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Single Port Right Colectomy: Surgical Technique

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Rezumat

Colectomia dreaptă single port: tehnică chirurgicală

Metoda laparoscopică single port a fost folosită pentru prima dată în 1999 pentru colecistectomie de către Bresadola. Peste un deceniu, în anul 2008, prima colectomie dreaptă single port a fost raportată de Bucher și alții într-un caz care implica un polip de colon ascendent (1,2). Evoluția continuă tehnologică permite prima colectomie dreaptă single port după 17 ani de la prima colectomie laparoscopică (1991) care a fost întâmpinată inițial cu reticență, iar apoi a căpătat un loc bine stabilit în arsenalul chirurgiei colorectale. (2). Accesul single port, ca și NOTES oferă comparativ cu procedura laparoscopică standard avantajul cosmetic, reducerea durerii postoperatorii și o durată de spitalizare mai scurtă iar ca dezavantaje am putea menționa o durată operatorie mai lungă datorată unei posibilități mai reduse de triangulație și viziune (3,4). Reducerea durerii postoperatorii la care se adaugă rezultate cosmetice bune fără creșterea semnificativă a complicațiilor postoperatorii demonstrate deja prin studii retrospective necesită confirmare prin studii randomizate avute în vedere de trial TRUE în Franța (5). Colectomia dreaptă single port poate fi realizată cu rezultate oncologice similare chirurgiei laparoscopice standard, având rezultate postoperatorii foarte bune din punct de vedere estetic și al durerii postoperatorii diminuate. (5,6,7).

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Cuvinte cheie: cancer de colon, colectomie dreaptă, trocar single port, tehnică chirurgicală

Abstract

The single port laparoscopic method was first used in 1999 by Bresadola for cholecystectomy. Nearly a decade later, in 2008, the first single port right hemicolectomy was reported by Bucher and others in a case involving an ascending colon polyp (1,2). The continuous technological evolutional lows the first single port right hemicolectomy 17 years after the first laparoscopic hemicolectomy (1991) which was initially met with reluctance and after has gained a well-established place in the range of colorectal surgery (2). Single port access, as well as NOTES, provides, in comparison with the standard laparoscopic procedure, the aesthetic benefit, the decrease of postoperative pain and a shorter duration of hospitalization, while in terms of disadvantages, we could mention a longer surgery duration due to fewer opportunities of triangulation and vision (3,4). The reduction of postoperative pain plus the good aesthetic results with no significant increase of postoperative complications, already proved by retrospective studies, require confirmation by randomized studies envisaged by trial TRUE in France (5). Single port right hemicolectomy can be achieved with oncologic results similar to standard laparoscopic surgery, having very good postoperative results in terms of aesthetics and reduced postoperative pain (5,6,7).

Key words: colorectal cancer, right hemicolectomy, single port trocar, surgical technique

Introduction

The purpose of this article is to present the details of an operative technique based on our experience and literature review.

The surgical technique employs a 35 mm - 50 mm OCTO PORT trocar with 4 trocar external ports placed in umbilical position, standard laparoscopic surgical instruments being required. The patient presents an ascending colon cancer, for which we performed a laparoscopically assisted right colectomy with mechanical right-lateral external anastomosis, and associated node lymphadenectomy. The surgical technique involves two main steps - dissection and ileo-colic laparoscopic release associated with L-L extracorporeal mechanical anastomosis.

Surgical technique

Right colectomy is performed under general anaesthesia with oro-tracheal intubation and requires no special preoperative preparation of the colon.

Positioning of the patient

The patient is initially positioned in supine position, and with single trocar placement, one proceeds to turning the operating table left at an angle of 20-30 degrees associated with the Trendelemburg position, to maintain the intestinal loops left from the midline.

Positioning of the surgical team

The surgeon is positioned to the left of the patient, the first assistant surgeon is located to the right of the surgeon, the second assistant to the right of the patient, and the nurse which provides instruments left of the surgeon. The monitor is placed in front of the surgeon on the right side of the patient.

