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Large and Giant Incisional Hernia Elective Surgical Repair Results. Retrospective Case Series with Follow-up

Resultados de la Reparación Quirúrgica Electiva de Hernias Incisionales Grandes y Gigantes. Serie de Casos Retrospectiva con Seguimiento

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SUMMARY: Incisional hernias (IH) represent the most common late complication of abdominal surgery and require surgical repair. The management of IH remains challenging, particularly in cases with extensive defects such as large incisional hernias (LIH) and giant incisional hernias (GIH). In these patients, surgery is associated with higher rates of postoperative complications (POC) and recurrence compared with smaller IH. The aim of this study was to report the results of surgical treatment of large and giant and IH in terms of CPO, using extraperitoneal mesh. The aim of this study was to report the results of elective surgical treatment of LIH and GIH using supra-aponeurotic mesh in terms of CPO. Retrospective case series with follow-up. The study was carried out at RedSalud Mayor Clinic in Temuco between 2011-2023. Patients older than 18 years with a fascial defect greater than 10 cm in diameter were included in the study. Primary defect closure was performed in all patients using a continuous PDS-1 suture, with supra-aponeurotic reinforcement using a polypropylene mesh. Outcome was POC measured at 30 days postoperatively, applying Clavien & Dindo classification. Other variables of interest were surgical time, hospital stay, mortality and follow-up. Descriptive statistics were applied. In the studied period, 41 patients with LIH and GIH (average age of 60.9±15.8 years, 63.4% female), underwent surgery. Median defect diameter was 17.1±6.8 cm. Average operation time was 85.5±36.4 minutes, and median hospital stay was 4.2±1.5 days. POC occurred in 24.3 % of cases, all of them Clavien & Dindo 1. One reintervention and one case of mortality occurred. With an average follow-up of 44.4±17.4 months, recurrence observed was 4.8 %. CPO rate is high but based on mild complications. However, cases of recurrence and mortality were verified.

KEY WORDS: Ventral hernia; Incisional hernia; Open incisional hernia repair.

INTRODUCTION

The development of an incisional hernia (IH) represents the most common late complication of abdominal surgery, with an incidence ranging from 9% to 12.5% during the first postoperative year, increasing to as much as 32% in subsequent years (Korkut *et al*., 2022). Surgical repair of large IH (LIH) and giant IH (GIH) (Memon *et al*., 2013; Korenkov *et al*., 2001) (Fig. 1), are associated with higher rates of postoperative complications (POC) and recurrence compared with smaller IHs; therefore, its management requires greater surgical expertise. Moreover, there is no evidence-based consensus regarding the optimal treatment for patients with LIH.

Pathophysiology of IH is related to excessive tension on the incision and impaired surgical wound healing. The most common predisposing factors are obesity and postoperative surgical site infection (SSI), which increases the risk of developing IH, with evidence indicating that IH occurs in 20–25 % of patients with SSI. Furthermore, in patients with a body mass index (BMI) >30 kg/m^2, the risk of IH increases to up to 32 % (Abbas *et al*., 2026). Fig. 2.

Other factors contributing to the development of IH include local causes (impaired wound healing, use of the same incision in multiple surgeries, and inadequate surgical technique), systemic factors (advanced age, pulmonary diseases, metabolic disorders, diabetes mellitus, immunosuppression, and corticosteroid use), and oncological factors (postoperative chemotherapy or radiotherapy).

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Fig. 1. Image of a large abdominal wall defect at the confluence of scars from a right subcostal laparotomy (RSCL) and a right supraumbilical transrectal laparotomy (RSTL). The defect ring was larger at the subcostal site but also involved the upper third of the right transrectal incision.

Additionally, in patients at risk of developing abdominal compartment syndrome, such as those with abdominal infection and intestinal edema, leaving the fascia open results in IH in 60–65% of cases (Parker *et al*., 2021; Manterola *et al*., 2016; Manterola *et al*., 2011).

According to the European Hernia Society (EHS) classification, incisional hernias (IH) are categorized as small (<5 cm in width or length), medium (5–10 cm in width or length), and large (>10 cm in width or length) (Muysoms *et al*., 2009). In addition, the concept of giant IH has been described, referring to hernias with a transverse diameter ≥15 cm (Memon *et al*., 2013; Eriksson *et al*., 2014). Fig. 3.

