ISSN 2218-4333 (online)

World Journal of *Clinical Oncology*

World J Clin Oncol 2015 June 10; 6(3): 22-29

Published by Baishideng Publishing Group Inc

WJCO World Journal of Clinical Oncology

A peer-reviewed, online, open-access journal of clinical oncology

Editorial Board

2015-2018

The *World Journal of Clinical Oncology* Editorial Board consists of 293 members, representing a team of worldwide experts in oncology. They are from 41 countries, including Argentina (1), Australia (6), Austria (2), Belgium (1), Brazil (1), Bulgaria (1), Canada (6), China (42), Cuba (1), Denmark (4), France (4), Germany (11), Greece (1), Hungary (1), India (7), Iran (2), Ireland (1), Israel (1), Italy (33), Japan (25), Malaysia (3), Netherlands (8), Norway (3), Peru (1), Poland (1), Portugal (2), Qatar (1), Romania (1), Russia (1), Saudi Arabia (3), Singapore (2), South Korea (12), Spain (11), Sri Lanka (1), Sweden (2), Switzerland (1), Syria (1), Turkey (7), United Kingdom (3), United States (77), and Viet Nam (1).

W J C O
World Journal of Clinical Oncology

Contents

Bimonthly Volume 6 Number 3 June 10, 2015

ABOUT COVER

Editorial Board Member of *World Journal of Clinical Oncology*, Klaus Felix, PhD, Assistant Professor, Lecturer, Research Laboratory, European Pancreas Center, Deptartment of Surgery, University Heidelberg, Heidelberg 69120, Germany

AIM AND SCOPE

World Journal of Clinical Oncology (*World J Clin Oncol*, *WJCO*, online ISSN 2218-4333, DOI: 10.5306) is a peer-reviewed open access academic journal that aims to guide clinical practice and improve diagnostic and therapeutic skills of clinicians.

WJCO covers a variety of clinical medical topics, including etiology, epidemiology, evidence-based medicine, informatics, diagnostic imaging, endoscopy, tumor recurrence and metastasis, tumor stem cells, radiotherapy, chemotherapy, interventional radiology, palliative therapy, clinical chemotherapy, biological therapy, minimally invasive therapy, physiotherapy, psycho-oncology, comprehensive therapy, and oncology-related nursing. Priority publication will be given to articles concerning diagnosis and treatment of oncology diseases. The following aspects are covered: Clinical diagnosis, laboratory diagnosis, differential diagnosis, imaging tests, pathological diagnosis, molecular biological diagnosis, immunological diagnosis, genetic diagnosis, functional diagnostics, and physical diagnosis; and comprehensive therapy, drug therapy, surgical therapy, interventional treatment, minimally invasive therapy, and robot-assisted therapy.

We encourage authors to submit their manuscripts to *WJCO*. We will give priority to manuscripts that are supported by major national and international foundations and those that are of great clinical significance.

INDEXING/ABSTRACTING

World Journal of Clinical Oncology is now indexed in PubMed Central, PubMed, Digital Object Identifier, and Directory of Open Access Journals.

FLYLEAF

EDITORS FOR THIS ISSUE

Responsible Assistant Editor: *Xiang Li*
Responsible Electronic Editor: *Su-Qing Liu*
Proofing Editor-in-Chief: *Lian-Sheng Ma*
Responsible Science Editor: *Yue-Li Tian*
Proofing Editorial Office Director: *Xiu-Xia Song*

NAME OF JOURNAL
World Journal of Clinical Oncology

ISSN
ISSN 2218-4333 (online)

LAUNCH DATE
November 10, 2010

FREQUENCY
Bimonthly

EDITOR-IN-CHIEF
Godefridus J Peters, PhD, Professor, Department of Medical Oncology, Cancer Center Amsterdam, VU University Medical Center, Amsterdam 1081 HV, Netherlands

EDITORIAL OFFICE
Jin-Lei Wang, Director
Xiu-Xia Song, Vice Director
World Journal of Clinical Oncology
Room 903, Building D, Ocean International Center, No. 62 Dongsihuan Zhonglu, Chaoyang District, Beijing 100025, China
Telephone: +86-10-59080039
Fax: +86-10-85381893
E-mail: editorialoffice@wjgnet.com
Help Desk: http://www.wjgnet.com/esps/helpdesk.aspx
http://www.wjgnet.com

PUBLISHER
Baishideng Publishing Group Inc
8226 Regency Drive,
Pleasanton, CA 94588, USA
Telephone: +1-925-223-8242
Fax: +1-925-223-8243
E-mail: bpgoffice@wjgnet.com
Help Desk: http://www.wjgnet.com/esps/helpdesk.aspx
http://www.wjgnet.com

PUBLICATION DATE
June 10, 2015

INSTRUCTIONS TO AUTHORS
Full instructions are available online at http://www.wjgnet.com/2218-4333/g_info_20100722172206.htm

ONLINE SUBMISSION
http://www.wjgnet.com/esps/

WJCO
World Journal of Clinical Oncology

Submit a Manuscript: http://www.wjgnet.com/esps/
Help Desk: http://www.wjgnet.com/esps/helpdesk.aspx
DOI: 10.5306/wjco.v6.i3.22

World J Clin Oncol 2015 June 10; 6(3): 22-24
ISSN 2218-4333 (online)

EDITORIAL

Robotic technology: Optimizing the outcomes in rectal cancer?

Nicolas C Buchs

Nicolas C Buchs, Clinic for Visceral and Transplantation Surgery, Department of Surgery, University Hospital of Geneva, 1211 Geneva 14, Switzerland

Author contributions: Buchs NC solely contributed to this manuscript.

Conflict-of-interest: The author has no financial disclosure or conflict of interest.

