Asian Journal of Surgery (2018) xx, 1–6

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.e-asianjournalsurgery.com

TECHNICAL NOTE

Laparoscopic transabdominal preperitoneal approach for giant inguinal hernias

Ryosuke Fujinaka [a], Takeshi Urade*[,a], Eiji Fukuoka, Koichi Murata, Yasuhiko Mii, Hidehiro Sawa, Mariko Man-i, Shigeteru Oka, Yoshiteru Iwatani, Daisuke Kuroda

Department of Surgery and Digestive Surgery, Kita-Harima Medical Center, Ono, Japan

Received 20 October 2017; received in revised form 13 December 2017; accepted 28 December 2017

KEYWORDS
Giant inguinal hernia;
Scrotal hernia;
TAPP;
Transabdominal preperitoneal approach

Summary *Background:* Many surgical techniques have been developed to treat inguinal hernia. In recent years, the laparoscopic transabdominal preperitoneal (TAPP) approach has been widely performed to repair inguinal hernia. Giant inguinal hernia (GIH) is an extremely rare disease that is a challenge for general surgeons. GIH appears when patients neglect the treatment for many years and it is defined as an inguinal hernia that extends below the midpoint of inner thigh in standing position. According to previous publications, the Lichtenstein tension-free hernioplasty is recommended to repair GIH. In this article, we describe consecutive four cases of GIH repaired via the TAPP approach.

Methods: From April 2015 to March 2017, 200 patients underwent hernioplasty against inguinal hernia at our hospital. Inguinal hernias were treated via the TAPP approach in principle. We performed hernioplasty via the TAPP approach in all 4 patients (2%) who met the definition of Type 1 GIH. Demographic information, maximum diameter of hernia sac, hernia orifice size, and surgical data were obtained.

Results: The mean operative time was 135 min. No intraoperative complications were encountered. All patients could walk from postoperative day 1 and were discharged home early, but they all had scrotal seromas. Three patients did not need puncture or drainage, but one of them required puncture. All seromas disappeared within 6 months. There was no recurrence in the 8- to 24-month follow-up.

Conclusion: The TAPP approach is a feasible, safe therapeutic option that may reduce wound size and pain following surgical treatment of Type 1 GIH.

© 2018 Asian Surgical Association and Taiwan Robotic Surgical Association. Publishing services by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

* Corresponding author. Department of Surgery and Digestive Surgery, Kita-Harima Medical Center, 926-250, Ichiba-cho, Ono, 675-1392, Japan. Fax: +81 794 62 9923.
E-mail address: uradet1125@gmail.com (T. Urade).
[a] Fujinaka and Urade contributed equally to this work.

https://doi.org/10.1016/j.asjsur.2017.12.004
1015-9584/© 2018 Asian Surgical Association and Taiwan Robotic Surgical Association. Publishing services by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Please cite this article in press as: Fujinaka R, et al., Laparoscopic transabdominal preperitoneal approach for giant inguinal hernias, Asian Journal of Surgery (2018), https://doi.org/10.1016/j.asjsur.2017.12.004

1. Introduction

The Lichtenstein tension-free hernioplasty technique is the gold standard procedure, but, in recent years, the laparoscopic transabdominal preperitoneal (TAPP) approach has been widely performed to repair inguinal hernia. Giant inguinal hernia (GIH) is an extremely rare disease that is a challenge for general surgeons. GIH appears when patients neglect the treatment for many years and it is defined as an inguinal hernia that extends below the midpoint of the inner thigh in standing position.[1] To our knowledge, a few publications report GIHs that were often repaired using the Lichtenstein technique, and this technique is recommended to repair the GIH.[2]

Laparoscopic hernia repair is widely performed currently, because a laparoscopic approach enables patients to return to normal activity earlier and reduces postoperative pain.[3] In this article, we describe four cases of GIH repaired via the TAPP approach.

2. Patients and methods

From April 2015 to March 2017, 200 patients underwent hernioplasty for inguinal hernia at our hospital. Inguinal hernias were treated via the TAPP approach in principle. Four patients (2%) met the definition of GIH (Fig. 1). Abdominal computed tomography was performed before operation to evaluate the hernia orifice and the contents of the hernia sac. One patient had a scrotal and femoral skin ulcer with infection and suffered from ileus due to ileocecal incarceration. A nasointestinal tube was preoperatively placed to reduce the pressure on the small intestine. All patients underwent hernia repair via the TAPP approach with intraoperative forced reduction. Demographic information, maximum diameter of hernia sac, hernia orifice size, and surgical data was obtained. Institutional review board approval and informed consent were obtained. Postoperative pain score was evaluated by the numerical rating scale.