Positioning of the trocar

A midline incision is performed above and below the umbilicus and to its left, about 6 cm in length, followed by dissection of the layers of the abdominal wall into the peritoneal cavity until penetration. Trocar placement involves several stages as described in the user manual:

a) insertion of the retractor which ensures retraction to the outside of the ring, across half the surface using the index, followed by introduction of the ring into the peritoneal cavity (*Fig.1, Fig. 2*);
b) placing the other half of the ring back into the peritoneal cavity, making sure the edges are fully extended over the parietal peritoneum (*Fig. 3*);
c) positioning the Self-Retractor fixing it to the edge of the retractor to complete position, followed by insertion of the silicone protector (*Fig. 4, Fig. 5*);
d) attaching the trocar containing four external ports

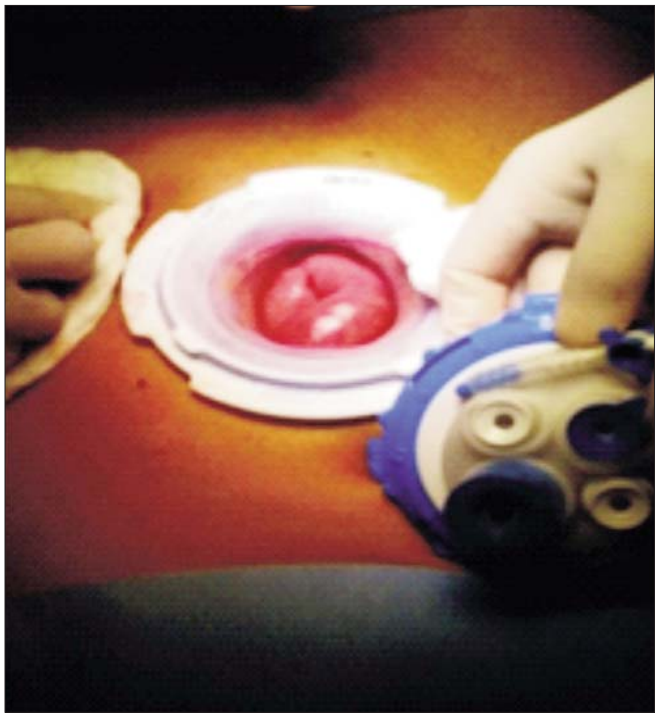

Figure 1. *Insertion of the intraoperative retractor*

Figure 2. *Insertion of the retractor - technique*

Figure 3. *Insertion of intraperitoneal ring*

Figure 4. *Self-Retractor positioning*

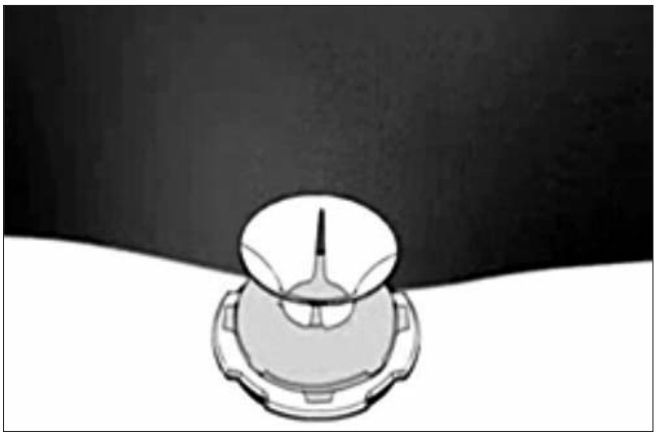

Figure 5. *Insertion of silicone protector*

Figure 6. *Attaching the intraoperative trocar*

Figure 7. *Attaching the trocar - technique*

using safety clips (*Fig. 6, Fig. 7*);

e) positioning the insufflator with the valve closed followed by opening the insufflation valve and the actual insufflation, then opening the smoke evacuation valve (*Fig. 8, Fig. 9*).

The surgeon uses a standard laparoscopic surgical kit with UltraCision Harmonic Scalpel, a standard 10 mm camera, 30 degrees, insufflation to 12 mmHg.

Operative steps

An atraumatic 5 mm forceps for the left hand and the 5mm UltraCision Harmonic Scalpel with a 3rd trocar containing the 10 mm camera for the right hand are introduced, determining an inverted triangle position to access the ascending colon (*Fig. 10*).

