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Laparoscopic “double-port” splenectomy. A new minimally-invasive option in a giant spleen

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ABSTRACT

INTRODUCTION: In case of massive splenomegaly, laparoscopic splenectomy (LS) becomes challenging, uncomfortable and risky both for the surgeon and for the patient. As a consequence of ongoing research to obtain efficient and cheaper “scarless surgery”, single-port technique and hand-assisted devices were developed and improved in this field.

PRESENTATION OF CASE: We present the clinical case of a patient affected by idiopathic myelofibrosis (MF) and splenomegaly who was admitted to our Department to perform a splenectomy for a suspected 5-cm splenic lesion.

DISCUSSION: The splenic longitudinal diameter measured 26 cm. The patient underwent splenectomy by laparoscopy, combining a single-port access and a gel-port device. The operation was completed laparoscopically. The operating time was 220 min and the estimate blood loss was 100 ml. The patient was discharged at 11 post-operative day in overall good conditions. Upon pathological analysis the splenic lesion was a localization of diffuse large B-cell Lymphoma in the context of MF.

CONCLUSION: this novel “hybrid technique” of splenectomy, combining the advantages of reduced number of abdominal incisions of the single-port technique to those of the hand assistance, is feasible in massive splenomegaly with good results. Furthermore, the use of the sovrapubic retrieval incision as the introduction site for the hand assisted device is convincing, since it's useful for both tasks. Further studies with large casuistries are necessary to confirm the effectiveness of the technique.

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1. Introduction

Laparoscopic splenectomy (LS) represents the standard treatment for hematologic disorders in normal-size spleens. In patients with massive splenomegaly and giant spleens, LS becomes technically challenging, because of the reduced abdominal working space and difficult intra-abdominal manipulation of large spleens [1].

The clinical practice guidelines of the European Association for Endoscopic Surgery (EAES) suggest that hand-assisted LS or open splenectomy should be considered in patients with massive and ultra-massive splenomegaly [2].

The hand-assisted technique can provide tactile feedback enabling manipulation of heavy-weighted spleens and control of unexpected bleeding, since non dominant hand of the surgeon is usually inserted through a midline incision or in left/right hypocondrium [3].

With the advent of the laparoscopic technique through a single access [4], this approach has spread to the point of being used also for splenectomy, bringing undoubted benefits in terms of less pain and better cosmetics [5]. Recently, few reports describe the use of single-port access for the treatment of benign spleens associated to massive splenomegaly [6,7]. Some differences exist in splenic malignancies associated to massive splenomegaly [8]. Since the spleen needs to be retrieved intact for anatomic-pathologic examination, a large incision needs to be made for spleen retrieval. In such cases, the hand-port incision can be used to an advantage, facilitating the extraction of the large specimen from the abdomen [9]. The hand-assisted technique has always been associated to conventional multi-port laparoscopy. To date, the association of single-port laparoscopy with the hand assistance has never been described, and above all, its use in the treatment of splenic malignancies. We present our “hybrid technique” that combines the use of the single-port technique with the hand assistance in case of massive splenomegaly. The work has been reported in line with the SCARE criteria [10].

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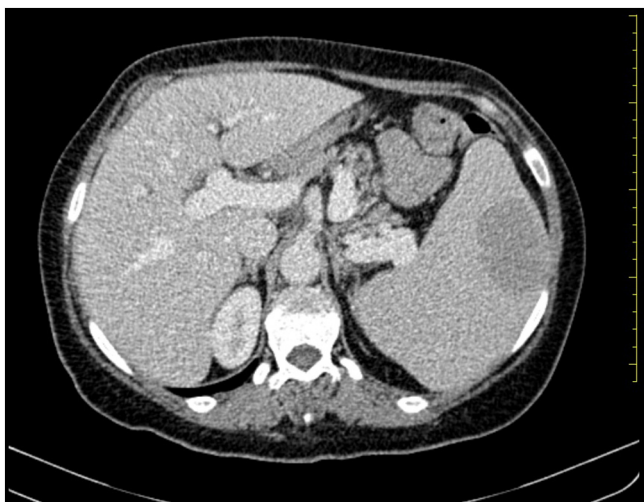


Fig. 1. CT scan showing an intra-parenchymal lesion of 5 cm in a 26-cm interpole diameter spleen.

2. Case report

In January 2018, a 57-year-old woman was admitted to our Department to perform a splenectomy for diagnostic purposes. The patient's medical history was significant for celiac disease, high blood pressure and idiopathic myelofibrosis (MF) diagnosed in 2014, confirmed with a bone marrow biopsy and treated with oncoarbide for 4 years. During the hematological follow-up, the patient developed a splenomegaly (spleen longitudinal diameter: 26 cm) and an intra-parenchymal lesion of 5 cm having standardized uptake values (SUV) of 14 at positron emission tomography (PET)/computerized tomography (CT) scan (Fig. 1).

