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REVIEW ARTICLE

The Feasibility and Future Prospects of Robot-Assisted Surgery in Gastric Cancer: Consensus Comments from the National Evidence-based Collaborating Agency Round-Table Conference

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To establish an appropriate policy for robotic surgery in Korea, the National Evidence-based Collaborating Agency (NECA) and the Korean Society of Health Policy and Administration held a round-table conference (RTC) to gather opinions through a comprehensive discussion of scientific information in gastric cancer. The NECA RTC is a public discussion forum wherein experts from diverse fields and members of the lay public conduct in-depth discussions on a selected social issue in the health and medical field. For this study, representatives from the medical field, patient groups, industry, the press, and policy makers participated in a discussion focused on the medical and scientific evidence for the use of robotic surgery in gastric cancer. According to the RTC results, robotic surgery showed more favorable results in safety and efficacy than open surgery and it is similar to laparoscopy. When the cost-effectiveness of robotic surgery and laparoscopy is compared, robotic surgery costs are higher but there was no difference between the two of them in terms of effectiveness (pain, quality of life, complications, etc.). In order to resolve the high cost issue of the robotic surgery, a proper policy should be implemented to facilitate the development of a cost-effective model of the robotic surgery equipment. The higher cost of robotic surgery require more evidence of its safety and efficacy as well as the cost-effectiveness issues of this method. Discussions on the national insurance coverage of robotic surgery seems to be necessary in the near future.

Keywords: Robotic surgery; Stomach neoplasms; Round-table conference

INTRODUCTION

Although the incidence of gastric cancer is declining worldwide, it is reported to be the second highest incidence rate behind thyroid cancer according the 2012 annual report of cancer statistics in Korea [1]. Despite its high incidence rate, the mortality rate for gastric cancer has steadily declined since 1995 because of the development of early diagnostic and treatment technologies. Conversely, the mortality rates of other types of cancer have been increasing steadily, according to Korea's annual statistical reports causes of death [2]. In high-risk regions such as Japan and Korea, the implementation of endoscopic screening for gastric cancer has become widespread, thereby leading to an increase in the detection rate of early gastric cancers, which constitute approximately 50% of all gastric cancers in Japan and Korea. Laparoscopy is frequently used to treat gastric cancers, and in 1994, was introduced as a surgical method. Its advantages of reduced pain, higher aesthetic satisfaction, faster return to work, and overall higher quality of life in patients have been reported. Consequently, laparoscopic gastrectomy has been widely adopted to treat early gastric cancers [3]. However, laparoscopic gastrectomy is limited by the requirements of a flat 2-dimensional screen and specific surgical equipment, and it requires specialized training. An additional disadvantage is that the extremely complicated and precise D2 lymph-

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adenectomy can only be performed in a few select institutions [4]. To overcome those disadvantages, some surgical methods have been introduced, the most advanced of which is robotic surgery. Robotic surgery was first used to treat gastric cancer in July 2005 in Korea [5]. Since then, this method has been consistently utilized, and in 2007, demand for the robot-assisted surgery grew dramatically, which increased the total number of gastric cancer surgeries performed; approximately 650 gastrectomies have been performed in Korea by the end of 2009 [6].

Robotic surgery has been used in the clinic since 2005, when it received approval from the Ministry of Food and Drug Safety and was registered as a non-covered service in 2006 [7] but no preliminary evaluation of the safety and efficacy of robotic surgery was conducted after its introduction in South Korea. Consequently, questions regarding the safety and efficacy of robotic surgery have been raised consistently. In spite of that, from July 2005 to July of 2012, 24,207 patients underwent robotic surgery (24,337 operations) in medical institutions across Korea. These robotic surgeries were performed in gastric cancer (1,296 patients, 5.4%) and were positioned fourth after prostate (8,146 patients, 33.7%), thyroid (6,869 patients, 28.4%) and rectal cancer (1,443 patients, 6.0%) [7].

Considering that robotic gastrectomy is in its early phase, it is premature to draw any conclusion in the safety and efficacy issues, but the number of robotic gastrectomy performed in Korea continues to increase every year. The robotic gastrectomy is the most advanced operative technique to overcome the disadvantages of laparoscopic gastrectomy [8,9]. However, no clear advantages have been identified for robotic surgery compared to laparoscopy in the treatment of early gastric cancer to date, especially considering the fact that it is 2–3 times more costly. Except for its advantage in offering more precision during lymphadenectomy, there are no significant differences between laparoscopy and robotic surgery with regard to outcomes [6].

Therefore, in order to make a reasonable decision on social issues related to robotic gastrectomy, it is necessary to evaluate general and scientific information regarding the steadily increasing use of robotic surgery in gastric cancer by gathering various stakeholders' opinions.

METHODS

The National Evidence-based Collaborating Agency (NECA)'s round-table conference (RTC) is a public discussion forum wherein experts from diverse fields and members of the lay public conduct in-depth discussions on a specific social issue in health and medicine in order to evaluate its value and reach a consensus.

