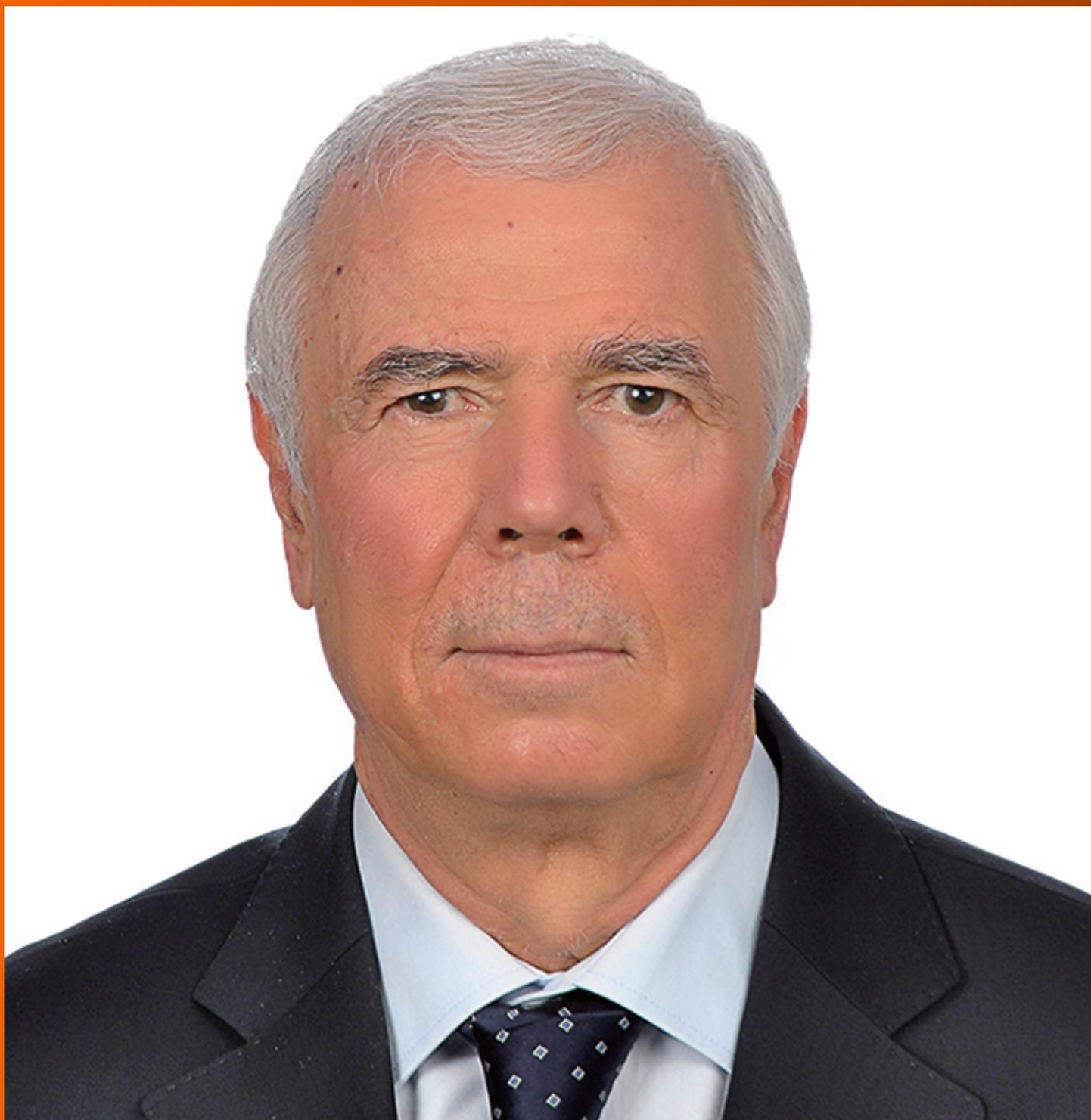


World Journal of *Gastrointestinal Surgery*

World J Gastrointest Surg 2021 November 27; 13(11): 1293-1522



REVIEW

- 1293 Acute appendicitis—advances and controversies
Teng TZJ, Thong XR, Lau KY, Balasubramaniam S, Shelat VG

MINIREVIEWS

- 1315 Application and progress of medical imaging in total mesopancreas excision for pancreatic head carcinoma
Feng P, Cheng B, Wang ZD, Liu JG, Fan W, Liu H, Qi CY, Pan JJ
- 1327 Retrorectal tumors: A challenge for the surgeons
Balci B, Yildiz A, Leventoğlu S, Mentis B
- 1338 Surgical ampullectomy: A comprehensive review
Scroggie DL, Mavroeidis VK
- 1351 Is surgery the best treatment for elderly gastric cancer patients?
Kawaguchi Y, Akaike H, Shoda K, Furuya S, Hosomura N, Amemiya H, Kawaida H, Kono H, Ichikawa D

ORIGINAL ARTICLE**Case Control Study**

- 1361 Nomogram for predicting chylous ascites after right colectomy
Zheng HD, Liu YR, Chen ZZ, Sun YF, Xu CH, Xu JH
- 1372 Comparison of safety, efficacy, and long-term follow-up between “one-step” and “step-up” approaches for infected pancreatic necrosis
Zheng Z, Lu JD, Ding YX, Guo YL, Mei WT, Qu YX, Cao F, Li F

Retrospective Study

- 1390 Risk of station 12a lymph node metastasis in patients with lower-third gastric cancer
Dong YP, Cai FL, Wu ZZ, Wang PL, Yang Y, Guo SW, Zhao ZZ, Zhao FC, Liang H, Deng JY
- 1405 Choice of operative method for pancreaticojejunostomy and a multivariable study of pancreatic leakage in pancreaticoduodenectomy
Liang H, Wu JG, Wang F, Chen BX, Zou ST, Wang C, Luo SW
- 1414 Laparoscopic vs open surgery in ileostomy reversal in Crohn’s disease: A retrospective study
Wan J, Yuan XQ, Wu TQ, Yang MQ, Wu XC, Gao RY, Yin L, Chen CQ