The great omentum and transverse colon are retracted

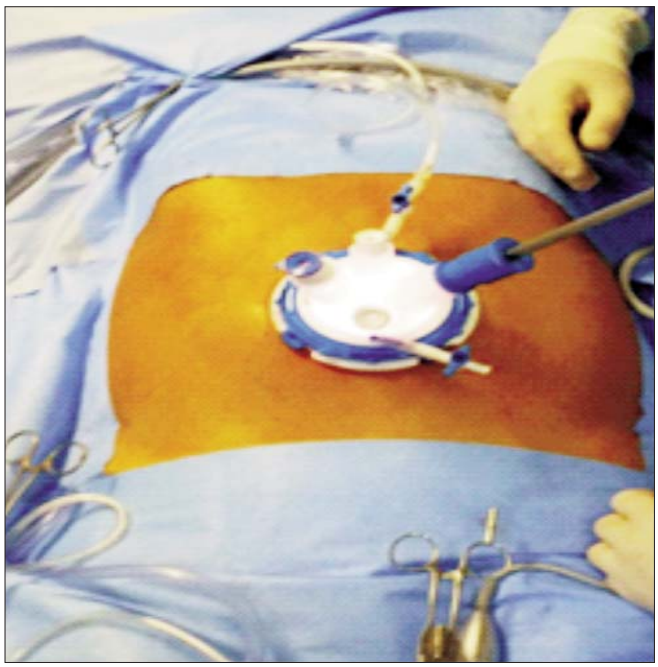

Figure 8. *Positioning the insufflator - intraoperative*

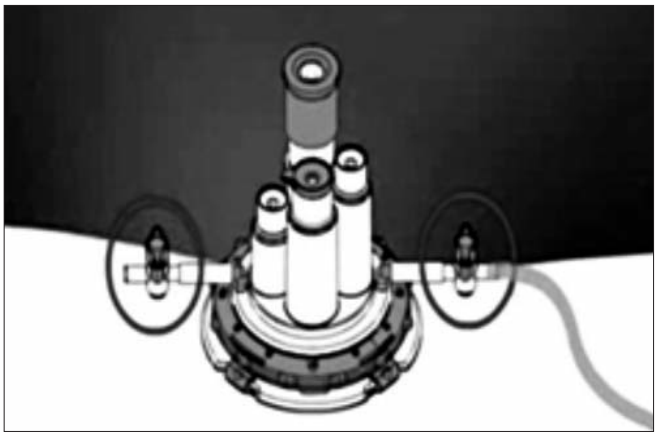

Figure 9. *Positioning the insufflator - technique*

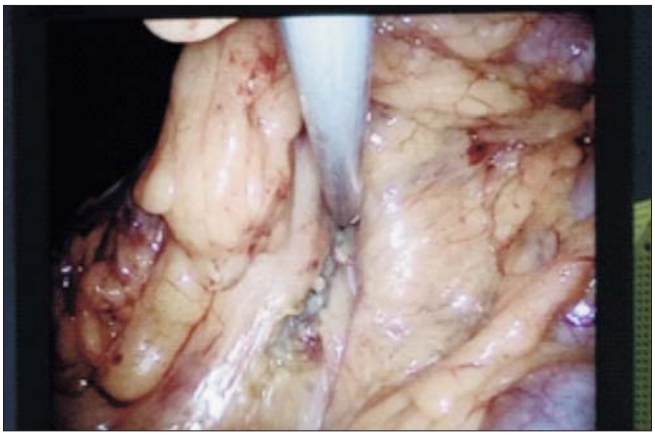

Figure 11. *Mesocolon dissection*

Figure 10. *Intraoperative positioning instruments*

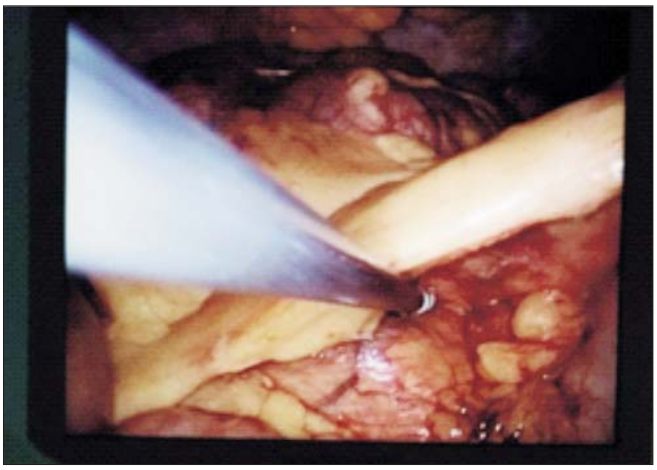

Figure 12. *Highlighting vascular pedicle*

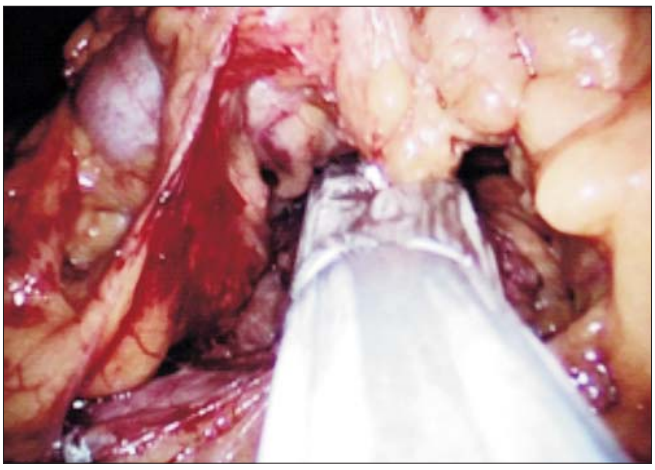

Figure 13. *Vascular pedicle clipping*

above the stomach, and the small intestine towards the left.

Retroperitoneal dissection starts from medial to lateral, exposing the ileocolic pedicle and right colic vessels, putting them under tension with the help of the atraumatic forceps held with the left hand followed by high ligation, originally using Ultracision and a vascular clipping clamp (*Fig. 11, Fig. 12, Fig. 13*).

Retroperitoneal plane dissection is continued extending laterally and deep into the right colon above the Gerota fascia and medially by detaching retro-peritoneal adhesions of the duodenum.The colon was then mobilized along the Toldt fascia until the point of the hepatic flexure (*Fig. 14, Fig. 15*).

The omentum attached to the colon was divided into proximal and distal, and the hepatic flexure was mobilized

