

# Single Port Access (SPA<sup>TM</sup>) laparoscopic ventral hernia repair: initial report of 30 cases

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## Abstract

**Background** Laparoscopic ventral hernia repair has been demonstrated to be an acceptable and successful technique. Aside from similar, albeit fewer, complications compared to open hernia repair, the laparoscopic technique has the additional complication of port site hernia to its follow-up criteria. Our initial experience with reduced port surgery in hernias was described as a two-port one-stitch repair technique in 2002. We initially applied our Single Port Access (SPA<sup>TM</sup>) technique to ventral hernia repairs and reported it at the American Hernia Society meeting in 2008. Now we present the first 30 cases, some with 6–24-month follow-up.

**Methods** The charts of 30 patients undergoing surgery for primary and recurrent ventral hernias employing the SPA technique were reviewed. The SPA technique was applied through a 1.0–1.6-cm incision remote from and lateral to the hernia location in the abdominal wall. Polypropylene-based coated mesh and non-fascial fixation were used in all cases.

**Results** All procedures were completed via the SPA technique. Operative time, length of stay, and estimated blood loss were acceptable. The size of mesh placed ranged from 81 to 500 cm<sup>2</sup>. Postoperative seromas were observed and all resolved spontaneously. There have been no wound

infections or port site hernias during the 6–24-month follow-up period. There have been no recurrent hernias at the primary site.

**Conclusion** We have successfully demonstrated the applicability of Single Port Access surgery for ventral hernia repair. In our initial series we performed this procedure on smaller hernias but have now begun applying it to larger repairs.

**Keywords** Hernia · Ventral hernia repair · SPA surgery · Single Port Access · Single-incision surgery · Laparoscopy · Reduced-port surgery

Abdominal wall hernia repairs are among the most common operations performed by general surgeons. Congenital hernias, such as umbilical hernias, often become symptomatic in adulthood, requiring closure. Alternatively, healing defects of prior incisions can develop into ventral or incisional hernias requiring repair.

Up to 10% of the population develops some type of hernia during their lifetime, resulting in more than a half million hernia operations performed annually in the United States. Fourteen percent of hernias are umbilical and 10% are incisional [1]. Smoking, obesity, and diabetes have been recognized as risk factors. As the abdominal wall becomes more lax with age, the prevalence of hernias rises.

Traditionally, hernia repairs were performed as open procedures. Initial repairs using suture approximation resulted in an approximately 50% recurrence rate [2]. With the introduction of mesh and methods of component separation, this recurrence rate decreased to <10% [3]. In the last decade, laparoscopic hernia repair has gained popularity. This procedure offers better visualization of the entire defect, ensuring fixation to healthy tissue and

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complete coverage of the hernia. In a large series of laparoscopic hernia repairs, the recurrence rate was <5% [4].

The technique of laparoscopic hernia repair typically employs a 10- or 12-mm trocar for visualization, along with two to four 5-mm trocars on contralateral sides of the abdominal wall for dissection and mesh placement [5]. Decreases in trocar size and number have been reported with similar outcomes to the traditional laparoscopic technique [6].

