



An undesired, least expected complication in a routinely followed surgical technique: TAPP for Inguinal hernia: A review article with literature

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ABSTRACT:

Background:

In the era of minimally access surgery, laparoscopic transabdominal hernia repair (TAPP) has become a standard procedure owing to its benefits as a minimally invasive procedure with less postoperative discomfort and a shorter hospital stay. But benefits accompany a handful complications, although far from many, are gruesome for the surgeon. Here we look at such an appalling complication.

Introduction:

In a TAPP approach to groin hernias, after the placement of a mesh, there are several approaches to close the peritoneum. To prevent mesh exposure to the viscera and the possibility of adhesions and bowel entrapment into peritoneal defects, complete closure is advised in all cases. A rare complication of V-LOC™ associated bowel obstruction due to a loose long free end is studied and compared with the available literature.

Aim:

To study and review cases of TAPP that have been complicated into post-operative obstruction, secondary to use of barbed sutures, and compare our case that fated the same.

Review Results:

Even after a meticulous closure of the peritoneum following mesh placement in a TAPP, a long cut barbed suture thread hanging into the peritoneum can be a potential cause of or a focus of obstruction. In one of the cases that we studied, it not only resulted in obstruction, but also, lead to perforation of gut viscera [1].

Conclusion:

To lower the risk of intestinal obstruction and perforation during TAPP, surgeons should be well aware about the properties of barbed suture and be proficient at closure of the peritoneum. The free end of the barbed suture that was present in the peritoneal cavity may encourage formation of adhesions, which could lead to bowel obstruction.

Clinical Significance:

In order to prevent more severe complications, surgeons utilising the barbed suture should be aware of this possible complication whilst operating.



Background

Since the 1990s, laparoscopic inguinal hernia repair techniques have become more popular, due to its benefits such as it being less invasive, decreased post-operative discomfort and better cosmesis, along with a shorter hospital stay, thus being more economical [1]. Transabdominal Pre-peritoneal repair (TAPP) has been adapted and improvised all over the world.

After placement of the mesh, the peritoneal defect that has been made needs closure, hence, needs to be sutured [2]. Given its cumbersome nature, and the potential drawbacks of limited manoeuvrability in closed spaces, multifilament sutures were soon to be replaced by barbed sutures [3]. Barbed sutures were initially reported in, as early as 1951 [4]. and have since developed into a standard component of surgical technique, especially in laparoscopic surgery. By providing tissue approximation and traction without the aid of an assistant, these materials' anchoring properties eliminate the need for a conventional surgical knot, increasing surgical efficiency.

Currently, V-loc™ (Covidien, Mansfield, MA, USA) a monofilament absorbable

unidirectional barbed suture [5] and Quill™ (Angiotech Pharmaceuticals, Vancouver, Canada), a monofilament absorbable bidirectional barbed suture [6] are the two

forms of barbed suture used most frequently in gastrointestinal surgery. Nevertheless, despite their quick adoption, little is known about the potential drawbacks of these materials, and doubts regarding their safety have started to surface in several procedures.

Review Results

Case 1:

A 72-year-old gentleman with no co-morbidities came to our hospital with a left groin pain and swelling since 3 months. On complete physical examination, he was found to have a left indirect inguinal hernia, no signs of prostatic enlargement, and no respiratory issues. Vitals were within normal limits, and systemic examination was normal. He was planned for TAPP procedure under general anaesthesia, and with standard port placement and standard operative technique as described by Jonathan Carter et. al., [7], underwent an uneventful procedure. We used a V-LOC™ 00 barbed suture for closure of the peritoneum. Patient was discharged the next day.

On post-operative day 3, he returned with distension of abdomen, vomiting and no peristaltic sounds. Further, on investigations, X-Ray Flat Plate (Erect Abdomen) revealed multiple air fluid levels, CECT Whole abdomen (Triple Contrast) revealed small bowel obstruction.



Image 1a through 1c, taken every 3 hours apart, demonstrate the increase in number of air fluid levels, on an X-Ray flat plate (erect abdomen).

