Letter to the Editor Concerning "Short-Term Outcomes of Laparoscopic Total Gastrectomy Performed by a Single Surgeon Experienced in Open Gastrectomy: Review of Initial Experience"

Seong-Ho Kong[1,2] and Bernard Dallemagne[3]

[1]Department of Surgery, Seoul National University Hospital, Seoul, Korea, [2]Image-Guided Minimally Invasive Surgical Institute, IHU Strasbourg, France, [3]Research Institute Against Cancer of the Digestive System, Strasbourg, France

Dear Editor:

We read with interest an article titled, "Short-Term Outcomes of Laparoscopic Total Gastrectomy Performed by a Single Surgeon Experienced in Open Gastrectomy: Review of Initial Experience" in your journal, published in September 2015 (doi: http://dx.doi.org/10.5230/jgc.2015.15.3.159), by Song et al.[1] First, we congratulate the authors for the excellent clinical results obtained in the initial series of laparoscopic total gastrectomy (LTG). The short-term results included only 13.5% of patients with complications, which comprised no grade ≥ 3 complications according to the Clavien-Dindo classification or anastomosis leaks, and a small amount of bleeding (80.8 ± 60.4 ml). On the basis of the moving average analysis of the operative time, the authors also reported that the learning curve of LTG is about 50 cases.

However, there is the possibility of misinterpreting that such excellent results can be achieved with 50 cases of LTG by any surgeon, if the surgeon's experience and clinical situation in Korea are not considered.

As described in the discussion, the surgeon had already performed more than 100 cases of open total gastrectomy (OTG)

and 15 cases of laparoscopic distal gastrectomy (LDG) before performing LTG. This number of cases required to attain competence is too high for western countries and even for Japan.[2] Although surgeons who are experienced with open gastrectomy need to understand laparoscopic surgical anatomy, visual-motor coordination, and changes in haptic sensation, understanding the surgical anatomy for many types of open gastrectomy procedures can be beneficial for facilitating the learning of laparoscopic gastrectomy, which was designed to simulate open procedures in many respects. The learning process involves repeating the same procedures; however, learning the surgical procedures involves more complex factors associated with various individual anatomic variations and unexpected surgical situations. Direct experience with various anatomies and clinical situations in open surgery and indirect experience from being involved in the Korean surgical society, where discussions and education about laparoscopic gastrectomy are provided, are not negligible factors in the learning curve, although the effect of indirect experience on the learning process in surgery has not been established.[3-5] Therefore, the proposed learning curve is not the learning curve of the principle procedures of total gastrectomy; instead, it is a "learning curve of laparoscopic skills" by which the surgeon performs well-known, essential steps of total gastrectomy.

Furthermore, the same surgeon performed LDG in four more cases than LTG during the learning period of LTG. Thus, the surgeon already had experience with more than 50 cases of lapa-

Correspondence to: Seong-Ho Kong
Department of Surgery, Seoul National University Hospital, 101 Daehak-ro, Jongno-gu, Seoul 03080, Korea
Tel: +82-2-2072-4199, Fax: +82-2-766-3975
E-mail: wisehearted@gmail.com
Received January 13, 2016
Accepted June 13, 2016

roscopic gastrectomy when he/she performed 8 cases of LTG (15 cases of LDG before LTG+8 of LTG+32 of LDG). As LTG and LDG have similar procedures, experience with LDG affects the surgeon's learning curve with LTG. This may be one of the reasons why the number of cases for overcoming the learning curve was smaller than that in a previous report that suggested 100 cases of LTG.[6] This number of cases is also similar or less than that reported for the learning curve of LDG.[7,8] Therefore, we would like to emphasize the authors' conclusion that more cases may be needed to achieve excellent results if a surgeon starts performing LTG without sufficient experience with OTG or LDG.

In addition, it is possible to misinterpret the plateau of the learning curves as achieving the surgical standard. A learning curve itself does not consider whether the surgical procedure meets acceptable quality standards. In Fig. 1, the learning curve of C reached the plateau faster than that of curve B. However, this does not guarantee that the quality of surgery C meets the surgical standard. Although curve E has a very long learning process (paradoxically called a steep learning curve), it reached the surgical standard, unlike curves C and D. In terms of the operative time, the learning curve of the surgeon in Song et al.'s study[1] can be interpreted as curve A. In Fig. 3A of Song et al.'s article,[1] the operation time was consistently less than 150 minutes after only a few initial cases. The gradual slope of the curve in Fig. 3B seems to be caused by the moving average values affected by the long operation time in the first couple of cases. If Fig. 3B was based on a smaller number of cases instead of the moving average of 15 cases, the plateau could have been reached with fewer than 54 cases.

A cumulative sum method can be an alternative tool for evaluating the learning process, which is based on whether the surgeon's procedure meets the surgical standard.[9] One research study suggested 23 and 35 cases for learning lymph node dissection in LTG; the failure of lymph node dissection was defined as ≤25 retrieved lymph nodes, and the target success rate was set to 92.5%.[10] Another research study assessed the occurrence of complications with a target success rate of 20%, and the authors suggested 45 cases as the plateau of complications for LTG.[11] These different results indicate that there can be different learning curves for each outcome parameter, and the learning curve of the surgery cannot be evaluated by a single parameter such as the operative time.

