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# Evaluation of the double mesh and intraperitoneal onlay mesh techniques in giant incisional hernias

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**Abstract**

**Background:** Giant incisional hernias are difficult to manage. The present study aims to comparatively evaluate the intraperitoneal onlay mesh (IPOM) technique to double-mesh repair techniques in patients with a midline abdominal wall incisional hernia larger than 15 cm (transvers width) that cannot be closed primarily.

**Material and methods:** Patients who underwent repair surgery with the diagnosis of incisional hernia in our hospital between January 2017 and December 2019 were retrospectively evaluated. The repair was performed with open surgery using the IPOM technique in 19 patients and the double-mesh technique in 13 patients for 2 years to evaluate for postoperative complications, pain, and recurrence.

**Results:** The mean age, gender distribution, body mass index, defect size, and American Society of Anesthesiologists scores were similar between the groups. The total rate of postoperative complications was 42.1% in Group A and 30.8% in Group B, with no significant difference between the groups ($p > 0.05$). Recurrence occurred in three patients (15.8%) in Group A, but it did not in Group B. Although the absence of recurrence in Group B was a remarkable finding, the difference was not statistically significant ($p>0.05$).

**Discussion:** The IPOM and double-mesh techniques can be used safely to perform tension-free abdominal wall reconstruction in patients with complex and giant incisional hernias. However, the double-mesh technique may be preferred owing to its lower recurrence rate.

**Key words:** giant incisional hernia, double mesh, IPOM

## Introduction

Incisional hernia is a common surgical problem, and it occurs in 2%–10% of laparotomies [1]. According to the European Hernia Society classification, incisional abdominal wall hernias with a defect size of >10 cm (transverse diameter [width] = W3) are classified as large incisional hernias [2]. Notably, very large hernias, also referred to as giant ventral hernias, are considered in cases in which the hernia orifice is >10 cm in width with loss of domain [3]. The management of giant hernia remains a surgical challenge, and one of the main technical difficulties has been reported to be parietal closure without tension [4].

Another challenge in the management of giant hernia is the reduction of the hernia content into the abdomen. Moreover, increased intraabdominal pressure and cardiovascular and respiratory problems are expected as surgical complications [4]. Surgical correction plays an important role in the treatment of giant incisional hernias. Special techniques, such as intraperitoneal onlay mesh, double-mesh, and component, separation have been developed and employed to reduce postoperative complications as well as to decrease the likelihood of recurrence, particularly in patients with giant incisional hernias that cannot be primarily closed at the midline by suture repair [5,6].

At present, to the best of our knowledge, no technique or approach has been recognized as the gold standard for ventral incisional hernia repair. The present study aimed to evaluate the intraperitoneal onlay mesh (IPOM) versus double-mesh surgical repair techniques used for large midline incisional hernias in which the hernia defect cannot be primarily closed without tension by suture repair; moreover, we aimed to examine the two techniques in terms of recurrence and share our experience.

## Material and methods

The records of patients who underwent giant incisional hernia repair surgery performed by two surgical

teams in XXX Hospital between January 2017 and December 2019 were retrospectively reviewed. The study protocol was approved by the local ethics committee (Haydarpaşa Numune Education and Training Hospital, Clinical Trials Ethics Committee, İstanbul, Turkey). The study included patients aged 18 years and older who had a midline abdominal wall defect of greater than 10 cm as evidenced by preoperative computed tomography scans or ultrasonography. Patients with recurrent hernias, those undergoing emergency surgery, those with ascites, those with metastatic disease, and those who did not attend control visits were excluded. The hospital records of 232 patients who underwent surgery with the diagnosis of incisional hernia were evaluated, and 36 patients who met the selection criteria were identified. However, two patients could not be reached, and two other patients died due to other causes. A total of 32 patients were included in the study, with 19 undergoing repair using the IPOM technique (DualMesh® [Gore®]) assigned to Group A and 13 undergoing repair using the double-mesh technique combining intraperitoneal onlay dual mesh and onlay polypropylene (PP) (Bard Ltd, UK) mesh assigned to Group B.