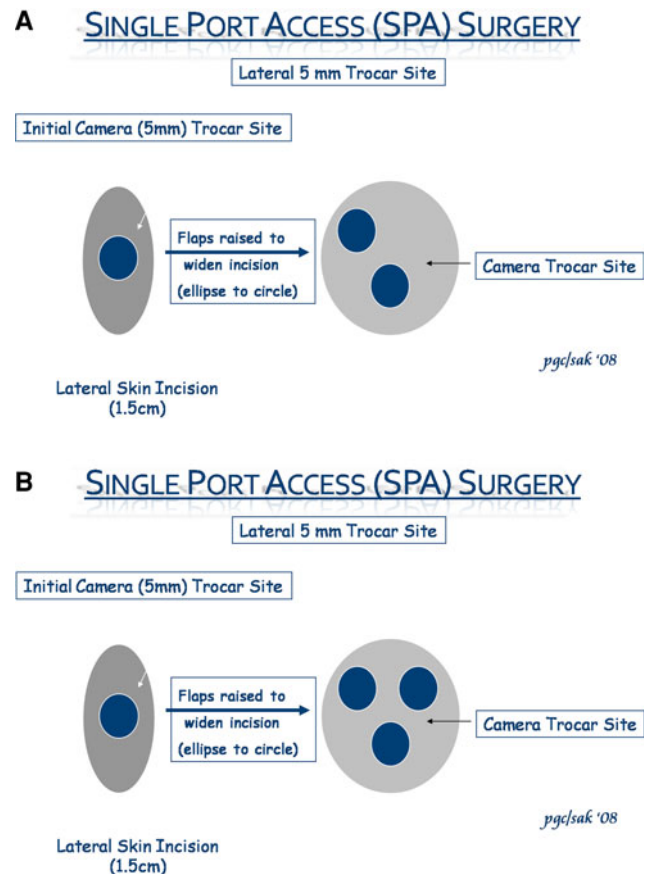
We introduce Single Port Access (SPA<sup>TM</sup>) ventral hernia repair and present our first 30 cases. This technique utilizes two to three 5-mm trocars within a single skin incision.

## Methods

Under IRB protocol, the medical charts of 30 patients who had undergone SPA ventral hernia repair were reviewed. Patient demographics and pre- and postoperative data were collected, as well as intraoperative information. Patient age, weight, height, and gender were recorded. Preoperative diagnosis and comorbidities were obtained. Intraoperative factors, including estimated blood loss, operative time, and the type and size of mesh were recorded. Initial and final wound lengths were assessed. Postoperative follow-up was also obtained.

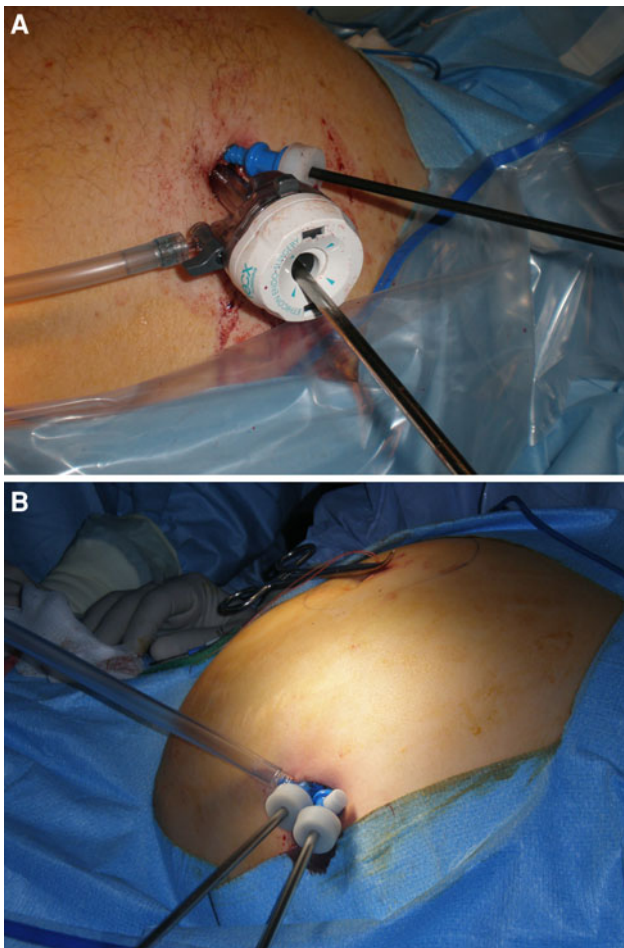
Thirty patients underwent SPA laparoscopic ventral hernia repair. All were positioned supine, prepped, and draped exposing the entire abdomen. The initial incision position was tailored to the location of the defect. A left lateral incision was the most common. The incision was approximately 1 cm long. The standard SPA technique was modified slightly for ventral hernia access (Fig. 1A, B). Skin and soft tissue flaps were then raised on either side of the incision for a distance of approximately 1–2 cm. The first clear 5-mm trocar (Xcel<sup>TM</sup>, Ethicon, Cincinnati, OH) was inserted using the direct visualization method. Once the abdomen was accessed, pneumoperitoneum was achieved. A second 5-mm, very-low-profile trocar (disposable Hunt cannula<sup>TM</sup>, Apple Medical Corp., Marlborough, MA, or reusable 5-mm trocar, Karl Storz, Tuttlingen, Germany) was inserted also using the direct visualization technique, this time using the visiport cannula in a very-low-profile trocar or with the 30° scope visualizing entry of the lateral trocar placement. If needed, a third trocar was inserted within the same incision in a triangulated fashion. In addition, for mobility, the larger-headed trocar can be exchanged for a second very-low-profile trocar (Fig. 2A, B).