Correspondence to: Nicolas C Buchs, MD, Clinic for Visceral and Transplantation Surgery, Department of Surgery, University Hospital of Geneva, Rue Gabrielle-Perret-Gentil, 4, 1211 Geneva 14, Switzerland. nicolas.c.buchs@hcuge.ch
Telephone: +41-22-3727703
Fax: +41-22-3737707

Received: February 24, 2015
Peer-review started: February 26, 2015
First decision: April 10, 2015
Revised: April 24, 2015
Accepted: May 7, 2015
Article in press: May 8, 2015
Published online: June 10, 2015

Abstract

Minimally invasive rectal resection remains a challenging procedure, even in experienced hands. Technical limitations explain at least in part the reasons of a relatively poor adoption of laparoscopy for rectal resection, in particular for low tumors in a deep and narrow pelvis. Robotics is intended to overcome these limitations. Potentially better short-term outcomes have been published: reduced conversion rates, better functional outcomes, shorter learning curve, reduction of positive margins, better specimen... However, robotic surgery has not yet taken over as the gold standard approach for low anterior resection. Several drawbacks might indeed discourage the most fervent surgeon: the size of the robot, the lack of tactile feedback, the risk and difficulties during multiquadrant surgery, and, of course, costs. Whilst new systems might overcome most of these drawbacks, it seems obvious that the development of robotic surgery is underway. Robotics is not just another interesting technical tool, but more a new concept, which should play a role in the future.

Key words: Robot; Laparoscopy; Total mesorectal excision; Transanal total mesorectal excision; Transanal endoscopic microsurgery; Outcomes; Rectal cancer

Core tip: The current evidences of robotic rectal resection are presented, as its potential limitations. While several better short-term outcomes have been reported (notably reduced conversion rates, better functional outcomes, shorter learning curve, reduction of positive margins, and better specimen), robotics has not yet taken over as the gold standard for low anterior resection. The reasons for this are analyzed, as the future developments in the robotic rectal field.

Buchs NC. Robotic technology: Optimizing the outcomes in rectal cancer? *World J Clin Oncol* 2015; 6(3): 22-24 Available from: URL: http://www.wjgnet.com/2218-4333/full/v6/i3/22.htm DOI: http://dx.doi.org/10.5306/wjco.v6.i3.22

TEXT

Rectal resection for cancer remains a difficult operation especially when using a minimally invasive approach. This explains at least in part the reasons for the limited diffusion of laparoscopy in the colorectal field. The technical explanations for this relatively low adoption are well known: unstable instrumentations, two-dimensional vision, narrow space, and poor ergonomics. These limitations are particularly relevant during low rectal dissection in the confines of the pelvis.

On the other hand, the recently published Colorectal cancer Laparoscopic or Open Resection (COLOR) Ⅱ study has confirmed that in selected patients with rectal cancer treated by skilled surgeons, laparoscopic surgery resulted in similar safety, resection margins, and completeness of resection to that of open surgery, while recovery was improved after laparoscopic surgery. However, even in highly experienced hands, the authors still reported a conversion rate of 17%[1].

The use of robotic technology is intended to overcome these limitations. The initial reports were encouraging with promising outcomes, although a clear advantage has not yet been demonstrated. More than 10 years after the initial experience, robotic surgery has not (yet?) taken over as the gold standard approach for low anterior resection (LAR), and the main question is why?

Focusing on the published evidences, there are yet potentially better short-term outcomes, as shown in several systematic reviews[2-6], notably better functional outcomes[7] and a shorter learning curve[8]. This is particularly true when applied in selected patients such as obese and/or male patients, especially those with preoperative radiotherapy, and tumors in the lower two thirds of the rectum[3]. Indeed, robotics may overcome the challenges associated with difficult pelvic anatomy and might reduce the risk of conversion (ranging from 1% to 7.3% for robotics *vs* 3% to 34% for laparoscopy)[3,9]. An open conversion in these difficult cases can be still technically challenging, leading to potentially worse short-term or oncological outcomes[9,10]. On the other hand, it is not clear why robotics might prevent conversion. There are some hypothetical explanations: (1) better vision that could allow better dissection; (2) a more stable platform; (3) a self-controllable camera; (4) instruments with more degrees of freedom and without tremor; (5) improved opportunity to control unexpected bleeding; and (6) better ergonomics.

According to the CLASICC trial (up to 34% of conversion!), the main reasons for conversion from laparoscopy were: tumor fixity or uncertainty of tumor clearance, obesity, anatomic problems, and tumor inaccessibility[9]. All these parameters are crucial from an oncological point of view when performing a LAR or an ultra-LAR. The risk of positive margins for low rectal tumor is indeed still high (9% with a laparoscopic approach, but up to 22% with an open approach)[1]. The corollary of these relatively poor outcomes has been the introduction and the development of different technical options to reduce the risk of positive margins.

Firstly, robotics might reduce the rate of positive circumferential resection margins (CRM)[5]. In addition, it might improve the quality of the specimen, with more complete total mesorectal excision (TME)[11], which might reduce the risk of local recurrence[12]. However, this advantage of the robotic approach remains hypothetical, and so far oncological outcomes seem to be comparable between robotic and laparoscopic approaches[13].

Secondly, transanal TME has been developed, based on the concept to start first the distal dissection from the anus (so called "bottom-up technique"), allowing to define precisely the distal margin. The early data are encouraging, with a reduced positive margins rate in comparison to standard approach[14]. However, this technique, still in its infancy, remains technically challenging, and again the robot could be applied to overcome the difficulties associated with this new technique[15]. Interestingly, the same advantages and drawbacks were seen when using robotics for transanal endoscopic microsurgery[16].