Evidence indicates that between 15 % and 47 % of patients with IH present with large IH; among these, approximately 11 % are estimated to be giant IH (Eriksson *et al*., 2014; Rosenberg *et al*., 2013; Deerenberg *et al*., 2015).

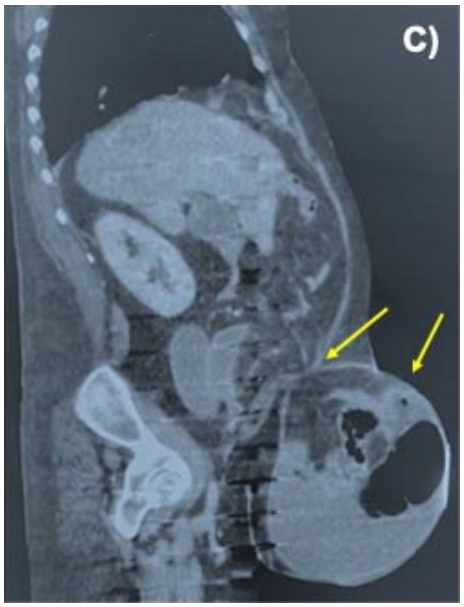

Fig. 2. A: Cephalocaudal view of a patient with an abdominal wall defect associated with a midline infraumbilical laparotomy scar in an obese patient. B: Lateral view of the lesion. C: Computed tomography image showing the defect ring and the hernia sac with its contents (greater omentum and small bowel loops). D: En bloc resected specimen (skin, sac, and contents). E: Final surgical result.

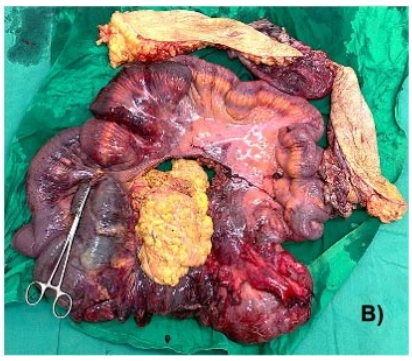

Fig. 3. A: Image of a large, multiloculated abdominal wall defect associated with a midline supraumbilical laparotomy scar. B: Specimen from resection of the greater omentum and small bowel loops with questionable viability at the time of exploration.

When assessing the feasibility of IH repair, the Carbonell rule (2 × RW:DW) is a useful tool for evaluating the suitability of complex repairs, particularly in cases of large and giant incisional hernias (Oprea *et al*., 2021). This rule emphasizes the need for adequate medialization to achieve successful defect closure without excessive tension, thereby guiding preoperative planning and technique selection.

The aim of this study was to report the results of elective surgical treatment of LIH and GIH using supra-aponeurotic mesh in terms of POC.

MATERIAL AND METHOD

The MInCir-ODS checklist for the reporting of results from descriptive observational studies was applied (Manterola & Otzen 2017).

Design: Retrospective case series.

Setting: The study was carried out at RedSalud Mayor Clinic in Temuco between January 2011 and December 2023 (13 years).

Participants: Patients older than 18 years with a fascial defect greater than 10 cm in diameter associated with a prior abdominal surgical scar were included in the study. Patients undergoing emergency surgery, those with intestinal perforation or intra-abdominal infection, and cases with an ASA score greater than 3 were excluded.

Sampling: A consecutive, non-probabilistic sampling was used.

Surgical technique: Surgery was performed with the patients under general anesthesia and placed in supine position. All patients received preoperative antibiotic prophylaxis (cefazolin sodium 1–2 g, depending on body weight).

Primary defect closure was performed in all patients using a continuous PDS-1 suture, with supra-aponeurotic reinforcement using a polypropylene mesh. Suction drainages were used up-to 3 days postoperatively in selected cases.

Variables: The outcome was POC measured at 30 days postoperatively applying Clavien & Dindo classification (Clavien *et al*., 2009). Other variables of interest were surgical time, hospital stay, mortality and follow-up.

Follow-up: Patients have been followed and controlled at months 1, 6, 12 and 24 with abdominal ultrasound or computed tomography and general exams.