3. Surgical technique

The patients were positioned supine and underwent surgery under general anesthesia. Rectus sheath and transversus abdominis plane blocks were achieved preoperatively with local anesthesia, using levobupivacaine 100 mg. The laparoscope was inserted through a 12-mm umbilical port. Another 12-mm port was placed at the lateral edge of the right abdominal rectus muscle and a 5-mm port was placed at the lateral edge of left abdominal rectus muscle. Any intra-abdominal content in the hernia sac was reduced by pushing the scrotum manually from outside of the body and simultaneously pulling the contents carefully using forceps (Figs. 2, 3A, B and 4A, B). We named this procedure the "push and pull maneuver." The hernia orifice size was measured. At the starting point of peritoneal dissection, the edge of the hernia orifice was dissected in a circular manner, and the hernia sac was left away inside the scrotum. The peritoneal flap was carefully dissected, and the myopectineal orifice was sufficiently exposed (Figs. 3C and 4C). A polypropylene mesh (SURGIMESH XD; Aspide Medical, France) was inserted into the preperitoneal cavity and secured to the myopectineal orifice using absorbable tacks (Figs. 3D and 4D). Finally, the peritoneal flap was closed using running sutures, fully covering the mesh (Figs. 3C, D and 4C, D). Intraoperative procedures in patient no. 4 are shown in the supplementary video.

Supplementary data related to this article can be found online at https://doi.org/10.1016/j.asjsur.2017.12.004.

4. Results

The 4 patients safely underwent hernioplasty via the TAPP approach. None of the cases were converted to open technique and no bowel resection was necessary. The surgical data of the patients are summarized in Table 1. The mean operative time for the GIHs was 135 min. There was

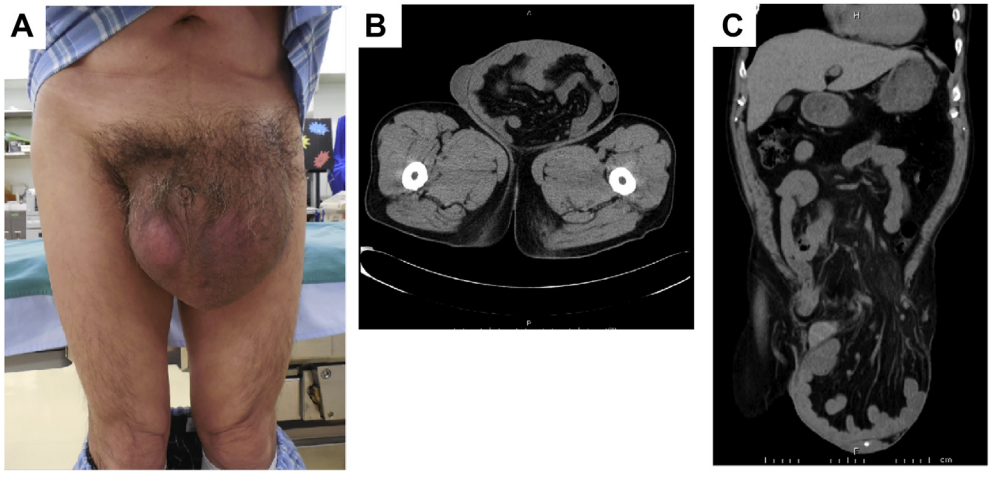


Fig. 1 Preoperative photograph and computed tomography findings (Patient No. 3). (A) The giant inguinal hernia extending below the midpoint of the inner thigh in standing position. (B) The hernia sac at the maximum diameter slice. (C) Small intestine in the hernia sac.