- 1423 Preoperative serum carbohydrate antigen 19-9 levels predict early recurrence after the resection of early-stage pancreatic ductal adenocarcinoma

Hong S, Song KB, Hwang DW, Lee JH, Lee W, Jun E, Kwon J, Park Y, Park SY, Kim N, Shin D, Kim H, Sung M, Ryu Y, Kim SC

- 1436 Patients with *Clostridium difficile* infection and prior appendectomy may be prone to worse outcomes

Shaikh DH, Patel H, Munshi R, Sun H, Meher Shahi S, Baiomi A, Alemam A, Pirzada U, Nawaz I, Naher K, Hanumanthu S, Nayudu S

Observational Study

- 1448 Novel roles of lipopolysaccharide and TLR4/NF- κ B signaling pathway in inflammatory response to liver injury in Budd-Chiari syndrome

Li J, Chen XM, Zhou CZ, Fang WW, Lv WF, Cheng DL

- 1463 Long-term survival of patients with stage II and III gastric cancer who underwent gastrectomy with inadequate nodal assessment

Desiderio J, Sagnotta A, Terrenato I, Garofoli E, Mosillo C, Trastulli S, Arteritano F, Tozzi F, D'Andrea V, Fong Y, Woo Y, Bracarda S, Parisi A

- 1484 Defecation disorders are crucial sequelae that impairs the quality of life of patients after conventional gastrectomy

Nakada K, Ikeda M, Takahashi M, Kinami S, Yoshida M, Uenosono Y, Terashima M, Oshio A, Kodera Y

SYSTEMATIC REVIEWS

- 1497 Is omentectomy necessary in the treatment of benign or malignant abdominal pathologies? A systematic review

Atay A, Dilek ON

SCIENTOMETRICS

- 1509 Global trends in research related to sleeve gastrectomy: A bibliometric and visualized study

Barqawi A, Abushamma FA, Akkawi M, Al-Jabi SW, Shahwan MJ, Jairoun AA, Zyoud SH

ABOUT COVER

Editorial Board Member of *World Journal of Gastrointestinal Surgery*, Ali Coskun, MD, Associate Professor, Doctor, Department of General Surgery, Izmir Bozyaka Training and Research Hospital, Izmir 35380, Turkey. dralicoskun3564@hotmail.com

AIMS AND SCOPE

The primary aim of *World Journal of Gastrointestinal Surgery* (*WJGS, World J Gastrointest Surg*) is to provide scholars and readers from various fields of gastrointestinal surgery with a platform to publish high-quality basic and clinical research articles and communicate their research findings online.

WJGS mainly publishes articles reporting research results and findings obtained in the field of gastrointestinal surgery and covering a wide range of topics including biliary tract surgical procedures, biliopancreatic diversion, colectomy, esophagectomy, esophagostomy, pancreas transplantation, and pancreatectomy, etc.

INDEXING/ABSTRACTING

The *WJGS* is now abstracted and indexed in Science Citation Index Expanded (SCIE, also known as SciSearch®), Current Contents/Clinical Medicine, Journal Citation Reports/Science Edition, PubMed, and PubMed Central. The 2021 edition of Journal Citation Reports® cites the 2020 impact factor (IF) for *WJGS* as 2.582; IF without journal self cites: 2.564; 5-year IF: 3.378; Journal Citation Indicator: 0.53; Ranking: 97 among 212 journals in surgery; Quartile category: Q2; Ranking: 73 among 92 journals in gastroenterology and hepatology; and Quartile category: Q4.

RESPONSIBLE EDITORS FOR THIS ISSUE

Production Editor: Rui-Rui Wu, Production Department Director: Xiang Li, Editorial Office Director: Ya-Juan Ma.

NAME OF JOURNAL

World Journal of Gastrointestinal Surgery

ISSN

ISSN 1948-9366 (online)

LAUNCH DATE

November 30, 2009

FREQUENCY

Monthly

EDITORS-IN-CHIEF

Shu-You Peng, Varut Lohsirawat, Jin Gu

EDITORIAL BOARD MEMBERS

<https://www.wjgnet.com/1948-9366/editorialboard.htm>

PUBLICATION DATE

November 27, 2021

COPYRIGHT

© 2021 Baishideng Publishing Group Inc

INSTRUCTIONS TO AUTHORS

<https://www.wjgnet.com/bpg/gerinfo/204>

GUIDELINES FOR ETHICS DOCUMENTS

<https://www.wjgnet.com/bpg/GerInfo/287>

GUIDELINES FOR NON-NATIVE SPEAKERS OF ENGLISH

<https://www.wjgnet.com/bpg/gerinfo/240>

PUBLICATION ETHICS

<https://www.wjgnet.com/bpg/GerInfo/288>

PUBLICATION MISCONDUCT

<https://www.wjgnet.com/bpg/gerinfo/208>

ARTICLE PROCESSING CHARGE

<https://www.wjgnet.com/bpg/gerinfo/242>

STEPS FOR SUBMITTING MANUSCRIPTS

<https://www.wjgnet.com/bpg/GerInfo/239>

ONLINE SUBMISSION

<https://www.f6publishing.com>

Is surgery the best treatment for elderly gastric cancer patients?

Yoshihiko Kawaguchi, Hidenori Akaike, Katsutoshi Shoda, Shinji Furuya, Naohiro Hosomura, Hidetake Amemiya, Hiromichi Kawaida, Hiroshi Kono, Daisuke Ichikawa

ORCID number: Yoshihiko

Kawaguchi 0000-0001-8788-9524; Hidenori Akaike 0000-0001-9713-7190; Katsutoshi Shoda 0000-0002-1011-5579; Shinji Furuya 0000-0002-6766-3779; Naohiro Hosomura 0000-0003-0483-3635; Hidetake Amemiya 0000-0002-4320-755X; Hiromichi Kawaida 0000-0003-3507-0167; Hiroshi Kono 0000-0001-6843-0814; Daisuke Ichikawa 0000-0003-0093-2206.