Looking at the published experience, it would seem obvious that robotic surgery is a valid option for low rectal cancer. However, the enthusiasm has been dampened by several drawbacks, which could discourage the most fervent surgeon: the size of the robot, the lack of tactile feedback, the risk and difficulties during multiquadrant surgery, and, of course, costs. While part of these disadvantages might be overcome with the new Xi system (Intuitive Surgical Inc., Sunnyvale, CA), the global economic impact of robotic surgery remains unclear and the increase in overall costs is probably the most limiting factor for a wide diffusion of robotic technology. The real benefits for the institution remain to be scrutinized (marketing impact, increased referral, reduced global costs), and beyond this local economic problem, the risk that this technology will be restricted to rich countries is real.

So far, the best indications for this technology are not yet clear. However, it seems obvious that the development of robotic surgery is underway. The number of series to date is significant and the safety and feasibility of the robotic approach have been proven, along with its oncological outcomes (at least the short-term outcomes). However, comparison between robotics and laparoscopy did not give the expected results in favor of robotics. While still in its youth, it should be noted that the perioperative outcomes associated with robotic LAR are at least as good as laparoscopy, and could be achieved with a shorter learning curve and better functional results, in particular in difficult patients. Regarding the learning curve, it is not clear if open colorectal surgeons (who probably did not embark on laparoscopy) would be interested by robotics (as were the urologists in those days). The learning curve might be then slightly different for an open surgeon starting robotic surgery than an already experienced laparoscopic colorectal surgeon embarking on robotics. The evidences concerning the learning curve are indeed mainly based on skilled minimally invasive surgeons.

So far, the main difference remains the reduction in conversion rate after a robotic LAR. The clinical corollary of this fact is still hypothetical, but might give some benefits to robotic patients. From an oncological point of view, similar outcomes have been reported. However, better TME and a reduction in positive CRM were reported in selected robotic series, especially when applied for low tumors.

To conclude, the main question is not whether robotic surgery will take over from laparoscopy, but when and how. However, technical challenges and barriers (such as costs, size of the robot, and lack of tactile feedback) still need to be overcome. Looking at the history of surgery, it seems obvious that robotics is not just another interesting technical tool, but more a new concept, creating a computer interface between the patient and the surgeon. The possibilities appear really interesting, notably in terms of planning, teaching, automation, and telemedicine. However, this technology has a cost, and it is not yet clear whether the surgical community, or even the overall community, is ready to pay for this.

ACKNOWLEDGMENTS

I would like to thank all the robotic team at the University Hospital of Geneva, Switzerland, particularly professor Philippe Morel for his support.

REFERENCES

1 **van der Pas MH**, Haglind E, Cuesta MA, Fürst A, Lacy AM, Hop WC, Bonjer HJ. Laparoscopic versus open surgery for rectal cancer (COLOR II): short-term outcomes of a randomised, phase 3 trial. *Lancet Oncol* 2013; **14**: 210-218 [PMID: 23395398 DOI: 10.1016/S1470-2045(13)70016-0]

2 **Aly EH**. Robotic colorectal surgery: summary of the current evidence. *Int J Colorectal Dis* 2014; **29**: 1-8 [PMID: 23995270 DOI: 10.1007/s00384-013-1764-z]

3 **Scarpinata R**, Aly EH. Does robotic rectal cancer surgery offer improved early postoperative outcomes? *Dis Colon Rectum* 2013; **56**: 253-262 [PMID: 23303155 DOI: 10.1097/DCR.0b013e3182694595]

4 **Memon S**, Heriot AG, Murphy DG, Bressel M, Lynch AC. Robotic versus laparoscopic proctectomy for rectal cancer: a meta-analysis. *Ann Surg Oncol* 2012; **19**: 2095-2101 [PMID: 22350601 DOI: 10.1245/s10434-012-2270-1]

5 **Xiong B**, Ma L, Zhang C, Cheng Y. Robotic versus laparoscopic total mesorectal excision for rectal cancer: a meta-analysis. *J Surg Res* 2014; **188**: 404-414 [PMID: 24565506 DOI: 10.1016/j.jss.2014.01.027]

6 **Yang Y**, Wang F, Zhang P, Shi C, Zou Y, Qin H, Ma Y. Robot-assisted versus conventional laparoscopic surgery for colorectal disease, focusing on rectal cancer: a meta-analysis. *Ann Surg Oncol* 2012; **19**: 3727-3736 [PMID: 22752371 DOI: 10.1245/s10434-012-2429-9]

7 **Kim JY**, Kim NK, Lee KY, Hur H, Min BS, Kim JH. A comparative study of voiding and sexual function after total mesorectal excision with autonomic nerve preservation for rectal cancer: laparoscopic versus robotic surgery. *Ann Surg Oncol* 2012; **19**: 2485-2493 [PMID: 22434245 DOI: 10.1245/s10434-012-2262-1]

8 **Melich G**, Hong YK, Kim J, Hur H, Baik SH, Kim NK, Sender Liberman A, Min BS. Simultaneous development of laparoscopy and robotics provides acceptable perioperative outcomes and shows robotics to have a faster learning curve and to be overall faster in rectal cancer surgery: analysis of novice MIS surgeon learning curves. *Surg Endosc* 2015; **29**: 558-568 [PMID: 25030474 DOI: 10.1007/s00464-014-3698-0]

9 **Guillou PJ**, Quirke P, Thorpe H, Walker J, Jayne DG, Smith AM, Heath RM, Brown JM. Short-term endpoints of conventional versus laparoscopic-assisted surgery in patients with colorectal cancer (MRC CLASICC trial): multicentre, randomised controlled trial. *Lancet* 2005; **365**: 1718-1726 [PMID: 15894098 DOI: 10.1016/S0140-6736(05)66545-2]

10 **Jayne DG**, Thorpe HC, Copeland J, Quirke P, Brown JM, Guillou PJ. Five-year follow-up of the Medical Research Council CLASICC trial of laparoscopically assisted versus open surgery for colorectal cancer. *Br J Surg* 2010; **97**: 1638-1645 [PMID: 20629110 DOI: 10.1002/bjs.7160]

