rectus abdominal muscle and left oblique external muscles fascia.

Closure of the posterior layer defect was made with approximation of the right transversal muscle with the posterior sheath of the rectus abdominal muscle on the left (Fig. 3). A continuous suture was made with non absorbable thread (Prolene® 1.0, Johnson & Johnson).

Following this, closure of the defect in the anterior layer was made by placing the internal and external oblique muscles together with aponeurosis of the contralateral rectus abdominal muscle (Fig. 4). A continuous suture was made with non absorbable thread (Prolene® 1.0, Johnson & Johnson).

After closure of the abdominal wall, a dilution of 300 UI of BTA (Botox®, Allergan) in 150 mL of saline solution 0.9% (2UI/mL) was prepared. BTA was applied in the whole musculature of the abdominal wall, reaching the internal obliques, external obliques and the transversals of the abdomen bilaterally, as well as the left rectus abdominal muscle. 16UI was applied to each point, 18 injections in total (9 in each side), as previously described. [8] BTA was not applied to the right rectus abdominal muscle because of the atrophy present when the procedure was carried out.

Following the applications, an inorganic polypropylene onlay mesh was placed, weight 120 ± 10 g/m^2, pores 0.9 ± 0.1 mm (Abdotex®, Barone, Campinas-SP, Brazil) 30 × 30 cm, covering the whole area of the hernia (Fig. 5). The mesh was fixed with absorbable thread (Vycril® 2.0, Johnson and Johnson), allowing complete incorporation [11].

Before closing the skin, two vacuum closed surgical drains were fitted. Fig. 6 shows the final aspect of the procedure.

3. Results

Repair of an incisional hernia was carried out following liver transplantation, with components separation, intraoperative application of BTA and placement of onlay mesh. The total operating time was 470 min.

Following surgery, the patient was sent to the intensive care unit, remaining under observation for three days. During the postoperative phase the patient presented ileus paralysis, without systemic repercussions, with the resumption of an oral diet on the fifth postoperative day, without incident. The drain was removed once a return of less than 50 mL in 24 h was reached. Hospital discharge occurred on the 12th postoperative day, with outpatient follow up.

4. Discussion

The incisional hernia is the most common delayed complication following liver transplantation [5]. Diabetes, obesity, male sex, advanced age, incision type, immunosuppression therapy, wound infection and pulmonary complications are the most prevalent risk factors for its development [1–3,8,18]. The incidence of incisional hernias in our service is 14.5%, consistent with the 35% reported in the literature.

Fig. 2. Bulging of the abdominal region consistent with the topography of an incisional hernia. Scarring resulting from previous liver transplantation. (photograph used with permission of the patient).

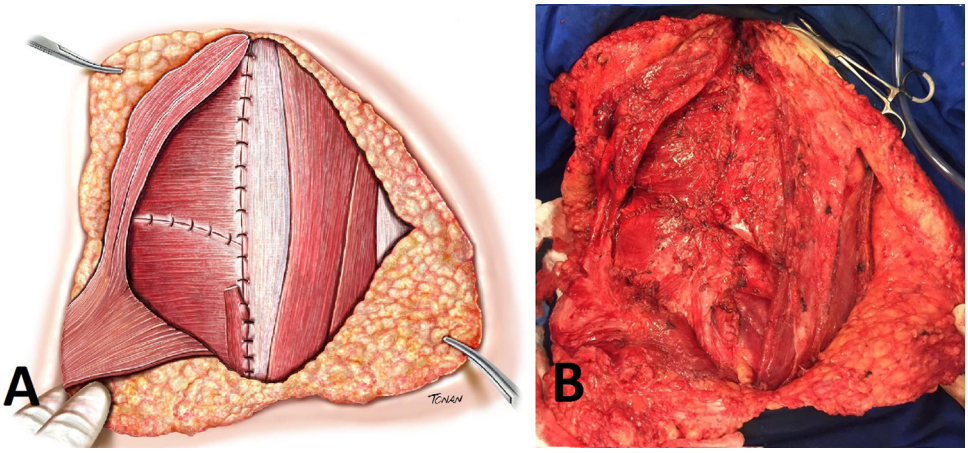

Fig. 3. A. Schematic showing the closure of posterior layer of the abdominal wall, transversal muscle (TM) with the posterior layer of the left rectus abdominal (RA) muscle. Internal (IO) and external oblique (EO) muscles exposed on the right. B. Intraoperative view of the closure of the defect on the posterior layer.