Please cite this article in press as: Fujinaka R, et al., Laparoscopic transabdominal preperitoneal approach for giant inguinal hernias, Asian Journal of Surgery (2018), https://doi.org/10.1016/j.asjsur.2017.12.004

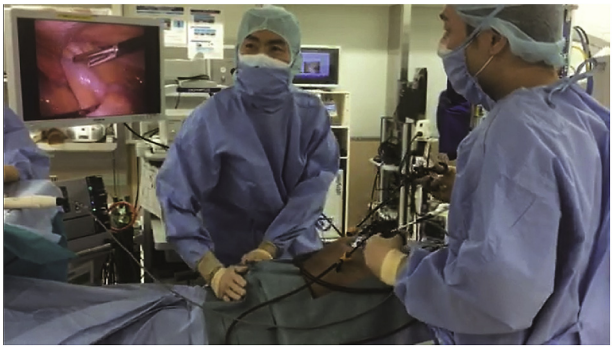


Fig. 2 Photograph of the operative field during the push and pull maneuver.

no intraoperative complication and the blood loss was minimal. All patients could walk from postoperative day 1; their mean hospital stay was 4.75 days. Postoperative pain was adequately controlled using oral nonsteroidal anti-inflammatory drugs. Patients were assessed for post-operative pain using the numerical rating scale (levels 1—5). They received two doses of loxoprofen sodium hydrate 60 mg at the median point of their hospitalization stays. All patients had postoperative seromas in the scrotum. There was no need of puncture or drainage in three patients, but Patient No. 3 required puncture three times. On computed tomography, seromas without puncture or drainage disappeared within 6 months (Fig.5). The seroma in patient no. 3 also disappeared within 6 months after it had been punctured three times. We observed no

