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Questionnaire to Survey Cosmetic Outcomes in Laparoscopic Surgery for Colorectal Cancer

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Background and objectives: There has been a steady increase in the use of minimally invasive surgery, including conventional multiport laparoscopic surgery (MLS) and single-site laparoscopic surgery (SLS) for colorectal cancer. We aimed to evaluate how important the cosmetic outcome, one of the advantages of SLS, is to patients and whether SLS reflects social needs.

Methods: We used a web-based questionnaire to survey nonmedical and medical workers for what factors were considered on the assumption that respondents undergo colorectal cancer surgery and that the most important person for them undergoes. Five items (curability, safety, pain, length of hospital stay, and cosmetic outcomes) were compared. After paired photographs before and after SLS and MLS were shown, perceptions of body image and cosmesis were assessed using a visual analog scale.

Results: This study included a total of 1352 respondents (990 nonmedical and 362 medical). Curability had the highest score (49.9–53.7 points), followed by safety (23.8–24.7 points). The scores for cosmetic outcomes (6.2–7.1 points) were almost equal to those of the length of hospital stay (6.2–7.1 points), which was associated with medical costs and pain (10.0–11.1 points), one of the main reasons for fear of surgery. Participants who were female, younger, and in the nonmedical group placed great importance on cosmetic outcomes. For all questions regarding body image and cosmesis, SLS had superior scores compared with MLS.

Conclusions: Understandably, curability, and safety were most important in colorectal cancer surgery. However, medical workers should consider cosmetic outcomes, even in malignant cases.

Keywords: colorectal cancer, conventional multiport laparoscopic surgery, cosmetic outcomes, single-site laparoscopic surgery

INTRODUCTION

In cancer surgery, curability and safety are most important, followed by preservation of function, and if these are compatible, minimally invasive is considered. Thanks to improved techniques, instrumentation, and detailed knowledge about the surgical anatomy, minimally invasive surgery, including conventional multiport laparoscopic surgery (MLS) and single-site laparoscopic surgery (SLS), can now be used to reduce operative trauma in a wider range of cases, from early to advanced cancer and from colon to rectal cancer.[1] Due to the enhanced visualization provided by laparoscopic surgery, which includes clarification of microanatomy and image sharing among medical workers, multiple randomized controlled trials and meta-analyses reported that MLS for colorectal cancer can achieve short- and long-term outcomes that are equal to or better than the outcomes following open surgery.[2–11] Such reports have led to increased use of minimally invasive surgery for colorectal cancer. In Japan, utilization of minimally invasive surgery for colorectal cancer increased from 27.1% in 2011 to 52.5% in 2019 for right hemicolectomy and from 29.5% in 2011 to 70.3% in 2019 for low anterior resection.[12] In addition, SLS is designed to minimize invasiveness and improve cosmetic outcomes and has been attracting a lot of attention due to reports of better or equivalent short- and long-term outcomes compared with MLS.[13–18]

There are reports of socioeconomic disparities, such as income or the medical insurance of patients, related to the use of minimally invasive surgery.[19] Patients assess the degree of importance of open, MLS, or SLS for colorectal cancer based on their situation and decide which surgery will be suitable for them. On the other hand, many medical workers believe that SLS, which minimizes operative trauma, will improve patient satisfaction for several reasons, including better cosmetic outcomes. A study of these different viewpoints of surgery may promote wide acceptance of SLS. So far no report has discussed how the general public evaluates the technique or has made a detailed comparison of medical and nonmedical workers' perceptions about the surgery, although the usefulness of SLS has been suggested in studies of patients undergoing surgery.[20] Therefore, the present study targeted the general public, including nonmedical and medical workers, and evaluated the importance of cosmetic outcomes in surgery for colorectal cancer and whether SLS reflects these outcomes using a web-based questionnaire survey.