Img. 1a: On Admission



Img. 1b: 3 hours after admission



Img. 1c: 6 hours after admission

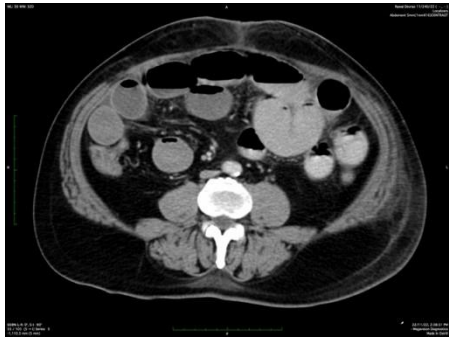


Image 2a through 2c: CECT Images showing small bowel obstruction

Img. 2a: Scout Image



Img. 2b: Axial image showing transitional point and kinking of bowel.



Img. 2c: Coronal image showing transition point in the left iliac region and location of tacker.



With evidence of obstruction and a point of transition, decision was taken to re-explore the patient, for diagnostic laparoscopy and proceed. On inspection of the abdominal cavity through the umbilical 10mm camera port, evidence

of torsion of an ileal loop around the loosely hanging V-LOC™ suture was visible. 2 other ports as mentioned above were reintroduced and the free hanging end of the suture was cut, thereby, freeing the adhered bowel to the



suture. The free suture was then carefully removed and the bowel was inspected for signs of viability. As bowel was found to be viable, without signs of perforation or injury to the serosa, decision was taken to close the patient after a thorough inspection of the abdominal cavity for other sites of mechanical obstruction. Patient was then discharged the next day, after an uneventful recovery. Current status of the patient is disease free, with no signs of obstruction.

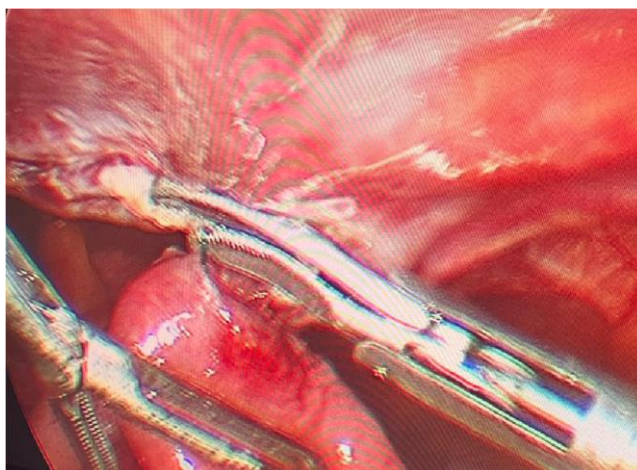
After a meticulous research of available literature, the cause of obstruction was attributed to the long loose end of the V-LOC™ barbed suture.

Below are the intra-operative images of the diagnostic laparoscopic findings:

Image 3a: Intra-operative diagnostic laparoscopic finding of torsion of a loop of ileum to the posterior surface of the anterior abdominal wall.



Image 3b: Dissection of the Ileal loop from the peritoneal surface, where the blue thread of V-LOC™ can be visible between the blades of the laparoscopic scissors. It was then cut to free the bowel from the under surface of the peritoneum.





Case 2:

A case report by Longbo Zheng, Xiangyi Yin et. al. [8] from Qingdao, China in February 2021, reported a similar finding, where a 62 year-old-man with symptomatic bilateral inguinal hernia underwent a TAPP procedure. Standard procedure steps followed, and closure of the peritoneum done with absorbable V-LOC™ barbed suture, leaving approximately 2 centimetres of exposed suture in the abdominal cavity.

Similar to our case, the patient then presented on POD-2 with obstipation from 2 days. On imaging, CT showed bowel distension with a 'whirlpool sign', indicative of volvulus of the bowel. Laparoscopy was then performed, and the reverse hook of suture was seen surrounding the bowel, causing significant oedema. It was then cut, bowel was de-rotated and abdominal closure was performed. He was discharged after an uneventful post-op recovery. Image attached below.

Case 3:

A case report by G. Köhler, F. Mayer et. al. [9] from Linz, Austria, in 2014 reported a case of a 82 year-old gentleman with bilateral inguinal hernia, with right sided hernia being recurrent, previously operated by anterior "Shouldice" repair done 10 years earlier to current presentation. A bilateral TAPP was performed and intra-operatively, a left sided indirect hernia and a right sided direct hernial sac was seen, which was reduced and mesh placed. A selfanchoring, absorbable V-LOC™ was used for peritoneal wound closure, and was discharged on POD 3. Patient then returned on POD-13 with abdominal pain, vomiting and a hypertympanic distended and tender abdomen. A small bowel herniation through the peritoneal defect was initially suspected, for which diagnostic laparoscopy was performed, but due to distinct bowel distention, converted the procedure to an open, midline laparotomy of the lower abdomen. The cause of obstruction was attributed to the barbed peritoneal closure suture material, which was in-growing into the small bowel serosa, thus being the source of ileus. It was then freed manually, under direct vision, bowel was found to be

healthy and patient discharged after an uneventful post-operative recovery.