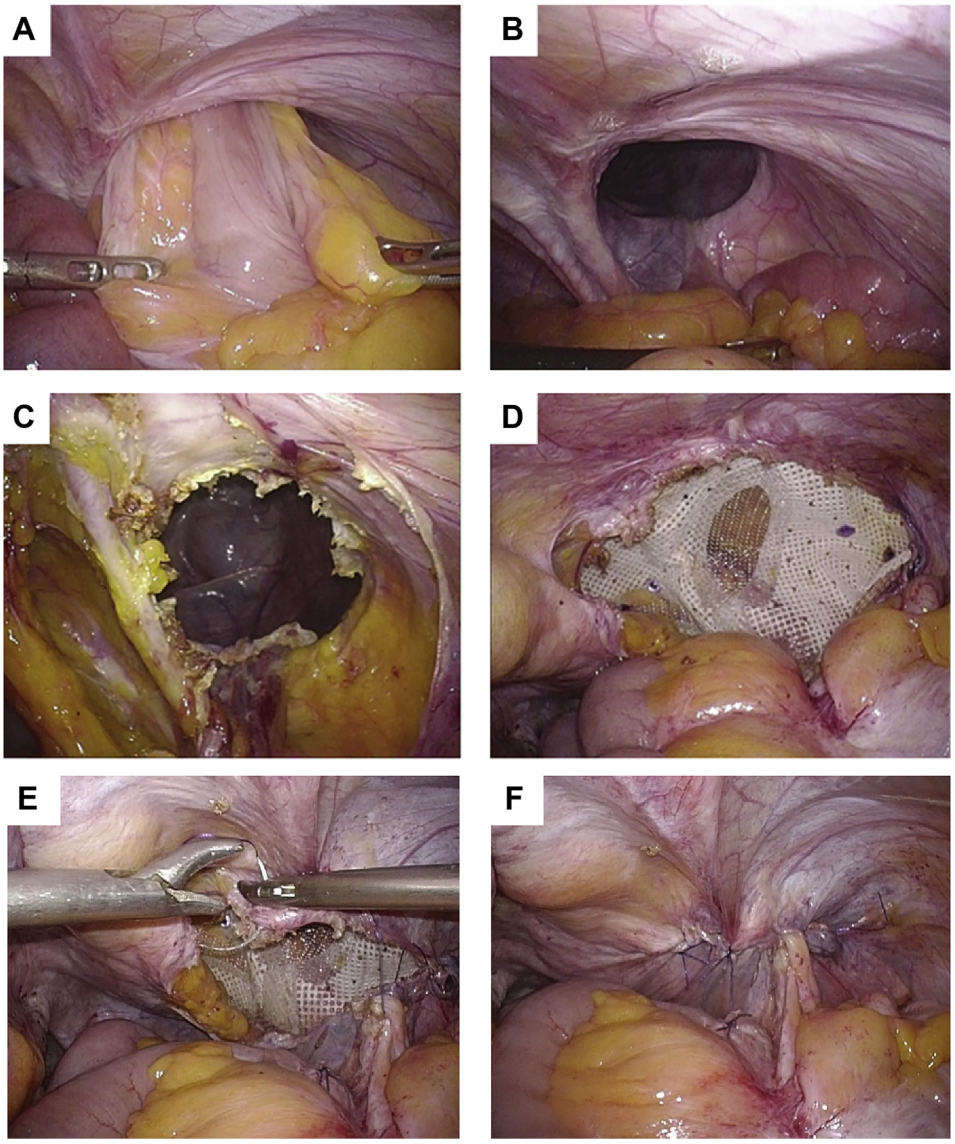


Fig. 3 Intraoperative findings of right-sided indirect inguinal hernia (Patient No. 2). (A)The prolapse of the ileocecum. (B) Right indirect hernia orifice. (C) After dissection of the preperitoneal space. (D) The prosthetic mesh placed on the myopectineal orifice. (E) The peritoneal flap was closed with running suture. (F) View of mesh fully covered by the peritoneum.

Please cite this article in press as: Fujinaka R, et al., Laparoscopic transabdominal preperitoneal approach for giant inguinal hernias, Asian Journal of Surgery (2018), https://doi.org/10.1016/j.asjsur.2017.12.004