11 **Baik SH**, Kwon HY, Kim JS, Hur H, Sohn SK, Cho CH, Kim H. Robotic versus laparoscopic low anterior resection of rectal cancer: short-term outcome of a prospective comparative study. *Ann Surg Oncol* 2009; **16**: 1480-1487 [PMID: 19290486 DOI: 10.1245/s10434-009-0435-3]

12 **Nagtegaal ID**, van de Velde CJ, van der Worp E, Kapiteijn E, Quirke P, van Krieken JH. Macroscopic evaluation of rectal cancer resection specimen: clinical significance of the pathologist in quality control. *J Clin Oncol* 2002; **20**: 1729-1734 [PMID: 11919228]

13 **Park EJ**, Cho MS, Baek SJ, Hur H, Min BS, Baik SH, Lee KY, Kim NK. Long-term oncologic outcomes of robotic low anterior resection for rectal cancer: a comparative study with laparoscopic surgery. *Ann Surg* 2015; **261**: 129-137 [PMID: 24662411 DOI: 10.1097/SLA.0000000000000613]

14 **Denost Q**, Adam JP, Rullier A, Buscail E, Laurent C, Rullier E. Perineal transanal approach: a new standard for laparoscopic sphincter-saving resection in low rectal cancer, a randomized trial. *Ann Surg* 2014; **260**: 993-999 [PMID: 24950270 DOI: 10.1097/SLA.0000000000000766]

15 **Gómez Ruiz M**, Parra IM, Palazuelos CM, Martín JA, Fernández CC, Diego JC, Fleitas MG. Robotic-assisted laparoscopic transanal total mesorectal excision for rectal cancer: a prospective pilot study. *Dis Colon Rectum* 2015; **58**: 145-153 [PMID: 25489707 DOI: 10.1097/DCR.0000000000000265]

16 **Buchs NC**, Pugin F, Volonte F, Hagen ME, Morel P, Ris F. Robotic transanal endoscopic microsurgery: technical details for the lateral approach. *Dis Colon Rectum* 2013; **56**: 1194-1198 [PMID: 24022537 DOI: 10.1097/DCR.0b013e3182a2ac84]

P- Reviewer: M'Koma A, Soreide K **S- Editor**: Ji FF
L- Editor: A **E- Editor**: Liu SQ

WJCO World Journal of Clinical Oncology

Submit a Manuscript: http://www.wjgnet.com/esps/
Help Desk: http://www.wjgnet.com/esps/helpdesk.aspx
DOI: 10.5306/wjco.v6.i3.25

World J Clin Oncol 2015 June 10; 6(3): 25-29
ISSN 2218-4333 (online)

MINIREVIEWS

Present status of endoscopic mastectomy for breast cancer

Tetsuhiro Owaki, Yuko Kijima, Heiji Yoshinaka, Munetsugu Hirata, Hiroshi Okumura, Simiya Ishigami, Yasuhito Nerome, Toshiro Takezaki, Shoji Natsugoe

Tetsuhiro Owaki, Yuko Kijima, Heiji Yoshinaka, Munetsugu Hirata, Hiroshi Okumura, Simiya Ishigami, Yasuhito Nerome, Toshiro Takezaki, Shoji Natsugoe, Community-based Medicine, Graduate School of Medical and Dental Health, Kagoshima University, Kagoshima 890-8544, Japan

Author contributions: All the authors equally contritued to this work.

Conflict-of-interest: None.

Correspondence to: Tetsuhiro Owaki, MD, PhD, Community-based Medicine, Graduate School of Medical and Dental Health, Kagoshima University, 8-35-1 Sakuragaoka, Kagoshima 890-8544, Japan. towaki@m2.kufm.kagoshima-u.ac.jp
Telephone: +81-99-2756898
Fax: +81-99-2756899

Received: January 10, 2015
Peer-review started: January 10, 2015
First decision: February 7, 2015
Revised: April 2, 2015
Accepted: May 5, 2015
Article in press: May 6, 2015
Published online: June 10, 2015

Abstract

Endoscopy is now being used for breast cancer surgery. Though it is used for mastectomy, lymph node dissection, and breast reconstruction, its prime use is for mastectomy. Because an incision can be placed inconspicuously in the axillary site, a relatively large incision can be created. A retractor with an endoscope, CO_2, and an abrasion device with the endoscope are used for operation space security. It is extremely rare that an endoscope is used for lymph node dissection. For breast reconstruction, it may be used for latissimus muscle flap making, but an endoscope is rarely used for other reconstructions. Endoscopic mastectomy is limited to certain institutions and practiced hands, and it has not been significantly developed in breast cancer surgery. On the other hand, endoscopic surgery may be used widely in breast reconstruction. With respect to the spread of robotic surgery, many factors remain uncertain.

Key words: Endoscopy; Video-assisted; Breast cancer; Surgery; Mastectomy

Core tip: Endoscopic mastectomy is limited to certain institutions and practiced hands, and has not yet been significantly developed in breast cancer surgery. However, endoscopic surgery may be used widely in breast reconstruction. Many factors remain uncertain with respect to the spread of robotic surgery.