In addition to the findings of physical examination, ultrasonography and computed tomography were used to diagnose recurrent hernia. Chronic pain was defined as pain that lasted for >6 months and necessitated the use of analgesics. The data of patients were retrieved from the hospital records, and the patients were contacted via telephone, if necessary. Demographic data (age, gender, body mass index [BMI]), the American Society of Anesthesiologists (ASA) score, defect size (cm), operation time (minutes), length of hospital stay (days), postoperative complications, pain, and recurrence parameters were recorded.

## Surgical technique

After excising the scar tissue, the hernia defect was exposed using dissection. Further, the adhesions were removed after entering the peritoneal cavity. An expanded polytetrafluoroethylene (ePTFE) dual mesh (DualMesh® [Gore®]) overlapping the defect by at least 5 cm in all directions was intraperitoneally inserted using an onlay technique and attached to the abdominal wall using transmural 2/0 prolene U-sutures. In the double-mesh technique, in addition to the ePTFE intraperitoneal onlay dual mesh placement described above, a supra-aponeurotic PP (polypropylene) mesh was placed using an onlay technique and attached with 2/0 prolene sutures. Subcutaneous aspiration drains were placed in both groups.

## Statistical analysis

The IBM SPSS Statistics 22 software package was used in the statistical analysis of the study data. The Kolmogorov–Smirnov and Shapiro–Wilk tests were used to examine whether the parameters were normally distributed. Along with descriptive statistics (mean, standard deviation, and frequency), the Student's t-test was used to compare quantitative parameters with a normal distribution between the two groups, whereas the Mann–Whitney U test was used to compare parameters without a normal distribution. The Fisher's exact chi-square test, Fisher–Freeman–Halton exact chi-square test, and Yates's correction for continuity were used to compare qualitative data. A p value of <0.05 was considered statistically significant.

## Results

Of the participants, 19 (59.4%) underwent repair using the open IPOM technique (Group A) and 13 (40.6%) using the double-mesh technique (Group B). The mean age was 57.58±13.66 years in Group A and 58.85±14.59 years in Group B. There was no significant difference between the two groups in terms of gender distribution, BMI, defect size, preoperative hemoglobin, albumin,and ASA scores. The demographic characteristics of the patients are presented in Table 1.

Table 1 Comparison of demographic characteristics between the groups

| | | Group A (n= 19) | Group B (n = 13) | Total (n = 32) | p |
|---|---|---|---|---|---|
| Age Mean ± SD | | 57.58 ± 13.66 | 58.85 ± 14.59 | 58.09 ± 13.82 | *0.804 |
| BMI Mean ± SD | | 33.34 ± 5.9 | 32.07 ± 4.9 | 32.83 ± 5.47 | *0.527 |
| Defect Size (cm) Mean ± SD | | 16.68 ± 2.08 | 16.08 ± 2.72 | 16.44 ± 2.34 | *0.480 |
| Preoperative Hb Mean ± SD | | 12.22 ± 1.31 | 12.64 ± 1.02 | 12.39 ± 1.2 | *0.342 |
| Preoperative albumin Mean ± SD | | 3.83 ± 0.41 | 3.85 ± 0.37 | 3.84 ± 0.39 | *0.848 |
| Length of hospital stay (day)<br>Mean ± SD (median) | | 8.95 ± 3.88<br>(8) | 8.54 ± 3.69 (8) | 8.78 ± 3.75<br>(8) | †0.846 |
| Gender n (%) | Male | 10 (52.6%) | 8 (61.5%) | 18 (56.2%) | ‡0.892 |
| | Female | 9 (47.4%) | 5 (38.5%) | 14 (43.8%) | |
| Comorbid Conditions n (%) | Present | 15 (78.9%) | 10 (76.9%) | 25 (78.1%) | §1.000 |
| | Absent | 4 (21.1%) | 3 (23.1%) | 7 (21.9%) | |
| ASA n (%) | 1 | 1 (5.3%) | 1 (7.7%) | 2 (6.3%) | ‖1.000 |
| | 2 | 8 (42.1%) | 5 (38.5%) | 13 (40.6%) | |