Statistics: Descriptive statistics were used with calculation of percentages, measures of central tendency and dispersion. Ethical principles: The identity of the patients was reserved using codes.

RESULTS

In the period studied, 41 patients with LIH and GIH (average age of 60.9±15.8 years, 63.4 % female, and average BMI of 29.4±62 kg/m^2), underwent surgery.

The median defect diameter was 17.1±6.8 cm (11 to 40 cm).

Table I. Laboratory variables (N = 41).

Variables	Average	Minimum	Maximum	*Normal values*
Hemoglobin (g/dL)	14	13	16	13.5 - 17.0
Hematocrit (%)	38.5	36	42	36 - 48 (female) 40 - 54 (male)
Total leukocytes (10^3/ul)	7500	5500	9000	4000 - 10000
Platelets (10^3/ul)	250	180	370	150 - 400
ESR (mm/h)	**15**	10	**28**	0 - 13
Glycemia (mg/dL)	95	90	**140**	70 - 100
Creatinine (mg/dL)	0.9	0.7	1.2	0.6 - 1.2
Total proteins (g/dL)	7.0	6.5	8.0	6.4 - 8.3
Albumin (g/dL)	3.9	3.5	4.8	3.4 - 4.8
Total bilirubin (mg/dL)	0.9	0.8	1.0	0.2 - 1.3
Alkaline phosphatases (U/L)	115	38	125	38 - 126
ASAT (U/L)	25	18	35	17 - 59
ALAT (U/L)	31	22	45	21 - 72
GGTP (U/L)	48	20	72	15 - 73
Prothrombin (%)	95	85	100	70 - 100
PTT (s)	27	23	31	21 - 32

ESR: Erythrocyte sedimentation rate; ASAT: Aspartate aminotransferase; ALAT: Alanine aminotransferase; GGTP: Gamma glutamyl transferase; PTT: Partial thromboplastin time.

The behavior of the laboratory variables can be observed in Table I, but discrete elevation in average and maximum values was registered in the variables erythrocyte sedimentation rate (15 mm/hr), and Glycemia (140 mg/dL), respectively (Table I).

The 78.1% of the patients had some coexisting condition, and 26.8 % of cases presented with more than one (Table II).

The average operation time was 85.5±36.4 minutes, and the median hospital stay was 4.2±1.5 days.

Table II. Coexisting conditions. (N = 41).

Variable	Nº cases	Frequency
None	9	21.9
Coexisting diseases *		
Arterial Hypertension	14	34.1
Obesity without comorbidities	8	19.5
Type 2 Diabetes Mellitus + Obesity	4	9.8
Type 2 Diabetes Mellitus	2	4.9
Type 2 Diabetes Mellitus + Arterial Hypertension	1	2.4
Smoking	4	9.8
Arterial Hypertension + Obesity	4	9.8
Chronic obstructive pulmonary disease	6	14.6

*: Eleven patients (26.8 %) presented with more than one coexisting condition. These were all cases of chronic obstructive pulmonary disease and smoking, and one case of arterial hypertension.

POC occurred in 24.3 %: 8 cases of persistent pain, one case of seroma, and other case of surgical site infection (all of them Clavien & Dindo 1).

One reintervention was required in a feminine patient. One case of mortality occurred, in a 65 years old patient who developed systemic inflammatory response syndrome (SIRS), and subsequent multi-organ failure 24 hours after surgery (it was a morbid obese and type 2 diabetes mellitus patient).

With an average follow-up of 44.4±17.4 months (24 to 108 months), two cases of recurrence (4.8 %) were observed.

DISCUSSION

The reported incidence of large incisional hernias (LIH) ranges from 2 % to 20 %, and is particularly high following abdominal aortic aneurysm repair, reaching up to 37 % (Nho *et al*., 2012). Patients with aneurysms are known to exhibit defects in the production of collagen types I and III (Bórquez *et al*., 2003; Molina & Manterola, 2012) and elastin, suggesting that connective tissue abnormalities may impair wound healing and predispose patients to the development of IH (Urabe *et al*., 2016).

Furthermore, there is evidence that comorbidities such as diabetes mellitus play a significant role in impaired wound healing and in the formation of large incisional hernias (Endo *et al*., 2023).