METHODS

Survey Via the Web

The questionnaire was administered to about 300,000 people who were registered with NTTCom Online Marketing Solutions

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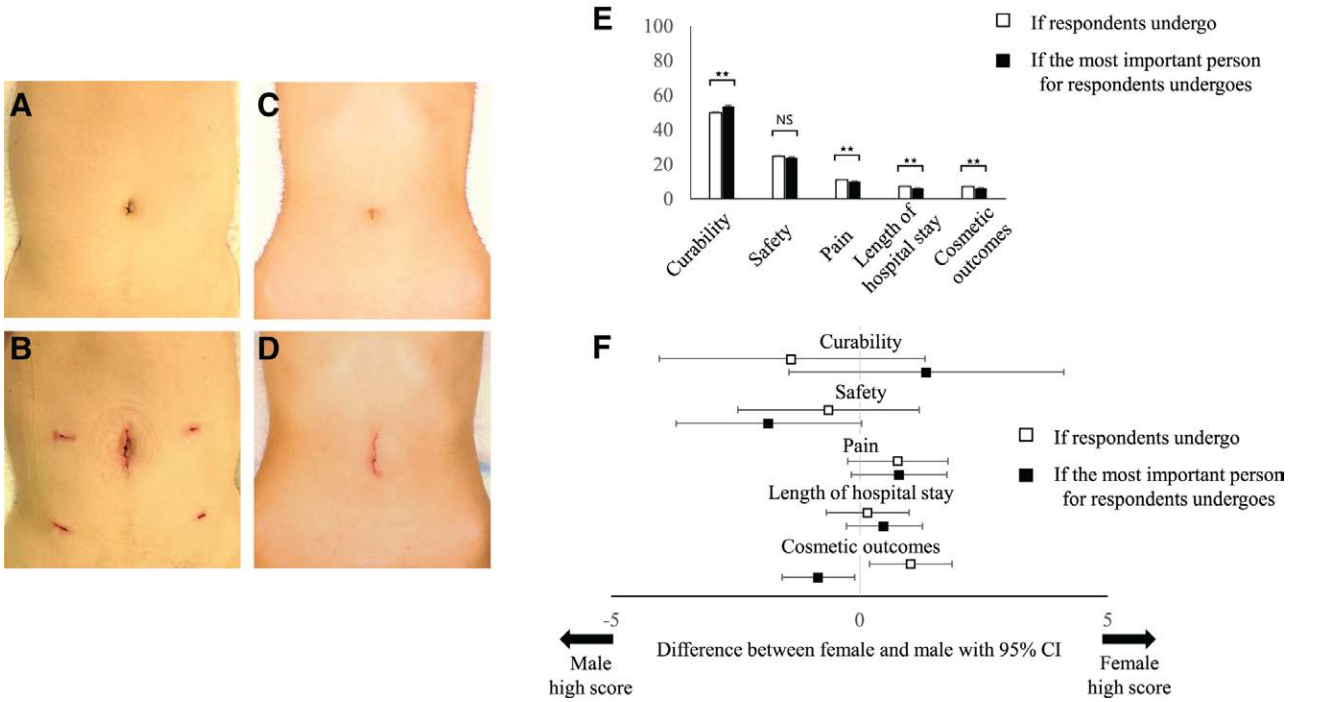

FIGURE 1. Importance of each outcome in colorectal cancer surgery. Representative photos used in the questionnaire before (A) and after (B) multiport laparoscopic surgery and before (C) and after (D) single-site laparoscopic surgery for colorectal cancer. (E) Respondents scored what factors are considered on the assumption that respondents (white bars) and the most important person for respondents (black bars) undergo surgery. Total scores summed to 100 points. (F) Differences between the scores given by females and males with 95% CI for each outcome. The difference was evaluated by the Student's *t* test.**$P < 0.01$; NS, not significant.

Corporation (Tokyo, Japan), which specializes in web surveys. Among the respondents who answered "Yes" to the question "can you cooperate in our study?", about 80 respondents from each age group (20s–70s), with equal numbers of males and females, were collected randomly for each questionnaire by the software. To compare the differences in the awareness of cosmetic outcomes between nonmedical and medical workers, the same web questionnaire was also administered to medical workers in about 30 hospitals. This questionnaire survey was performed twice to confirm the reproducibility.

