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## Laparoscopic relief of reduction en masse followed by elective preperitoneal inguinal hernia repair with Modified Kugel™ Patch

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## ABSTRACT

**INTRODUCTION:** Reduction en masse is a rare complication of inguinal hernia. This condition is defined as the displacement of a strangulated hernia mass into the preperitoneal space.

**CASE PRESENTATION:** A 62-year-old man presented with severe abdominal pain after a forcible reduction of an incarcerated right inguinal hernia. Abdominal computed tomography (CT) scan suggested strangulated bowel. Emergency exploratory laparoscopy was performed and the incarcerated bowel was successfully released. Elective preperitoneal inguinal hernia repair using the Modified Kugel™ Patch was performed under laparoscopic guidance. The patient made an uneventful recovery.

**DISCUSSION:** Reduction en masse should be considered when abdominal pain persists after a difficult reduction of inguinal hernia. Laparoscopic guidance led to the definitive repair of the inguinal hernia with reduction en masse.

**CONCLUSION:** Laparoscopic relief can be an efficient therapeutic option for the management of this condition. In addition, Modified Kugel™ Patch repair with ligation of the hernia sac could be a reasonable treatment.

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## 1. Introduction

Reduction en masse of an inguinal hernia is defined as a strangulated hernial mass that is reduced into the preperitoneal space [1–3]. Delayed diagnosis causes necrosis of the incarcerated bowel, finally leading to a lethargic outcome [4]. However, preoperative diagnosis is comparatively difficult because this condition is rare. Furthermore, the definitive surgical treatment modality is still uncertain. Herein, we present a case of laparoscopic relief of reduction en masse followed by elective preperitoneal inguinal hernia repair using the Modified Kugel™ Patch. This case has been reported in accordance with the SCARE criteria [5].

## 2. Presentation of case

A 62-year-old man developed a bulge in the right groin and had a history of repeated reductions several years earlier. He was referred to us because of difficulty in self-reduction and severe abdominal

pain. Although the reduction by a physician was successful, the abdominal pain persisted for several hours. Abdominal computed tomography (CT) scan showed a closed loop of small bowel around the right inguinal region and the beaked bladder compressed by a mass of small bowel (Fig. 1).

On the first day of admission, an emergency exploratory laparoscopy was performed under general anesthesia based on a high index of suspicion of bowel strangulation. The incarcerated bowel was observed in the right inguinal region and was gently dragged out of the hernia sac, of which the fibrosed neck caused the strangulation (Fig. 2). Although brownish ascites was observed, bowel resection was judged unnecessary from the view of the bowel that appeared viable with only mild ischemic change.

Three days after the first operation, paralytic ileus improved, and there was no clinical evidence of infection associated with contamination from the ischemic bowel. Therefore, preperitoneal inguinal hernia mesh repair was performed via an anterior approach using the Modified Kugel™ Patch (Davol Inc., Warwick, RI) under laparoscopic observation. During the operation, a transfixing suture was placed at the neck of the hernial sac and then ligated in order to close the hernial orifice. The excess redundant sac was removed by cutting. The Modified Kugel™ Patch was inserted into the preperitoneal space to prevent the recurrence of bowel incarceration in the preperitoneal space. Laparoscopic observation showed that the hernial orifice had been correctly repaired, and the patch was placed in the preperitoneal space without migration (Fig. 3b).

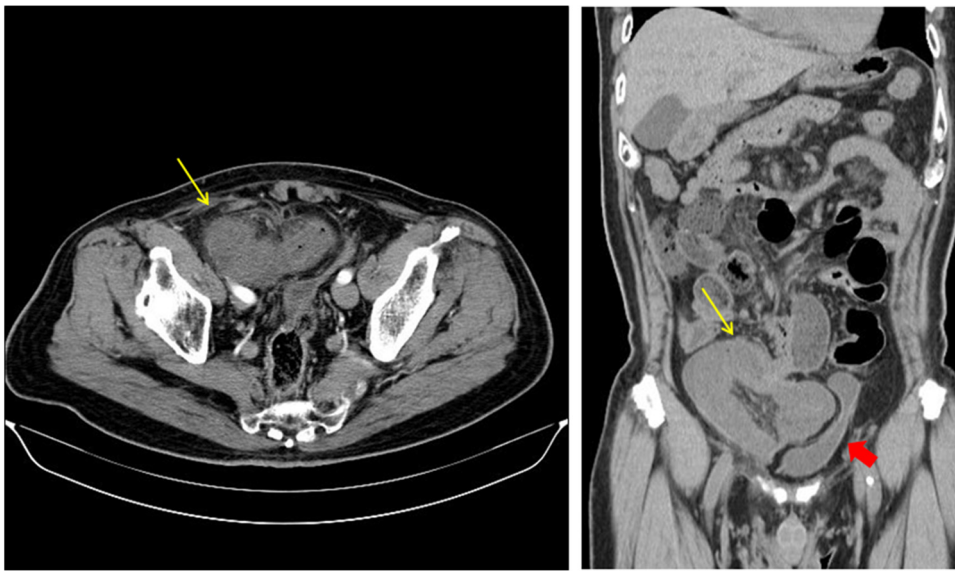
**Abbreviations:** CT, computed tomography; TAPP, laparoscopic transperitoneal hernia repair.

