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ROBOTIC TRANSABDOMINAL PREPERITONEAL (TAPP) REPAIR FOR M1 (SUBXIPHOID) VENTRAL HERNIA: A CASE REPORT

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ABSTRACT
Background: Background: The subxiphoid, or M1, region of the European Hernia Society classification is an unusual and technically challenging site for a ventral hernia, owing to how closely it lies to the costal margin, sternum and diaphragm. Such defects can follow prior sternotomy, or, less often, arise where a specimen was withdrawn through an epigastric trocar during upper abdominal laparoscopy such as cholecystectomy. We describe a 55-year-old man with diabetes and hypertension who developed a reducible, cough-impulse-positive epigastric swelling eight months after laparoscopic cholecystectomy, during which the gallbladder had been extracted via the epigastric port. Imaging demonstrated a 3 × 4 cm fascial gap at the M1 level. He underwent robotic transabdominal preperitoneal (TAPP) repair on the CMR Versius platform: the peritoneal flap was raised as far as the diaphragmatic central tendon, the defect closed primarily, and a sublay polypropylene mesh secured beneath the re-approximated peritoneum. Recovery was uneventful, with no recurrence at follow-up. **Conclusion**: Robotic TAPP allows accurate, sutured preperitoneal dissection and peritoneal closure within the narrow subxiphoid field, making it a dependable option for repair of M1 hernias.

KEYWORDS: M1 hernia; subxiphoid hernia; port-site hernia; robotic surgery; rTAPP; transabdominal preperitoneal repair; Versius robotic system

INTRODUCTION

Midline ventral hernias are conventionally staged using the European Hernia Society (EHS) system, which splits the medial abdominal wall into five zones, labelled M1 through M5, spanning the distance between the xiphoid process and the pubis1. Zone M1 corresponds to the subxiphoid segment, extending no more than 3 cm below the xiphoid1. Hernias confined to this zone, whether primary or incisional, are relatively rare, but their repair is disproportionately demanding given how close they sit to the costal margin, sternum and the diaphragmatic central tendon2. An international panel convened to build consensus on subxiphoid hernia stressed that surgeons need a firm grasp of this regional anatomy, since achieving adequate cranial mesh coverage requires dissecting the peritoneum off the diaphragmatic fibres as far as the central tendon2. Where the defect is broad, some groups have described injecting botulinum toxin A into the lateral abdominal wall muscles before surgery, temporarily relaxing and lengthening them to ease fascial closure3.Iatrogenic M1 hernias most often follow median sternotomy, though they can also arise, less commonly, at the site of an epigastric trocar used to extract a specimen during upper abdominal laparoscopy, gallbladder retrieval after cholecystectomy being a typical example. Compared with umbilical extraction, epigastric-port retrieval carries a somewhat lower rate of wound infection and incisional herniation in most published series4, though the risk is not abolished altogether, especially where obesity, diabetes or a long fascial incision are present5. Working in this zone laparoscopically is technically constrained, since the costal margin restricts instrument triangulation; the robotic platform, offering wristed movement, three-dimensional optics and steady exposure, has consequently become a favoured means of performing transabdominal preperitoneal repair for M1 defects6. We describe a patient with a symptomatic M1 (port-site) hernia following epigastric gallbladder extraction, repaired robotically by the TAPP technique on the Versius system.

Case Report

A 55-year-old man from north India came with an eight-month history of a slowly enlarging, intermittently painful epigastric lump. Four years earlier he had undergone laparoscopic cholecystectomy for an empyematous gallbladder at a centre in Delhi, with specimen retrieval through the epigastric port. He carried a background of diabetes mellitus and hypertension, both on medical treatment. His vital signs were stable at presentation and his body mass index measured 30.5 kg/m². Examination revealed a 4 × 5 cm epigastric swelling, overlying the previous scars, with a positive expansile cough impulse. The swelling reduced easily, was neither tender nor warm, and a fascial gap could be felt beneath it. A clinical impression of port-site (M1) hernia was formed (Figure 1).

Contrast-enhanced CT of the abdomen showed a 3 × 4 cm gap in the deep fascia at the subxiphoid (M1) level, without any suggestion of bowel involvement or strangulation (Figure 2).