Case 4:

A case report by Eugenio M. Tagliaferri et. al. [10] from Lingen, Germany, reported a case of a 50-year old gentleman who presented with abdominal pain and distension, with vomiting and feeding intolerance. He was previously undergone a TAPP surgery, a day prior. On further examination of surgical records, a similar barbed suture (V-LOC™) was used to close the peritoneum. CT of the abdomen was carried out, which revealed small bowel obstruction with a possible volvulus. On laparoscopic re-examination through the same ports, they found that the loose cut end of the V-LOC suture had entangled and was integrated into the mesentery of the small intestine, which created a volvulus and was associated with ischemia. After releasing the adherent suture, de-rotation was carried out, which resulted in a good re-perfusion of the bowel, hence, no resection anastomosis was necessary. He was discharged the next day after a soft abdomen was visible on inspection, and was able to tolerate solid food.


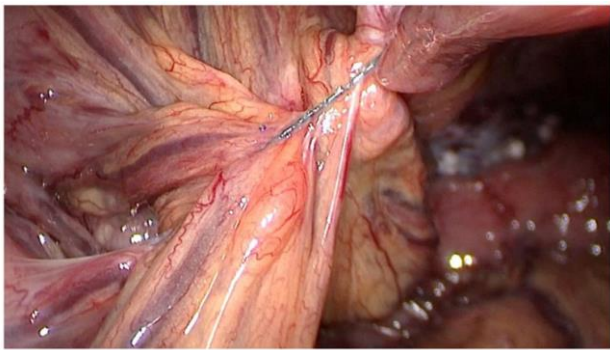
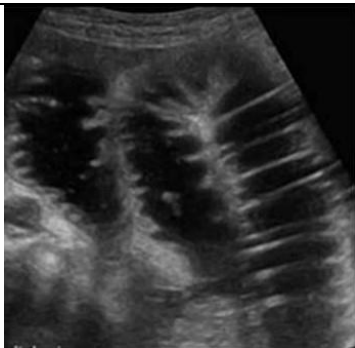
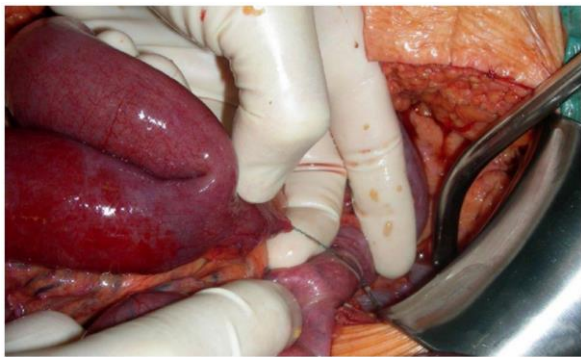
Case 5

A case report by Liming Wang et. al. [11] from Hokkaido Japan reported two such cases wherein one of which presented with signs of obstruction, while the other presented with signs of perforation. In the former, a 45 year old male with a right indirect inguinal hernia underwent TAPP procedure and the peritoneal defect was closed with a 4-0 absorbable monofilament barbed suture (V-LOC™). The patient was then discharged the following day but was readmitted a day after complaining of abdominal pain and vomiting. CT revealed a possible ileal volvulus. Although the symptoms resolved spontaneously after 2 days of rehydration and NPO status, the patient had intermittent abdominal pain and was readmitted again on POD 47 with pain which had worsened. Laparoscopic exploration revealed the tail of the barbed suture was found to be much longer and embedded within the mesentery of the small bowel causing volvulus. It was then cut and removed, and the patient was discharged on 4th post-operative day. In the second case that the author has




