

Case Series

Subcutaneous onlay laparoscopic approach for ventral hernia and rectus abdominis diastasis repair: a case series

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ABSTRACT

Ventral hernia repairs have been posing a major aesthetic problem over the years giving rise to cosmetically unpleasing scars, significant post-operative pain and an array of post operative complications including post-operative adhesive obstruction and recurrence. Surgical repair of these hernias can be done either by open or laparoscopic methods. The standard open approach is associated with higher chances of flap necrosis, seroma, wound and mesh infection, the incidence of which increases with increasing size of defect, age of the patient and associated comorbidities. The advent of minimal access surgery has refurbished ideas and techniques associated with the repair of ventral hernias and one such novel technique developed as an extrapolation of the open onlay mesh repair is subcutaneous onlay laparoscopic repair (SCOLA). The technique described by Claus and Malcher integrates subcutaneous onlay laparoscopic mesh repair with plication of the rectus diastasis, which has long been acknowledged as a significant contributor to recurrence when left unaddressed. The success of this procedure lies in overcoming the limitations of other hernia repairs by being minimally invasive, ergonomically favourable, minimizing risk of bowel injury with better cosmetic outcomes. The aim of the article is to describe our experience in this relatively novice technique and understanding the advantages and shortcomings in order to improve patient's outcome.

Keywords: Ventral hernia, Rectus diastasis, Subcutaneous onlay laparoscopic approach

INTRODUCTION

Amongst the ventral hernia groups described by the European Hernia Society (EHS), repair of midline hernias has been associated with an increased incidence of untoward complications. However, complications such as prolonged hospital stay, postoperative pain, hernia recurrence, and wound infection were observed to be significantly lower in patients undergoing laparoscopic repair, in addition to the advantage of superior cosmetic outcomes.¹ Though intraperitoneal onlay mesh (IPOM) and IPOM plus have been the standard of care for a long time, its limitations such as risk of visceral adhesions and enterocutaneous fistulas, have called the need for an alternate and minimally invasive approach.² The subcutaneous onlay laparoscopic approach (SCOLA), has

emerged as a promising option for the repair of ventral hernia and diastasis, especially in females. This technique involves placing the mesh in a subcutaneous plane, allowing for enhanced fixation and reduced tension on the abdominal wall.

In addition, SCOLA can also simultaneously deal with diastasis of recti. Diastasis of recti refers to thinning of the linea alba and separation of the muscle borders by a distance of more than 2.2 cm.^{3,4} If its repair is ignored in the primary surgery it can give rise to recurrence in the future.⁵

Claus and Malcher effectively integrated the advantages of laparoscopic surgery with the subcutaneous onlay approach, enabling simultaneous repair of ventral hernias

and rectus diastasis through a minimally invasive technique.⁶

In this article, we explore the key principles, technical considerations, and clinical benefits of the subcutaneous onlay laparoscopic approach, providing a comprehensive overview for surgeons and healthcare professionals involved in abdominal wall reconstruction. Let's discuss about the operative technique of SCOLA in the upcoming section.

The following case series includes a total of 8 cases done in a single centre (Government Stanley Hospital) at the Department of General Surgery between February 2022 to February 2024.

The following criteria were considered for selecting participants for the study as non-complicated ventral hernias with or without divarication of recti, patients >18 years and hernia defect <5 cm.

CASE SERIES

Case 1

A 41 years old male came with history of swelling in the umbilical region for the past 3 months associated with pain.

O/E

Swelling of size 3×3 cm in the umbilical region which was reducible with cough impulse in both umbilical and epigastric region. Divarication of rectus was present (Figure 1).



Figure 1: Case 1.

Computed tomography abdomen

2 defects noted one in the epigastric region of size 1.7×1.3 cm with omentum as content and in the umbilical region of size 2.5 cm with omentum and bowel as content.

Intra-operative period

2 separate defects were identified, sac opened, contents reduced and mesh placed.

Post-operative period

Immediate post-operative period was uneventful, however patient developed mesh infection following DT removal on day 28 and mesh extraction was done.

Case 2

A 53 years old male with complaints of swelling in the upper abdominal region for the past 1 month.

O/E

Swelling of size 2.5×2.5 cm in the epigastric region with no cough impulse, Swelling couldn't be reduced completely (Figure 2).



Figure 2: Case 2.

Computed tomography abdomen

Defect of size 2 cm in the epigastric region with omentum as content.