Splenic 2-deoxy-2-[18F]fluoro-D-glucose (FDG) uptake was considered suspected of lymphoma or sarcoma.

Abdominal examination showed a palpable spleen in the left upper quadrant. No ascites or declivous edemas were evident. No previous abdominal surgery was reported. The patient was classified American Society of Anesthesiologists (ASA) score 2. Laboratory tests and other routine exams including platelets, biochemical investigations and serological viral markers were normal.

2.1. Surgical procedure

Under general anaesthesia, the patient was placed in the semi-lateral decubitus, tilted at a 15° reverse trendelenburg position and bended at the umbilicus. Antibiotic profilaxis with 2gr of Cefazolin was given at the induction of anaesthesia. The first operator and the camera holder stood at the right side of the patient. A 3 cm-long intraumbilical incision was realized and a single-port device (Single Port, Unimax Medical Systems Inc., Taipei, Taiwan) was introduced. After creation of a 12 mm Hg CO₂ pneumoperitoneum, the device for the hand assistance (Gelport, Applied Medical Resources Corporation, Rancho Santa Margarita, California, USA) was introduced from a 7-cm suprapubic incision. The Unimax port was used to accommodate a 30° angled 10-mm telescope, a curved grasper and a radiofrequency device (Ligasure; Covidien Italia, Segrate (Mi), Italy). The Gelport was used to accommodate alternatively, the left hand of the assistant placed on the left side of the patient and a retractor. The surgical technique was similar to that used in standard LS [11].

Main differences were represented by the use of intraperitoneal hand providing initial traction on the splenic flexure of the colon to allow division of the splenocolic ligament. Then, the intraabdominal hand pushed the spleen laterally to allow the entry to the lesser



Fig. 2. The Unimax port is positioned in the umbilicus and the Gelport in a supra-pubic incision. The Gelport accommodates the assistant's left hand in the first part of the operation.

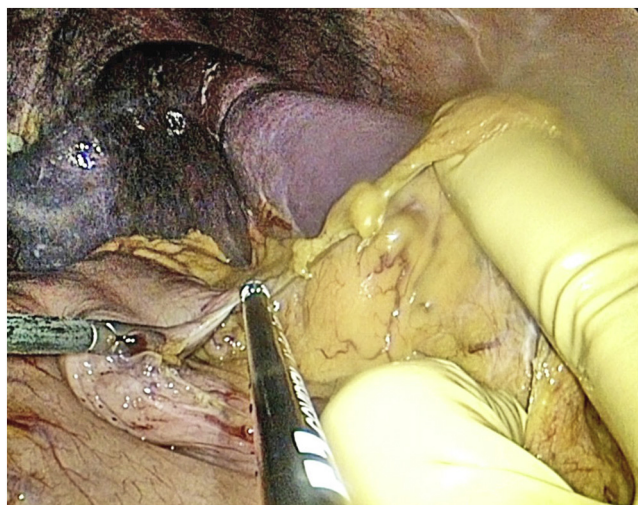


Fig. 3. The assistant's hand puts the gastro-splenic ligament in tension to enter the lesser sac.

sac (Figs. 2 and 3). The short gastric vessels were then sequentially divided. The instruments were then moved to the posterior face of the spleen and the table was tilted to the right to take advantage of gravity and to expose the retro-splenic area. The spleen was retracted medially by the hand, enabling the dissection of the posterior and lateral attachments.

The pancreatic tail and splenic hilum were then localized with the intraperitoneal hand. After isolation of the hilum, the pedicle was divided with a 6-cm vascular stapler (Echelon, Ethicon Endo-Surgery) introduced from the umbilical port. Following hilar division, the inserted hand was retracted from the Gelport to place a retractor to expose the remaining superior attachments (Fig. 4). A 15-mm endobag (Endocatch II; Covidien, Mansfield, MA, USA) was inserted through the Gelport and the intraperitoneal hand became instrumental in guiding the specimen into the bag. The bag was pulled to the Gelport hand-assisted device and the spleen was retrieved intact (Fig. 5). Upon specimen removal, pneumoperitoneum was re-established and the vascular staple line was reinspected before closure. An abdominal drainage was left in place.