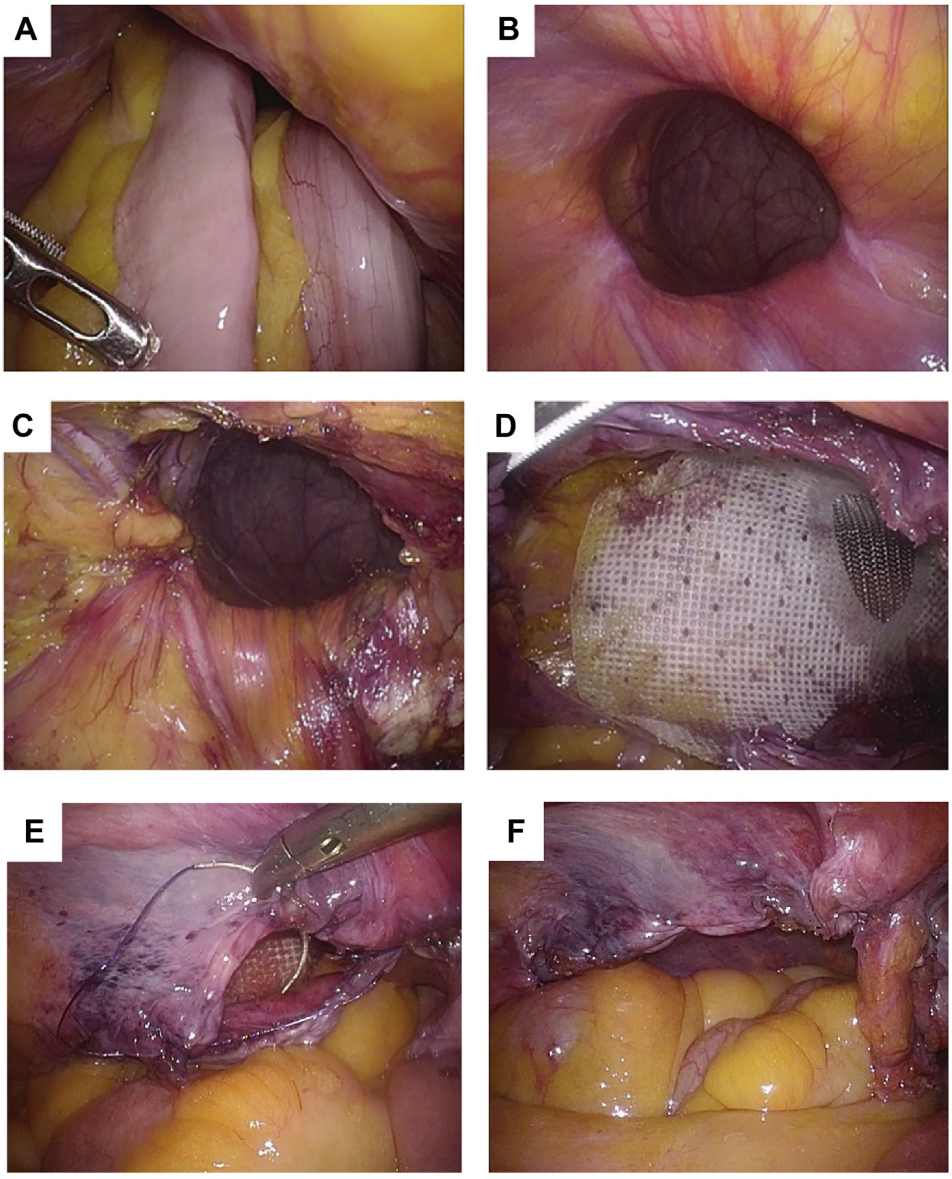


Fig. 4 Intraoperative findings of left-sided direct inguinal hernia (Patient No. 3). (A) The prolapse of the small intestine. (B) Left direct hernia orifice. (C) After dissection of the preperitoneal space. (D) The prosthetic mesh placed on the myopectineal orifice. (E) The peritoneal flap was closed with running suture. (F) View of mesh fully covered by the peritoneum.

complications related to scrotal skin. No hematoma or surgical site infection occurred. During the 8- to 24-month follow-up, there were no recurrences at present.

5. Discussion

We showed that laparoscopic management of GIH via the TAPP approach is safe and feasible in our cases. Although postoperative seroma occurred in them all, we effectively managed the seromas without hernia recurrences.

The repair of inguinoscrotal hernia has been discussed previously. The European Hernia Society guidelines described that Lichtenstein repair is preferred for large scrotal, irreducible inguinal hernias.[4] The guidelines for laparoscopic and endoscopic treatment of inguinal hernia described that TAPP approaches are possible therapeutic options in inguinoscrotal hernias.[5] However, choosing the surgical approach for GIH is still problematic, because GIH is seldom seen in clinical practice, only after years of self-neglect.[4] Previous literature mostly reported GIH repair via the Lichtenstein technique.[6,7] Although there is no recommendation for GIH in these guidelines, we believe that laparoscopic management of GIHs can be performed safely according to the size of the hernia.

Atthaphorn et al showed that GIHs were classified into the following three types based on scrotum length: Type 1, scrotum extending below mid inner thigh, but above the imaginary line at the lower thigh; the line between the middle point of the inner thigh and suprapatellar; Type 2, scrotum extending below the imaginary line at the lower thigh, but above the superior border of patellar bone; and Type 3, scrotum extending below the superior borders of the patellar bone.[7] Hernioplasty with forced reduction

Please cite this article in press as: Fujinaka R, et al., Laparoscopic transabdominal preperitoneal approach for giant inguinal hernias, Asian Journal of Surgery (2018), https://doi.org/10.1016/j.asjsur.2017.12.004

Table 1 Surgical data of the patients.

Patient no.	Sex/Age	BMI (kg/m^2)	Maximum diameter of the sac (cm)	Inguinal hernia types	Hernia orifice size (cm)	Contents in the sac	Operative time (min)	Mesh (cm × cm)	Hernia recurrence
1	M/62	30.8	13	R, indirect	4	Sigmoid colon	166	11 × 15	No recurrence 24 months
2	M/67	19.9	12	R, indirect	4	Small intestine Ileocecum	155	10 × 13	No recurrence 20 months
3	M/69	25.5	16	L, direct	4.5	Small intestine	254 (132)[a]	10 × 13	No recurrence 19 months
4	M/70	24.4	13.5	R, indirect	5	Small intestine Ileocecum	87	11 × 15	No recurrence 8 months

M, male; BMI, body mass index; R, right; L, left.
[a] Patient No. 3 underwent bilateral inguinal hernia repair. It took 132 min to repair the left-sided giant inguinal hernia.