Owaki T, Kijima Y, Yoshinaka H, Hirata M, Okumura H, Ishigami S, Nerome Y, Takezaki T, Natsugoe S. Present status of endoscopic mastectomy for breast cancer. *World J Clin Oncol* 2015; 6(3): 25-29 Available from: URL: http://www.wjgnet.com/2218-4333/full/v6/i3/25.htm DOI: http://dx.doi.org/10.5306/wjco.v6.i3.25

INTRODUCTION

Surgery using an endoscope began with intra-abdominal surgery and progressed to intra-articular surgery and thoracic surgery. Surgery using an endoscope is said to be minimally invasive surgery, but its low invasiveness is actually difficult to prove. However, it is definitely useful for shortening the length of hospital stay and alleviation of postoperative pain. A major advantage of endoscopic surgery over normal surgery is that the operative incision can be small. A small wound is a major factor related to shortening of the length of hospital stay and alleviation of postoperative pain. In this way, endoscopic surgical techniques have been applied to surgical procedures in a variety of organs. And this technique is used to minimize the skin incision and improve breast reconstruction outcomes in breast surgery in 2002[1]. Prior to it in 1996, endoscopic axillar lymph node dissection was reported[2]. Furthermore, prior to it, the use of endoscopes to assist in latissimus muscle harvest has been effectively since 1994[3]. In breast cancer surgery, an endoscope is used most particularly for partial or total mastectomy, as well as for lymph node dissection and breast reconstruction.

MASTECTOMY

In most breast cancer surgery, an endoscope is used in order to have a small wound; the purpose of using an endoscope in breast cancer surgery is not to reduce the invasiveness of surgery. Depending on the site of the tumor, the operative method of mastectomy, lymph node dissection, and mammary reconstruction, the moving window method from the small incised part of the skin is used under direct vision[4,5].

However, most reports show a method to exfoliate breast from the skin through a small incision using an abrasion device with an endoscope, the retractor with the endoscope, and the appliance that exfoliates with a balloon under endoscopic observation. For an endoscope with an abrasion device, a vein abrasion retractor with a 30° endoscope[6-9] or optical tracker[10] is used, and for a retractor with the endoscope, an Ultra Retractor (Johnson and Johnson Company, New Brunswick, NJ)[11,12] or Optical Retractor (Karl Storz GmbH and Co. KG, Tuttlingen, Germany)[11] with a 30° endoscope is used. Under endoscopic observation, a round balloon dissector (for example, PDB balloon: autosuture or preperitoneal distention balloon: United States Surgical) is used as an appliance for exfoliating with a balloon[10,13,14]. Carbon dioxide and an appliance for pulling skin are used to secure the virtual cavity of the operation. Nakajima *et al*[15,16] introduced an exclusive device, called the HIROTECK retractor, for pulling the breast in the ventral aspect. The authors also introduced a device to pull skin using a Kirschner wire (two wire retractors)[17]. Serra-Renom *et al*[18] reported an appliance for skin lifting and tractioning the muscle upward, which they designed originally as the Serra-Renom endoscopic retractor.

A 2.5-5 cm incision is placed in the axillary region in many cases[6,10,16,19-21]. The semi-ark incision is placed in the areolar edge, and an abrasion device is used through this wound[14]. Some articles show that both axillary and periareolar incisions are used as windows for manipulating instruments[1,7-9,12,13,17]. Most of these reports are from Japan and Korea. It is thought that the small volumes of the breasts of Asian women and the small extent of resection are reasons for using endoscopy to treat breast cancer.

LYMPH NODE DISSECTION

Axillary lymph node dissection is performed through an axillary finesse incision with direct observation in many cases. A major reason for its use is that there are few cosmetic problems and the wound does not attract attention, even if the axillary wound area is slightly larger. Dissection of only sentinel lymph nodes or dissection of level 1 or 2 lymph nodes can be performed in the above-mentioned manner.

A method of endoscopic lymph node dissection has also been reported. Salvat *et al*[2], Suzanne *et al*[22], Brun *et al*[23], and Cangiotti *et al*[24] performed axillary lymph node dissection by securing the surgical field with carbon dioxide after liposuction with an axilloscope (a normal rigid endoscope device). Kamprath *et al*[25] and Lim *et al*[26] reported axillary lymph node dissection using an endoscope without a liposuction device. Moreover, Tagaya *et al*[27] reported axillary lymph node dissection using an endoscope without a liposuction device with an insufflated space using carbon dioxide. Saimura *et al*[9] and Nakajima *et al*[16] reported axillary lymph node dissection using an endoscope with a vein retractor without using carbon dioxide. Conrado-Abrão *et al*[28] and Long *et al*[29] reported a method of parasternal lymph node dissection using thoracoscopic technique. Long *et al*[29] performed internal mammary node dissection simultaneously with mastectomy, and Conrado-Abrão *et al*[28] performed this dissection 18 mo after radical mastectomy.

After reports such as that of Owaki *et al*[17] in 2005, in the case of endoscopic mastectomy, not only axillary lymph node dissection but also sentinel lymph node dissection has been performed. Sentinel lymph node dissection was performed under direct vision in all reports. For the sentinel lymph node biopsy, the operation area is limited, and it is not necessary to use an endoscope, because the dissection field is just beneath the axillary incision.

BREAST RECONSTRUCTION

Mobilizing the remnant breast gland and fatty tissue or an autologous lateral tissue flap using the latissimus muscle (for reconstruction after total extirpation of the breast and in reconstruction after partial extirpation) and the insertion of an implant after total breast extirpation are used for breast reconstruction.

Owaki *et al*[17] reported reconstruction of the defect using the remaining mammary gland tissue with endoscopic assistance after quadrantectomy by endoscopic technique.

To make a latissimus muscle flap as a caulescent flap, it is isolated from the trunk part using an abrasion appliance with an endoscope through a small axillary incision[6,16,18,30,31]. Yang *et al*[31] used Pediatric Omni-tract retractors to maintain the surgical view. Alternatively, Pomel *et al*[32], Missana *et al*[33], and Selber *et al*[34] reported a method using carbon dioxide to secure the surgical field when they prepare a latissimus muscle flap. In particular, Selber *et al*[34] reported an operative method to make a latissimus muscle flap using the da Vinci system under insufflation with carbon dioxide.