QUESTIONNAIRES

Before the questions, there was a brief explanation of the epidemiological statistics, prognosis, and surgical procedures, including some technical problems of SLS for colorectal cancer. To evaluate the importance of cosmetic outcomes, 4 other items (curability, safety, pain, and length of hospital stay) that seemed to be important in colorectal cancer surgery were compared (Supplementary Table 1, http://links.lww.com/AOSO/A354). The respondents were to assume that they and the most important person for them were undergoing surgery and rank the factors according to the importance of each outcome, with total scores summed to 100 points. The abdominal photographs of consecutive patients who underwent laparoscopic surgery for colorectal cancer at Osaka University, Sapporo Medical University, and National Hospital Organization Osaka National Hospital were collected to evaluate the differences in the perception of body image and cosmesis between SLS and MLS. A total of 32 patients' photographs before and after surgery were used in this study (20 patients who underwent SLS and 12 patients who underwent MLS). Photographs of 1 patient before and after the surgery were grouped, and the pairs from SLS and MLS were randomly shown on the website (Fig. 1A–D). The perceptions of body image and cosmesis were assessed using a visual analog scale (0–10). The respondent was to assume the wound was theirs and answer previously reported questions with the following responses: "dissatisfied with appearance", "difficult to see self naked", "less physically attractive", and "body damage from surgery".[21] This study also added the following simple questions: "Does the wound worry you?" and "Which age group is suitable for SLS?" In addition, 3 questions compared SLS and MLS: "Which wound is good-looking?", "Which surgical procedure do you want to undergo?", and "Which surgical procedure do you want for the most important person for you to undergo?" All patients provided their written informed consent for the use of their abdominal photographs, and our study was approved by the institutional review board for studies in humans at Osaka University (approval number: 15238).

SURGICAL TECHNIQUES

Standard laparoscopic surgery for colorectal cancer at our institutions was performed as previously described.[13] For SLS, a vertical skin incision of 3 cm was made in the umbilicus. A multichannel access device was fitted into this incision, followed by the insertion of a 12-mm camera port and two 5-mm instrument ports. MLS was performed using 5 ports—including the first 12-mm trocar in the umbilicus as a camera port, another 12-mm trocar, and three 5-mm trocars. The incision of a camera port was enlarged so that the large intestine could be extracted. The length of the umbilical incision in MLS was almost equal to that in SLS, and intra-abdominal manipulations were the same in both SLS and MLS.

STATISTICAL ANALYSIS

Statistical analyses were performed using JMP Pro 16 software (SAS Institute, Cary, NC, USA). Statistically significant differences were evaluated using Student's *t* test and Spearman's rank correlation coefficient. Probabilities of less than 0.05 were considered significant.

TABLE 1.

Characteristics of Respondents

	Nonmedical (*n* = 990)	Medical (*n* = 362)	Total (*n* = 1352)
Sex			
Male	498 (50.3)	286 (79.0)	784 (58.0)
Female	492 (49.7)	76 (21.0)	568 (42.0)
Age (years)	50.0 ± 16.8*	42.6 ± 9.6*	48.0 ± 15.6*
Occupation			
Medical staff	0	362 (100)	362 (26.7)
Professional, administrative, clerical, service	331 (33.5)	0	331 (24.5)
Housewife, househusband	228 (23.0)	0	228 (16.9)
Retiree, unemployed	189 (19.1)	0	189 (14.0)
Part-time employment	104 (10.5)	0	104 (7.7)
Other	138 (13.9)	0	138 (10.2)
Highest level of education			
College	454 (45.9)	318 (87.9)	772 (57.1)
High school	315 (31.8)	4 (1.1)	319 (23.6)
Other	221 (22.3)	40 (11.0)	261 (19.3)
Abdominal surgical history			
+	233 (23.5)	46 (12.7)	279 (20.6)
–	757 (76.5)	316 (87.3)	1073 (79.4)

Data are shown as the number of patients (percentage) unless otherwise indicated.

*Mean ± Standard Deviation.

RESULTS

Characteristics of Respondents

This study included a total of 1352 respondents (990 nonmedical and 362 medical) (Table 1). For the nonmedical group, the same questionnaire survey was filled out twice and their characteristics were almost the same (data not shown). The most common occupation was professional, administrative, clerical, or service (n = 331), followed by housewife or househusband (n = 228) in the nonmedical group. In the medical group, 282 respondents (77.9%) were doctors, while the remaining respondents were primarily nurses.