The most common type of incision used in transplantation is the subcostal bilateral transversal laparotomy, with cranial extension on the medial line, known as Mercedes. It is most associated with the development of incisional hernias in the postoperative phase, compared to the J incision [2–4,18]. In our service, the J incision is routinely used for patients submitted to liver transplantation.

Closure of the abdominal wall without tension with placement of mesh is the standard treatment for correcting incisional hernias [11,19]. Tension in the sutured area is associated with local ischemia and predisposition for recurrence. In cases where the hernia is large, measures to stretch the abdominal wall are required in order to guarantee primary repair [1,10,12].

The technique of anterior component separation (ACS) described by Ramirez et al. allows fascial repositioning through lateral stretching, reestablishing the integrity of the abdominal wall [20]. However, the literature presents a significant recurrence rate associated with this procedure [12,21]. Posterior component separation, on the other hand, allows a minimization of the lateral forces of traction, decreasing the rate of incisional hernias [13,21,22]. As a result of the size of the hernia in our case and the atrophy of the right abdominal muscle, we opted for a combination of both techniques in order to ensure correction of the defect under minimal lateral tension in the sutures.

BTA is a therapeutic option to decrease the suture tension and rate of hernia recurrence. It is a neurotoxin that provokes a reversible chemical denervation of the muscle, manifested as a flaccid muscular paralysis that takes effect from two days after application and lasts for 6–9 months [9,12,15,16,23]. It reduces the thickness of the abdominal wall, increasing its length, allowing hernial reduction and therefore allowing closure without tension.

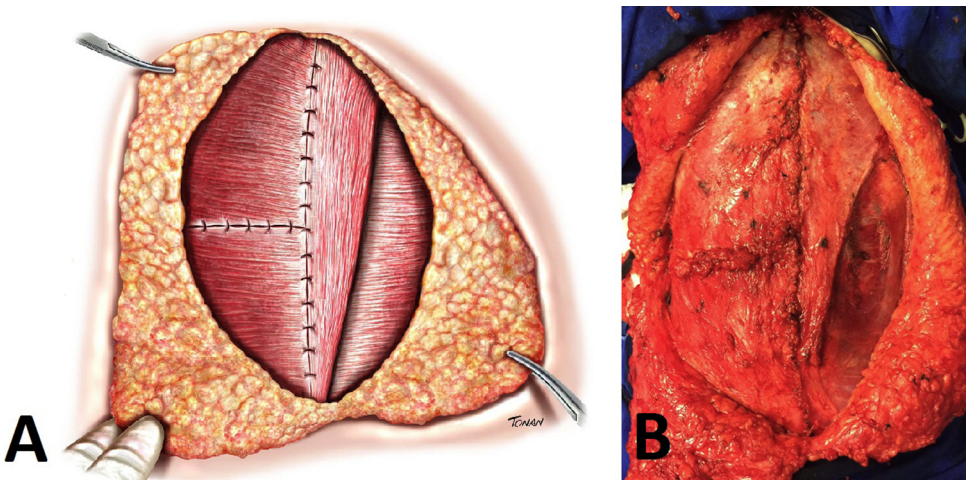

Fig. 4. A. Schematic of the final aspect of the anterior layer of the defect in the abdominal wall. Joining of the internal (IO) and external oblique (EO) muscles on the right with the aponeurosis of the rectus abdominal (RA) contralateral muscle. B. Final intraoperative view of the closure of the defect in the anterior layer.

Fig. 5. Detail of the placement of the mesh over the previously corrected hernia. Sutures made with absorbable thread around the edge, as well as continuous sutures in complementary regions.

Despite there still not being a consensus in the literature about the optimal location and the time of application, BTA can be used in preoperative preparation [10,14,23].