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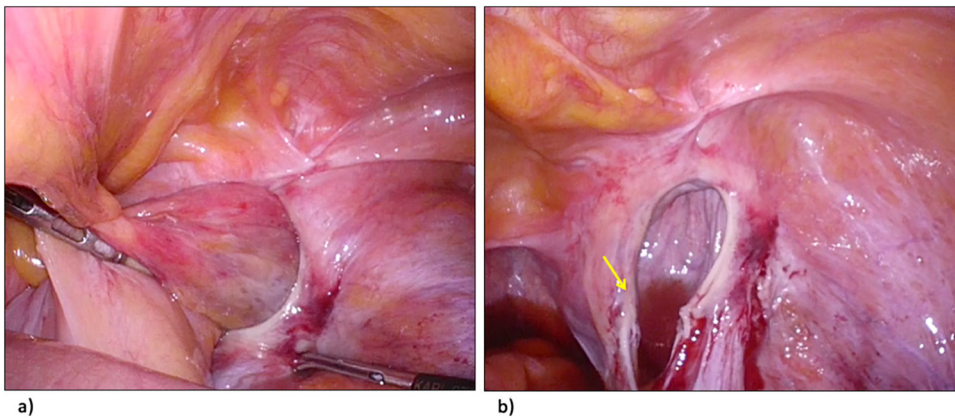
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**Fig. 1.** A closed loop of small bowel (thin yellow arrow) with beaking of the bladder (thick red arrow).



**Fig. 2.** a) Treatment of the incarcerated bowel. b) Fibrosed neck of the loosened hernia sac (thin yellow arrow).

The postoperative course was uneventful and no recurrence was observed during 12-month follow-up.

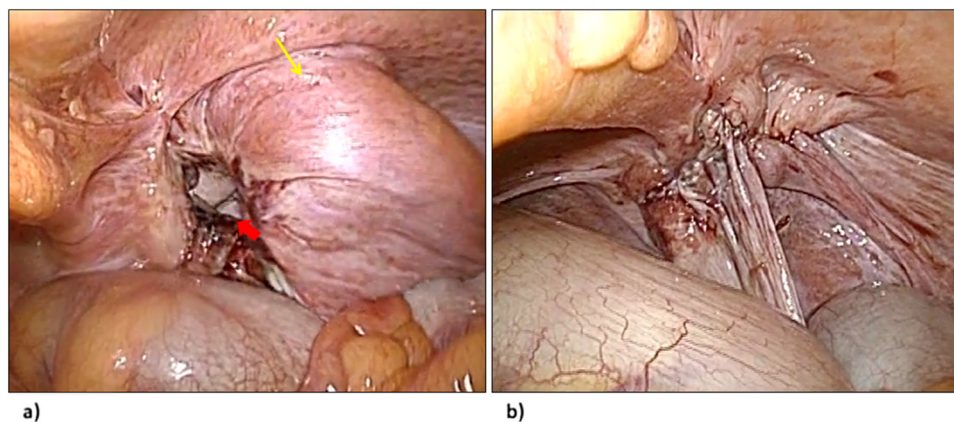
### 3. Discussion

Reduction en masse is an extremely rare complication of inguinal hernia, with a reported incidence of about 1 in 13,000 hernia cases [1]. Therefore, accurate preoperative diagnosis is considerably difficult. The typical presentation is persistent abdominal pain regardless of a successful reduction. Moreover, the last reduction is often aggressive. Repeated reductions may lead to fibrosis of the hernial sac, resulting in prevention of the bowel loops from freely sliding back into the abdomen [2]. The CT findings of reduction en masse include a closed-loop obstruction, a ball-like bowel in the inguinal region, and a beak of the bladder along the closed loop due to the exclusion [6].

Surgical procedures are usually chosen according to whether ischemic bowel required resection, whether primary or secondary hernioplasty is appropriate considering the contamination associated with ischemic bowel, or whether laparoscopic transperitoneal hernia repair (TAPP) or the anterior approach is preferred. In this case, after evaluation of bowel viability, bowel resection was not performed. Elective hernioplasty, however, was considered safer considering the possibility of contamination and the complexity of

mesh-related infection. Furthermore, as the exacerbation of paralytic ileus leads to increasing abdominal pressure and contributes to postoperative recurrence of hernia, a two-stage approach was chosen. Nevertheless, a study suggested that extensive washing prevents mesh-related infection and makes it possible to perform primary hernioplasty, even if bowel resection is necessary [7].