Preoperative preparation with botulinum toxin injection has become a valuable adjunct in the repair of LIH, inducing temporary flaccid paralysis of the lateral abdominal wall muscles without systemic effects. This results in a significant increase in muscle length and a reduction in muscle tension, thereby facilitating medialization of the rectus muscles and reducing the size of the fascial defect by up to 5 cm, which increases the likelihood of tension-free closure (Jacombs *et al*., 2021; Rodríguez-Acevedo *et al*., 2018; Mejía-Saavedra *et al*., 2025). Furthermore, it has been shown to maintain the integrity of the repair site during the early postoperative phase, which may reduce the recurrence rate (Jacombs *et al*., 2021; Rodriguez-Acevedo *et al*., 2018).

The use of mesh is considered the standard of care in the surgical repair of IH larger than 2 cm in diameter, as it reduces the high recurrence rates (Kaufmann *et al*., 2018). Meshes are broadly classified into two groups: biological and synthetic. Biological meshes are derived from acellular collagen-rich tissues obtained from cadaveric or animal sources. However, synthetic meshes—such as polypropylene, polyester, and expanded polytetrafluoroethylene (ePTFE)—are the most commonly used.

A variety of new meshes with different material and structural properties have been developed, including so-called dual meshes (Korkut *et al*., 2022). Dual meshes are primarily based on synthetic materials. Their intraperitoneal surface is coated with a substance that prevents adhesion of the intestines to the mesh. Their use is mandatory in laparoscopic repairs where the mesh is placed within the abdominal cavity, as well as in cases where tissue approximation is not feasible, such as in the open repair of large incisional hernias (Vorst *et al*., 2015; Gönüllü *et al*., 2015).

Accordingly, there is evidence supporting that meshes placed in an extraperitoneal position using an open approach can be used safely, with low rates of complications and recurrence, and therefore should be considered in therapeutic decision-making (Alimi *et al*., 2020).

The European Hernia Society has defined the following mesh placement techniques: onlay, inlay, sublay-retromuscular, sublay-preperitoneal, and sublay-intraperitoneal (Amili *et al*., 2020). However, each method presents specific advantages, technical challenges, and potential complications; therefore, there is no consensus among surgeons regarding the optimal mesh position or the type of mesh to be used in IH repair (Amili *et al*., 2020; Cobb *et al*., 2018).

The surgical management of IH represents a major challenge for surgeons due to the high rate of complications. Morbidity ranges from 4 % to as high as 100 % (median 32 %), recurrence with follow-up of one to five years may reach up to 35 % (median 5%–8 %), and mortality ranges from 0% to 5 % (median 2 %) (Deerenberg *et al*., 2015; Eriksson *et al*., 2014; Kroese *et al*., 2018). Surgery for large incisional hernias is more complex than that for small and medium-sized IH and requires greater expertise. Accordingly, it is recommended that the management of LIH be performed by experienced surgeons (Deerenberg *et al*., 2015; Lindmark *et al*., 2018).

The role of drains in the prevention and management of fluid accumulation, as well as their potential to reduce the formation of postoperative seromas and hematomas, remains controversial due to the lack of high-quality evidence to resolve this uncertainty (Willemin *et al*., 2023; Sahm *et al*., 2024). Nevertheless, there is evidence suggesting that the use of drains increases hospital length of stay and the risk of infection, without clearly reducing the risk of seroma formation (Sanha *et al*., 2024).

Complications following LIH and GIH surgery may occur in both the early and late postoperative periods. In the early phase, complications include perioperative bowel injury, seroma, hemorrhage, superficial or deep wound infection, skin necrosis, and mesh detachment due to inadequate fixation. Late complications include hernia recurrence and mesh-related reactions (Amili *et al*., 2020; Cobb *et al*., 2018).

As limitations, it should be noted that this study comprises a small, single-center case series; therefore, it provides level IV evidence and is insufficient for comparative analysis of outcomes.

In conclusion, it can be noted that CPO rate is high but based on mild complications. However, cases of recurrence and mortality were verified.

MANTEROLA, C. & RIVADENEIRA, J. Resultados de la reparación quirúrgica electiva de hernias incisionales grandes y gigantes. Serie de casos retrospectiva con seguimiento. *Int. J. Morphol., 44(3)*:1084-1089, 2026.