Intra-operative findings

Sac of size 3×2 cm noted with omentum as content. Divarication was present.

Post-operative period

Uneventful, DT removed on day 15. No evidence of post operative seroma/mesh infection.

Case 3

A 33 years old male with complaints of swelling in the umbilical region since birth that gradually increased in size, associated with pain for last 15 days.

O/E

Swelling of size 3×3cm in the umbilical region with umbilicus everted, cough impulse and swelling was reducible in nature (Figure 3).



Figure 3: Case 3.

Computed tomography abdomen

Defect of size 2.1×2.1 cm noted in the umbilical region with herniation of omentum with minimal surrounding fat stranding.

Intra-operative findings

Defect of size 2×2 cm in the umbilical region with omentum adherent to hernial sac. Divarication was absent.

Post-operative period

Uneventful, no complications, DT removed on day 15.

Case 4

A 49 years old male came with complaints of pain in the umbilical region and swelling that appears on straining or coughing.

O/E

Swelling of size 1.5×1.5 cm in the umbilical region, completely reducible, cough impulse positive (Figure 4).

Computed tomography abdomen

Defect of size 2 cm in the umbilical region with omentum as content.

Intra-operative findings

Sac of size 2×2 cm with omentum as content. Divarication was present.

Post-operative period

Immediate post OP period was unsuccessful. However, after Dt removal on POD 15 patient developed seroma of

size 4×4×2 cm on POD 21 which was aspirated and compression dressing applied. Seroma formation decreased over the days and completely stopped on day 32.



Figure 4: Case 4.

Case 5

A 60 years old male with complaints of swelling in the umbilical region associated with pain for the past 6 months.

O/E

Swelling of size 2.5×2.5 cm in the umbilical region, reducible with cough impulse (Figure 5).

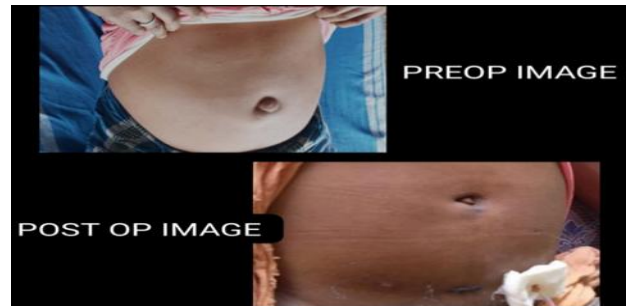


Figure 5: Case 5.

Computed tomography abdomen

Defect of size 2.3 cm in the umbilical region with omentum as content.

Intra-operative findings

Sac of size 2.5×2.5 cm with omentum as content. No adhesions

Post-operative period

Uneventful.

Case 6

A 32 years old female with complaints of periumbilical pain for 10 days and swelling in the umbilical region for 3 months.

O/E

Swelling in the umbilical region of size 2×2 cm which was reducible with cough impulse (Figure 6).



Figure 6: Case 6.

Computed tomography abdomen

Defect of size 1.8×1.2 cm with omentum as content.

Intra-operative findings

Swelling of size 2×2 cm noted in the umbilical region with pre peritoneal fat as content. No divarication noted.

Post-operative period

Patient was discharged on POD 5 and DT was removed on POD 14. No post operative complications were noted.

Case 7

A 36 years old female with complaints of swelling in the umbilical region, that increased on coughing and straining.

O/E Swelling in the umbilical region of size 2×2 cm with cough impulse and appendicectomy scar (Figure 7).

Computed tomography abdomen

Defect of size 2.2×2.4 cm noted in the umbilical region with omentum as content with minimal fat stranding.

Intra-operative findings

Defect of size 1.5×1.5 cm noted, with omentum as content. Divarication of recti was present.

Post-operative period

Patient was discharged without any complications on POD 10. However, developed post operative seroma after DT removal on Day 18 that was managed conservatively.



Figure 7: Case 7.

Case 8

A 35 years old female with complaints of swelling in the umbilical region.

O/E

Swelling of size 2.5×2.5 cm in the umbilical region with cough impulse and tenderness (Figure 8).



Figure 8: Case 8.

Computed tomography abdomen

Defect of size 2.4×2.2 cm noted in the umbilical region with omentum as content.

Intra-operative findings

Defect of size 2.5×2.5 cm noted in the umbilical region with omentum as content.