Cothier-Savey *et al*[35] and Zaha *et al*[36] used the greater omentum, which was isolated as a caulescent flap using laparoscopic technique, for breast reconstruction. Yenumula *et al*[37] performed breast reconstruction using a transverse rectus abdominis musculocutaneous flap, which was isolated by the extraperitoneal approach using a laparoscopic dissector and balloon dissector.

Implant insertion is performed after having secured space for its insertion by exfoliation of the pectoralis major muscle from the chest wall using an abrasion appliance with an endoscope[20,21]. In many cases, implant instruments are inserted under direct visualization after mastectomy using endoscopic technique[1,9,10,13].

Methods of breast reconstruction using remnant mammary gland under direct visualization after mastectomy using endoscopic technique have also been reported[7,8,11,15].

PROGNOSIS AFTER RESECTION

There are few reports of follow-up, recurrence rates, and survival rates after endoscopic mastectomy. Many authors may think that endoscopic breast surgery does not greatly affect the survival rate compared with open breast surgery. Regarding the rates of local recurrence, Kitamura *et al*[20] demonstrated that there was no significant difference between endoscopic mastectomy and open mastectomy in a retrospective study. Furthermore, Kitamura *et al*[20] showed that overall survival following endoscopic and open mastectomy for early stage breast cancer was comparable. In 2011, Leff *et al*[38] summarized many previous reports of mastectomy using the endoscope. In their review, they reported that it is possible to achieve disease control with high rates of overall survival and a low rate of local relapse recurrence and/or distant metastasis.

DISCUSSION

Recently, in cases of breast cancer, the approach has been to reduce the surgical field and prevent recurrence by postoperative irradiation. In addition, for lymph node dissection, sentinel lymph node dissection has come to be widely accepted, and wide resection of axillary lymph nodes is not commonly performed. Particularly in the case of sentinel lymph node dissection, lymph node dissection under direct vision may be adequate, and the necessity of using an endoscope through a small, non-conspicuous, axillary incision is low. If normal axillary dissection is required following sentinel node dissection, the wound can simply be enlarged, and more lymph nodes can be dissected without an endoscope. Even with a larger axillary wound, the wound is covered under the armpits and remains inconspicuous, thus obviating the need for using an endoscope. Thus, the need to use an endoscope may not be very great, even for normal axillary lymph node dissection.

Given this situation, the method of using an endoscope for breast cancer surgery has not shown significant development, and endoscopic mastectomy has not been performed widely. Alternatively, robotic surgery with the da Vinci system has been used for breast cancer resection[34]. The advantages of robotic surgery include a smaller wound and the potential for moving the incision from the anterior chest to the axillary region. However, robotic surgery is expensive and appears unlikely to become commonly used, because the expense outweighs the small advantages it offers.

However, for breast reconstruction, we think that an endoscopic abrasion device is useful for latissimus muscle isolation through an incision only for the discreet axillary part. Using an abrasion device with the endoscope is important, because an expander implant can be inserted through a small incision in the process of preparing the expander implant insertion space. By the development of materials and the shape of the implant, we resect the whole breast and reconstruct neatly. On this occasion, skin-sparing approach is achieved to resect breast using the endoscope *via* an axillary and/or periareolar operation wound[39]. The endoscope enables the mastectomy *via* small incision at the site which is not conspicuous, and provides cosmetic advantage.

CONCLUSION

Endoscopic mastectomy is limited to some institutions and practiced hands, and it has not been significantly developed in breast cancer surgery. On the other hand, in breast reconstruction, endoscopic surgery may be used widely. With respect to the spread of robotic surgery, many factors remain uncertain.

REFERENCES

1 **Ho WS**, Ying SY, Chan AC. Endoscopic-assisted subcutaneous mastectomy and axillary dissection with immediate mammary prosthesis reconstruction for early breast cancer. *Surg Endosc* 2002; **16**: 302-306 [PMID: 11967683 DOI: 10.1007/s004640000203]

2 **Salvat J**, Knopf JF, Ayoubi JM, Slamani L, Vincent-Genod A, Guilbert M, Walker D. Endoscopic exploration and lymph node sampling of the axilla. Preliminary findings of a randomized pilot study comparing clinical and anatomo-pathologic results of endoscopic axillary lymph node sampling with traditional surgical treatment. *Eur J Obstet Gynecol Reprod Biol* 1996; **70**: 165-173 [PMID: 9119098 DOI: 10.1016/S0301-2115(95)02587-1]

3 **Fine NA**, Orgill DP, Pribaz JJ. Early clinical experience in endoscopic-assisted muscle flap harvest. *Ann Plast Surg* 1994; **33**: 465-469; discussion 469-472 [PMID: 7857038 DOI: 10.1097/00000637-199411000-00001]