The operating time was 220 min and the estimate blood loss was 100 ml. During the postoperative course, the patient developed fever, splenic and partial portal vein thrombosis and pleural

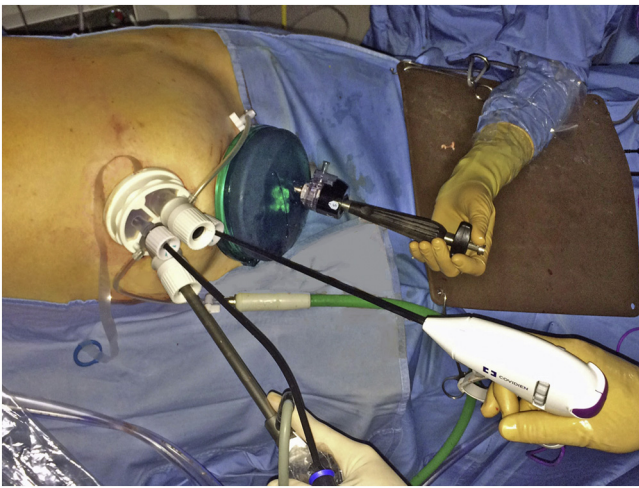


Fig. 4. The Gelport device accommodates a retractor for the dissection of the superior pole of the spleen, as the splenic dissection proceeds.

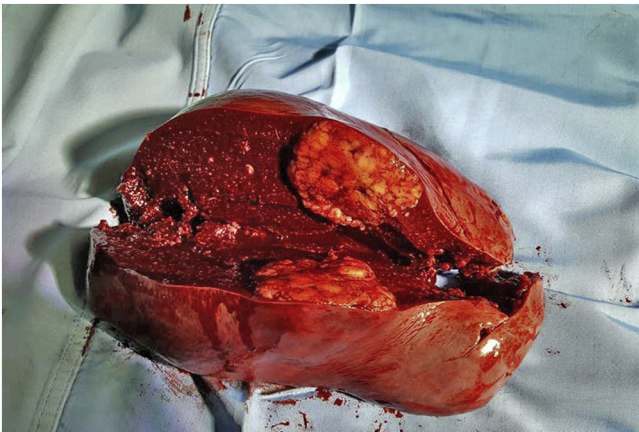


Fig. 5. The specimen is retrieved *in toto* for anatomico-pathological examination. The splenic nodular lesion appeared whitish, solid and well demarcated.

effusion. The patient was treated with anticoagulant and antibiotic therapy for 10 days and discharged at 11 post-operative day in overall good conditions. Upon pathological analysis the splenic lesion was a localization of diffuse large B-cell Lymphoma in the context of MF. The patient is alive and in healthy condition 4 months after the operation.

3. Discussion

With the development of the laparoscopic technique through a single access, this approach has spread to the point of being used also for splenectomy [4,5]. Reports showed that single-port splenectomy achieved similar results to the traditional laparoscopic approach, bringing undoubted benefits in terms of less pain and better cosmetics [12,13]. Laparoscopic single-port splenectomy of normal-size spleens is broadly spreading, whereas its use in splenomegaly is still little explored [6,7]. In massive splenomegaly, the main issue is represented by the extraction of the piece that for anatomico-pathological purposes must be retrieved *in toto*. Hence the need for a service mini-laparotomy which partially affects the benefits of laparoscopy [14]. Thanks to our experience of liver resection in which the specimen is retrieved from a suprapubic incision, for totally laparoscopic splenectomy we have therefore shifted from a subcostal to a suprapubic access.

This incision, in which muscle fibers are split and not cut off, gives less pain and less respiratory problems. The necessity to make an incision at the end of the procedure has pushed us to use this access since the beginning of the operation for the hand assistance and not only therefore for the specimen retrieval.

The hand assistance, by regaining of tactile feedback, also increases the safety of the procedure, since it enables the surgeon to rapidly identify vascular structures and, in the case of accidental bleeding, allows immediate hemostatic control by digital compression. Furthermore, manual manipulation of the spleen, particularly when it is a large one, is probably safer and easier than manipulation with laparoscopic instruments [3].

Contrary to what is described in the classic hand-assisted technique, in our case it is not the hand of the surgeon to be used but that of the assistant, inserted intraperitoneally through a suprapubic Pfannestiel incision. Usually the surgeon's non-dominant left hand is inserted intraperitoneally through a 7-cm abdominal incision [3]. In our case it's the assistant's left hand to be used, thus leaving the operator the ability to use the laparoscopic instruments with both hands.

A theoretical disadvantage of having the surgeon's hand in the abdomen includes limiting the operative working space. In our case, this issue has not been experienced because the assistant's hand arrived laterally on the operating field, limiting the reduction of the visual field to a minimum. In addition, the assistant was a female resident with a thin arm and a small hand that perfectly fitted the task.