Post-operative period

Patient was discharged on POD 5 and DT removed on POD 15. No complications noted.

A total of 8 cases were operated using the subcutaneous onlay laparoscopic approach with plication of divarication of recti. It was found that with increase in experience the mean operating time reduced. Of the 8 cases, 3 of them had post operative complications, two of them had seroma, one of which was managed conservatively and 1 required

aspiration. One of them required surgery for extraction of infected mesh. Patients were followed for a period of 2

years during which they didn't have any longterm complications or recurrence (Table 1).

Table 1: Case summary.

Parameters	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8
Age/sex	53/M	41/M	33/M	49/M	60/M	32/F	36/F	35/F
Type of ventral hernia	Epiga- -stria	Epigastric and umbilical	Umbili- cal	Umbili- cal	Umbili- cal	Umbili- cal	Umbili- cal	Umbilic- -al
Defect size on CT	2×2 cm	Epigastric- 1.7×1.3 cm, umbilical - 2.5×2.3 cm	2.1×2.1 cm	2×2 cm	2.3 cm	1.2×1.3 cm	2.2×2.4 cm	2.4×2.2 cm
Diastasis	+	+	-	+	-	-	-	+
Operating time	2 hours 18 mins	3 hours 10 mins	2 hours 7 mins	2 hours 35 mins	2 hours 15 mins	1 hour 35 mins	2 hours 5 mins	1 hour 48 mins
Post op complication	Nil	Mesh infection	Nil	Seroma	Nil	Nil	Seroma	Nil

DISCUSSION

SCOLA-discovery and evolution

In 1993, Karl LeBlanc pioneered the era of laparoscopic ventral hernia repair by introducing the placement of an expanded PTFE mesh on the peritoneal surface, aiming to reduce visceral adhesions. For many years, IPOM repair was regarded as the standard approach. However, with increasing clinical experience, concerns regarding the long-term outcomes of IPOM emerged, including postoperative mesh bulging, seroma formation, and lack of restoration of abdominal wall function.⁷ This led to the development of the IPOM plus technique, described by Franklin et al which involved primary defect closure in combination with mesh placement.⁸ Subsequently, the SCOLA technique, popularized by Claus and Malcher in 2018, was introduced primarily for ventral hernia repair associated with rectus diastasis. This approach allows the repair to be performed with minimal incisions, avoiding the large skin flaps associated with conventional open surgery and thereby improving cosmetic outcomes. Although SCOLA is conceptually equivalent to open onlay mesh repair, it is considered superior due to smaller, discreet incisions along the vest line and lower recurrence rates.⁹ The main reported complication of SCOLA is postoperative seroma formation, occurring in approximately 30% of cases, due to the extensive subcutaneous dissection.^{7,10}

Operative procedure

The procedure begins with a 2 cm transverse incision just above the pubis. The subcutaneous tissue is dissected down to the anterior aponeurosis of the rectus abdominis muscle. Using a 10 mm optical trocar, blunt dissection is performed to create a working space laterally and superiorly, followed by placement of two additional 5 mm ports. A purse-string suture is placed around the 10 mm

trocar, and CO₂ insufflation is maintained at 8–10 mmHg. The two 5 mm ports are positioned on either side of the central port. Subcutaneous tissue is dissected from the anterior aponeurosis using a grasper and electrocautery hook or scissors. The umbilicus is detached from the underlying musculoaponeurotic plane, and dissection extends superiorly to the xiphoid and laterally to the ribs, with at least 12–15 cm of lateral extension. The hernia sac is carefully dissected, and its contents reduced (Figure 9).

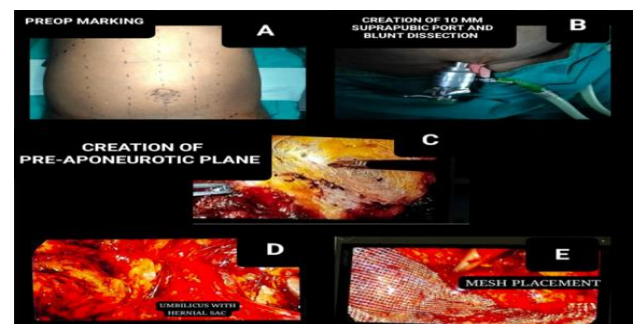


Figure 9: Steps of SCOLA.