The patient in this case did not receive preoperative BTA, because it was unavailable, and so only intraoperative application was possible. The benefit of intraoperative application was the ability to see the relevant muscle groups and apply the BTA directly to them. When we applied BTA, we expected a progressive relaxation of the abdominal wall, minimizing the risk of compartment syndrome.

During postoperative recuperation and the period of scarring of the operative wound, the corrected area is under no tension. Forces of traction are minimized on the area of closure due to the effects of the toxin. This guarantees adequate perfusional support to the area of the scarring, reducing postoperative morbidity, including pain, increasing the chances of successful primary closure of the incisional hernia [15,16]. In our case, the patient reported suffering less pain than would be expected, requiring only non-opioids analgesics.

The ideal location for the placement of mesh is not well established in the literature. Haskins et al. propose that there is no statistical difference between sublay and onlay of mesh in low-risk patients. There is, however, still a lack of studies that compare these methods for later outcomes and more complex cases. We opted to carry out closure of the hernial defect with placement of onlay mesh, based on the benefits suggested by Chevrel [19].

The surgical approach to large incisional hernias is a topic that remains controversial in the literature, because they are mainly found in high complexity patients, such as liver transplant recipients [19]. The advantage of the combination of anterior and posterior component separation with intraoperative BTA is the minimal tension and protection of the sutures in the postoperative phase. It reduces the risk of recurrence, without the need for preoperative preparation of the patient. This is our service's proposal for the primary closure of large hernial defects. However, further studies are necessary, alongside long term follow up of these patients

5. Conclusion

A number of aspects of the closure of large incisional hernias in liver transplant recipients remain controversial. Among these is the use of botulinum toxin A used in the intraoperative phase.

In our service, the incidence of incisional hernias following liver transplantation is 14.5%.

This paper describes a successful clinical approach, involving the intraoperative application of BTA, combined with anterior and posterior component separation and placement of onlay mesh. Given the complexity of such cases, however, more studies are necessary.

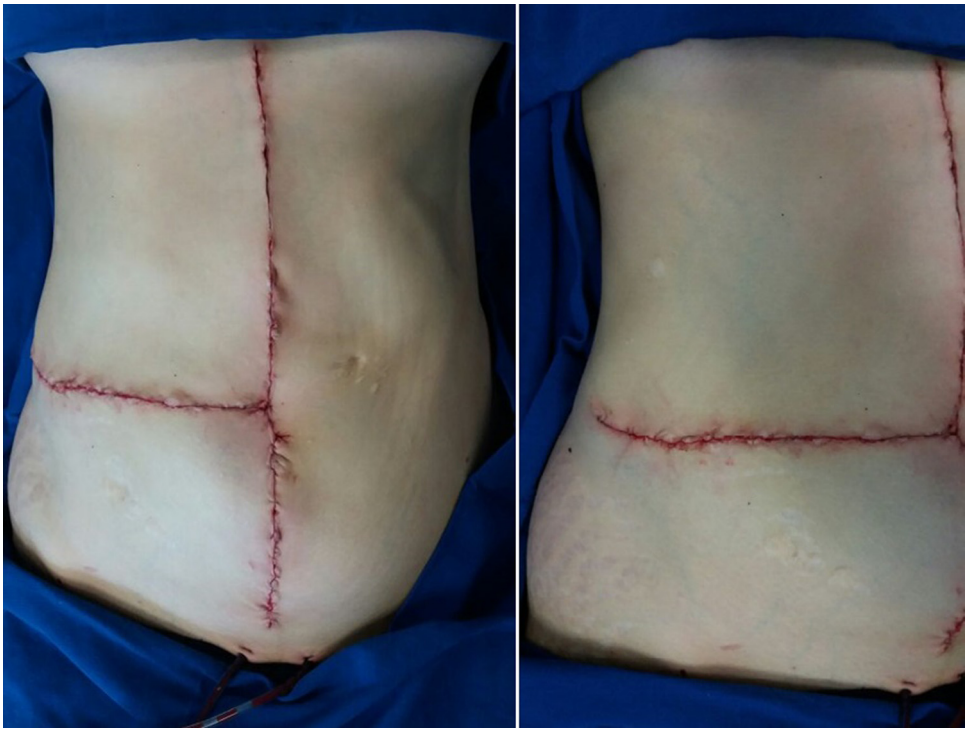

Fig. 6. Final view of the patient's abdomen following skin closure. Presence of two surgical vacuum drains in the abdominal wall.