IMPORTANCE OF EACH OUTCOME IN COLORECTAL CANCER SURGERY

The mean scores for the 5 items the respondents considered when they and the most important person for them were undergoing surgery, respectively, were 49.9 points and 53.7 points for curability (P < 0.001), 24.7 points and 23.8 points for safety (P = 0.203), 11.1 points and 10.0 points for pain (P = 0.004), 7.3 points and 6.2 points for length of hospital stay (P < 0.001), and 7.1 points and 6.2 points for cosmetic outcomes (P = 0.002) (Fig. 1E). When considering "If you undergo a surgery", the female group ranked cosmetic outcomes higher than the male group (7.7 points *vs* 6.7 points; P = 0.015), while the male group ranked cosmetic outcomes higher than the female group (6.6 points *vs* 5.8 points; P = 0.027) when considering "If the most important person for you undergo a surgery" (Fig. 1F *and* Fig. 2A,B). For both questions, the group aged >50 years had higher scores for curability, and lower scores for safety, pain, and cosmetic outcomes (Fig. 2C,D). The respondents whose occupation was not associated with medical care placed higher importance on pain, length of the hospital stay, and cosmetic outcomes compared with those whose occupation was associated with medical care (Fig. 2E,F). The respondents without an abdominal surgical history gave a higher score for cosmetic outcomes than those with an abdominal surgical history when considering "If you undergo a surgery" and "If the most important person for you undergoes a surgery" (7.4 points *vs* 6.1 points; P = 0.016 and 6.5 points *vs* 5.4 points; P = 0.018) (Supplementary Figure 1A,B, http://links.lww.com/AOSO/A352).

THE RELEVANCE OF THE RESPONDENT'S AGE ON THE IMPORTANCE OF EACH OUTCOME

The curability score positively correlated with the age of the respondents in both groups of "If you undergo a surgery" and "If the most important person for you undergoes a surgery" (r = 0.173, P < 0.001; r = 0.161, P < 0.001) (Fig. 3A1,A2). The age of respondents was negatively associated with the scores of safety (r = –0.109, P < 0.001; r = –0.106, P < 0.001), pain (r = –0.106, P < 0.001; r = –0.111, P < 0.001), and cosmetic outcomes (r = –0.181, P < 0.001; r = –0.136, P < 0.001) for both questions (Fig. 3B,C,E). There was no association between the age of respondents and the length of the hospital stay scores (Fig. 3D).

THE SUITABLE AGE GROUP FOR SLS

For the question "Which age group is suitable for single-site laparoscopic surgery?", the highest score was for 20–39-year-old females, followed by 40–49-year-old females, 20–39-year-old males, 50–59-year-old females, and 40–49-year-old males (Fig. 4A). The younger group tended to have higher scores for both males and females.

THE AWARENESS OF BODY IMAGE AND COSMESIS FOR SLS AND MLS

For Question 1: "Does the wound worry you if it is yours?", the mean score was lower for SLS than for MLS (2.6 points *vs* 6.4 points; P < 0.001), suggesting that the wound from SLS did not worry participants more than the wound from MLS (Fig. 4B). Each mean score was also lower for SLS compared with MLS for Question 2: "Are you less satisfied with your body if the wound is yours?", Question 3: "Is it difficult to look at yourself naked if the wound is yours?", Question 4: "Do you feel less attractive as a result of the operation if the wound is yours?", and Question 5: "Do you think the operation has damaged your body if the wound is yours?" (2.7 points *vs* 6.0 points; P < 0.001, 2.4 points *vs* 5.2 points; P < 0.001, 2.3 points *vs* 5.0 points; P < 0.001, and 2.7 points *vs* 6.2 points; P < 0.001, respectively) (Fig. 4C–F). The SLS wound was thought to be better-looking than the MLS wound, based on Question 6: Which wound is good-looking? (Supplementary Figure 2A, http://links.lww.com/AOSO/A353). In addition, SLS proved to be preferred based on Question 7: "Which surgical procedure do you want to undergo?" and