*Student's t-test †Mann–Whitney U Test ‡Yates's correction for continuity §Fisher's Exact test ‖Fisher–Freeman–Halton Exact test *p < 0.05* ASA, American Society of Anesthesiologists

Table 2 Comparison of operative findings between the groups

| | | Group A (n = 19) | Group B (n = 13) | Total (n = 32) | p |
|---|---|---|---|---|---|
| Operation time (min) Mean ± SD (median) | | 175.0 ± 21.8 (170) | 206.92 ± 34.0 (210) | 187.97 ± 31.26 (180) | *0.007* |
| Perioperative organ injury n (%) | Present | 0 (0%) | 1 (7.7%) | 1 (3.1%) | †0.406 |
| | Absent | 19 (100%) | 12 (92.3%) | 31 (96.9%) | |

*Mann–Whitney U Test †Fisher's Exact Test *p < 0.05*

The mean operation time was 175.0±21.8 (170) minutes in Group A and 206.92±34.0 (210) minutes in Group B, showing a significantly longer operation time in the double-mesh repair group (p<0.05). The comparison of operative findings between the groups is presented in Table 2. No significant perioperative hemorrhage occurred in our patients, and no patient required a blood transfusion.

When evaluated in terms of complications, the rate of seroma was 21.1% in Group A and 23.1% in Group B, the rate of wound site infection was 15.8% in Group A and 15.4% in Group B, and the rate of respiratory problems was 5.3% in Group A and 23.1% in Group B, showing no significant difference between the groups. Despite the observation of a difference in respiratory complications, no statistically significant difference was found owing to the small number of patients. No patient developed hematoma or hemorrhage, and no patient required blood replacement.

In terms of late complications, chronic pain occurred in three patients (15.8%) in Group A and one patient (7.7%) in Group B (p>0.05); recurrence was observed in three patients (15.8%) in Group A, whereas no recurrence was observed in Group B. Recurrence occurred at 9 months in one patient and 1 year after surgery in two patients. Although the absence of recurrence in the double-mesh repair group was a remarkable finding, the difference was not statistically significant (p>0.05). No mortality occurred. Postoperative early and late complications are presented in Table 3.

Table 3 Evaluation of postoperative complications

| | Group A (n = 19) | Group B (n = 13) | Total (n = 32) | |
|---|---|---|---|---|
| | n (%) | n (%) | n (%) | p |
| Early Complications | | | | |
| Seroma | 4 (21.1%) | 3 (23.1%) | 7 (21.9%) | 1.000 |
| Hematoma | 0 (0%) | 0 (0%) | 0 (0%) | - |
| Bands | 0 (0%) | 1 (7.7%) | 1 (3.1%) | 0.406 |
| Wound site infection | 3 (15.8%) | 2 (15.4%) | 5 (15.6%) | 1.000 |
| Respiratory problems | 1 (5.3%) | 3 (23.1%) | 4 (12.5%) | 0.279 |
| Late Complications | | | | |
| Chronic pain | 3 (15.8%) | 1 (7.7%) | 4 (12.5%) | 0.629 |
| Recurrence | 3 (15.8%) | 0 (0%) | 3 (9.4%) | 0.253 |
| Mortality | 0 (0%) | 0 (0%) | 0 (0%) | - |
| Postoperative Complications (Total) | 8 (42.1%) | 4 (30.8%) | 12 (37.5%) | 0.713 |

*Fisher's Exact Test*

## Discussion

The goals of surgery for incisional hernias are to perform surgical correction and to reduce complications and recurrence. In complex incisional hernias of >10 cm, suture repair is technically more difficult, and there is debate about the choice of surgical procedure owing to the increased postoperative morbidity and high recurrence rates [7,8].

Although some studies have published the advantages of laparoscopic repair over open surgery, the guidelines have recommended open repair of hernias with a defect size of >10cm [9,10]. All patients in the present study had undergone open surgery and defect size of >15 cm. There is still debate about the ideal surgical technique for the repair of incisional hernias. The Rives–Stoppa technique involving retro muscular mesh placement will gain widespread acceptance if the fascia can be closed primarily. Because the mesh is not located in the intra-abdominal cavity, this surgical method has some advantages, including low rates of surgical site infection, low recurrence rates in the long term, and low rates of intra-abdominal complications [11].