Author contributions: Kawaguchi Y performed the majority of the writing, prepared the table; Akaike H and Shoda K edited and revised the article for important intellectual content; and all authors critically reviewed and approved the final manuscript.

Conflict-of-interest statement:

There is no conflict of interest associated with any of the senior author or other coauthors contributed their efforts in this manuscript.

Country/Territory of origin: Japan

Specialty type: Gastroenterology and hepatology

Provenance and peer review:

Invited article; Externally peer reviewed.

Peer-review report's scientific quality classification

Grade A (Excellent): 0
Grade B (Very good): 0

Yoshihiko Kawaguchi, Hidenori Akaike, Katsutoshi Shoda, Shinji Furuya, Naohiro Hosomura, Hidetake Amemiya, Hiromichi Kawaida, Hiroshi Kono, Daisuke Ichikawa, First Department of Surgery, Faculty of Medicine, University of Yamanashi, Yamanashi 409-3898, Japan

Corresponding author: Yoshihiko Kawaguchi, MD, PhD, Doctor, First Department of Surgery, Faculty of Medicine, University of Yamanashi, 1110 Shimokato, chuou-shi, Yamanashi 409-3898, Japan. ykawa@yamanashi.ac.jp

Abstract

As the elderly population increases, the number of patients with gastric cancer has also been increasing. Elderly people have various preoperative problems such as malnutrition, high frequency of comorbidities, decreased performance status, and dementia. Furthermore, when surgery is performed, high postoperative complication rates and death from other diseases are also concerns. The goal of surgery in the elderly is that short-term outcomes are comparable to those in nonelderly, and long-term outcomes reach life expectancy. Perioperative problems in the elderly include: (1) Poor perioperative nutritional status; (2) Postoperative pneumonia; and (3) Psychological problems (dementia and postoperative delirium). Malnutrition in the elderly has been reported to be associated with increased postoperative complications and dementia, pointing out the importance of nutritional management. In addition, multidisciplinary team efforts, including perioperative respiratory rehabilitation, preoperative oral care, and early postoperative mobilization programs, are effective in preventing postoperative pneumonia. Furthermore, there are many reports on the usefulness of laparoscopic surgery for the elderly, and we considered that minimally invasive surgery would be the optimal treatment after assessing preoperative risk.

Key Words: Elderly; Gastric cancer; Surgery; Laparoscopy; Gastrectomy; Dementia

©The Author(s) 2021. Published by Baishideng Publishing Group Inc. All rights reserved.

Core Tip: The definition of elderly varies from 75 to 85 years of age and over. Therefore, we classified individuals into ages 75, 80, and 85 years and over. In addition, long-term functional performance in the elderly should consider not only prognosis but also life expectancy. Perioperative problems were discussed separately for preoperative, intraoperative, and postoperative procedures. Regarding surgery,

Grade C (Good): C
 Grade D (Fair): 0
 Grade E (Poor): 0

Open-Access: This article is an open-access article that was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution NonCommercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>

Received: June 26, 2021

Peer-review started: June 26, 2021

First decision: July 18, 2021

Revised: July 27, 2021

Accepted: August 25, 2021

Article in press: August 25, 2021

Published online: November 27, 2021

P-Reviewer: Yu L

S-Editor: Yan JP

L-Editor: A

P-Editor: Wu RR



based on the latest findings, we discussed surgical indications compared with best supportive care, laparoscopic surgery, total gastrectomy, and the extent of lymph node dissection.

Citation: Kawaguchi Y, Akaike H, Shoda K, Furuya S, Hosomura N, Amemiya H, Kawaida H, Kono H, Ichikawa D. Is surgery the best treatment for elderly gastric cancer patients? *World J Gastrointest Surg* 2021; 13(11): 1351-1360

URL: <https://www.wjgnet.com/1948-9366/full/v13/i11/1351.htm>

DOI: <https://dx.doi.org/10.4240/wjgs.v13.i11.1351>

INTRODUCTION

Although gastric cancer (GC) has declined over the past decades[1], it is still one of the most common cancers worldwide. It is the fifth leading cancer and the third leading cause of cancer-related death globally[2]. Surgery is the main treatment for GC, and chemotherapy and radiation therapy are adjuvants. Gastric carcinogenesis is a multifactor and multistep process characterized by a complex interplay between the host and environmental factors[3]. Although there are many reports of an association between *Helicobacter pylori* (*H. pylori*) infection and GC, recent reports show that *H. pylori* might be more a commensal and an opportunistic pathogen than a confirmed pathogen[4]. In addition, gut microbiota dysbiosis and chronic inflammation play a greater role in the initiation and progress of GC than in the presence of *H. pylori*[5]. GC due to *H. pylori* infection is recognized as noncardia GC, and a decrease in *H. pylori* infection contributes to a decrease in noncardia GC[6]. On the other hand, cardia GC caused by obesity and gastroesophageal reflux disease has increased[7].

Life expectancy has increased globally. According to the 2020 World Health Statistics released by the World Health Organization, Japan has the highest life expectancy, 84.2 years, followed by Switzerland, with a life expectancy of 83.3 years. Twenty-eight countries have an average life expectancy of over 80 years. Many European countries are ranked high, and Asia, Singapore, and South Korea, in addition to Japan, are also ranked high[8]. As a result, the prevalence of elderly patients with GC increases significantly as the population ages[9].