RESUMEN: Las hernias incisionales (HI) constituyen la complicación tardía más frecuente de la cirugía abdominal y requieren reparación quirúrgica. La cirugía de las HI sigue siendo un desafío, especialmente en casos con defectos extensos como las HI de gran tamaño (HIGT) y las HI gigantes (HIG). En este tipo de pacientes, la cirugía se asocia a mayores tasas de complicaciones postoperatorias (CPO) y de recurrencia que en las HI más pequeñas. El objetivo de este estudio fue reportar los resultados del tratamiento quirúrgico electivo de HIGT y HIG mediante el uso de malla supra aponeurótica en términos de CPO. Serie de casos retrospectiva con seguimiento. El estudio se realizó en Clínica Mayor RedSalud en Temuco (2011-2023). Se incluyeron pacientes mayores de 18 años con defecto fascial >10 cm de diámetro. En todos los pacientes se realizó el cierre primario del defecto mediante una sutura continua PDS-1, con refuerzo supra aponeurótico con malla de polipropileno. La variable resultado fue CPO medida a los 30 días postoperatorios, aplicando la clasificación de Clavien y Dindo. Otras variables de interés fueron tiempo quirúrgico, estancia hospitalaria, mortalidad y seguimiento. Se utilizaron estadísticas descriptivas. En el período estudiado, 41 pacientes con LIH y GIH (edad promedio de 60,9±15,8 años, 63,4 % mujeres) fueron sometidos a cirugía. El diámetro medio del defecto fue de 17,1±6,8 cm. El tiempo promedio de operación fue de 85,5±36,4 minutos, y la estancia hospitalaria media fue de 4,2±1,5 días. Se produjo POC en el 24,3 % de los casos, todos ellos Clavien & Dindo 1. Se produjo una reintervención y un caso de mortalidad. Con un seguimiento promedio de 44,4±17,4 meses, la recurrencia observada fue 4,8 %. La tasa de CPO es alta, pero con base en complicaciones leves. Sin embargo existe recurrencia y mortalidad asociada a la reparación quirúrgica de estos pacientes.

PALABRAS CLAVE: Hernia ventral; Hernia incisional; Cirugía abierta de hernia incisional.

REFERENCES

Abbas, A. A.; Gunning, P.; Chintapatla, S. & Kröger, R. Incisional Hernia Development: Wound Healing Gone Wrong? *Wound Repair Regen., 34(2)*:e70131, 2026. https://www.doi.org.10.1111/wrr.70131.

Alimi, Y.; Merle, C.; Sosin, M.; Mahan, M. & Bhanot, P. Mesh and plane selection: a summary of options and outcomes. *Plast. Aesthetic. Res., 20*; 7:5, 2020. https://www.doi.org.10.20517/2347-9264.2019.39.

Bórquez, P.; Garrido, L.; Manterola, C.; Peña, P.; Schlageter, C.; Orellana, J. J. *et al*. Estudio de fibras colágenas y elásticas del tejido conjuntivo de pacientes con y sin hernia inguinal primaria. *Rev. Med. Chile., 131(11)*:1273-1279, 2003. https://www.doi.org.10.4067/S0034-98872003001100007.

Clavien, P. A.; Barkun, J.; de Oliveira, M. L.; Vauthey, J. N.; Dindo, D.; Schulick, R. D. *et al*. The Clavien-Dindo classification of surgical complications: five-year experience. *Ann. Surg., 250(2)*:187-96, 2009. https://www.doi.org.10.1097/SLA.0b013e3181b13ca2.

Cobb, W. S. A current review of synthetic meshes in abdominal wall reconstruction. *Plast. Reconstr. Surg., 142*:64S-71S, 2018. https://www.doi.org.10.1097/PRS.0000000000004857.

Deerenberg, E. B.; Timmermans, L.; Hogerzeil, D. P.; Slieker, J. C.; Eilers, P. H.; Jeekel, J.; Lange, J. F. A systematic review of the surgical treatment of large incisional hernia. *Hernia., 19(1)*:89-101, 2015. https://www.doi.org.10.1007/s10029-014-1321-x.