Giant incisional hernias, in which the abdominal wall cannot be closed, have prompted surgeons to seek alternative methods. Among these methods, the component separation technique has necessitated the addition of single- and double-mesh placements because the technique created new weak spots and was associated with increased postoperative morbidity. The addition of mesh placement resulted in reduced morbidity and recurrence rates [7,12]. The Expert Consensus Guided by Systematic Review has stated that the use of IPOM may be beneficial in the repair of large incisional hernias [13]. The IPOM technique is particularly recommended for patients in whom laparoscopic surgery is contraindicated, those with obesity, those with multiple previous laparotomies, and those with hernia recurrence after preperitoneal mesh placement.

Usher first reported the double-mesh technique, and several modifications have been published since [14]. An open repair using IPOM and double-mesh techniques is used to solve a complex problem caused by a large defect that cannot be closed, primarily owing to anatomical limitations. The objective of repair is to perform tension free reconstruction without compressing the abdominal compartment.

In accordance with the recommendations of these guidelines and the preferences of the two surgical teams, IPOM and double-mesh repair techniques were used in the present study to repair large incisional hernias. In a meta-analysis, obesity was reported to be a factor in the development of recurrence in many studies in which the BMI cut off value was accepted as 30 kg/m2 [8]. A study of 163 patients found that patients with a BMI of >32 kg/m2 had a higher recurrence rate 10.5%, whereas those with a BMI of <32 kg/m2 had a recurrence rate of 1.7% [15]. In the present study, there was no significant difference in BMI between the groups, and the mean BMI was 32.83±5.47 kg/m2. However, two out of three patients who developed recurrent hernia had a BMI of >40 kg/m2. The mean defect size in the

present study was 16.44±2.34 cm, which is similar to the defect sizes reported in the literature for large and giant incisional hernias that were repaired using the IPOM and double-mesh repair techniques [16].

In a meta-analysis, the risk of recurrence was reported to increase with increasing defect diameter, but no significant relationship was found between defect diameter and recurrence rate [8]. The length of hospital stay has been reported to be 5±4 days, with some studies reporting 6–60 days [16,17]. Consistent with the literature, the mean length of hospital stay in the present study was 8.78±3.75 days, with no significant difference between the groups. The mean operation time has been reported to be 60–300 minutes in the literature [16,18]; the operation times in the present study were consistent with those reported in the literature, and the operation time was significantly longer in the double-mesh repair group. It is not an unexpected result as it is already predicted that placing two meshes will increase the operation time.

Notably, postoperative complication rates in open IPOM technique are 1.6%–12.5% for seroma, 2.5% for hematoma, 2.5%–10% for wound site infection, and 3.3% to 4% for chronic pain [17,19]. In the present study, with the use of the IPOM technique (Group A), the rates of seroma, wound site infections, and chronic pain were 21.1%, 15.8%, and 15.8%, respectively. In a series of 19 patients undergoing surgical repair using the double-mesh technique, the rate of wound site infections during a follow-up period of 30 months was 5.8%,, and the rate of chronic pain was 35.3% [20]. In a study by Moreno-Egea et al. [16] involving a follow-up period of 48 months in patients undergoing repair using the double-mesh technique, the rates of seroma, skin necrosis, and wound site infections were 10%, 4%, and 2%, respectively. In another study of 43 patients in which modified double-mesh and onlay mesh techniques were compared, seroma, hematoma, wound site infection, and chronic pain were observed in 9.1%, 4.5%, 4.5%, and 4.5% of the cases treated with double-mesh technique [21].