However, GC treatment in the elderly faces several challenges, such as increased underlying comorbidities[10], low organ function, low immune function, and decreased willingness for treatment. Other problems that arise when surgery is performed are high postoperative complication rates and death from other diseases[11]. In addition, weight loss after gastrectomy significantly worsens quality of life and adversely affects the long-term prognosis of elderly patients with GC[12]. Herein, we consider the problems encountered in GC treatment in the elderly.

OVERVIEW OF SURGICAL TREATMENTS IN ELDERLY PATIENTS WITH GC

Regarding the evaluation of surgical outcomes, short-term outcomes include postoperative complications and hospital mortality, whereas long-term outcomes include prognosis. The goal of surgical treatment in the elderly is short-term outcomes comparable to the nonelderly and long-term outcomes that reach life expectancy.

Many studies of surgery for elderly patients with GC have been reported. Preoperative characteristics of the elderly include decreased nutritional status, high frequency of comorbidities[13], and high frequency of dementia[14]. In general, the incidence of complications increases with age[10,13]. However, the definition of elderly varies from 75 to 85 years and over.

In studies divided by 75 and 80 years, some reports stated no difference in the postoperative complication rate even though the elderly had many comorbidities and a high American Society of Anesthesiologists (ASA) physical status[15-17]. However, several reports suggest that mortality due to surgical[13,18,19] and severe complications[10] was higher in the elderly (Table 1).

On the other hand, in a report defining the elderly as individuals aged 85 years and over, there was no difference in the complication rate related to surgery. Still, the incidence of pneumonia[20] and delirium[21] was high. However, there are limits to the interpretation of these results, such as the same ASA physical status and performance status in the control group and the elderly[20] and a low rate of total gastrectomy[22] (Table 1).

Several reports[10,13] have shown that the 5-year overall survival as a long-term outcome is lower with older age; however, cancer-related survival was not significantly different. This finding means that elderly individuals often die from other illnesses[23,24]. Some reports revealed that a low preoperative prognostic nutritional index (PNI) or sarcopenia[25] and multiple comorbidities[24] were significant risk factors for death from other diseases. Hashimoto *et al*[11]. revealed that the causes of death from other diseases in the elderly group were other malignancies (22%), pneumonia (18%), cardiovascular disease (10%), cerebrovascular disease (10%), and malnutrition (8%).

Two studies compared life expectancy and long-term outcomes. Life expectancy varies from country to country and should be considered individually for each country.

The first study is from Japan, in which postoperative life expectancy of late-elderly patients (≥ 80 years) was assessed by analyzing patient survival, except for cancer recurrence-related death. As a result, the median estimated life expectancy was equivalent to the life expectancy in the demographic data presented by the Japanese Ministry of Health, Labor, and Welfare[18].

The second study was from South Korea. The postoperative life expectancy of late-elderly patients (≥ 80 years) after eliminating death from recurrence was comparable to the corresponding aged general population after eliminating death from GC[10].

Treatment goals in these studies were achieved because survival from surgery was equivalent to life expectancy.

CRITICAL PROBLEMS IN THE PERIOPERATIVE CARE FOR ELDERLY PATIENTS

Nutritional status during the perioperative period

Elderly patients with GC are often poorly nourished. Therefore, the nutritional status before surgery in elderly patients is important for surgical risk assessment. Body mass index (BMI), the PNI, controlling nutritional status (CONUT), serum albumin, skeletal muscle mass, and the geriatric nutritional risk index (GNRI) have been reported as nutritional parameters. Among these, GNRI is reported as useful for predicting postoperative complications[26]. The CONUT score is reported as useful for predicting postoperative procedure-unrelated infectious morbidity and prognosis in elderly patients with GC[27].

Furthermore, malnutrition in the elderly is associated with weakness, sarcopenia, and frailty. Preoperative sarcopenia has been reported as a risk factor for severe postoperative complications in elderly patients undergoing gastrectomy[28]. Preoperative exercise and nutritional support programs have recently been actively attempted[29]. Nutritional support[30] and social and financial support are also needed in patients with muscle loss after gastrectomy[31].

Postoperative pneumonia

Postoperative pneumonia is one of the most frequent complications in the elderly and can be fatal[32]. The causes reported are swallowing dysfunction due to age-related anatomical and physiological changes, lower respiratory function, and poor immunocompetence[33].

Age and preoperative albumin levels, hypertension, male gender, D2 dissection[34, 35], impaired postoperative respiratory function, diabetes mellitus, and blood transfusion[36] have been reported as risk factors for pneumonia. Postoperative pneumonia is associated with reduced long-term survival[37,38]. Recent multidisciplinary team efforts, including perioperative respiratory rehabilitation, preoperative oral care, and early postoperative mobilization programs, have generally been reported effective in preventing postoperative pneumonia[33,39,40].

Psychological problems

Dementia is increasing due to the aging population. Malnutrition in the elderly has

been reported to be associated with dementia[41]. The degree of dementia varies from mild to severe, and it is necessary to consider the surgical indication. In addition, patients with GC after gastrectomy, especially after total gastrectomy, show an increased risk of Alzheimer's disease[42]. Therefore, those who received continual vitamin B12 supplementation after a total gastrectomy were less likely than controls to develop Alzheimer's.

Likewise, postoperative delirium is common in the elderly[38]. Shim *et al*[43] reported a significant decrease in delirium symptom severity (DSS) over three postoperative days. Age and anesthesia time were positively associated with the initial DSS level, and medication history for memory complaints was related to a slower recovery from delirium symptoms. While propofol as an anesthetic agent was associated with a lower initial DSS, it predicted slower recovery from DSS.

Risk factors for subsyndromal delirium have also been reported in the elderly and poorly educated[44]. Multivariate analysis revealed that male gender, age ≥ 75 years, a history of cerebrovascular disease, and frequent use of sleeping pills were independent predictive factors for postoperative delirium[45]. Therefore, artificial control of the sleep-wake cycle by drug therapy is effective for postoperative delirium[46].