Figure 1: Preoperative marking showing the costal margins and the subxiphoid (M1) defect outlined over the epigastric port-site scar.

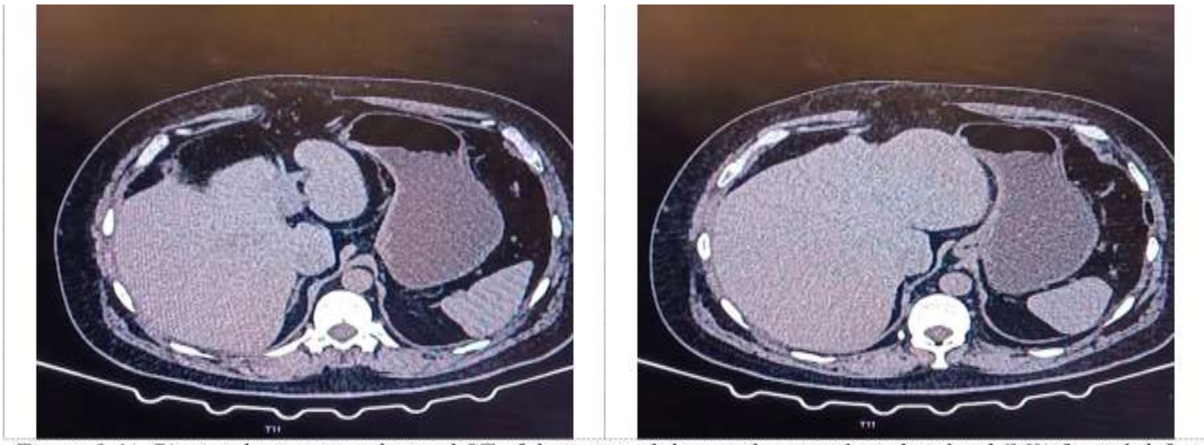

Figure 2 (A, B): Axial contrast-enhanced CT of the upper abdomen showing the subxiphoid (M1) fascial defect (A) and, at an adjacent level, herniation of preperitoneal fat through the defect (B).

He was planned for robotic TAPP repair using the CMR Versius system. Following induction of general anaesthesia and creation of pneumoperitoneum, ports were sited in the infra-umbilical midline (optical), left and right iliac fossae. Diagnostic laparoscopy showed a 4 × 3 cm transverse defect in the M1 zone. A horizontal peritoneotomy was fashioned roughly 8 cm below the defect and a peritoneal flap raised cranially up to its edge, with the preperitoneal fat within the sac reduced (Figures 3 and 4). Dissection was then carried further upward into the subdiaphragmatic space, freeing the peritoneum from the diaphragmatic fibres as far as the central tendon so as to obtain sufficient cranial mesh coverage. The fascia was reapproximated with 2-0 barbed suture, and a 10 × 15 cm polypropylene mesh, trimmed to fit, was positioned in the preperitoneal plane with wide margins on every side and fixed with sutures. The peritoneal flap was drawn back over the mesh and closed with 2-0 barbed suture, keeping the prosthesis fully outside the peritoneal cavity.

Figure 3: Dissection of the subdiaphragmatic space with reduction of the preperitoneal fat contained within the sac.

Figure 4: The M1 fascial defect fully exposed after complete reduction of the sac contents, prior to primary fascial closure.

Recovery was smooth; oral intake and mobilisation began on the first postoperative day, and he was discharged in good condition. At subsequent review he remained free of symptoms, with no seroma, wound infection or recurrence.