In the present study, with the use of the double-mesh technique (Group B), the rates of seroma, wound site infections, and chronic pain were 23.1%, 15.4%, and 7.7% (one patient), respectively. Notably, the complication rates in both groups were found to be higher than those reported in the relevant literature, and this difference may be attributed to the small number of patients in our study. The rates of seroma, hematoma, and wound site infections have been reported to be higher in the onlay (supra-aponeurotic) mesh technique than in the intraperitoneal onlay mesh technique owing to the need for more extensive subcutaneous dissection during mesh placement in the onlay mesh technique [21]. In the present study, although the second mesh was placed in the supra-aponeurotic area using an onlay technique in the double-mesh group, postoperative complications were found to be similar between the two groups.

Previous studies have reported recurrence rates of 0%–61.0% (mean, 12.6%) using the IPOM Technique [16,18] and 0%–18% using the double-mesh technique [21-24]. In the present study, recurrence was observed in three patients in Group A (15.8%), whereas no recurrence was observed in Group B (0%). Despite the small number of patients and the consequent lack of a statistically significant difference between the two groups, the authors believe that the addition of a second mesh to the surgical repair procedure would reduce recurrence rates. Notably, the recurrence rates for both surgical techniques were found to be consistent with those reported in the literature.

The small number of patients and retrospective study design are limitations of the present study. However, the repair of giant incisional hernias is challenging, and there is a lack of an evidence-based research using data from large-scale randomized studies. In conclusion, the authors of the present study suggest that the IPOM and double-mesh techniques can be used safely to perform tension-free abdominal wall reconstruction in patients with complex and giant incisional hernias; however, despite the lack of a statistically significant difference, the double-mesh technique may appear to be a better option in terms of recurrence. Therefore, large-scale studies are required.

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## References

1. Le Huu Nho R, Mege D, Ouaïssi M, Sielezneff I, Sastre B. incidence and prevention of ventral incisional hernia. *J Visc Surg*. 2012;149 Supplement:e3-14. https://doi.org/10.1016/j.jviscsurg.2012.05.004
2. Muysoms FE, Miserez M, Berrevoet F, Campanelli G, Champault GG, Chelala E, et al. Classification of primary and incisional abdominal wall hernias. *Hernia*. 2009;13:407-14. https://doi.org/10.1007/s10029-009-0518-x
3. Flament JB, Palet JP. Nyhus and Condon's Hernia 5th edition. Philadelphia, USA: Lippincott W&W; 2002. Prosthetic repair of massive abdominal ventral hernias; pp. 341-66.
4. Muysoms FE, Antoniou SA, Bury K, Campanelli G, Conze J, Cuccurullo D, et al. European Hernia Society guidelines on the closure of abdominal wall incisions. *Hernia*. 2015;19:1-24. https://doi.org/10.1007/s10029-014-1342-5
5. Lasses Martínez B, Peña Soria MJ, Cabeza Gómez JJ, Jiménez Valladolid D, Flores Gamarra M, Fernández Pérez C, et al. Surgical treatment of large incisional hernias with intraperitoneal composite mesh: a cohort study. *Hernia*. 2017;21:253-60. https://doi.org/10.1007/s10029-016-1557-8
6. Holmdahl V, Stark B, Clay L, Gunnarsson U, Strigård K. One-year outcome after repair of giant incisional hernia using synthetic mesh or full-thickness skin graft: a randomised controlled trial. *Hernia*. 2019;23:355-61. https://doi.org/10.1007/s10029-019-01900-4
7. O'halloran EB, Barwegen CJ, Dombrowski JM, Vandevender DK, Luchette FA. Can't have one without the other: component separation plus mesh for repairing difficult incisional hernias. *Surgery*. 2014;156:894-9. https://doi.org/10.1016/j.surg.2014.06.021
8. Parker SG, Mallett S, Quinn L, Wood CPJ, Boulton RW, Jamshaid S, et al. Identifying predictors of ventral hernia recurrence: systematic review and meta-analysis. *BJS Open*. 2021;5:071. https://doi.org/10.1093/bjsopen/zraa071
9. Silecchia G, Campanile FC, Sanchez L, Ceccarelli G, Antinori A, Ansaloni L, et al. Laparoscopic ventral/incisional hernia repair: updated Consensus Development Conference based guidelines [corrected]. *Surg Endosc*. 2015;29:2463-84. https://doi.org/10.1007/s00464-015-4293-8
10. Ali F, Sandblom G, Wikner A, Wallin G. Laparoscopic ventral and incisional hernia repair using intraperitoneal onlay mesh with peritoneal bridging. *Hernia*. 2022;26:635-46. https://doi.org/10.1007/s10029-021-02502-9