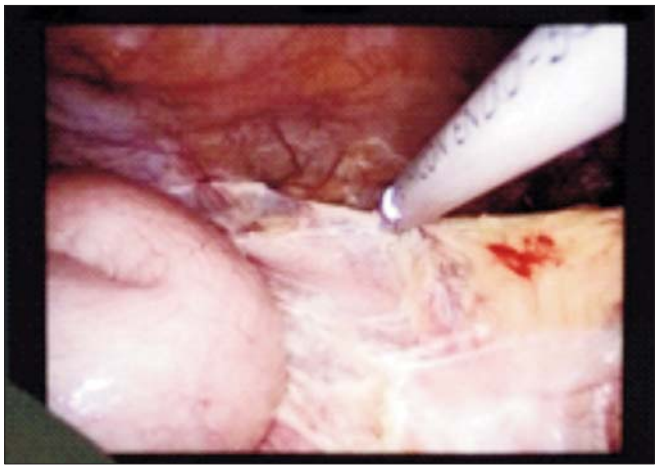

Figure 14. *Dissection of the hepatic flexure of the colon*

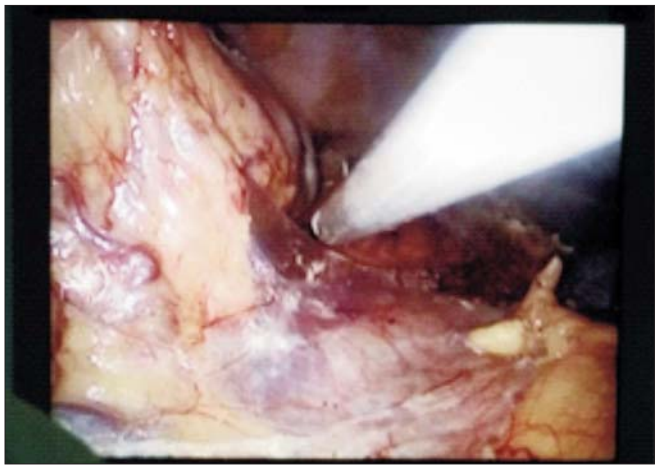

Figure 15. *Right parieto-colic dissection*

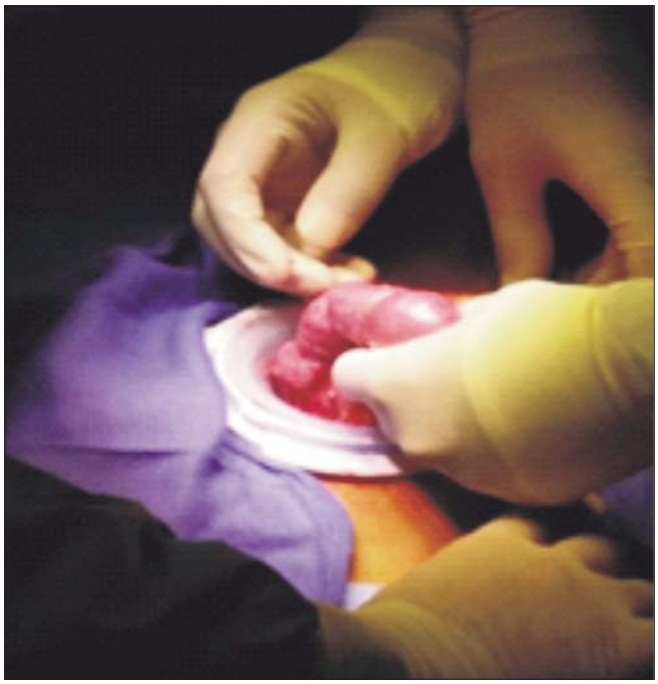

Figure 16. *Removing the superior segment of the trocar*

Figure 17. *Exteriorising the terminal ileon and right colon*

towards the middle colic vessels, obtaining its manipulation by internal traction.

Middle colic vessels ligation was not performed. After complete ileo-colic intracorporeal dissection and checking haemostasis, one proceeded to remove the upper segment of the trocar with the 4 holes, followed by externalization of the terminal ileum and right colon to perform mechanical anastomosis (*Fig.16, Fig. 17*).

The ileum and colon, thus externalized, are put in contact at the level of the antimesenteric side to achieve a lateral-lateral mechanical anastomosis, with the possibility of performing other types of mechanical or manual anastomoses as well, depending on operator preference and ability.

Two small incisions at the level of the colon and ileum are performed, after prior protection of the surgical field, introducing the two branches of the mechanical forceps through the 2 incisions. Two "en coeur" clamps