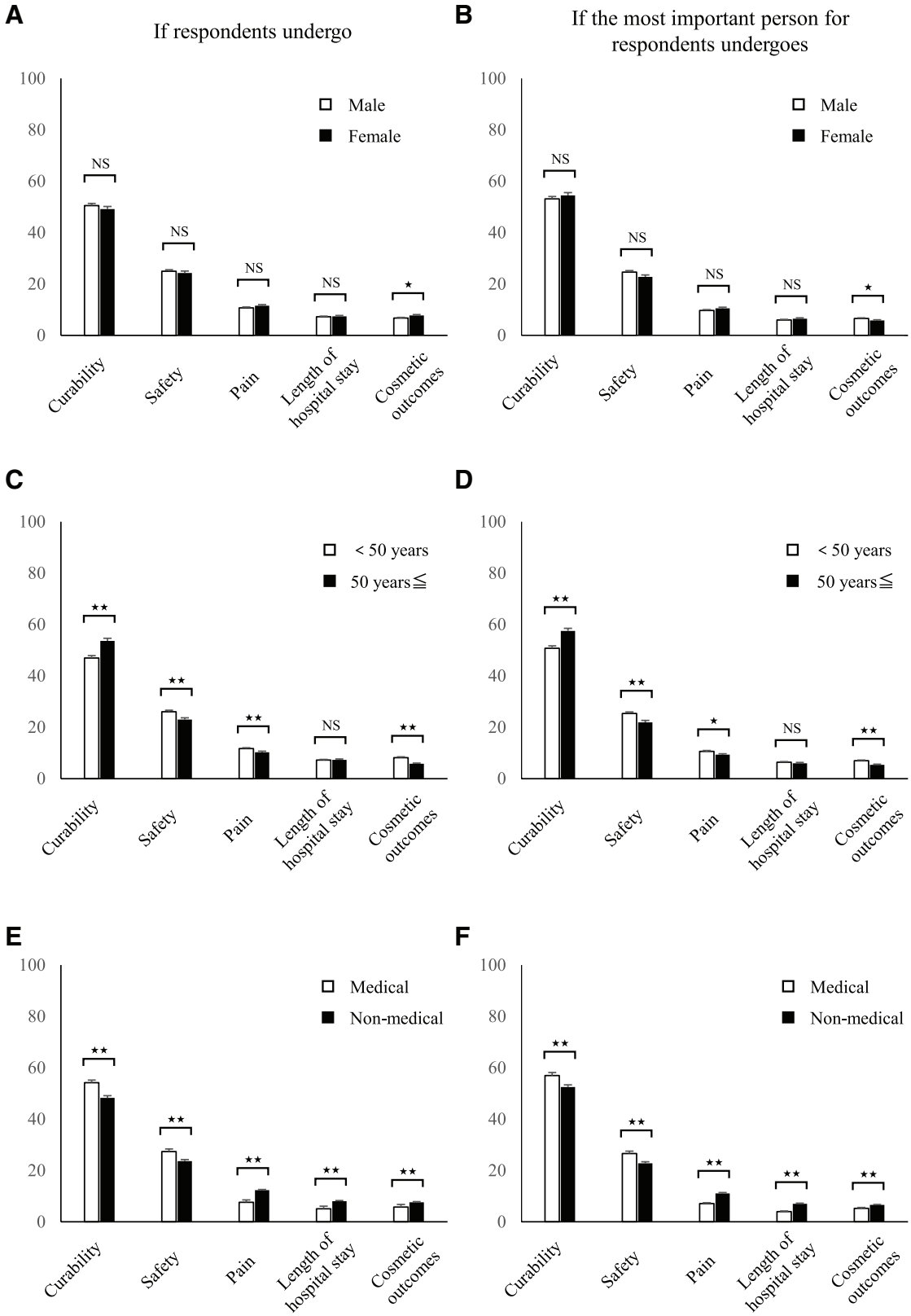

FIGURE 2. Importance of each outcome according to sex (A and B), the age of respondents (C and D), and their occupation (E and F). Respondents scored the importance of each outcome (sum = 100 points). Panels A, C, and E represent what factors are considered when respondents undergo surgery and B, D, and F represent what factors are considered when the most important person for respondents undergoes surgery. The difference was evaluated by the Student's *t* test. ⋆$P < 0.05$; ⋆⋆$P < 0.01$; NS, not significant.

Question 8: "Which surgical procedure do you want for the most important person for you to undergo?" (Supplementary Figure B,C, http://links.lww.com/AOSO/A353).

DISCUSSION

The present study targeted the general public, including non-medical and medical workers, and evaluated the importance of