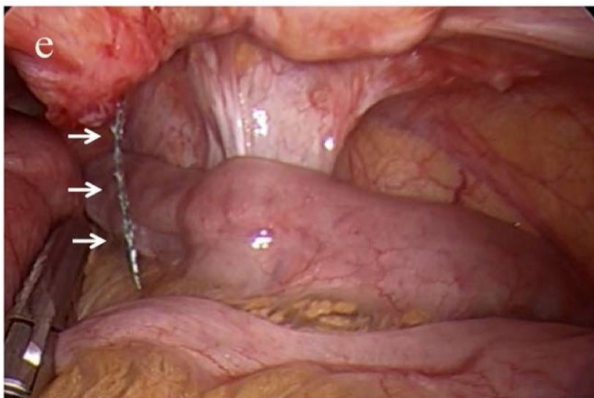
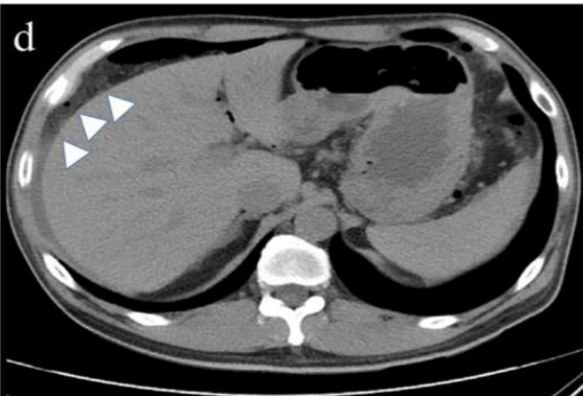
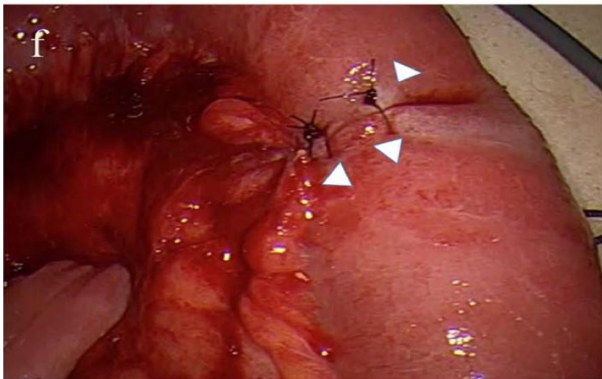


mentioned, the patient presented with unremitting pain in the abdomen. CT demonstrated free air in the abdomen, indicative of perforation. After laparoscopic exploration, findings showed an elongated tail of barbed suture had

been pierced into the small intestine. The serosa and the muscular defect were closed with 2 absorbable single knot sutures. Patient was then discharged on POD 7, after an uneventful recovery.

Cas e No.	Radiological Image	Re-exploration Image
02	 Vortex Sign, Marks volvulus.	 Free end of barbed suture seen entangled with mysentry.
03	 Piano key sign on USG.	 Laparotomy findings s/o barbed suture entangled



04		
05 (a)		
05 (b)	 <p>Free air in the abdominal cavity</p>	 <p>Single sutures taken over perforation over serosa and muscular layer.</p>



Discussion:

Because of advancements in technology, TAPP repair, generally has a low rate of

complications. The incidence of SBO after TAPP repair, according to statistical data, ranges from 0.2% to 0.5% [12] and is typically due to insufficient peritoneal closure, trocar site herniation, or adhesion [13]. Following laparoscopic TAPP repair, complete peritoneal closure is a crucial step to prevent both bowel incarcerations due to herniation into the preperitoneal space and mesh exposure to the intestine, which increases the risk of adhesions and bowel obstructions [14,15]. After placement of the mesh in the space above the peritoneum, the cut end of the peritoneum is sutured back. This can be done with tacks, running sutures, staplers or even adhesives, all having their own advantages and drawbacks. Out of all the mentioned techniques of closure of the peritoneum, running sutures have an advantage over the others as they cause the least discomfort for the patient [16] and allow for the best possible peritoneal closure [17], although, the disadvantage being it takes the longest amount of time. Due to the possibility of neural injuries and adhesions, penetrating devices like tacks, clips, staples, or strap devices should be avoided for mesh fixation as well as for peritoneal closure [18,19]. To curtail the time taken for running sutures, surgeons have embraced a self-anchoring monofilamentous barbed suture, like V-LOC™. The advantage of V-LOC over the other suture materials is that it eliminates the necessity for knotting [19]. The ease of use, with advantage of least discomfort for the patient, has barbed suture being adapted into everyday practice. Although faster, barbed sutures come with its own set of dangers and, or, complications. We found several case reports that were similar to ours in which a selfanchoring barbed suture was left behind during TAPP repair and resulted in SBO [17-19]. Although they are uncommon, these reports offer a wealth of literary insights.