4 **Noguchi M**, Inokuchi M, Ohno Y, Yokoi-Noguchi M, Nakano

Y, Kosaka T. Oncological and cosmetic outcome in breast cancer patients undergoing "moving window" operation. *Breast Cancer Res Treat* 2011; **129**: 849-856 [PMID: 21818589 DOI: 10.1007/s10549-011-1701-1]
5 **Ohno Y**, Noguchi M, Yokoi-Noguchi M, Nakano Y, Shimada K, Yamamoto Y, Kawakami S. Nipple- or skin-sparing mastectomy and immediate breast reconstruction by the "moving window" operation. *Breast Cancer* 2013; **20**: 54-61 [PMID: 22038670 DOI: 10.1007/s12282-011-0302-5]
6 **Nakajima H**, Sakaguchi K, Mizuta N, Hachimine T, Ohe S, Sawai K. Video-assisted total glandectomy and immediate reconstruction for breast cancer. *Biomed Pharmacother* 2002; **56** Suppl 1: 205s-208s [PMID: 12487283 DOI: 10.1016/S0753-3322(02)00281-0]
7 **Ozaki S**, Ohara M, Shigematsu H, Sasada T, Emi A, Masumoto N, Kadoya T, Murakami S, Kataoka T, Fujii M, Arihiro K, Okada M. Technical feasibility and cosmetic advantage of hybrid endoscopy-assisted breast-conserving surgery for breast cancer patients. *J Laparoendosc Adv Surg Tech A* 2013; **23**: 91-99 [PMID: 23272727 DOI: 10.1089/lap.2012.0224]
8 **Park HS**, Lee JS, Lee JS, Park S, Kim SI, Park BW. The feasibility of endoscopy-assisted breast conservation surgery for patients with early breast cancer. *J Breast Cancer* 2011; **14**: 52-57 [PMID: 21847395 DOI: 10.4048/jbc.2011.14.1.52]
9 **Saimura M**, Mitsuyama S, Anan K, Koga K, Watanabe M, Ono M, Toyoshima S. Endoscopy-assisted breast-conserving surgery for early breast cancer. *Asian J Endosc Surg* 2013; **6**: 203-208 [PMID: 23368666 DOI: 10.1111/ases.12018]
10 **Ito K**, Kanai T, Gomi K, Watanabe T, Ito T, Komatsu A, Fujita T, Amano J. Endoscopic-assisted skin-sparing mastectomy combined with sentinel node biopsy. *ANZ J Surg* 2008; **78**: 894-898 [PMID: 18959644 DOI: 10.1111/j.1445-2197.2008.04687.x]
11 **Yamashita K**, Shimizu K. Trans-axillary retro-mammary gland route approach of video-assisted breast surgery can perform breast conserving surgery for cancers even in inner side of the breast. *Chin Med J* (Engl) 2008; **121**: 1960-1964 [PMID: 19080256]
12 **Sakamoto N**, Fukuma E, Higa K, Ozaki S, Sakamoto M, Abe S, Kurihara T, Tozaki M. Early results of an endoscopic nipple-sparing mastectomy for breast cancer. *Indian J Surg Oncol* 2010; **1**: 232-239 [PMID: 22695768 DOI: 10.1007/s13193-011-0057-7]
13 **Yamashita K**, Shimizu K. Transaxillary retromammary route approach of video-assisted breast surgery enables the inner-side breast cancer to be resected for breast conserving surgery. *Am J Surg* 2008; **196**: 578-581 [PMID: 18809067 DOI: 10.1016/j.amjsurg.2008.06.028]
14 **Takemoto N**, Koyanagi A, Yamamoto H. Comparison between endoscope-assisted partial mastectomy with filling of dead space using absorbable mesh and conventional conservative method on cosmetic outcome in patients with stage I or II breast cancer. *Surg Laparosc Endosc Percutan Tech* 2012; **22**: 68-72 [PMID: 22318064 DOI: 10.1097/SLE.0b013e3182414b25]
15 **Nakajima H**, Fujiwara I, Mizuta N, Sakaguchi K, Hachimine Y, Magae J. Video-assisted skin-sparing breast-conserving surgery for breast cancer and immediate reconstruction with autologous tissue: clinical outcomes. *Ann Surg Oncol* 2009; **16**: 1982-1989 [PMID: 19390899 DOI: 10.1245/s10434-009-0429-1]
16 **Nakajima H**, Fujiwara I, Mizuta N, Sakaguchi K, Ohashi M, Nishiyama A, Umeda Y, Ichida M, Magae J. Clinical outcomes of video-assisted skin-sparing partial mastectomy for breast cancer and immediate reconstruction with latissimus dorsi muscle flap as breast-conserving therapy. *World J Surg* 2010; **34**: 2197-2203 [PMID: 20458581 DOI: 10.1007/s00268-010-0607-0]
17 **Owaki T**, Yoshinaka H, Ehi K, Kijima Y, Uenosono Y, Shirao K, Nakano S, Natsugoe S, Aikou T. Endoscopic quadrantectomy for breast cancer with sentinel lymph node navigation via a small axillary incision. *Breast* 2005; **14**: 57-60 [PMID: 15695082 DOI: 10.1016/j.breast.2004.05.002]
18 **Serra-Renom JM**, Serra-Mestre JM, Martinez L, D'Andrea F. Endoscopic reconstruction of partial mastectomy defects using latissimus dorsi muscle flap without causing scars on the back. *Aesthetic Plast Surg* 2013; **37**: 941-949 [PMID: 23877754 DOI: 10.1007/s00266-013-0192-3]
19 **Tamaki Y**, Nakano Y, Sekimoto M, Sakita I, Tomita N, Ohue M, Komoike Y, Miyazaki M, Nakayama T, Kadota M, Monden M. Transaxillary endoscopic partial mastectomy for comparatively early-stage breast cancer. An early experience. *Surg Laparosc Endosc* 1998; **8**: 308-312 [PMID: 9703608 DOI: 10.1097/00019509-199808000-00015]
20 **Kitamura K**, Ishida M, Inoue H, Kinoshita J, Hashizume M, Sugimachi K. Early results of an endoscope-assisted subcutaneous mastectomy and reconstruction for breast cancer. *Surgery* 2002; **131**: S324-S329 [PMID: 11821832 DOI: 10.1067/msy.2002.120120]
21 **Tukenmez M**, Ozden BC, Agcaoglu O, Kecer M, Ozmen V, Muslumanoglu M, Igci A. Videoendoscopic single-port nipple-sparing mastectomy and immediate reconstruction. *J Laparoendosc Adv Surg Tech A* 2014; **24**: 77-82 [PMID: 24401140 DOI: 10.1089/lap.2013.0172]
22 **Suzanne F**, Emering C, Wattiez A, Bournazeau JA, Bruhat MA, Jacquetin B. [Axillary lymphadenectomy by lipo-aspiration and endoscopic picking. Apropos of 72 cases]. *Chirurgie* 1997; **122**: 138-142; discussion 142-143 [PMID: 9238808]
23 **Brun JL**, Rousseau E, Belleannée G, de Mascarel A, Brun G. Axillary lymphadenectomy prepared by fat and lymph node suction in breast cancer. *Eur J Surg Oncol* 1998; **24**: 17-20 [PMID: 9542509 DOI: 10.1016/S0748-7983(98)80118-2]
24 **Cangiotti L**, Poiatti R, Taglietti L, Re P, Carrara B. A mini-invasive technique for axillary lymphadenectomy in early breast cancer: a study of 15 patients. *J Exp Clin Cancer Res* 1999; **18**: 295-298 [PMID: 10606172]
25 **Kamprath S**, Bechler J, Kühne-Heid R, Krause N, Schneider A. Endoscopic axillary lymphadenectomy without prior liposuction. Development of a technique and initial experience. *Surg Endosc* 1999; **13**: 1226-1229 [PMID: 10594271 DOI: 10.1007/PL00009626]
26 **Lim SM**, Lam FL. Laparoscopic-assisted axillary dissection in breast cancer surgery. *Am J Surg* 2005; **190**: 641-643 [PMID: 16164939 DOI: 10.1016/j.amjsurg.2005.06.031]
27 **Tagaya N**, Kubota K. Experience with endoscopic axillary lymphadenectomy using needlescopic instruments in patients with breast cancer: a preliminary report. *Surg Endosc* 2002; **16**: 307-309 [PMID: 11967684 DOI: 10.1007/s00464-001-8139-1]
28 **Conrado-Abrão F**, Das-Neves-Pereira JC, Fernandes A, Jatene FB. Thoracoscopic approach in the treatment of breast cancer relapse in the internal mammary lymph node. *Interact Cardiovasc Thorac Surg* 2010; **11**: 328-330 [PMID: 20576656 DOI: 10.1510/icvts.2010.240606]
29 **Long H**, Situ DR, Ma GW, Zheng Y. Thoracoscopic internal mammary lymph node dissection: a video demonstration. *Ann Surg Oncol* 2013; **20**: 1311-1312 [PMID: 23208126 DOI: 10.1245/s10434-012-2751-2]
30 **Losken A**, Schaefer TG, Carlson GW, Jones GE, Styblo TM, Bostwick J. Immediate endoscopic latissimus dorsi flap: risk or benefit in reconstructing partial mastectomy defects. *Ann Plast Surg* 2004; **53**: 1-5 [PMID: 15211189 DOI: 10.1097/01.sap.0000106425.18380.28]
31 **Yang CE**, Roh TS, Yun IS, Kim YS, Lew DH. Immediate partial breast reconstruction with endoscopic latissimus dorsi muscle flap harvest. *Arch Plast Surg* 2014; **41**: 513-519 [PMID: 25276643 DOI: 10.5999/aps.2014.41.5.513]
32 **Pomel C**, Missana MC, Atallah D, Lasser P. Endoscopic muscular latissimus dorsi flap harvesting for immediate breast reconstruction after skin sparing mastectomy. *Eur J Surg Oncol* 2003; **29**: 127-131 [PMID: 12633554 DOI: 10.1053/ejso.2002.1326]
33 **Missana MC**, Pomel C. Endoscopic latissimus dorsi flap harvesting. *Am J Surg* 2007; **194**: 164-169 [PMID: 17618797 DOI: 10.1016/j.amjsurg.2006.10.029]
34 **Selber JC**, Baumann DP, Holsinger FC. Robotic latissimus dorsi muscle harvest: a case series. *Plast Reconstr Surg* 2012; **129**: 1305-1312 [PMID: 22634647 DOI: 10.1097/PRS.0b013e31824ecc0b]
35 **Cothier-Savey I**, Tamtawi B, Dohnt F, Raulo Y, Baruch J.