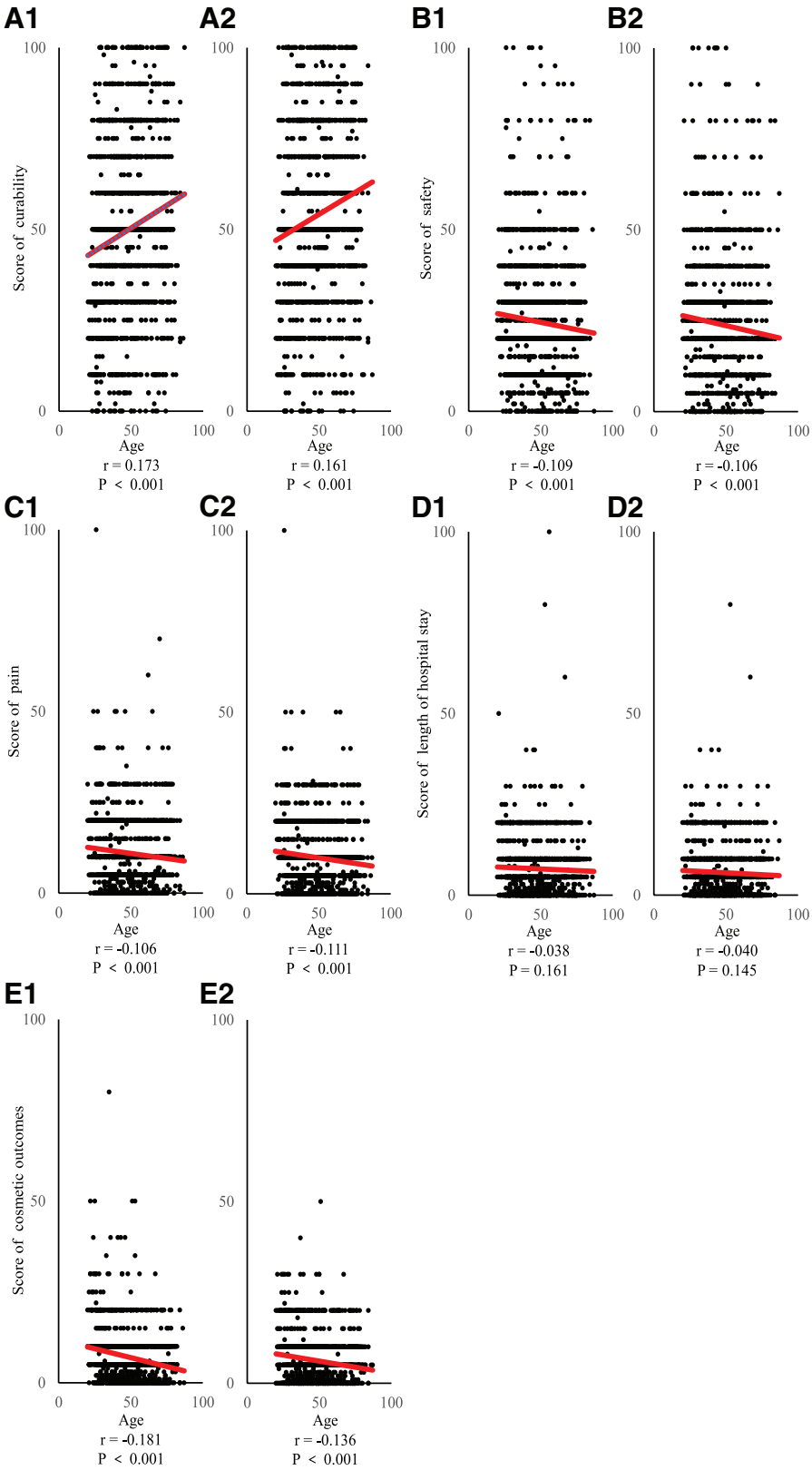

FIGURE 3. The relevance of the age of the respondents to the importance of curability (A1 and A2), safety (B1 and B2), pain (C1 and C2), length of hospital stay (D1 and D2), and cosmetic outcomes (E1 and E2). Panels (A1–E1) represent the scores for the outcomes when respondents undergo surgery and (A2–E2) represent the scores for the outcomes when the most important person for respondents undergoes surgery. The relation between age and the importance of each outcome was calculated using Spearman's rank correlation coefficient.

cosmetic outcomes in surgery for colorectal cancer. Curability had the highest score, followed by safety, and the scores for cosmetic outcomes were almost equal with those of the length of hospital stay and pain in the questionnaire to survey respondents for what factors were considered on the assumption that they undergo surgery and that the most important