Adhesiolysis was performed using sharp or blunt dissection along with cautery or a tissue-sealing device. Once the abdominal wall was cleared of adhesions, the defect



**Fig. 1** (A) SPA schematic ventral hernia, two trocars and (B) SPA schematic ventral hernia, three trocars

was measured to determine the appropriate mesh size. The mesh chosen would allow a 3–5-cm overlap in all directions. A variety of polypropylene-based meshes were used. A central stitch was placed in the mesh. The mesh was rolled tightly and inserted through the central 5-mm trocar site. If this access site was stretched with mesh insertion and an air leak developed, a 10-mm trocar could be placed to prevent gas leakage. The mesh was then positioned below the defect, ensuring appropriate overlap of 3–5 cm in all directions. The central stitch was pulled through the skin (Fig. 3A) at the center of the defect. A laparoscopic tacker secured the mesh to abdominal wall (Fig. 3B). Manual pressure on the external abdominal wall provided a 90° angle to the tacker in every position (Fig. 4). This was repeated around the circumference of the mesh until it was completely secured (Fig. 5A, B). An attempt to pull the mesh off the abdominal wall to test the tack strength is done for every patient. The operative trocar was then withdrawn. The abdomen was desufflated slowly to visualize proper placement of the mesh without creases or folds. The other trocar was then withdrawn. The trocar sites were approximated with 0–0 Vicryl, providing complete