Conflicts of interest

The authors declare that they have no competing interest.

Funding

Grant #2016/20446-1, São Paulo Research Foundation (FAPESP).

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Consent

Informed consent was obtained from all individual participants included in the study.

Author contribution

Lucas Torres Oliveira: study conception and design, acquisition of data, analysis and interpretation of data, and drafting of manuscript; Felipe Futema Essu, Yuri Justi Jardim, Gustavo Heluani Antunes de Mesquita, Leandro Ryuchi Iuamoto: acquisition of data and analysis and interpretation of data, and drafting of manuscript; Fábio Yuji Suguita, Diego Ramos Martines, Fernanda Nii: acquisition of data and analysis and interpretation of data; Alberto Meyer: acquisition of data and critical revision of manuscript; Daniel Reis Waisberg, Wellington Andraus, Luiz Augusto Carneiro D'Albuquerque: critical revision of manuscript.

Guarantor

Lucas Torres Oliveira and Alberto Luiz Monteiro Meyer.

References

[1] G. Vennarecci, G. Mascianà, E. De Werra, et al., Effectiveness and versatility of biological prosthesis in transplanted patients, World J. Transplant. 7 (1) (2017) 43–48.
[2] P. Fikatas, W. Schoening, J.E. Lee, S.S. Chopra, D. Seehofer, O. Guckelberger, G. Puhl, P. Neuhaus, S.C. Schmidt, Incidence, risk factors and management of incisional hernia in a high volume liver transplant center, Ann. Transplant. 16 (May (18)) (2013) 223–230.
[3] E.H. Ayvazoglu Soy, M. Kirnap, S. Yildirim, G. Moray, M. Haberal, Incisional hernia after liver transplant, Exp. Clin. Transplant. 15 (February (Suppl. 1)) (2017) 185–189.
[4] S. Weiss, A. Weissenbacher, R. Sucher, C. Denecke, A. Brandl, F. Messner, R. Oellinger, S. Schneeberger, T. Schmid, J. Pratschke, M. Biebl, Outcome analysis of laparoscopic incisional hernia repair and risk factors for hernia recurrence in liver transplant patients, Clin. Transplant. 29 (October (10)) (2015) 866–871.
[5] D. Sommacale, G. Nagarajan, M. Lhuaire, F. Dondero, P. Pessaux, T. Piardi, A. Sauvanet, R. Kianmanesh, J. Belghiti, Surgical procedures in liver transplant patients: a monocentric retrospective cohort study, Int. J. Surg. 24 (March (41)) (2017) 58–64.
[6] Ministério da Saúde. SNT. Centrais de Notificação Captação e Distribuição de Órgãos e Tecidos (CNCDO) data (2015). Available on the website: http://portalsaude.saude.gov.br/ (Accessed 11 March 2017).
[7] F.E. Muysoms, M. Miserez, F. Berrevoet, et al., Classification of primary and incisional abdominal wall hernias, Hernia 13 (4) (2009) 407–414.
[8] K.E. Elstner, A.S. Jacombs, J.W. Read, O. Rodriguez, M. Edye, P.H. Cosman, A.N. Dardano, A. Zea, T. Boesel, D.J. Mikami, C. Craft, N. Ibrahim, Laparoscopic repair of complex ventral hernia facilitated by pre-operative chemical component relaxation using botulinum toxin A, Hernia 20 (April (2)) (2016) 209–219.
[9] S.C. Lien, Y. Hu, A. Wollstein, M.G. Franz, S.P. Patel, W.M. Kuzon Jr., M.G. Urbanchek, Contraction of abdominal wall muscles influences size and occurrence of incisional hernia, Surgery 158 (July (1)) (2015) 278–288.
[10] T.R. Ibarra-Hurtado, C.M. Nuño-Guzmán, A.G. Miranda-Díaz, R. Troyo-Sanromán, R. Navarro-Ibarra, L. Bravo-Cuéllar, Effect of botulinum toxin type A in lateral abdominal wall muscles thickness and length of patients with midline incisional hernia secondary to open abdomen management, Hernia 18 (October (5)) (2014) 647–652.
[11] G.H.A. De Mesquita, L.R. Iuamoto, F.Y. Suguita, et al., Simple technique of subxiphoid hernia correction carries a low rate of early recurrence: a retrospective study, BMC Surg. 17 (2017) 51.