For splenectomy, several sites for the surgeon's hand introduction were proposed: upper midline, left or right hypocondrium and right iliac fossa in case of massively enlarged spleens [5,11].

This is the first case where the suprapubic incision was adopted. The main drawback is that this incision is located far from the surgical site, and it could represent a problem, especially in tall patients. In fact, in our case the superior pole of the spleen was not reachable by the hand. This problem has been overcome by introducing a retractor from the Gelport device. This device showed great versatility, enabling the surgeon to alternatively introduce the hand or the laparoscopic instruments without the need of a trocar.

In conclusion, this novel "hybrid technique" combining the advantages of reduced number of abdominal incisions of the single-port technique to those of the hand assistance is feasible in massive splenomegaly with good results. Furthermore, the use of the suprapubic retrieval incision as the introduction site for the hand assisted device is convincing, since it's useful for both tasks. Further studies with large casuistries are necessary to confirm the effectiveness of the technique.

Conflicts of interest

None.

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Ethical approval

The Ethical Committee of the IRCCS Ospedale Policlinico San Martino has exempted the work from ethical approval because it involves only negligible risk for the patient; furthermore, the patient data publicly recorded contain only non-identifiable data about him.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Authors contribution

Marco Casaccia, Denise Palombo: study design, writing.
Rosario Fornaro, Andrea Razzore: acquisition of data, writing.
Domenico Soriero: acquisition of data.
Marco Frascio: final approval of the version to be submitted.

Registration of research studies

NA.

Guarantor

Marco Casaccia.
Denise Palombo.

Provenance and peer review

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References

- [1] S.W. Grahn, J. Alvarez, III, K. Kirkwood, Trends in laparoscopic splenectomy for massive splenomegaly, *Arch. Surg.* 141 (2006) 755–762.
- [2] B. Habermalz, S. Sauerland, G. Decker, et al., Laparoscopic splenectomy: the clinical practice guidelines of the European Association for Endoscopic Surgery (EAES), *Surg. Endosc.* 22 (2008) 821–848.
- [3] G.K. Kaban, D.R. Czerniach, R. Cohen, et al., Hand-assisted laparoscopic splenectomy in the setting of splenomegaly, *Surg. Endosc.* 18 (2004) 1340–1343.
- [4] J.R. Romanelli, D.B. Earle, Single-port laparoscopic surgery: an overview, *Surg. Endosc.* 23 (2009) 1419–1427.
- [5] E.M. Targarona, M.B. Lima, C. Balague, et al., Single- port splenectomy: current update and controversies, *J. Minim. Access Surg.* 7 (2011) 61–64.
- [6] S. Li, M. Li, W. Xu, et al., Single-incision laparoscopic splenectomy using the suture suspension technique for splenomegaly in children with hereditary spherocytosis, *J. Laparoendosc. Adv. Surg. Tech. A* 25 (2015) 770–774.
- [7] R. Zorron, S.H. Cunha, M.C. Barreto, et al., Single port laparoscopic splenectomy for wandering spleen with splenomegaly in a patient with Wolf-Hirschhorn syndrome, *J. Minim. Access Surg.* 13 (2017) 135–138.
- [8] R.S. Berman, A.M. Yahanda, P.F. Mansfield, et al., Laparoscopic splenectomy in patients with hematologic malignancies, *Am. J. Surg.* 178 (1999) 530–536.
- [9] T.W. Swanson, A.T. Meneghetti, S. Sampath, et al., Hand-assisted laparoscopic splenectomy versus open splenectomy for massive splenomegaly: 20-year experience at a Canadian centre, *Can. J. Surg.* 54 (2011) 189–193.
- [10] 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.
- [11] M. Casaccia, Minimally invasive splenectomy for massive splenomegaly, in: C.T. Frantzides, M.A. Carlson (Eds.), *Video Atlas of Advanced Minimally Invasive Surgery*, Elsevier Saunders, Philadelphia, 2012, pp. 183–190.
- [12] Y. Fan, S.D. Wu, J. Kong, et al., Feasibility and safety of single-incision laparoscopic splenectomy: a systematic review, *J. Surg. Res.* 186 (2014) 354–362.
- [13] K.K. Choi, M.J. Kim, H. Park, et al., Single-incision laparoscopic splenectomy versus conventional multiport laparoscopic splenectomy: a retrospective comparison of outcomes, *Surg. Innov.* 20 (2013) 40–45.
- [14] M. Casaccia, P. Torelli, A. Pasa, et al., Putative predictive parameters for the outcome of laparoscopic splenectomy: a multicenter analysis performed on the Italian Registry of Laparoscopic Surgery of the Spleen (IRLSS), *Ann. Surg.* 251 (2010) 287–291.

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