The hernial orifice is reported to be possibly retained after Lichtenstein repair against reduction en masse [8]. The persistence of the hernial orifice and widened preperitoneal space may cause recurrence of bowel incarceration. Therefore, we tried to precisely confirm the disappearance of the hernial orifice via a hybrid approach with laparoscopic observation, which gave several novel insights. First, laparoscopic observation showed that it was difficult to turn the hernial sac over in such a way as to plug the hernial orifice because the plug easily migrated into the loosened preperitoneal space (Fig. 3a). Therefore, mesh plug repair without laparoscopic observation should be avoided in case of reduction en masse. Second, once the excess sac was ligated and removed by cutting, the hernial orifice completely disappeared (Fig. 3b). This procedure may be important in the anterior approach. Based on these findings, it appears reasonable to insert the Modified Kugel™ Patch with ligation of the sac into the preperitoneal space, where the strangulated bowel was displaced.



**Fig. 3.** a) The plug may migrate into the preperitoneal space (thin yellow arrow) and may not close the hernial orifice (thick red arrow). b) Complete resolution of the hernial orifice after ligation of the hernial sac and insertion of the Modified Kugel™ Patch into the preperitoneal space.

Laparoscopic relief appears to be a good approach because it is less invasive than open surgery [8,9]. Recently, the usefulness of TAPP was reported even in cases of incarcerated hernia [10]. TAPP allows simple and definitive exploration of the abdominal cavity and determination of bowel viability. Moreover, the incarcerated bowel can be relieved comparatively safely by gentle traction. Therefore, if there is no risk of mesh-related infection, primary TAPP can be a choice after the relief of incarcerated bowel.

#### 4. Conclusion

Reduction en masse should be considered when abdominal pain persists after a difficult reduction of inguinal hernia. Laparoscopic relief could be an efficient therapeutic option for the management of this condition. In addition, the Modified Kugel™ Patch repair with ligation of the hernial sac could be a reasonable treatment modality.

#### Conflicts of interest

The authors declare that they have no competing interests.

#### Funding

We have no disclosures or financial support.

#### Ethical approval

This study was approved by the ethics review board of our hospital.

#### Consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

#### Author contribution

TA drafted the manuscript. TO is the chief of the department and contributed supportive information. KM, KK, and YK are members of the attending staff of the department who discussed the treatment. All of the authors approved publication of the manuscript.

#### Registration of research studies

Not applicable.

#### Guarantor

Takashi Omura.

#### References

- [1] H.E. Pearse, Strangulated hernia reduced en masse, *Surg. Gynecol. Obstet.* 53 (1931) 822–828.
- [2] H. Mings, J.D. Olson, Reduction “en masse” of groin herniae, *Arch. Surg.* 90 (1965) 764–769.
- [3] M.H. Querna, Reduction of hernia “en masse”, *Am. J. Surg.* 118 (1969) 539–540.
- [4] I. Watanobe, N. Yoshia, Late-onset bowel strangulation due to reduction en masse of inguinal hernia, *Case Rep. Surg.* (2014), <http://dx.doi.org/10.1155/2014/295686>.
- [5] R.A. Agha, A.J. Fowler, A. Saetta, I. Barai, S. Rajmohan, D.P. Orgill, for the SCARE Group, The SCARE statement: consensus-based surgical case report guidelines, *Int. J. Surg.* 34 (2016) 180–186.
- [6] M. Kitami, T. Yamada, CT findings of ‘reduction en masse’ of an inguinal hernia, *Eur. J. Radiol. Extra* 67 (2008) e111–e114.
- [7] N. Yamada, A. Akai, False reduction of an inguinal hernia treated by Kugel patch repair via an anterior approach, *BMC Surg.* 15 (2015) 9.
- [8] M.R. Sahoo, A. Kumar, Laparoscopic management of reduction-en-masse, *BMJ Case Rep.* (2012), <http://dx.doi.org/10.1136/bcr-2012-007919>.
- [9] A. Hoshino, Y. Kawachi, Reduction en masse can be treated using pure laparoscopic transabdominal preperitoneal hernioplasty following early CT diagnosis: report of a case, *J. Surg. Case Rep.* 5 (2015) 1–3.
- [10] B.J. Leibl, C.G. Schmedt, Laparoscopic transperitoneal hernia repair of incarcerated hernias: is it feasible? Results of a prospective study, *Surg. Endosc.* 15 (2001) 1179–1183.

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