DISCUSSION

Anatomically, the M1 zone sits at the subxiphoid segment of the abdominal wall, capped above by the xiphoid process and costal margin[1]. Two features of this site make it surgically demanding. One is that the bony margin overhead restricts how much cranial fascial and mesh overlap can be achieved relative to hernias elsewhere on the midline, since neither suture nor fixation device can safely engage bone or cartilage[2]. The other is that the potential space just deep to the xiphoid opens directly into the diaphragmatic musculature and its central tendon, so that obtaining an adequate preperitoneal plane means freeing the peritoneum off these fibres, a step carrying a theoretical risk of phrenic injury or pneumothorax unless the correct plane is clearly identified[2]. The 2025 international Delphi consensus on subxiphoid hernia advised that, whichever operative route is chosen, the mesh should sit in an extraperitoneal plane with over 5 cm of overlap, and that cranial exposure up to the central tendon is a necessary and accepted part of achieving this[2]. In the present patient, the hernia developed at a prior epigastric trocar site used for gallbladder extraction, a recognised, though less common, iatrogenic route than herniation through the umbilical port. Randomised evidence suggests epigastric-port extraction carries a lower rate of wound infection and incisional herniation than umbilical extraction[4], yet a large multicentre retrospective cohort has shown that the risk persists, and that obesity and diabetes, both features of this patient, add further to the likelihood of trocar-site herniation irrespective of which port is used for extraction[5]. This reinforces the value of careful fascial closure at any 10 mm port used for specimen retrieval. Several operative strategies exist for M1 hernia. These range from an open retromuscular repair with posterior component separation through to extraperitoneal minimally invasive options such as laparoscopic or robotic TAPP, and enhanced-view totally extraperitoneal repair[7]. For a defect of this size (EHS width class W1, under 4 cm), extraperitoneal repair by either an open or minimally invasive route is regarded as acceptable, so long as adequate mesh overlap is achieved[2]. Wider defects may call for adjuncts such as preoperative botulinum toxin A injected into the lateral oblique muscles, allowing tension-free primary closure before the mesh is placed[3]. Here, the 4 × 3 cm defect closed primarily with barbed suture, without requiring such measures. A further option worth mentioning is the retrorectus Rives-Stoppa configuration, reached through either an enhanced-view totally extraperitoneal (eTEP) or transabdominal retromuscular (TARM) route[7]. This begins by developing the retrorectus plane on both sides up to the M1 defect, reducing the preperitoneal fat and sac contents. As the dissection is carried further cranially toward the subdiaphragmatic region, the surgeon shifts from the retrorectus into the preperitoneal plane, a transition achieved through a limited bilateral transversus abdominis release in the M1 area. This cross-over step links the two retrorectus spaces to the midline preperitoneal plane and lets the mesh extend cranially past the costal margin toward the diaphragm while staying clear of the peritoneal cavity[7]. It offers a reasonable alternative to the pure TAPP method used here, and may suit wider or bilaterally extensive M1 defects where a larger retrorectus mesh bed is wanted. Borrowed originally from inguinal hernia surgery, the TAPP technique for ventral defects reduces the hernia sac, raises peritoneal flaps, closes the fascia, positions the mesh extraperitoneally, and finally restores the peritoneum over it, keeping the prosthesis away from the viscera while preserving the physiological benefits of a sublay position[6,8]. Its laparoscopic form has proven workable and mirrors the principles of open retromuscular repair with less associated morbidity[8], though operating this near the costal margin by straight-stick laparoscopy is limited by rigid instruments and awkward angles when suturing both the defect and the flap. The robotic platform overcomes much of this: wristed articulation, tremor damping and stable three-dimensional vision permit accurate, sutured closure of the fascia and peritoneum even within the tight subxiphoid field, and early robotic TAPP series report the method to be safe and consistent for ventral hernias in such demanding locations[9]. The Versius system used here is a modular platform with independently mounted bedside units that has seen growing use in hernia surgery, including reports of TAPP repair for hernias at difficult midline sites with encouraging early results[10]. A further merit of robotic TAPP over an intraperitoneal onlay mesh technique is that fully re-peritonealising the mesh, as done in this case, keeps it from lasting contact with the viscera and so avoids the adhesion formation, erosion or fistulation that have been linked to prolonged intraperitoneal mesh exposure[8]. Here, that translated into a straightforward recovery free of early seroma, infection or recurrence.

CONCLUSION

The M1 zone differs anatomically from other parts of the ventral midline in its closeness to the costal margin and diaphragm, calling for careful attention to subxiphoid and subdiaphragmatic anatomy if the repair is to hold. In this patient, robotic TAPP permitted safe preperitoneal dissection up to the diaphragmatic central tendon and primary closure of the fascial defect. The mesh was placed preperitoneally and the peritoneum sutured back over it, and recovery was uneventful. As robotic platforms become more widely available, this technique may increasingly be favoured for hernias arising in this technically demanding zone.

Conflict of Interests
The authors have no conflicts of interest to declare.

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Patient Consent
The patient provided written informed consent for publication of this case report.

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