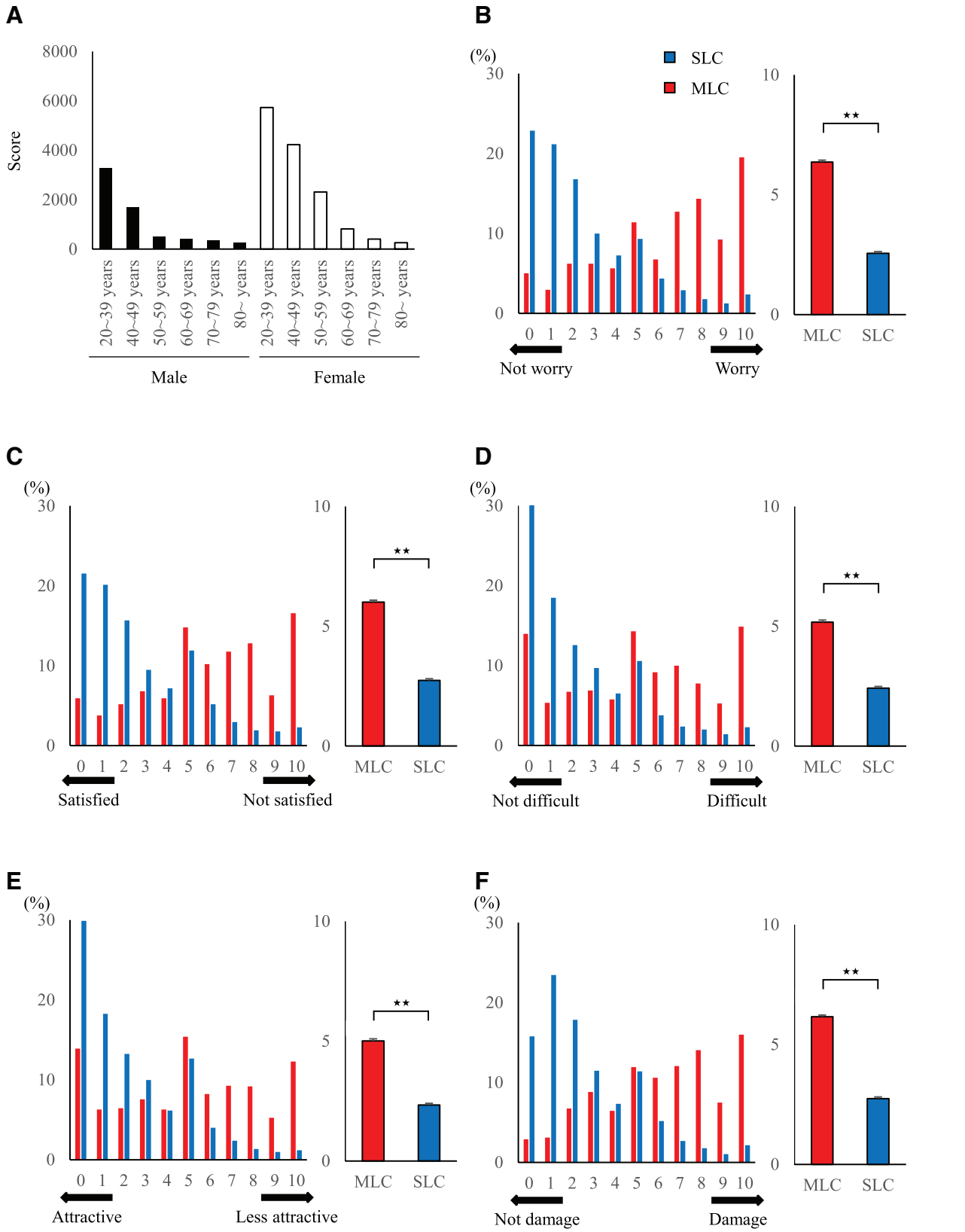

FIGURE 4. Questionnaire regarding perceptions of body image and cosmesis. (A) Result from the question "Which age group is suitable for single-site laparoscopic surgery?" We scored the sample as follows: most suitable scored 5, 2nd suitable scored 4, 3rd suitable scored 3, 4th suitable scored 2, and 5th suitable scored 1. The plotted numbers were obtained by summing these scores. (B) Question: Does the wound worry you if it is yours? (C) Question: Are you less satisfied with your body if the wound is yours? (D) Question: Is it difficult to look at yourself naked if the wound is yours? (E) Question: Do you feel less attractive as a result of the operation if the wound is yours? (F) Question: Do you think the operation has damaged your body if the wound is yours? A visual analog scale (0–10) was used for these questions. The right side figures show the mean ± SE of the scales. The difference was evaluated by the Student's *t* test. $^{**}P < 0.01$.

person for them undergoes. For all questions regarding body image and cosmesis, SLS had superior scores compared with MLS. These results indicated that curability and safety were most important in colorectal cancer surgery, although medical workers should consider cosmetic outcomes, even in malignant cases.