Endo, T.; Miyahara, K.; Shirasu, T.; Mochizuki, Y.; Taniguchi, R.; Takayama, T. *et al*. Risk factors for incisional hernia after open abdominal aortic aneurysm repair. *In Vivo., 37(6)*:2803-7, 2023. https://www.doi.org.10.21873/invivo.13393.

Eriksson, A.; Rosenberg, J. & Bisgaard, T. Surgical treatment for giant incisional hernia: a qualitative systematic review. *Hernia. 18(1)*:31-8, 2014. https://www.doi.org.10.1007/s10029-013-1066-y.

Gönüllu¨, D. & Nihat Köksoy, F. The prosthetic materials in hernia repair. *J. Acad. Res. Med., 5*:1-5, 2015. https://www.doi.org.10.5152/jarem.2015.577.

Jacombs, A.; Elstner, K.; Rodriguez-Acevedo, O.; Read, J. W.; Ho-Shon, K.; Wehrhahn, M. *et al*. Seven years of preoperative BTA abdominal wall preparation and the Macquarie system for surgical management of complex ventral hernia. *Hernia., 26(1)*:109-21, 2021. https://www.doi.org.10.1007/s10029-021-02428-2.

Kaufmann, R.; Halm, J. A.; Eker, H. H.; Klitsie, P. J.; Nieuwenhuizen, J.; van Geldere, D. *et al*. Mesh versus suture repair of umbilical hernia in adults: a randomised, double-blind, controlled, multicentre trial. *Lancet., 391*:860-9, 2018. https://www.doi.org.10.1016/S0140-6736(18)30298-8.

Korenkov, M.; Paul, A.; Sauerland, S.; Neugebauer, E.; Arndt, M.; Chevrel, J. P. *et al*. Classification and surgical treatment of incisional hernia. Results of an experts' meeting. *Langenbecks Arch. Surg., 386(1)*:65-73, 2001. https://www.doi.org.10.1007/s004230000182.

Kroese, L. F.; Kleinrensink, G. J.; Lange, J. F. & Gillion, J. F. External validation of the European Hernia Society classification for postoperative complications after incisional hernia repair: a cohort study of 2,191 patients. *J. Am. Coll. Surg., 226(3)*:223-9, 2018. https://www.doi.org.10.1016/j.jamcollsurg.2017.11.018.

Korkut, E.; Aksungur, N.; Altundaş, N.; Kara, S.; Peksöz, R. & Öztürk, G. Giant Incisional Hernia Repair Using Open Intraperitoneal Dual Mesh. *Cureus. 14(7)*:e27126, 2022. https://www.doi.org.10.7759/cureus.27126.

Lindmark, M.; Strigård, K.; Löwenmark, T.; Dahlstrand, U. & Gunnarsson, U. Risk factors for surgical complications in ventral hernia repair. *World J. Surg., 42(11)*:3528-36, 2018. https://www.doi.org.10.1007/s00268-018-4642-6.

Manterola, C. & Otzen, T. Checklist for Reporting Results Using Observational Descriptive Studies as Research Designs: The MInCir Initiative. *Int. J. Morphol., 35(1)*:72-6, 2017. https://www.doi.org.10.4067/S0717-95022017000100013.

Manterola, C.; Flores, P. & Otzen, T. Floating stoma: An alternative strategy in the context of damage control surgery. *J. Visc. Surg., 153(6)*:419-24, 2016. https://www.doi.org.10.1016/j.jviscsurg.2016.06.003.

Manterola, C.; Moraga, J. & Urrutia, S. Contained laparostomy with a Bogota bag. Results of case series. *Cir. Esp., 89(6)*:379-85. https://www.doi.org.10.1016/j.ciresp.2011.01.010.

Mejía-Saavedra, Y.; Mejía-Saavedra, A.; Caballero-Alvarado, J.; Zavaleta-Corvera, C.; Lau-Torres, V. & Lozano-Peralta, K. Effect of preoperative botulinum toxin injection in the treatment of giant incisional hernias: a systematic review and meta-analysis. *Hernia., 29(1)*:188, 2025. https://www.doi.org.10.1007/s10029-025-03384-x.

Memon, A. A.; Khan, A.; Zafar, H.; Murtaza, G. & Zaidi, M. Repair of large and giant incisional hernia with onlay mesh: perspective of a tertiary care hospital of a developing country. *Int. J. Surg., 11(1)*:41-5, 2013. https://www.doi.org.10.1016/j.ijsu.2012.11.006.