TREATMENT-RELATED ASPECTS

Laparoscopic surgery

The use of laparoscopic gastrectomy (LG) has become widespread. It is a surgical option for GC that is minimally invasive. Some multicenter randomized clinical trials have demonstrated that LG can provide similar short- and long-term results to open surgery patients with GC[47,48]. However, the age criteria of these clinical trials were 80 years or younger; therefore, the safety and feasibility of laparoscopic procedures were not fully evaluated in elderly patients.

Several studies of laparoscopic surgery for the elderly over 80 years of age have reported no difference in postoperative complications in the elderly despite a high prevalence of cardiovascular disease, decreased respiratory function[49], and a higher ASA physical score and PS[50,51].

Yoshida *et al*[52] compared the elderly to the nonelderly, and there were significant differences between the two groups in preoperative respiratory and renal function, hemoglobin, and nutritional indicators. However, the only significant differences in postoperative complications were pneumonia and delirium. There were no significant differences in surgery-related complications. On the other hand, some reports have demonstrated the advantages of LG rather than open gastrectomy (OG).

Using propensity score matching analysis, the incidence of postoperative complications grade ≥ 2 in the OG subgroup was significantly higher than in the LG subgroup [53]. Another large-scale propensity score analysis also demonstrated that LG might reduce in-hospital mortality and reduce the incidence of postoperative complications in patients with an ASA ≥ 3 [54].

In a nationwide Japanese prospective cohort study, postoperative complications and mortality were significantly higher in OG than in LG. In addition, LG shortened the length of postoperative hospital stay[55].

Adjuvant chemotherapy

The usefulness of adjuvant chemotherapy for Stage II and III GC has been reported in Japan[56-58] and South Korea[59], and it has become a standard treatment. However, since most of the clinical trials in Japan are conducted in patients aged 80 years or younger, the usefulness of adjuvant chemotherapy cannot be directly applied to elderly adults aged 80 years or older. Therefore, in Japan, a phase III study is currently underway to define the prognosis of adjuvant chemotherapy for stage II/III patients aged 80 years or older who have undergone gastrectomy[60]. On the other hand, in South Korea, surgery alone and adjuvant chemotherapy were examined in elderly patients with GC aged 75 years or older. There was no significant difference in the overall 5-year survival rate between the two groups[61].

Elderly adults have reduced physical fitness and organ function, especially renal function; therefore, it is necessary to consider the individual patient's condition before adding adjuvant chemotherapy[62].

Table 1 Short- and long-term outcomes of surgical treatments in elderly patients with gastric cancer

Variables	Gretschel <i>et al</i> [13]	Park <i>et al</i> [15]	Otowa <i>et al</i> [16]	Sakurai <i>et al</i> [17]	Takeshita <i>et al</i> [18]	Katai <i>et al</i> [19]	Yang <i>et al</i> [10]	Yamada <i>et al</i> [20]	Hikage <i>et al</i> [21]	Isobe <i>et al</i> [22]
Definition of elderly (yr)	> 75	≥ 80	≥ 80	≥ 80	≥ 80	≥ 80	≥ 80	≥ 85	≥ 85	≥ 85
No. of elderly people	48	291	39	95	104	112	68	24	55	56
BMI	ND	E < N-E	E = N-E	ND	ND	ND	ND	E = N-E	E = N-E	ND
Comorbidities	E > N-E ^a	E > N-E ^a	E > N-E	E > N-E ^a	ND	E > N-E ^a	ND	E = N-E	E = N-E	E = N-E
PS	ND	ND	ND	ND	ND	ND	ND	E = N-E	E > N-E ^a	ND
ASA physical status	E > N-E ^a	E > N-E ^a	E > N-E ^a	E > N-E ^a	ND	ND	E > N-E ^a	E = N-E	E > N-E ^a	ND
cStage	ND	E > N-E ^a	ND	ND	E > N-E ^a	E = N-E	E > N-E ^a	E = N-E	E = N-E	E = N-E
Rate of TG in surgery	E < N-E ^a	ND	E = N-E	E = N-E	E = N-E	E = N-E	E = N-E	E = N-E	E = N-E	E < N-E ^a
Percentage of TG in surgery	46	ND	35.9	29.5	24	32	20.6	37.5	23.6	8.9
Complication rate	E = N-E	ND	E = N-E	E = N-E	E = N-E	E = N-E	E > N-E ^a	E = N-E	E = N-E	E < N-E ^a
Respiratory complication	E = N-E	ND	E = N-E	E = N-E	E = N-E	E > N-E ^a	E = N-E	E > N-E ^a	E = N-E	E = N-E
Delirium rate	ND	ND	ND	ND	ND	ND	ND	ND	E > N-E ^a	E = N-E
Mortality rate	E > N-E ^a	ND	ND	E = N-E	E > N-E	E > N-E	E > N-E ^a	ND	E = N-E	E = N-E
Adjuvant chemotherapy	ND	ND	E < N-E ^a	E < N-E ^a	ND	ND	E < N-E ^a	ND	E < N-E ^a	ND
Overall survival rate	E < N-E ^a	E < N-E ^a ₁	E < N-E(stage II) ^a	E < N-E(stage II, I II) ^a	E < N-E ^a	E < N-E ^a	E < N-E ^a	ND	E < N-E ^a	E = N-E
Disease-specific mortality	E = N-E	E < N-E ^a ₁	E < N-E(stage II)	E < N-E(stage II, I II) ^a	E = N-E	E = N-E	E = N-E	ND	E = N-E	E = N-E

¹Curative treated patient.

^a*P* < 0.05. BMI: Body mass index; E: Elderly; N-E: Nonelderly; ND: Not described; PS: Performance status; ASA: American Society of Anesthesiologists; TG: Total gastrectomy.