In most instances where SBO was caused due to barbed suture, the most common feature that was found is that the

small intestine and mesentery was involved; which was intertwined, resulting in a volvulus.

Not only general surgery, the use of barbed sutures has been documented in various other domains of gynaecological surgery [20,21], plastic surgery [22], orthopaedic surgery [23, 24] and urology, all having reported benefits and risks, with complications of the aforementioned sutures [25].

6 weeks after a laparoscopic myomectomy, Lee and Wong [26] described a case of SBO brought on by barbed sutures. In a rat model developed by Api et al. [27], it was discovered that peritonization was unable to prevent adhesions from forming when barbed suture material was employed intra-abdominally.

Below is a comprehensive table of 14 such authors which summarises the findings of their respective case reports / case series.

Clinical Significance:

When a new device, drug or a material is introduced for surgical practice, it is essential to not only know the benefits, but also the potential side effects or complications that may be caused

due to it.

While barbed suture materials, like the V-loc™ suture, make laparoscopic suturing simpler and may shorten the surgical procedure, exposed suture material may trap on surrounding tissues and act as a nidus for mechanical blockage. Laparoscopic surgeons must be aware of this comparatively unrecognised possible consequence.

When analysing post-operative imaging in situations where SBO complicates the initial recovery from laparoscopic inframesocolic surgery, it is critical to keep a high index of suspicion and take barbed suture entanglement as a possible cause of this condition. To maximise the advantages of this surgical technology, we advise taking pre-cautionary steps to protect the ends of barbed sutures during inframesocolic surgery.



Author	Age	Sex	Day of Present -ation	Area / Field	Surgery	Rei nte rve nti on	Lap / Open	Resec ti on of Bowel	Suture used	Management
Longbo Z [8]	62	M	2	Pelvis	TAPP	Yes	Lap	No	V-LOC	Cut Suture, Free entangled bowel.
Köhler G. [9]	82	M	13	Pelvis	TAPP	Yes	Open	No	V-LOC	Cut Suture, Free entangled bowel.
Eugeni o M. [10]	50	M	1	Pelvis	TAPP	Yes	Lap	No	V-LOC	Cut Suture, Free entangled bowel.
Liming Wang [11]	45	M	47	Pelvis	TAPP	Yes	Lap	No	V-LOC	Cut Suture, Free entangled bowel.
Kindin ger LM [28]	52	F	30	Pelvis	Myomec tomy	Yes	Lap.	No	V-LOC	Cut Suture, Free entangled bowel.
Ovesen RJ [29]	62	M	5	Pelvis	Bilateral TAPP	Yes	Lap.	No	V-LOC	Cut Suture, Free entangled bowel.
Romba ut S [30]	30	F	21	Pelvis	Myomec tomy	Yes	Lap.	No	Quill SRS	Cut Suture, Free entangled bowel.
Vasude van SP [31]	30	F	1	Pelvis	Rectope xy	Yes	Lap.	No	V-LOC	Cut Suture, Free entangled bowel.
Thuber t T [32]	61	F	30	Pelvis	Colpope xy	Yes	Open	No	V-LOC	Cut Suture, Free entangled bowel.
Burchet t MA [33]	48	F	40	Pelvis	Myomec tomy	Yes	Open	No	V-LOC	Cut Suture, Free entangled bowel.
Buchs NC [34]	37	F	8	Pelvis	Inguinal hernia repair with	Yes	Lap.	No	V-LOC	Cut Suture, Free entangled bowel.



					Pelvis floor repair					
Salmine n HJ [35]	35	F	30	Pelvis	Rectopexy	Yes	Open	Yes	V-LOC	Resection Anastomosis
Quilbel S [36]	50	F	10	Pelvis	Vaginofixation	Yes	Lap.	No	V-LOC	Cut Suture, Free entangled bowel.
Segura JJ [37]	63	F	5	Infram esocolic	Jejunostomy	Yes	Lap.	No	V-LOC	Cut, Enteroraphy.

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