

Novel Technique of Mesh Fixation with Cyanoacrylate in Totally Extraperitoneal Laparoscopic Hernia Repair: Early Experience

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Totally extraperitoneal laparoscopic hernioplasty (TEP) is an alternative surgery for inguinal hernia repair, but chronic pain is still a problem. The authors proposed the use of cyanoacrylate for mesh fixation instead of staples which might be the cause of chronic groin pain. The authors also innovated an instrument for delivery of cyanoacrylate for mesh fixation. The present article reported early experience in the first 15 patients who were treated with this technique. Early post-operative pain was comparable to a previous study, no recurrence and no chronic groin pain was detected after surgery.

Keywords: Laparoscopic surgery, Laparoscopic hernia, Hernia, Hernioplasty, Hernia repair, TEP, Cyanoacrylate

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Totally extraperitoneal laparoscopic hernioplasty (TEP) has been accepted as an alternative technique for inguinal hernia repair. However, chronic groin pain is still a long term problem⁽¹⁾. The use of mesh fixation devices could be the cause of chronic pain⁽²⁾. There are two possible methods to avoid this problem. The first method is TEP without mesh fixation which has been shown to have comparable results^(3,4).

The second method is using glue for mesh fixation. Many reports used fibrin sealant for this purpose with comparable outcome to standard fixing devices⁽⁵⁻⁷⁾.

Cyanoacrylate, which is an adhesive substance used for many purposes such as bleeding varices, embolization, was also used for mesh fixation in animal hernias repair models^(8,9). It was also used in hernia repair in human, however, only a few cases were reported⁽¹⁰⁾.

The objective of the present article was to identify the outcome of using cyanoacrylate for mesh fixation in TEP.

Material and Method

From June 2009 to September 2009 fifteen patients who were scheduled for elective TEP were enrolled into the present study. Inclusion criteria were the patients who had unilateral inguinal hernia and had no previous pelvic or hernia surgery. Written informed consent was obtained from all patients. Protocol of the present study was approved by the ethic committee at Rajavithi hospital. The detailed operative technique was the same as The authors' previous report⁽¹¹⁾, except that cyanoacrylate was used instead of staples for mesh fixation. Cyanoacrylate was delivered into the operative field by a specially designed instrument to fix 9 x12 cm. Ultrapro™ mesh with iliopubic tract, Cooper's ligament, and rectus muscle. The specially designed instrument is a long metallic pipe with a handle that the diameter is small enough to pass into 5 mm port and large enough to insert a small epidural catheter, that connected to the glue injector, through its lumen (Fig. 1).

Chronic groin pain was defined as pain in the groin area that persisted more than 3 months post-operatively. Recurrence was defined as hernia that can be detected post-operatively at any point of time.

Demographic data, operative time and anesthetic time were recorded. Patients were assessed at 4, 8, 12, 24, 36 and 48 hours postoperatively by using visual analogue pain score (VAS). Analgesic requirement and postoperative complication were

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Fig. 1 Cyanoacrylate delivery device with Ultrapro™ mesh

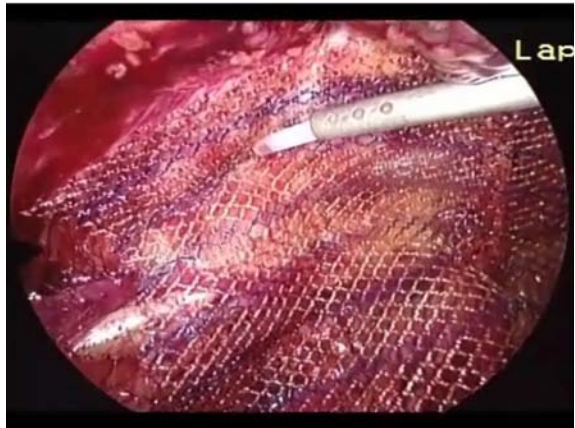


Fig. 2 Ultrapro™ was fixed with cyanoacrylate which was delivered through our device

recorded. Recurrence and groin pain was also evaluated and recorded at 3 months. Descriptive statistics in term of mean \pm standard deviation (SD) and frequency were used to present the result.

Results

Demographic data are shown in Table 1. Mean age of patients was 55 ± 12.25 years. Almost all patients were male. Right side hernias were more common than left side. All patients were in either ASA 1 or ASA 2.

The operative and post-operative data are shown in Table 2. All data are expressed in mean \pm standard deviation. All the results were comparable to the authors' previous study⁽¹¹⁾. Chronic groin pain and recurrence was not detected in any patients.