OPTIMAL SURGICAL TREATMENT FOR ELDERLY GC

Male gender, low BMI, poor PS, low serum albumin levels, and advanced tumor stage were reported as predictors of overall survival[20]. In a report comparing supportive care and surgery in patients aged 85 and older, distal gastrectomy resulted in significantly better long-term survival in women, but not in men[63]. In addition, it has been reported that surgery contributes to a better prognosis than supportive care for patients with early or low-risk GC[64]. In clinical practice, in elderly patients with GC, it is very important to correctly evaluate the patients' organ reserve functions and mental status to select and provide appropriate treatment options to each patient according to these assessments. Also, the indications for surgery of elderly patients over 85 years of age should be carefully considered based on the prognosis.

Extent of gastrectomy

We have reported that total gastrectomy is a risk factor for postoperative pneumonia [37]. However, in this study, the rate of laparotomy was relatively high. Abdominal breathing could be impaired due to incision pain and impairment of the abdominal rectus muscle in laparotomy cases, which might increase pulmonary complications.

On the other hand, in recent years, several studies[53,65,66] of laparoscopic total gastrectomy (LTG) in patients with GC have reported favorable short- and long-term outcomes compared with open surgery. However, LTG is more difficult due to technology than laparoscopic distal gastrectomy, reconstruction is complicated, and it

has been reported that the complication rate is high in the real world[67]. It has been reported that LTG does not increase complications even in the elderly[68]; however, LTG has been reported to have anastomotic leakage[69] and complications[70]. Only well-trained laparoscopic teams should perform LTG. Recent reports have shown that laparoscopic subtotal gastrectomy[71], which leaves a very small residual stomach, has better short-term outcomes and nutritional status than LTG and laparoscopic proximal gastrectomy, suggesting that it may be possible in elderly adults[72].

The extent of lymph node dissection

Standard treatment strategies for Japanese patients with GC, especially the extent of lymph node dissection, have been established in the Japanese Gastric Cancer Treatment Guidelines[73]. However, these guidelines are not standardized for elderly patients with GC, and standard treatments can be highly invasive.

Several studies have reported the extent of reduced dissection in the elderly, and no difference was found between the incidence of complications and prognosis[17] or disease-specific mortality[18] after 80 years of age.

In studies on elderly patients who are over 85 years of age, there was no association between limited lymph node dissection and comorbidities, except for cerebrovascular events. Gastrectomy with radical lymph node dissection appears to be an effective treatment for patients with Stage II GC[74]. On the other hand, D2 dissection has been reported as a risk factor for postoperative pneumonia[34,35]. Studies using the Charson complications score reported a high incidence of postoperative complications and no significant improvement in overall survival[75]. From these studies, the extent of dissection is still controversial.

Preoperative prediction of various complications

Preoperative risk predictions for developing complications have been reported, with male gender, combined resection[76], preoperative albumin, PNI, and Hiroshima POSSUM[77] being risk factors.

Japan has a nationwide database called the National Clinical Database, which can calculate risks, such as postoperative 30-d mortality, surgery-related mortality, suture failure rate, and the pneumonia rate[78,79]. Reliable predictive models must be useful in treatment strategy decision-making in elderly patients with GC.

CONCLUSION

There are specific problems in the elderly, such as preoperative malnutrition, dementia, postoperative pneumonia, and delirium. However, in recent years, it has been shown that the minimal invasiveness of laparoscopic surgery is as useful or better than open surgery. Pre- and postoperative nutritional support are also important. It is necessary to use these and some risk predictions regarding surgical indications.

REFERENCES

- 1 **Zhu AL**, Sonnenberg A. Is gastric cancer again rising? *J Clin Gastroenterol* 2012; **46**: 804-806 [PMID: 22914346 DOI: 10.1097/MCG.0b013e3182604254]
- 2 **Bray F**, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin* 2018; **68**: 394-424 [PMID: 30207593 DOI: 10.3322/caac.21609]
- 3 **Petryszyn P**, Chapelle N, Matysiak-Budnik T. Gastric Cancer: Where Are We Heading? *Dig Dis* 2020; **38**: 280-285 [PMID: 32062657 DOI: 10.1159/000506509]
- 4 **Reshetnyak VI**, Burmistrov AI, Maev IV. *Helicobacter pylori*: Commensal, symbiont or pathogen? *World J Gastroenterol* 2021; **27**: 545-560 [PMID: 33642828 DOI: 10.3748/wjg.v27.i7.545]
- 5 **Li J**, Perez-Perez GI. *Helicobacter pylori* the Latent Human Pathogen or an Ancestral Commensal Organism. *Front Microbiol* 2018; **9**: 609 [PMID: 29666614 DOI: 10.3389/fmicb.2018.00609]
- 6 **Venerito M**, Vasapolli R, Rokkas T, Malfertheiner P. Gastric cancer: epidemiology, prevention, and therapy. *Helicobacter* 2018; **23** Suppl 1: e12518 [PMID: 30203589 DOI: 10.1111/hel.12518]
- 7 **Powell J**, McConkey CC. Increasing incidence of adenocarcinoma of the gastric cardia and adjacent sites. *Br J Cancer* 1990; **62**: 440-443 [PMID: 2206952 DOI: 10.1038/bjc.1990.314]
- 8 **World Health Organization**. Life expectancy and Healthy life expectancy. [cited 20 May 2021]. Available from: <https://apps.who.int/gho/data/node.main.688>
- 9 **Saito H**, Osaki T, Murakami D, Sakamoto T, Kanaji S, Tatebe S, Tsujitani S, Ikeguchi M. Effect of