holding the tissues in tension are used. One proceeds to the verification of the posterior face of possible interpositions of fat. A TA clamp is then used, which eliminates together with ending the anastomosis any holes used to introduce previous mechanical clamps.

To achieve this we can also use one or two linear mechanical clamps. Excision of the surgical piece is performed by sectioning the ileocolon using a disposable forceps scalpel at TA clamp level (*Fig. 18, Fig. 19*).

Anastomosis can be protected by a surjet using resorbable thread 4/0 at the level of the section tranche, or by separate points if necessary. The closure of the mesenteric breach is preferably closed in separate points. Abdominal cavity drainage is not recommended except in particular situations. Abdominal wall closure is performed after the priorintraabdominal introduction of the anastomosis, intestinal loops rearranging and trocar removal (*Fig. 20, Fig. 21*).

Figure 18. *Placing the linear clipping forceps*

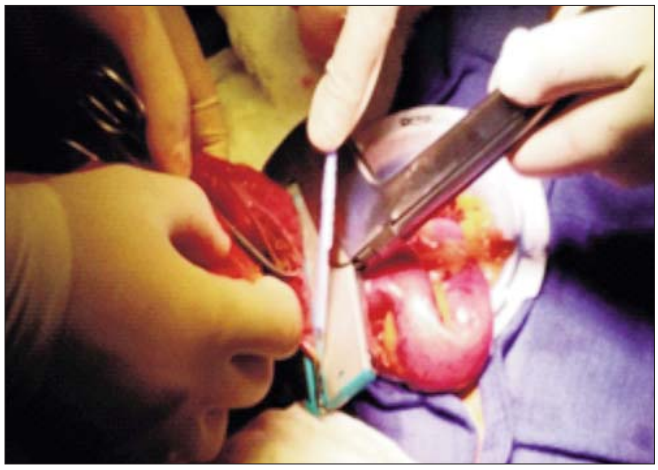

Figure 19. *Intraoperative sample excision with TA forceps*

Discussions

Single port technique is feasible for right and left colectomy after a prior selection of patients in centres specialized in minimally invasive surgery (8).