One patient had small seroma which resolved spontaneously within 2 months. There was no mortality

in the present study.

Discussion

Laparoscopic TEP is an alternative surgical repair of inguinal hernia with excellent result. However, chronic groin pain was a long term problem in many reports^(1,2,12). Poobalan reviewed chronic inguinal pain and found that fixing devices or staples might be the cause of this pain⁽²⁾. In order to avoid this chronic groin pain, Ferzli a conducted prospective study of unstapled mesh and concluded that unstapled mesh was comparable to stapled mesh in terms of recurrence but with less cost⁽³⁾. Furthermore, Taylor conducted another study and confirmed the study by Ferzli⁽⁴⁾. However, the meshes used were larger (10-15 cm x 15 cm).

An alternative method to do TEP without staples is using biologic adhesive or glue for mesh fixation. Fibrin glue was used for this purpose. Topart concluded from his retrospective study that fibrin glue was equally effective as staples in mesh fixation and had a lower incidence of chronic groin pain and less cost⁽⁵⁾. This was also confirmed by other reports^(6,7,13). Cyanoacrylate is a well known glue which can be used

Table 1. Demographic data of 15 patients

Characteristics	n=15
Age (Mean \pm SD)	55.53 \pm 12.25
Sex (Male/Female)	14/1
Side (Right/Left)	10/5
ASA (1/2)	8/7

SD = Standard deviation, ASA = American Society of Anesthesiologists

Table 2. Operative and Post-operative data

	Mean \pm SD
Operative time (minutes)	81.53 \pm 37.98
Anesthetic time (minutes)	104.00 \pm 39.70
VAS score at 4 hours	3.77 \pm 1.59
8 hours	3.20 \pm 1.82
12 hours	2.47 \pm 1.92
24 hours	1.47 \pm 1.55
36 hours	1.33 \pm 1.63
48 hours	0.87 \pm 1.55
Morphine used (milligram)	13.92 \pm 17.92

SD = Standard deviation, VAS = Visual analogue pain score

in human such as Dermabond™ for wound closure and Histoacryl™ for injection of esophagogastric varices. Although there was a report of delayed incorporation of tissue in animal study, it occurred only at the cyanoacrylate application sites⁽¹⁴⁾. In 1998 Jourdan used cyanoacrylate for mesh fixation in TEP but reported just only a few cases of inguinal hernia successfully treated by this technique without early recurrence and adverse reaction⁽¹⁰⁾.

The authors' results from the present study suggest that cyanoacrylate can be used for mesh fixation in TEP because the cost is lower than fibrin glue and its effectiveness in terms of recurrence and complication. The challenging part of the operation is the technique of cyanoacrylate delivery for mesh fixation because the glue will rapidly polymerize when it is exposed to body fluid, especially blood. Since there is no instrument designed for this purpose, the authors had designed a glue delivery device for the laparoscopic surgery that was different from the commercial fibrin delivery system. This device could deliver glue through laparoscopic port without difficulty and control the direction of glue injection precisely (Fig. 2). After fixation with glue, the mesh was in the proper place without any displacement.

There was no early recurrence which meant that cyanoacrylate could effectively fix the meshes without displacement. The result also showed that early post-operative pain was comparable to mesh fixation by staples from the authors' previous report⁽¹¹⁾ but chronic groin pain was not detected which is very promising. However, a further randomized controlled trial is needed to confirm the efficacy of this technique.

Conclusion

TEP with mesh fixation by cyanoacrylate has promising results in terms of recurrence and chronic groin pain. The device that the authors designed can be used to deliver glue laparoscopically to keep the mesh in place without displacement.

Potential conflicts of interest

None.

References

1. Bright E, Reddy VM, Wallace D, Garcea G, Dennison AR. The incidence and success of treatment for severe chronic groin pain after open, transabdominal preperitoneal, and totally extraperitoneal hernia repair. *World J Surg* 2010; 34: 692-6.