- age on prognosis in patients with gastric cancer. *ANZ J Surg* 2006; **76**: 458-461 [PMID: 16768768 DOI: 10.1111/j.1445-2197.2006.03756.x]
- 10 **Yang JY**, Lee HJ, Kim TH, Huh YJ, Son YG, Park JH, Ahn HS, Suh YS, Kong SH, Yang HK. Short- and Long-Term Outcomes After Gastrectomy in Elderly Gastric Cancer Patients. *Ann Surg Oncol* 2017; **24**: 469-477 [PMID: 27489057 DOI: 10.1245/s10434-016-5482-y]
 - 11 **Hashimoto T**, Kurokawa Y, Mikami J, Takahashi T, Miyazaki Y, Tanaka K, Makino T, Yamasaki M, Motoori M, Kimura Y, Nakajima K, Mori M, Doki Y. Postoperative Long-Term Outcomes in Elderly Patients with Gastric Cancer and Risk Factors for Death from Other Diseases. *World J Surg* 2019; **43**: 2885-2893 [PMID: 31388706 DOI: 10.1007/s00268-019-05109-5]
 - 12 **Kong H**, Kwon OK, Yu W. Changes of quality of life after gastric cancer surgery. *J Gastric Cancer* 2012; **12**: 194-200 [PMID: 23094232 DOI: 10.5230/jgc.2012.12.3.194]
 - 13 **Gretschel S**, Estevez-Schwarz L, Hünerbein M, Schneider U, Schlag PM. Gastric cancer surgery in elderly patients. *World J Surg* 2006; **30**: 1468-1474 [PMID: 16850149 DOI: 10.1007/s00268-005-0633-5]
 - 14 **Hall CB**, Verghese J, Sliwinski M, Chen Z, Katz M, Derby C, Lipton RB. Dementia incidence may increase more slowly after age 90: results from the Bronx Aging Study. *Neurology* 2005; **65**: 882-886 [PMID: 16186528 DOI: 10.1212/01.wnl.0000176053.98907.3f]
 - 15 **Park HJ**, Ahn JY, Jung HY, Lee JH, Jung KW, Kim DH, Choi KD, Song HJ, Lee GH, Kim JH, Han S. Clinical Characteristics and Outcomes of Gastric Cancer Patients Aged over 80 Years: A Retrospective Case-Control Study. *PLoS One* 2016; **11**: e0167615 [PMID: 27942044 DOI: 10.1371/journal.pone.0167615]
 - 16 **Otowa Y**, Okamoto S, Fujinaka R, Arai K, Murata K, Mii Y, Kakinoki K, Oka S, Kuroda D. Feasibility and Effectiveness of Gastrectomy for Elderly Gastric Cancer Patients. *In Vivo* 2019; **33**: 1307-1311 [PMID: 31280223 DOI: 10.21873/invivo.11604]
 - 17 **Sakurai K**, Muguruma K, Nagahara H, Kimura K, Toyokawa T, Amano R, Kubo N, Tanaka H, Ohtani H, Yashiro M, Maeda K, Ohira M, Hirakawa K. The outcome of surgical treatment for elderly patients with gastric carcinoma. *J Surg Oncol* 2015; **111**: 848-854 [PMID: 25753213 DOI: 10.1002/jso.23896]
 - 18 **Takeshita H**, Ichikawa D, Komatsu S, Kubota T, Okamoto K, Shiozaki A, Fujiwara H, Otsuji E. Surgical outcomes of gastrectomy for elderly patients with gastric cancer. *World J Surg* 2013; **37**: 2891-2898 [PMID: 24081528 DOI: 10.1007/s00268-013-2210-7]
 - 19 **Katai H**, Sasako M, Sano T, Maruyama K. The outcome of surgical treatment for gastric carcinoma in the elderly. *Jpn J Clin Oncol* 1998; **28**: 112-115 [PMID: 9544826 DOI: 10.1093/jjco/28.2.112]
 - 20 **Yamada H**, Shinohara T, Takeshita M, Umesaki T, Fujimori Y, Yamagishi K. Postoperative complications in the oldest old gastric cancer patients. *Int J Surg* 2013; **11**: 467-471 [PMID: 23602896 DOI: 10.1016/j.ijso.2013.04.005]
 - 21 **Hikage M**, Tokunaga M, Makuuchi R, Irino T, Tanizawa Y, Bando E, Kawamura T, Terashima M. Surgical outcomes after gastrectomy in very elderly patients with gastric cancer. *Surg Today* 2018; **48**: 773-782 [PMID: 29536199 DOI: 10.1007/s00595-018-1651-x]
 - 22 **Isobe T**, Hashimoto K, Kizaki J, Miyagi M, Aoyagi K, Koufujii K, Shirouzu K. Surgical procedures, complications, and prognosis for gastric cancer in the very elderly (>85): a retrospective study. *Kurume Med J* 2012; **59**: 61-70 [PMID: 23823016 DOI: 10.2739/kurumemedj.59.61]
 - 23 **Nunobe S**, Oda I, Ishikawa T, Akazawa K, Katai H, Isobe Y, Miyashiro I, Tsujitani S, Ono H, Tanabe S, Fukagawa T, Suzuki S, Kakeji Y; Registration Committee of the Japanese Gastric Cancer. Surgical outcomes of elderly patients with Stage I gastric cancer from the nationwide registry of the Japanese Gastric Cancer Association. *Gastric Cancer* 2020; **23**: 328-338 [PMID: 31451990 DOI: 10.1007/s10120-019-01000-3]
 - 24 **Kunisaki C**, Akiyama H, Nomura M, Matsuda G, Otsuka Y, Ono HA, Shimada H. Comparison of surgical outcomes of gastric cancer in elderly and middle-aged patients. *Am J Surg* 2006; **191**: 216-224 [PMID: 16442949 DOI: 10.1016/j.amjsurg.2005.09.001]
 - 25 **Kuwada K**, Kuroda S, Kikuchi S, Yoshida R, Nishizaki M, Kagawa S, Fujiwara T. Sarcopenia and Comorbidity in Gastric Cancer Surgery as a Useful Combined Factor to Predict Eventual Death from Other Causes. *Ann Surg Oncol* 2018; **25**: 1160-1166 [PMID: 29404820 DOI: 10.1245/s10434-018-6354-4]
 - 26 **Kushiya S**, Sakurai K, Kubo N, Tamamori Y, Nishii T, Tachimori A, Inoue T, Maeda K. The Preoperative Geriatric Nutritional Risk Index Predicts Postoperative Complications in Elderly Patients with Gastric Cancer Undergoing Gastrectomy. *In Vivo* 2018; **32**: 1667-1672 [PMID: 30348732 DOI: 10.21873/invivo.11430]
 - 27 **Suzuki S**, Kanaji S, Yamamoto M, Oshikiri T, Nakamura T, Kakeji Y. Controlling Nutritional Status (CONUT) Score Predicts Outcomes of Curative Resection for Gastric Cancer in the Elderly. *World J Surg* 2019; **43**: 1076-1084 [PMID: 30569221 DOI: 10.1007/s00268-018-04889-6]
 - 28 **Fukuda Y**, Yamamoto K, Hirao M, Nishikawa K, Nagatsuma Y, Nakayama T, Tanikawa S, Maeda S, Uemura M, Miyake M, Hama N, Miyamoto A, Ikeda M, Nakamori S, Sekimoto M, Fujitani K, Tsujinaka T. Sarcopenia is associated with severe postoperative complications in elderly gastric cancer patients undergoing gastrectomy. *Gastric Cancer* 2016; **19**: 986-993 [PMID: 26407875 DOI: 10.1007/s10120-015-0546-4]
 - 29 **Yamamoto K**, Nagatsuma Y, Fukuda Y, Hirao M, Nishikawa K, Miyamoto A, Ikeda M, Nakamori S, Sekimoto M, Fujitani K, Tsujinaka T. Effectiveness of a preoperative exercise and nutritional support program for elderly sarcopenic patients with gastric cancer. *Gastric Cancer* 2017; **20**: 913-918