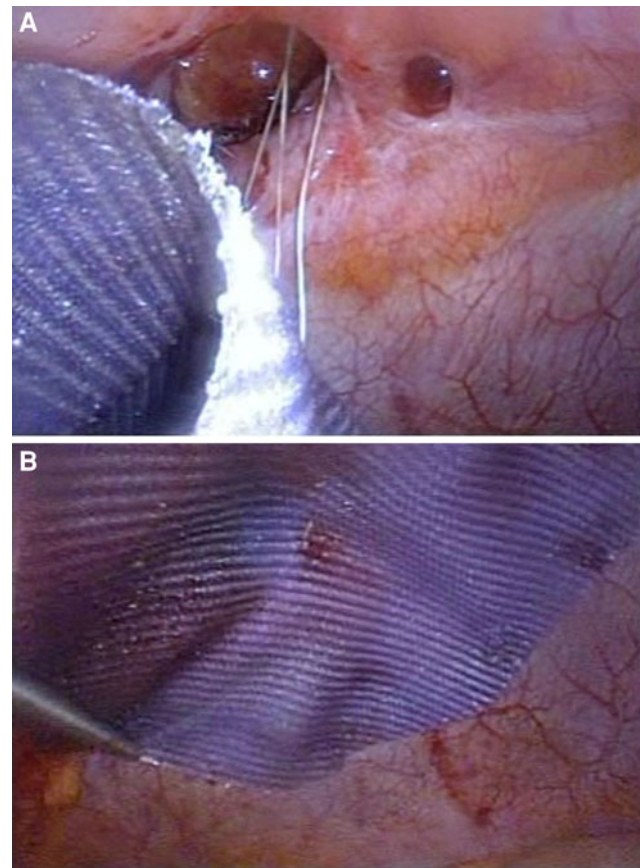


**Fig. 2** (A) Two trocar external view and (B) two very-low-profile trocars

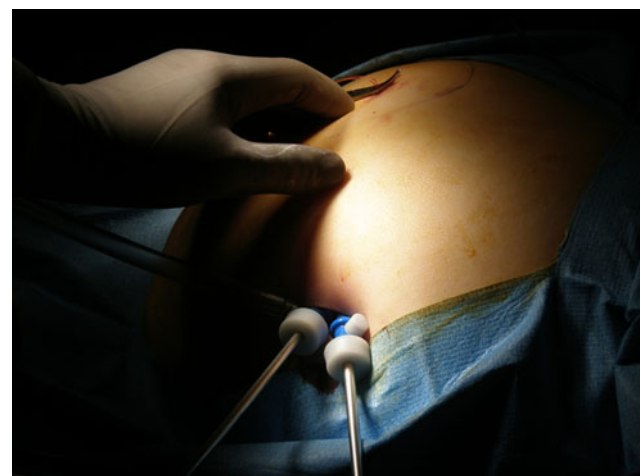
closure of these fascial defects. The skin was then approximated with 4–0 Vicryl (Fig. 6).

## Results

Thirty patients (13 female, 17 male) underwent successful SPA ventral hernia repair. Twenty-two primary hernias and eight recurrent hernias were repaired. There was no bias for body habitus. Patients were excluded from data collection if a concurrent operation was performed. All repairs were elective. All hernias were reducible or contained fat at the time of operation. Operative time ranged from 39 to 88 min (mean = 62 min). Average length of stay was an overnight observation, with six same-day discharges. Mesh size ranged from 80 to 500 cm<sup>2</sup> (avg = 173 cm<sup>2</sup>). Final skin incisions ranged between 1 and 1.6 cm. Length of stay ranged from 1 to 4 days (avg = 1.7 days). There were no wound infections, and follow-up (6–24 months) has yet to reveal any hernia recurrences at the primary site. No access site hernias (ASH) have been identified at the port site.



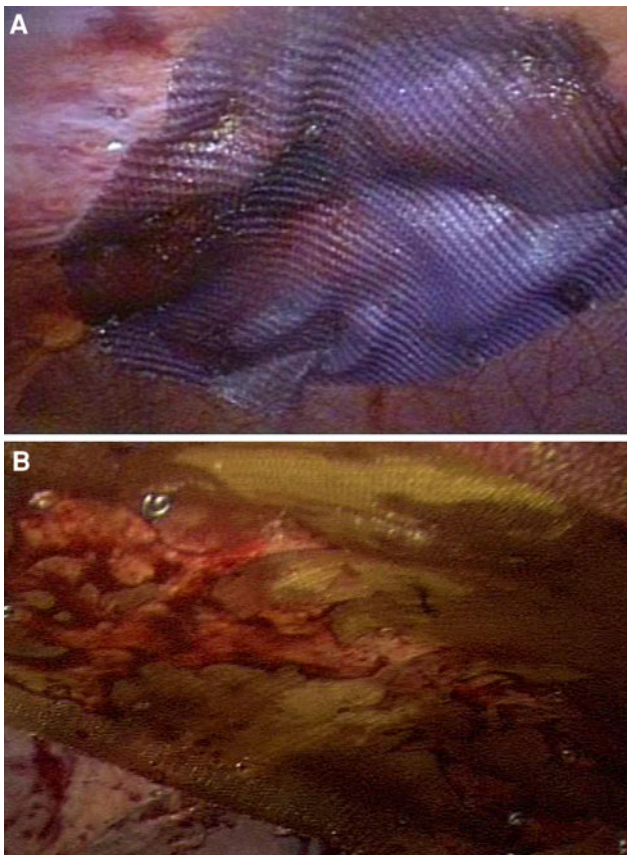
**Fig. 3** (A) Central stitch and (B) tacking mesh



**Fig. 4** External tacking

## Discussion

Laparoscopic ventral hernia repair has become more popular than open repair over the last decade. Along with offering the benefits of minimally invasive surgery, such as decreased postoperative pain, shorter length of stay, and quicker return to the activities of daily life, laparoscopic