Retrospective studies reveal that it is possible to perform an oncological surgical procedure, patients presenting negative R0 histologic margins and a total number of resected lymph nodes comparable to standard laparoscopic technique or open surgery (6,7,9).

The first series of straight single port colectomies where mechanical anastomoses were achieved entirely intraperitoneal have been reported (10). Quoting from specialized literature one can discuss conversion to standard laparoscopic surgery or open surgery (11,12,13,14,15,16) of postoperative infection (11,17), intraabdominal abscesses (11), seromas (11,18), postoperative ileus (6,19), hematoma requiring evacuation (19).

Mild complications cited in the specialized colorectal surgery literature vary between 9% and 31.5 %, and severe complications between 3.2% and 9.6% (20).

Skin incision length varies on average between 4-8 cm depending on the device used and the size of the tumour (21).

Multiport trocar choice may offer the surgeon a series of advantages related to the number of trocar ports, feasibility of triangulation, limited or enhanced vision, and not least, the individual experience of the surgeon with one or the other trocars (3,4,16).

Our experience using the OCTO PORT 35 mm-50 mm trocar with 4 external trocar ports allowed us to achieve very good triangulation and vision, to the detriment of a postoperative scar 2-3 cm larger than the smallest size devices used for straight single port colectomy.

Conclusions

Reduction in postoperative pain plus good cosmetic results without the significant increase in postoperative complications already demonstrated by retrospective studies require confirmation by randomized trial envisaged by TRUE in France (5).

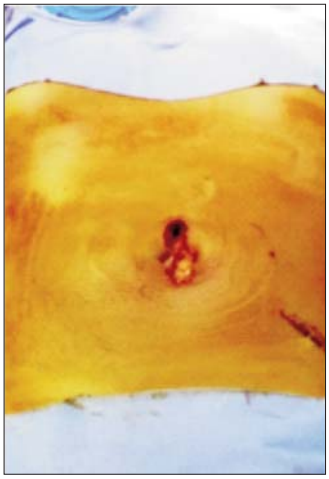

Figure 20 *Abdominal parietoraphy*

Figure 21 *Intradermic skin suture*

Single port right colectomy can be achieved with oncologic results similar to standard laparoscopic surgery, having good postoperative results in terms of aesthetics and reduced postoperative pain (5,6,7) (*Fig. 20, Fig. 21*).

References

1. Patel CB, Ramos-Valadez DI, Ragupathi M, Haas EM. Single incision laparoscopic-assisted right hemicolectomy: technique and application (with video). Surg Laparosc Endosc Percutan Tech. 2010;20(5):e146-9. doi: 10.1097/SLE.0b013e3181ee039f.
2. Costedio MM, Remzi FH. Single-port laparoscopic colectomy. Tech Coloproctol. 2013;17 Suppl 1:S29-34. doi: 10.1007/s10151-012-0935-1. Epub 2012 Dec 20.
3. Bucher P, Pugin F, Morel P. Single port access laparoscopic right hemicolectomy. Int J Colorectal Dis. 2008;23(10): 1013-6. doi: 10.1007/s00384-008-0519-8. Epub 2008 Jul 8.
4. Watanabe M, Murakami M, Kato T, Onaka T, Aoki T. Rational manipulation of the standard laparoscopic instruments for single-