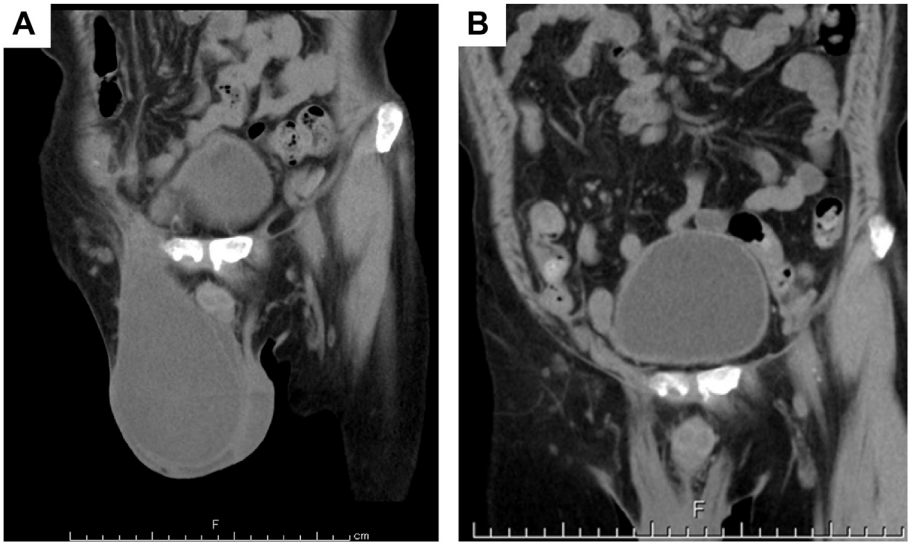


Fig. 5 Computed tomography findings of postoperative seroma (Patient No. 2). (A) Seroma in the scrotum area was found 2 months after surgery. (B) Seroma has disappeared without puncture in 6 months.

was feasible for the treatment of Type 1 GIH.[8,9] All our patients were classified as Type 1 GIH. We found that hernioplasty via the TAPP approach with forced reduction was feasible and safe in Type 1 GIHs. However, several authors reported that the TAPP approach for GIHs resulted in recurrences and emphasized its limitations.[10] Since one case in their study was a bilateral GIH, it might have been classified as a Type 2, and an open approach might have been needed for the resection of the abdominal contents. We emphasize that the TAPP approach may be indicated for Type 1 GIH, but is probably contraindicated for Types 2 or 3. In addition, this procedure is considered a relative contraindication for patients with compromised respiratory function or cardiac function, because forced reduction of the massive contents of the hernial sac leads to an increase in both intraabdominal and intrathoracic pressures, which can cause onset of abdominal compartment syndrome.

There are many advantages of the TAPP approach for GIHs. First, the TAPP approach allows for excellent observation of hernia contents from the intra-abdominal space. The sac of GIH holds various contents due to its large size. For example, small intestine, iliocecum, ascending colon, sigmoid colon, greater omentum, or urinary bladder were reported in previous literature. Secondly, pneumoperitoneum and the push and pull maneuver can facilitate the reduction of hernia contents. Siow et al reported a similar maneuver was performed to aid in reduction for incarcerated scrotal hernia.[11] The laparoscopic approach inflates the intra-abdominal space, which is sufficient to reduce the hernia contents. In addition, the push and pull maneuver enables reduction of intestines by careful manipulation under an appropriate external pressure, which prevents the injury of hernia contents. Thirdly, the hernia orifice can be observed from the intra-abdominal space and fully covered by using the appropriate size mesh potentially reducing hernia recurrence. Lastly, the wound size of laparoscopic hernioplasty is smaller than that of open hernioplasty, which often requires an additional incision due to the reduction of the giant hernia sac. Laparoscopic hernioplasty results in a lower incidence of wound infection, hematoma formation, and early recovery to normal activities. In patients with scrotal and femoral skin

Please cite this article in press as: Fujinaka R, et al., Laparoscopic transabdominal preperitoneal approach for giant inguinal hernias, Asian Journal of Surgery (2018), https://doi.org/10.1016/j.asjsur.2017.12.004

infection, the use of mesh is considered contraindicated because surgical site or mesh infection may occur. Even if there is an infection on the scrotal skin, the TAPP approach can be performed.

There are some drawbacks of the TAPP approach for GIHs. GIHs have a high risk of seroma. Leibl et al reported that the most frequent complication of scrotal hernioplasty by the TAPP approach was formation of a seroma; 10.5% of these seromas required evacuation via puncture.[12] In our patients, scrotal seromas occurred due to the hernia sac remaining, and one patient required scrotal seroma puncture. Laparoscopic complete dissection of the giant hernia sac is challenging for surgeons, and it might increase the risk of orchitis and hematoma because adhesion is usually detected due to disease chronicity. They also found there was no difference in postoperative formation of a seroma between complete and incomplete sac dissection.[12] Thus, we believe complete hernia sac dissection is not necessary due to its difficulty, especially in GIH. In addition, Bierca et al reported on the effectiveness of Lichtenstein repairs in 15 patients with GIH.[13] In their study, postoperative scrotal seroma occurred in three patients (20%). We suspect that the incidence of scrotal seroma was lower than the incidence in our study because drains were placed on the mesh for all patients in their study. Misra et al reported on the repair of 21 massive scrotal hernias, using the totally extraperitoneal approach.[14] In their study, postoperative scrotal seroma occurred in 14 patients (70%); all of these seroma cases required needle aspiration. Because postoperative seroma frequently occurs following hernioplasty of GIH, a new technique is necessary to reduce seroma formation in GIH patients.