11. López-Cano M, Martin-Dominguez LA, Pereira JA, Armengol-Carrasco M, García-Alamino JM. Balancing mesh-related complications and benefits in primary ventral and incisional hernia surgery. A meta-analysis and trial sequential analysis. *PLOS ONE*. 2018;13:e0197813. https://doi.org/10.1371/journal.pone.0197813
12. Köckerling F. What do we know about the Chevrel technique in ventral incisional hernia repair? *Front Surg*. 2019;6:15. https://doi.org/10.3389/fsurg.2019.00015
13. Liang MK, Holihan JL, Itani K, Alawadi ZM, Gonzalez JR, Askenasy EP, et al. Ventral hernia management: expert consensus guided by systematic review. *Ann Surg*. 2017;265:80-9. https://doi.org/10.1097/SLA.0000000000001701
14. Bröker M, Verdaasdonk E, Karsten T. Components separation technique combined with a double-mesh repair for large midline incisional hernia repair. *World J Surg*. 2011;35:2399-402. https://doi.org/10.1007/s00268-011-1249-6
15. Ayik N, Klein P, Grützmann R, Demir R. Long-term outcome of ıncisional hernia repairs using the erlangen ınlay onlay mesh (EIOM) technique. *J Surg Res*. 2019;243:14-22. https://doi.org/10.1016/j.jss.2019.04.045
16. Moreno-Egea A, Mengual-Ballester M, Cases-Baldó MJ, Aguayo-Albasini JL. Repair of complex incisional hernias using double prosthetic repair: single-surgeon experience with 50 cases. *Surgery*. 2010;148:140-4. https://doi.org/10.1016/j.surg.2009.12.014
17. Bernard C, Polliand C, Mutelica L, Champault G. Repair of giant incisional abdominal wall hernias using open intraperitoneal mesh. Hernia. 2007;11:315-20. https://doi.org/10.1007/s10029-007-0222-7
18. Oussoultzoglou E, Baulieux J, De la Roche E, Peyregne V, Adham M, Berthoux N,Ducerf C. Long-term results of 186 patients with large incisional abdominal wall hernia treated by intraperitoneal mesh. *Ann Chir*. 1999;53:33-40.
19. Al Taha MA. Outcome of open intraperitoneal dual mesh versus on–lay mesh for incisional hernia repair. *Medico-Legal Update*. 2020;20:1253-8. https://doi.org/10.37506/mlu.v20i1.546
20. Afifi RY. A prospective study between two different techniques for the repair of a Large recurrent ventral hernia: a double mesh intraperitoneal repair versus onlay mesh repair. *Hernia*. 2005;9:310-5. https://doi.org/10.1007/s10029-005-0017-7
21. Farid M, Fiad A, Nour H, Mohamed H. Management of large midline incisional hernia, double mesh modification of Chevrel's technique versus on lay mesh hernioplasty, A comparative study. *RJPBCS*. 2020;11:60-8. https://doi.org/10.33887/rjpbcs/2020.11.5.7
22. Godara R, Garg P, Raj H, Singla SL. Comparative evaluation of sublay versus onlay meshplasty in ventral hernia. *Indian J Gastroenterol*. 2006;25:2223.
23. Afifi RY, Hamood M, Hassan M. The outcome of A. Double mesh intraperitoneal repair for complex ventral hernia: a retrospective cohort study. *Int J Surg*. 2018;53:129-36. https://doi.org/10.1016/j.ijsu.2018.03.036
24. Köckerling F, Scheuerlein H, Schug-Pass C. Treatment of large ıncisional hernias in sandwich technique - a review of the literature. *Front Surg*. 2018;5:37. https://doi.org/10.3389/fsurg.2018.00037