Molina, V. & Manterola, C. ¿Existe alteración de los mecanismos de degradación del colágeno de la matriz extracelular manifestada en la expresión de MMP2 y TIMP2 en pacientes con hernia inguinal primaria? *Int. J. Morphol., 30(2)*:683-7, 2012. https://www.doi.org.10.4067/S0717-95022012000200054.

Muysoms, F. E.; Miserez, M.; Berrevoet, F.; Campanell, G.; Champault, G. G.; Chelala, E. *et al*. Classification of primary and incisional abdominal wall hernias. *Hernia., 13(4)*:407-14, 2009. https://www.doi.org.10.1007/s10029-009-0518-x.

Nho, L. H.; Mege, D.; Ouaïssi, M.; Sielezneff, I. & Sastre, B. Incidence and prevention of ventral incisional hernia. *J. Visc. Surg., 149(5 Suppl)*:e3-14, 2012. https://www.doi.org.110.1016/j.jviscsurg.2012.05.004.

Oprea, V.; Mardale, S.; Buia, F.; Gheorghescu, D.; Nica, R.; Zdroba, S. *et al*. The influence of transversus abdominis muscle release (TAR) for complex incisional hernia repair on the intraabdominal pressure and pulmonary function. *Hernia., 25(6)*:1601–1609, 2021. https://www.doi.org.10.1007/s10029-021-02395-8.

Parker, S. G.; Mallett, S.; Quinn, L.; Wood, C. P. J.; Boulton, R. W.; Jamshaid, S. *et al*. Identifying predictors of ventral hernia recurrence: systematic review and meta-analysis. *BJS Open., 2021, 5(2)*:zraa071. https://www.doi.org.10.1093/bjsopen/zraa071

Rodriguez-Acevedo, O.; Elstner, K. E.; Jacombs, A. S. W.; Read, J. W.; Martins, R. T.; Arduini, F. *et al*. Preoperative botulinum toxin A enabling defect closure and laparoscopic repair of complex ventral hernia. *Surg. Endosc., 32*:831-9, 2018. https://www.doi.org.10.1007/s00464-017-5750-3.

Rosenberg, J.; Kehlet, H.; Jorgensen, L. N. & Bisgaard, T. Nationwide prospective study of outcomes after elective incisional hernia repair. *Helgstrand F. J. Am. Coll. Surg., 216*:217-228, 2013. https://www.doi.org.10.1016/j.jamcollsurg.2012.10.013.

Sahm, M.; Pross, M.; Hukauf, M.; Adolf, D.; Kockerling, F. & Mantke, R. Drain versus no drain in elective open incisional hernia operations: a registry-based analysis with 39,523 patients. *Hernia., 28(4)*:1077-91, 2024. https://www.doi.org.10.1007/s10029-023-02862-4.

Sanha, V.; Trindade, B. O. & Elvir, F. A. R. Do surgical drains reduce the postoperative surgical complications following incisional hernia repair? A systematic meta-analysis. *Hernia., 28(2)*:377-84, 2024. https://www.doi.org.10.1007/s10029-024-02961-w.

Urabe, G.; Hoshina, K.; Shimanuki, T.; Nishimori, Y.; Miyata, T. & Deguchi, J. Structural analysis of adventitial collagen to feature aging and aneurysm formation in human aorta. *J. Vasc. Surg., 63(5)*:1341-50, 2016. https://www.doi.org.10.1016/j.jvs.2014.12.057.

Vorst, A. L.; Kaoutzanis, C.; Carbonell, A. M. & Franz, M. G. Evolution and advances in laparoscopic ventral and incisional hernia repair. *World. J. Gastrointest. Surg., 7(11)*:293-305, 2015. https://www.doi.org.10.4240/wjgs.v7.i11.293.

Willemin, M.; Schaffer, C.; Kefleyesus, A.; Dayer, A.; Demartines, N.; Schäfer, M. *et al*. Drain versus no drain in open mesh repair for incisional hernia, results of a prospective randomized controlled trial. *World. J. Surg., 47(2)*:461-68, 2023. https://www.doi.org.10.1007/s00268-022-06725-4.

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