The first consensus conference was held in the name of 'consensus development conference' at the National Institutes of Health, USA in September 1977. Since the early 1980s, consensus conferences have become popular in many European countries and have been held with expert panels from various fields when there were controversial healthcare topics, or needed provision of information or knowledge transfer in many developed countries.

Thus consensus conference reaches a conclusion through the participation and discussion of various stakeholders about the problem and a solution of social conflicts. It has the advantage of improving the quality and legitimacy and enhancing the acceptance of an agreement.

As the period of implementation of robot-assisted surgery in gastric cancer has been short, it may be premature to draw a conclusion based on comparing it with other similar surgical methods. The purpose of the RTC was to share general and scientific information related to robotic surgery reported to date, and based on this, to gather stakeholders' opinions on pertinent social issues and establish specific guidelines.

Therefore, the RTC jointly organized by NECA and the Korean Society of Health Policy and Administration, hold a debate on the topic 'the feasibility and future prospects of robotic surgery in gastric cancer' to identify areas of improvement. A total of 8 representatives from each field were on the panel. The panel was composed of three surgeons from the medical field, one person from patient groups, one person from industry, one person from the press, and two policy makers, and the panel was presided over by the chairperson. The panelists shared their opinions on the safety and effectiveness of current robot-assisted surgery technology. Source data were provided, and the results from a NECA study [7] comparing the safety and efficacy of robotic surgery and laparoscopy for gastric cancer were presented by NECA researcher.

RESULTS

The panel of experts had an in-depth discussion and shared their opinions on the basis of evidence presented for 'the feasibility and future prospects of robotic surgery in gastric cancer' but failed to reach consensus. The following points summarize the main opinions of the RTC participants.

The scientific evidence for the robotic surgery in gastric cancer to date

In 2013, the NECA conducted a systematic literature review, covering domestic and international literature, in order to evaluate the clinical efficacy and safety of robotic surgery, open gastrectomy, and laparoscopy as gastric cancer treatments [7]. In terms of clinical safety, the findings of this meta-analysis revealed no significant differences between the robotic surgery group versus the laparoscopy group, when clinical variables such as mortality (risk ratio, 1.65; 95% confidence interval [CI], 0.45-6.02), major complications (risk ratio, 0.93; 95% CI, 0.61-1.42), abdominal bleeding (risk ratio, 1.27; 95% CI, 0.56-2.89), and intestinal obstruction (risk ratio, 1.14; 95% CI, 0.52-2.48) were investigated.

Regarding the evaluation of clinical efficacy, first, the robotic surgery group experienced a shorter length of hospital stay by 0.89 day ($p = 0.001$) and less blood loss during surgery by 30.08 mL ($p = 0.07$) compared to the laparoscopy groups and the initiation of soft diet was faster by 0.32 days ($p = 0.0004$) in the robotic surgery. Conversely, the robotic surgery operation duration was longer by 58.05 minutes ($p < 0.0001$) than the laparoscopy group, which is an established disadvantage of robotic surgery. No other variables showed differences between both groups.

Among the panel, surgeons insisted that considering the short history of robotic surgery compared to laparoscopy, it was an inspiring result because there was no difference in terms of safety and efficacy between these two surgical methods. It was also suggested that the robotic surgery can have a complementary relation with laparoscopy, not replace it.

The cost–effectiveness of robot–assisted surgery in gastric cancer

A recent fact-finding investigation by the Ministry of Health and Welfare showed that more than 1,000 gastric cancer patients have been treated with robotic surgery, which is the highest number of patients after those with prostate, thyroid, and rectal cancers [7]. As shown, the use of robotic gastrectomy has been increasing steadily since August 2008, when it was registered as a non-covered service.

When we compared the cost-effectiveness of robotic and laparoscopic surgery, robotic surgery required higher cost but there was no difference between two groups in terms of effectiveness (pain, quality of life, complications, etc.). According to the representative of Ministry of Health and Welfare, the studies about the safety, efficacy and economic evaluation have been conducted to secure sufficient evidence and the decision for the health insurance service will be made in 2015-2016.

Future prospects of robot–assisted surgery in gastric cancer

Robotic surgery is a good alternative in the current situation due to the lack of surgeons and its use in gastric cancer compared to urology began after a while. Therefore, the surgical results will improve by the accumulation of experience for robotic surgery as well as for urology. The situation about the research and development related to the medical robotic system in our country is still in the beginning stages, but as the benefit of robotic surgery has been advocated around the world including the USA, it is predicted that the applications of robotic gastrectomy will steadily expand along with technological advancements. In order to solve the high cost of the robotic equipment due to the monopoly of a single company, an efficient policy should be implemented by the involved organizations to facilitate the development of low-cost models of the robot with comparable functionality.

CONCLUSION

The opinions of expert panels in RTC for 'the feasibility and future prospects of robot-assisted surgery in gastric cancer' can be summarized as higher cost of robotic surgery require more evidence of its safety and efficacy as well as the cost-effectiveness issues of this method. Discussions on the national insurance coverage of robotic surgery seems to be necessary in the near future.

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