2. Poobalan AS, Bruce J, Smith WC, King PM, Krukowski ZH, Chambers WA. A review of chronic pain after inguinal herniorrhaphy. *Clin J Pain* 2003; 19: 48-54.
3. Ferzli GS, Frezza EE, Pecoraro AM Jr, Ahern KD. Prospective randomized study of stapled versus unstapled mesh in a laparoscopic preperitoneal inguinal hernia repair. *J Am Coll Surg* 1999; 188: 461-5.
4. Taylor C, Layani L, Liew V, Ghusn M, Crampton N, White S. Laparoscopic inguinal hernia repair without mesh fixation, early results of a large randomised clinical trial. *Surg Endosc* 2008; 22: 757-62.
5. Topart P, Vandenbroucke F, Lozac'h P. Tisseel versus tack staples as mesh fixation in totally extraperitoneal laparoscopic repair of groin hernias: a retrospective analysis. *Surg Endosc* 2005; 19: 724-7.
6. Novik B, Hagedorn S, Mork UB, Dahlin K, Skullman S, Dalenback J. Fibrin glue for securing the mesh in laparoscopic totally extraperitoneal inguinal hernia repair: a study with a 40-month prospective follow-up period. *Surg Endosc* 2006; 20: 462-7.
7. Ceccarelli G, Casciola L, Pisanelli MC, Bartoli A, Di Zitti L, Spaziani A, et al. Comparing fibrin sealant with staples for mesh fixation in laparoscopic transabdominal hernia repair: a case control-study. *Surg Endosc* 2008; 22: 668-73.
8. Miyano G, Yamataka A, Kato Y, Tei E, Lane GJ, Kobayashi H, et al. Laparoscopic injection of dermabond tissue adhesive for the repair of inguinal hernia: short- and long-term follow-up. *J Pediatr Surg* 2004; 39: 1867-70.
9. Losi P, Burchielli S, Spiller D, Finotti V, Kull S, Briganti E, et al. Cyanoacrylate surgical glue as an alternative to suture threads for mesh fixation in hernia repair. *J Surg Res* 2010; 163: e53-e58.
10. Jourdan IC, Bailey ME. Initial experience with the use of N-butyl 2-cyanoacrylate glue for the fixation of polypropylene mesh in laparoscopic hernia repair. *Surg Laparosc Endosc* 1998; 8: 291-3.
11. Subwongcharoen S, Udompornmongkol V. A randomized control trial of levobupivacaine, bupivacaine versus placebo extraperitoneal infusion in totally extraperitoneal laparoscopic inguinal hernioplasty. *J Surg Res* 2010; 162: 279-83.
12. Dickinson KJ, Thomas M, Fawole AS, Lyndon PJ, White CM. Predicting chronic post-operative pain following laparoscopic inguinal hernia repair.

- Hernia 2008; 12: 597-601.
13. Schwab R, Willms A, Kroger A, Becker HP. Less chronic pain following mesh fixation using a fibrin sealant in TEP inguinal hernia repair. *Hernia* 2006; 10: 272-7.
 14. Fortelny RH, Petter-Puchner AH, Walder N, Mittermayr R, Ohlinger W, Heinze A, et al. Cyanoacrylate tissue sealant impairs tissue integration of macroporous mesh in experimental hernia repair. *Surg Endosc* 2007; 21: 1781-5.

นวัตกรรมใหม่ของการยึดแผ่นสังเคราะห์ที่ใช้ในการรักษาไส้เลื่อนขาหนีบด้วยการผ่าตัดผ่านกล้องวิดิทัศน์

สอาด ตริพงษ์ภรณ์, สมบูรณ์ ทรัพย์วงศ์เจริญ

การผ่าตัดรักษาไส้เลื่อนทางวิดิทัศน์ผ่านนอกเยื่อช่องท้องทั้งหมด (*Laparoscopic totally extraperitoneal hernia repair, TEP*) เป็นวิธีการผ่าตัดที่เป็นที่ยอมรับอย่างกว้างขวางวิธีหนึ่ง แต่ยังมีปัญหาเรื่องอาการปวดขาหนีบเรื้อรัง ผู้นิพนธ์เสนอวิธีการผ่าตัดดังกล่าวข้างต้นโดยไม่ต้องใช้เครื่องเย็บตาข่าย (*staples*) ซึ่งสงสัยว่าเป็นสาเหตุให้เกิดอาการปวดขาหนีบเรื้อรังโดยใช้กาว *cyanoacrylate* แทนผู้นิพนธ์ได้คิดค้นอุปกรณ์สำหรับฉีดกาวเพื่อยึดตาข่ายให้ติดบริเวณการผ่าตัดที่ต้องการ รายงานนี้จัดทำขึ้นเพื่อรายงานประสบการณ์การผ่าตัดโดยเทคนิคนี้ในผู้ป่วย 15 รายแรก ซึ่งพบว่าอาการปวดช่วงหลังผ่าตัดไม่แตกต่างจากรายงานก่อนหน้าและไม่พบการเป็นไส้เลื่อนซ้ำและไม่พบอาการปวดขาหนีบเรื้อรัง