incision laparoscopic right colectomy. Int Surg. 2013;98(3):205-9. doi: 10.9738/INTSURG-D-12-00037.1.
5. Khayat A, Maggiori L, Vicaut E, Ferron M, Panis Y. Does single port improve results of laparoscopic colorectal surgery? A propensity score adjustment analysis. Surg Endosc. 2015;29(11):3216-23. doi: 10.1007/s00464-015-4063-7. Epub 2015 Jan 22.
6. Boni L, Dionigi G, Cassinotti E, Di Giuseppe M, Diurni M, Rausei S, et al. Single incision laparoscopic right colectomy. Surg Endosc. 2010;24(12):3233-6. doi: 10.1007/s00464-010-1100-4. Epub 2010 May 13.
7. Mufty H, Hillewaere S, Appeltans B, Houben B. Single-incision right hemicolectomy for malignancy: a feasible technique with standard laparoscopic instrumentation. Colorectal Dis. 2012; 14(11):e764-70. doi: 10.1111/j.1463-1318.2012.03175.x.
8. Gaujoux S, Bretagnol F, Ferron M, Panis Y. Single-incision laparoscopic colonic surgery. Colorectal Dis. 2011;13(9):1066-71. doi: 10.1111/j.1463-1318.2010.02404.x.
9. Boone BA, Wagner P, Ganchuk E, Evans L, Zeh HJ, Bartlett DL, et al. Single-incision laparoscopic right colectomy in an unselected patient population. Surg Endosc. 2012;26(6):1595-601. doi: 10.1007/s00464-011-2076-4. Epub 2011 Dec 17.
10. Bucher P, Pugin F, Morel P. Single port access laparoscopic right hemicolectomy. Int J Colorectal Dis. 2008;23(10):1013-6. doi: 10.1007/s00384-008-0519-8. Epub 2008 Jul 8.
11. Boone BA, Wagner P, Ganchuk E, Evans L, Zeh HJ, Bartlett DL, et al. Single-incision laparoscopic right colectomy in an unselected patient population. Surg Endosc. 2012;26(6):1595-601. doi: 10.1007/s00464-011-2076-4. Epub 2011 Dec 17.
12. Chen WT, Chang SC, Chiang HC, Lo WY, Jeng LB, Wu C, et al. Single-incision laparoscopic versus conventional laparoscopic right hemicolectomy: a comparison of short-term surgical results. Surg Endosc. 2011;25(6):1887-92. doi: 10.1007/s00464-010-1481-4. Epub 2011 Feb 27.
13. Chew MH, Wong MT, Lim BY, Ng KH, Eu KW. Evaluation of current devices in single-incision laparoscopic colorectal surgery: a preliminary experience in 32 consecutive cases. World J Surg. 2011;35(4):873-80. doi: 10.1007/s00268-011-0989-7.
14. Ostrowitz MB, Eschete D, Zemon H, DeNoto G. Robotic-assisted single-incision right colectomy: early experience. Int J Med Robot. 2009;5(4):465-70. doi: 10.1002/rcs.281.
15. Pietrasanta D, Romano N, Prosperi V, Lorenzetti L, Basili G, Goletti O. Single-incision laparoscopic right colectomy for cancer: a single-centre preliminary experience. Updates Surg. 2010;62(2):111-5. doi: 10.1007/s13304-010-0023-x. Epub 2010 Sep 25.
16. Ramos-Valadez DI, Patel CB, Ragupathi M, Bartley Pickron T, Haas EM. Single-incision laparoscopic right hemicolectomy: safety and feasibility in a series of consecutive cases. Surg Endosc. 2010;24(10):2613-6. doi: 10.1007/s00464-010-1017-y. Epub 2010 Apr 3.
17. Advani V, Ahad S, Hassan I. Single incision laparoscopic right hemicolectomy for colon cancer: less is more? Surg Innov. 2011 Sep;18(3):NP4-6. doi: 10.1177/1553350610397879. Epub 2011 Feb 22.
18. Hoyuela C, Ardid J, Martrat A, Obiols J, Guillaumes S. Single incision laparoscopic right hemicolectomy due to cancer of the colon: surgical technique and preliminary results. Cir Esp. 2011;89(8):551-3. doi: 10.1016/j.ciresp.2010.08.009. Epub 2011 Feb 18. Spanish
19. Keshava A, Young CJ, Mackenzie S. Single-incision laparoscopic right hemicolectomy. Br J Surg. 2010;97(12):1881-3. doi: 10.1002/bjs.7255. Epub 2010 Sep 24.
20. Daher R, Chouillard E, Panis Y. New trends in colorectal surgery: single port and natural orifice techniques. World J Gastroenterol. 2014;20(48):18104-20. doi: 10.3748/wjg.v20.i48.18104.
21. Wong MT1, Ng KH, Ho KS, Eu KW. Single-incision laparoscopic surgery for right hemicolectomy: our initial experience with 10 cases. Tech Coloproctol. 2010;14(3):225-8. doi: 10.1007/s10151-010-0596-x. Epub 2010 Jun 30.