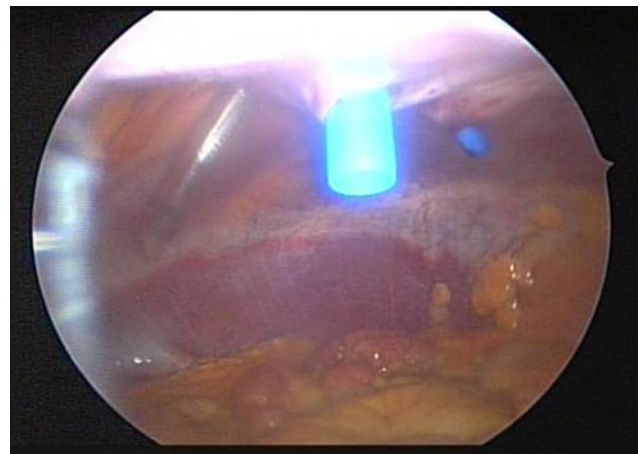


**Fig. 5** (A) Final mesh and (B) final mesh



**Fig. 6** Final closure

repair has operative advantages. Visualization is enhanced, providing a complete view of the entire defect and ensuring tacking of the mesh to healthy tissue. In addition, the pneumoperitoneum provides a tight abdominal wall for setting the mesh, and, when released, allows comfortable placement of the mesh within the abdominal cavity.



**Fig. 7** SPA triangulation

In traditional laparoscopic ventral hernia repair, as many as five trocar sites may be placed. This provides new points of laxity in the abdominal wall and the potential for additional hernia formation. It has been shown that reduction of trocars is possible with similar outcomes [6]. Initially, we performed a large series of ventral hernia repairs using a two-trocar technique [7–9]. Port, or access site, reduction applies not only to ventral hernia repair. Many reports of reduced port techniques have been published [10–12]. After gradual, successful reduction of ports, we developed a technique using a single incision called Single Port Access (SPA<sup>TM</sup>) surgery, to perform various laparoscopic procedures [13]. We first applied this access technique to placement of gastrostomy tubes [14]. Our first series of procedures was laparoscopic cholecystectomy [15, 16]. Subsequently, the SPA technique was applied to a variety of general-surgery procedures along with gynecologic and urologic cases [17]. The SPA technique allows the surgeon to perform virtually the same procedure as multiport laparoscopic cases through one incision. Setup and equipment are standard and can be adapted for surgeon preference. Using standard equipment maintains equal (or equivalent) costs and results in a technique available to all surgeons. Using individual trocars allows “independence of movement” [13]. The widened skin flaps provide triangulation at the skin level (Fig. 7). In addition, the single port of entry offers access to all quadrants of the abdomen without altering the setup.

These advantages make the SPA technique ideal for ventral hernia repair. The entire procedure is performed via a single incision through the left lateral abdominal wall or subxyphoid area. A left-upper-quadrant access point is a safe location for initial access and can be lateral enough to accommodate repair of a defect of any size. Applying pressure to the external abdominal wall enables the tacker and internal abdominal wall to be in contact at 90° in every

position, ensuring that the mesh is properly secured. Only one incision is another benefit of the SPA technique. This incision offers better visualization of the fascia for closure with suture. Decreasing the number of access sites decreases the potential for access site hernia (ASH) formation.

In this series of 30 initial SPA ventral hernia repairs, operative time and length of stay were comparable to standard multiport procedures. Both of these parameters depend on the extent of adhesiolysis required and the size of the defect. In some cases, seromas were observed at initial follow-up, none requiring aspiration. No infections were observed. No recurrences were seen at a follow-up of 6–24 months.

Single Port Access (SPA) ventral hernia repair is an alternative technique to traditional laparoscopic repair. In addition to having the benefits of laparoscopic surgery, incision reduction may prevent additional port site hernia formation by decreasing the number of fascial defects. The single larger defect allows more adequate closure of the abdominal wall. SPA surgery is a widely available technique not requiring additional cost or equipment.

Longer-term studies as well as larger-patient-number studies will be necessary to ensure no long-term hernia formation at the access site. In addition, we can make no judgment yet about the benefit of SPA ventral hernia repair in terms of decreased pain, improved recovery, or faster return to work compared to those of multiport procedures. The differences may, in fact, be isolated to cosmesis and decreased potential for number of possible hernia sites.

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