[12] N.N. Alam, S.K. Narang, S. Pathak, I.R. Daniels, N.J. Smart, Methods of abdominal wall expansion for repair of incisional herniae: a systematic review, Hernia 20 (April (2)) (2016) 191–199.
[13] W. Gibreel, M.G. Sarr, M. Rosen, Y. Novitsky, Technical considerations in performing posterior component separation with transverse abdominis muscle release, Hernia 20 (June (3)) (2016) 449–459.
[14] J.M. Weissler, M.A. Lanni, M.G. Tecce, M.J. Carney, V. Shubinets, J.P. Fischer, Chemical component separation: a systematic review and meta-analysis of botulinum toxin for management of ventral hernia, J. Plast. Surg. Hand Surg. 20 (February) (2017) 1–9.
[15] T.R. Ibarra-Hurtado, C.M. Nuño-Guzmán, J.E. Echeagaray-Herrera, E. Robles-Vélez, J. de Jesús González-Jaime, Use of botulinum toxin type a before abdominal wall hernia reconstruction, World J. Surg. 33 (December (12)) (2009) 2553–2556.
[16] B. Zendejas, M.A. Khasawneh, B. Srvantstyan, D.H. Jenkins, H.J. Schiller, M.D. Zielinski, Outcomes of chemical component paralysis using botulinum toxin for incisional hernia repairs, World J. Surg. 37 (December (12)) (2013) 2830–2837.
[17] R.A. Agha, A.J. Fowler, S. Rajmohan, I. Barai, D.P. Orgill, PROCESS Group, Preferred reporting of case series in surgery; the PROCESS guidelines, Int. J. Surg. 36 (December (Pt A)) (2016) 319–323.
[18] C.T. Smith, M.G. Katz, D. Foley, B. Welch, G.E. Leverson, L.M. Funk, J.A. Greenberg, Incidence and risk factors of incisional hernia formation following abdominal organ transplantation, Surg. Endosc. 29 (February (2)) (2015) 398–404.
[19] I.N. Haskins, G.R. Voeller, N.F. Stoikes, D.L. Webb, R.G. Chandler, S. Phillips, B.K. Poulose, M.J. Rosen, Onlay with adhesive use compared with sublay mesh placement in ventral hernia repair: was chevrel right? An Americas hernia society quality collaborative analysis, J. Am. Coll. Surg. 224 (May (5)) (2017) 962–970.
[20] O.M. Ramirez, E. Ruas, A.L. Dellon, Components separation method for closure of abdominal-wall defects: an anatomic and clinical study, Plast. Reconstr. Surg. 86 (September (3)) (1990) 519–526.
[21] E.M. Pauli, J. Wang, C.C. Petro, R.M. Juza, Y.W. Novitsky, M.J. Rosen, Posterior component separation with transversus abdominis release successfully addresses recurrent ventral hernias following anterior component separation, Hernia 19 (April (2)) (2015) 285–291.
[22] A.M. Afifi, E. Hartmann, A. Talaat, A.A. Alfotooh, O.S. Omar, S. Mareei, R. Sanchez, S.J. Kempton, Quantitative assessment of tension reduction at the midline closure during abdominal component separation, J. Am. Coll. Surg. 224 (May (5)) (2017) 954–961.
[23] K.E. Elstner, A.S. Jacombs, J.W. Read, O. Rodriguez, M. Edye, P.H. Cosman, A.N. Dardano, A. Zea, T. Boesel, D.J. Mikami, C. Craft, N. Ibrahim, Laparoscopic repair of complex ventral hernia facilitated by pre-operative chemical component relaxation using botulinum toxin A, Hernia 20 (April (2)) (2016) 209–219.