Song et al.[1] did not provide learning curves for parameters other than the operative time. However, the excellent average val-
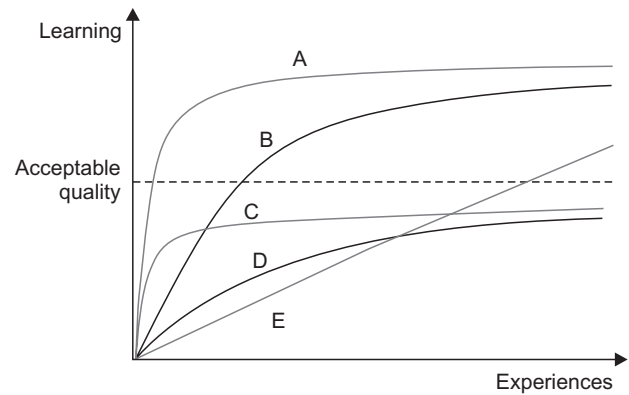

Fig. 1. Examples of different learning curves. Curves A, B, and E obtained acceptable quality in learning, with different rates of improvement before they plateaued. Line C plateaued after a short learning process; however, curves C and D did not reach an acceptable quality.

ues of the 74 cases in the series, including the number of retrieved lymph nodes (39.9±11.8), blood loss (80.8±60.4 ml), and rate of complications (13.5% without grade ≥3 complications), are comparable or even superior to those reported in previous studies conducted by experienced laparoscopic gastric surgeons of an earlier generation.[12] Therefore, it was estimated that the learned skill set of LTG surpasses the surgical standard before 54 cases of LTG are performed. This implies that the learning process of laparoscopic surgery has been facilitated for surgeons of a new generation owing to the development and standardization of surgical procedures and the accumulated expertise of surgeons of an earlier generation.

In conclusion, we think that the excellent results of the initial series of LTG should be interpreted as a result from exceptional baseline experiences with OTG and LDG of a surgeon at an extremely high-volume center in Korea, and 54 as the number of cases required for a stabilized learning curve cannot be used by most surgeons worldwide. However, surgeons can achieve acceptable skill sets and outcomes of LTG with highly concentrated training and experience even before they reach the plateau of their personal learning curve.

References

1. Song JH, Choi YY, An JY, Kim DW, Hyung WJ, Noh SH. Short-term outcomes of laparoscopic total gastrectomy performed by a single surgeon experienced in open gastrectomy: review of initial experience. J Gastric Cancer 2015;15:159-166.

2. Kodera Y. Extremity in surgeon volume: Korea may be the

place to go if you want to be a decent gastric surgeon. Gastric Cancer 2016;19:323-325.

3. Way LW, Stewart L, Gantert W, Liu K, Lee CM, Whang K, et al. Causes and prevention of laparoscopic bile duct injuries: analysis of 252 cases from a human factors and cognitive psychology perspective. Ann Surg 2003;237:460-469.

4. Draganov PV, Chang M, Coman RM, Wagh MS, An Q, Gotoda T. Role of observation of live cases done by Japanese experts in the acquisition of ESD skills by a western endoscopist. World J Gastroenterol 2014;20:4675-4680.

5. Yang SJ, Ahn EJ, Park SH, Kim JH, Park JM. The early experience of laparoscopy-assisted gastrectomy for gastric cancer at a low-volume center. J Gastric Cancer 2010;10:241-246.

6. Jung do H, Son SY, Park YS, Shin DJ, Ahn HS, Ahn SH, et al. The learning curve associated with laparoscopic total gastrectomy. Gastric Cancer 2016;19:264-272.

7. Kim MC, Jung GJ, Kim HH. Learning curve of laparoscopy-assisted distal gastrectomy with systemic lymphadenectomy for early gastric cancer. World J Gastroenterol 2005;11:7508-7511.

8. Kunisaki C, Makino H, Yamamoto N, Sato T, Oshima T, Nagano Y, et al. Learning curve for laparoscopy-assisted distal gastrectomy with regional lymph node dissection for early gastric cancer. Surg Laparosc Endosc Percutan Tech 2008;18:236-241.

9. Williams SM, Parry BR, Schlup MM. Quality control: an application of the cusum. BMJ 1992;304:1359-1361.

10. Lee JH, Ryu KW, Lee JH, Park SR, Kim CG, Kook MC, et al. Learning curve for total gastrectomy with D2 lymph node dissection: cumulative sum analysis for qualified surgery. Ann Surg Oncol 2006;13:1175-1181.

11. Jeong O, Ryu SY, Choi WY, Piao Z, Park YK. Risk factors and learning curve associated with postoperative morbidity of laparoscopic total gastrectomy for gastric carcinoma. Ann Surg Oncol 2014;21:2994-3001.

12. Kunisaki C, Makino H, Takagawa R, Kimura J, Ota M, Ichikawa Y, et al. A systematic review of laparoscopic total gastrectomy for gastric cancer. Gastric Cancer 2015;18:218-226.