Immediate breast reconstruction using a laparoscopically harvested omental flap. *Plast Reconstr Surg* 2001; **107**: 1156-1163; discussion 1164-1165 [PMID: 11373555 DOI: 10.1097/00006534-200104150-00009]

36 **Zaha H**, Inamine S, Naito T, Nomura H. Laparoscopically harvested omental flap for immediate breast reconstruction. *Am J Surg* 2006; **192**: 556-558 [PMID: 16978975 DOI: 10.1016/j.amjsurg.2006.06.030]

37 **Yenumula P**, Rivas EF, Cavaness KM, Kang E, Lanigan E. The extraperitoneal laparoscopic TRAM flap delay procedure: an alternative approach. *Surg Endosc* 2011; **25**: 902-905 [PMID: 20734077 DOI: 10.1007/s00464-010-1294-5]

38 **Leff DR**, Vashisht R, Yongue G, Keshtgar M, Yang GZ, Darzi A. Endoscopic breast surgery: where are we now and what might the future hold for video-assisted breast surgery? *Breast Cancer Res Treat* 2011; **125**: 607-625 [PMID: 21128113 DOI: 10.1007/s10549-010-1258-4]

39 **Patani N**, Mokbel K. Oncological and aesthetic considerations of skin-sparing mastectomy. *Breast Cancer Res Treat* 2008; **111**: 391-403 [PMID: 17965954 DOI: 10.1007/s10549-007-9801-7]

P- Reviewer: Giordano A, Guan YS **S- Editor**: Tian YL
L- Editor: A **E- Editor**: Liu SQ

Published by **Baishideng Publishing Group Inc**
8226 Regency Drive, Pleasanton, CA 94588, USA
Telephone: +1-925-223-8242
Fax: +1-925-223-8243
E-mail: bpgoffice@wjgnet.com
Help Desk: http://www.wjgnet.com/esps/helpdesk.aspx
http://www.wjgnet.com