Next, the rectus diastasis and hernia defect are corrected using a barbed suture to approximate the right and left rectus muscles along the midline. A polypropylene mesh is then placed and secured with barbed sutures.

The umbilicus is reattached to the musculoaponeurotic plane using one or two simple sutures. Due to the subcutaneous dissection, a closed suction drain is inserted through the 5 mm port site.

Advantages of SCOLA technique

Mesh placement

Unlike traditional intraperitoneal mesh placement, which carries the risk of adhesions and visceral complications,

SCOLA positions the mesh above the abdominal muscles but outside the peritoneal cavity, minimizing contact with internal organs.

Minimally invasive

Being a laparoscopic procedure, SCOLA requires only small incisions, resulting in less postoperative pain, reduced infection risk, and faster recovery compared to open repair.

Tension-free repair

The subcutaneous onlay mesh placement creates a tension-free repair, decreasing stress on surrounding tissues, promoting better healing, and reducing recurrence rates.

Reduced complications

SCOLA lowers the likelihood of complications associated with intraperitoneal mesh, such as bowel injury, mesh erosion, or infection.

Lower recurrence rates

The mesh used in SCOLA is less prone to migration and adhesions, providing durable long-term repair.

Quicker recovery

Patients generally experience faster recovery and less discomfort due to the minimally invasive approach.

Improved cosmetic outcomes

The smaller laparoscopic incisions minimize scarring, while the subcutaneous mesh placement eliminates the need for large open incisions, yielding better aesthetic results.

CONCLUSION

With the inception of laparoscopic approach and improving infrastructure in government medical colleges this technique of subcutaneous onlay mesh repair for ventral hernias has proven to be an effective method in improving cosmetic outcomes and also recurrences. With increased experience in this technique the open method of repair of ventral hernias has taken a back seat bringing this novel technique to limelight. SCOLA technique is a safe, reproducible and effective alternative to open repair for patients with ventral hernias associated with divarication of recti.

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REFERENCES

1. Martins MR, Santos-Sousa H, Alves do Vale M, Bouça-Machado R, Barbosa E, Sousa-Pinto B. Comparison between the open and the laparoscopic approach in the primary ventral hernia repair: a systematic review and meta-analysis. *Langenbeck's Arch Surg.* 2024;409:52.
2. Holihan JL, Alawadi ZM, Harris JW, Flores-Gonzalez JR, Kao LS, Liang MK. Mesh location in open ventral hernia repair: a systematic review and network meta-analysis. *World J Surg.* 2016;40(1):89-99.
3. Beer GM, Schuster A, Seifert B, Manestar M, Mihic-Probst D. The normal width of the linea alba in nulliparous women. *Clin Anat.* 2009;22(6):706-11.
4. Mendes DA, Nahas FX, Ferreira LM, Gomide L. Anatomical study of the linea alba and abdominal wall aponeuroses with emphasis on diastasis recti. *Aesthetic Plast Surg.* 2007;31(3):314-20.
5. Nahabedian MY. Management strategies for diastasis recti. *Semin Plast Surg.* 2018;32(1):147-54.
6. Claus CM, Malcher F, Cavazzola LT, Furtado M, Morrell A, Azevedo M, et al. Subcutaneous onlay laparoscopic approach (SCOLA) for ventral hernia and rectus abdominis diastasis repair: Technical description and initial results. *Arq Bras Cir Dig.* 2018;31(1):e1399.
7. Deshpande GA, Tirpude B, Bhanarkar H, Akulwar V, Kodape G, Gajbhiye R. Prospective, observational study of intraperitoneal onlay mesh repair with defect closure versus SCOLA for primary ventral hernia. *J Minim Access Surg.* 2024;20(4):397-402.
8. Franklin ME Jr, Gonzalez JJ Jr, Glass JL, Manjarrez A. Laparoscopic ventral and incisional hernia repair: An 11-year experience. *Hernia.* 2004;8(1):23-7.
9. da Silva Neto LP, Claus CM, Malcher F, Cavazzola LT, Furtado M, Azevedo M, et al. Subcutaneous onlay laparoscopic approach (SCOLA) for ventral hernia and rectus diastasis: early and mid-term outcomes. *Surg Endosc.* 2021;35(7):3461-9.
10. Venclauskas L, Miseikyte-Kaubriene E, Kiudelis M. Prevention of seroma after abdominal hernia repair with mesh: a systematic review. *Hernia.* 2012;16(1):59-69.

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