The factors that are important for patients undergoing surgery for a malignancy may be different from the important factors when undergoing surgery for a benign disease. Other characteristics, such as sex, age, race, and the region where participants live, may also affect what factors are important. Lee et al[22] conducted a questionnaire survey among healthy volunteers and reported that the most important factor for the treatment of benign gynecologic diseases was safety, followed by pain and cosmetic outcomes, and that age did not affect the ranking. Our results when evaluating the importance of each outcome in colorectal cancer surgery showed that curability had the highest importance when considering "If you undergo a surgery" and "If the most important person for you undergoes a surgery", followed by safety. Respondents who received a brief explanation of colorectal cancer, including the prognosis, placed the greatest importance on curability, which was reasonable due to the malignancy of the disease. Curability and safety must be considered in cancer surgery. On the other hand, the scores of cosmetic outcomes were almost equal to those of the length of hospital stay, which is associated with medical costs and pain, which is one of the main reasons for fearing surgery (Fig. 1E). This suggested that better cosmetic outcomes were expected, even in colorectal cancer surgery. Thus, cosmetic outcomes should be considered, along with pain and the length of the hospital stay.[23,24]

There is a possibility that medical workers' awareness of surgery is different from that of nonmedical workers. To verify this hypothesis, we compared the importance of each outcome in colorectal cancer surgery between medical and nonmedical workers. Notably, medical workers placed higher importance on curability and safety, while nonmedical workers placed higher importance on pain, the length of hospital stay, and cosmetic outcomes (Fig. 2E,F). This finding indicated that awareness of surgery differs between medical workers and nonmedical workers and that medical workers should pay attention to these 3 factors that affect the quality of life of patients undergoing colorectal cancer surgery.

To evaluate which population placed great significance on cosmetic outcomes, we analyzed each characteristic of the respondents. The female group ranked cosmetic outcomes higher than the male group when considering "If you undergo a surgery", and conversely, the male group ranked cosmetic outcomes higher than the female group when considering "If the most important person for you undergoes a surgery" (Fig. 1F and Fig. 2A,B). This may indicate a subconscious desire for cosmetic appearance in both men and women. In addition, we found that younger and nonmedical participants without an abdominal surgical history tended to place great importance on cosmetic outcomes (Fig. 2C–F and Supplementary Figure 1, http://links.lww.com/AOSO/A352). The data presented in Fig. 4A regarding the suitable age groups for SLS supported these results. Thus, it will be necessary to consider each patient's background when deciding which technique to use.

There are only a few reports evaluating body image and cosmetic outcomes when comparing the conventional MLS and SLS. Hamabe et al[21] investigated patients who underwent conventional multiport surgery (n = 102) and reduced port surgery (n = 166) for colorectal disease using a validated Body Image Questionnaire and Photo Series Questionnaire and reported that reduced port surgery, especially single port surgery, enhances patient satisfaction due to reduced operative trauma. Lurje et al[25] investigated patients who underwent conventional 4 port laparoscopic cholecystectomy (n = 48) and single port laparoscopic cholecystectomy (n = 48) for symptomatic gallbladder disease in double-blinded randomized controlled trials and reported better short- and long-term cosmetic and body images with single port laparoscopic cholecystectomy compared with conventional 4-port laparoscopic cholecystectomy. Both reports that targeted patients undergoing surgery indicated the superiority of SLS in regards to body image and cosmetic outcomes. Our study differs from these reports in that we investigated how the general public feels about surgery and surgical wounds. To the best of our knowledge, this is the first report that used a questionnaire survey to target a large sample of the general public and found SLS best reflects the outcomes society wants. A brief and unbiased explanation of colorectal cancer, including epidemiological statistics, prognosis, and surgical procedures, was shown before the questionnaire, considering that the general public does not have enough information about colorectal cancer. This was one limitation of our study and may have led to an inductive bias in the questions. Since this study is for the general public, it may not be completely generalizable to the preferences of patients actually facing the need for cancer surgery. The awareness of body image and cosmesis may be different depending on race, region, and socioeconomics. Although our sample was from one country, our multifaceted analyses suggest there is wide acceptance of SLS for colorectal cancer.

SLS can be difficult due to some technical problems, such as instrument crowding, in-line viewing, and inadequate counter traction. In a the Robotic Versus Laparoscopic Surgery for Middle and Low Rectal Cancer (REAL) trial, a randomized controlled trial for rectal cancer, robotic surgery resulted in better short-term outcomes, including oncological quality of resection, than conventional laparoscopic surgery.[26] The da Vinci SP system (Intuitive Surgical Inc., Sunnyvale, CA, USA), a surgical robot characterized by single-site surgery, has a potential for opening up new avenues for the development of SLS due to its some advantages, including a good field of vision, sufficient counter traction, and favorable ergonomics, that resulted from its articulating 3-arm compared with SLS using 2 straight forceps.[27]

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