The limitations of this study include a small sample size and short follow-up period. Although we successfully repaired the GIHs via the TAPP approach, we must consider transitioning to an open anterior approach if the inguinal hernia is irreducible.

In conclusion, the laparoscopic TAPP approach is a feasible, safe therapeutic option for surgical treatment of Type 1 GIH that may reduce wound size and pain, compared with open hernioplasty. Further studies are needed to evaluate and compare surgical outcomes between the TAPP approach and the Lichtenstein technique.

Conflict of interest

The authors have no conflicts of interest to declare.

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.asjsur.2017.12.004.

References

1. Hodgkinson DJ, McIlrath DC. Scrotal reconstruction for giant inguinal hernias. *Surg Clin North Am*. 1984;64:307–313.
2. Dinesh HN, Jagadish Kumar CD, Shreyas N. Giant inguinoscrotal hernia repaired by lichtensteins technique without loss of domain – A case report. *J Clin Diagn Res*. 2014;8. ND07–08.
3. Goodney PP, Birkmeyer CM, Birkmeyer JD. Short-term outcomes of laparoscopic and open ventral hernia repair: a meta-analysis. *Arch Surg*. 2002;137:1161–1165.
4. Simons MP, Aufenacker T, Bay-Nielsen M, et al. European Hernia Society guidelines on the treatment of inguinal hernia in adult patients. *Hernia*. 2009;13:343–403.
5. Bittner R, Arregui ME, Bisgaard T, et al. Guidelines for laparoscopic (TAPP) and endoscopic (TEP) treatment of inguinal hernia [International Endohernia Society (IEHS)]. *Surg Endosc*. 2011;25:2773–2843.
6. Tarchouli M, Ratbi MB, Bouzroud M, et al. Giant inguinoscrotal hernia containing intestinal segments and urinary bladder successfully repaired by simple hernioplasty technique: a case report. *J Med Case Rep*. 2015;9:276.
7. Trakarnsagna A, Chinswangwatanakul V, Methasate A, et al. Giant inguinal hernia: report of a case and reviews of surgical techniques. *Int J Surg Case Rep*. 2014;5:868–872.
8. Tsutsumi N, Guntani A, Rikimaru T, Watanabe A, Kohnoe S. Giant inguinal hernia containing right colon repaired using the prolene hernia system. *ANZ J Surg*. 2008;78:219.
9. Tay E, Gray E, Morgan MW. Repair of a massive inguinal hernia. *J R Soc Med*. 1999;92:586–587.
10. Bernhardt GA, Gruber K, Gruber G. TAPP repair in a giant bilateral scrotal hernia - limits of a method. *ANZ J Surg*. 2010;80:947–948.
11. Siow SL, Mahendran HA, Hardin M, Chea CH, Nik Azim NA. Laparoscopic transabdominal approach and its modified technique for incarcerated scrotal hernias. *Asian J Surg*. 2013;36:64–68.
12. Leibl BJ, Schmedt CG, Kraft K, Ulrich M, Bittner R. Scrotal hernias: a contraindication for an endoscopic procedure? Results of a single-institution experience in transabdominal preperitoneal repair. *Surg Endosc*. 2000;14:289–292.
13. Bierca J, Kosim A, Kołodziejczak M, Zmora J, Kultys E. Effectiveness of Lichtenstein repairs in planned treatment of giant inguinal hernia - own experience. *Wideochir Inne Tech Maloinwazyjne*. 2013;8:36–42.
14. Misra MC, Bhowate PD, Bansal VK, Kumar S. Massive scrotal hernias: problems and solutions. *J Laparoendosc Adv Surg Tech A*. 2009;19:19–22.

Please cite this article in press as: Fujinaka R, et al., Laparoscopic transabdominal preperitoneal approach for giant inguinal hernias, Asian Journal of Surgery (2018), https://doi.org/10.1016/j.asjsur.2017.12.004