- [PMID: 28032232 DOI: 10.1007/s10120-016-0683-4]
- 30 **Takahashi S**, Shimizu S, Nagai S, Watanabe H, Nishitani Y, Kurisu Y. Characteristics of sarcopenia after distal gastrectomy in elderly patients. *PLoS One* 2019; **14**: e0222412 [PMID: 31509590 DOI: 10.1371/journal.pone.0222412]
 - 31 **Besora-Moreno M**, Llauro E, Tarro L, Solà R. Social and Economic Factors and Malnutrition or the Risk of Malnutrition in the Elderly: A Systematic Review and Meta-Analysis of Observational Studies. *Nutrients* 2020; **12** [PMID: 32168827 DOI: 10.3390/nu12030737]
 - 32 **Shibata C**, Ogawa H, Nakano T, Koyama K, Yamamoto K, Nagao M, Takeyama D, Takami K, Yasumoto A, Sase T, Kimura SI, Sawada K, Katayose Y. Influence of age on postoperative complications especially pneumonia after gastrectomy for gastric cancer. *BMC Surg* 2019; **19**: 106 [PMID: 31395044 DOI: 10.1186/s12893-019-0573-x]
 - 33 **Miki Y**, Makuuchi R, Honda S, Tokunaga M, Tanizawa Y, Bando E, Kawamura T, Yurikusa T, Tanuma A, Terashima M. Prospective phase II study evaluating the efficacy of swallow ability screening tests and pneumonia prevention using a team approach for elderly patients with gastric cancer. *Gastric Cancer* 2018; **21**: 353-359 [PMID: 28612219 DOI: 10.1007/s10120-017-0736-3]
 - 34 **Kimura R**, Moriyama T, Ohuchida K, Shindo K, Nagai S, Ohtsuka T, Nakamura M. Risk factors for postoperative pneumonia after laparoscopic gastrectomy in patients aged 75 years and over with gastric cancer. *Asian J Endosc Surg* 2021; **14**: 408-416 [PMID: 33145998 DOI: 10.1111/ases.12883]
 - 35 **Suzuki S**, Kanaji S, Matsuda Y, Yamamoto M, Hasegawa H, Yamashita K, Oshikiri T, Matsuda T, Sumi Y, Nakamura T, Kakeji Y. Long-term impact of postoperative pneumonia after curative gastrectomy for elderly gastric cancer patients. *Ann Gastroenterol Surg* 2018; **2**: 72-78 [PMID: 29863154 DOI: 10.1002/ags3.12037]
 - 36 **Miki Y**, Makuuchi R, Tokunaga M, Tanizawa Y, Bando E, Kawamura T, Terashima M. Risk factors for postoperative pneumonia after gastrectomy for gastric cancer. *Surg Today* 2016; **46**: 552-556 [PMID: 26077287 DOI: 10.1007/s00595-015-1201-8]
 - 37 **Kiuchi J**, Komatsu S, Ichikawa D, Kosuga T, Okamoto K, Konishi H, Shiozaki A, Fujiwara H, Yasuda T, Otsuji E. Putative risk factors for postoperative pneumonia which affects poor prognosis in patients with gastric cancer. *Int J Clin Oncol* 2016; **21**: 920-926 [PMID: 27173949 DOI: 10.1007/s10147-016-0987-8]
 - 38 **Takeuchi D**, Koide N, Suzuki A, Ishizone S, Shimizu F, Tsuchiya T, Kumeda S, Miyagawa S. Postoperative complications in elderly patients with gastric cancer. *J Surg Res* 2015; **198**: 317-326 [PMID: 26033612 DOI: 10.1016/j.jss.2015.03.095]
 - 39 **Cassidy MR**, Rosenkranz P, McCabe K, Rosen JE, McAneny D. I COUGH: reducing postoperative pulmonary complications with a multidisciplinary patient care program. *JAMA Surg* 2013; **148**: 740-745 [PMID: 23740240 DOI: 10.1001/jamasurg.2013.358]
 - 40 **Wren SM**, Martin M, Yoon JK, Bech F. Postoperative pneumonia-prevention program for the inpatient surgical ward. *J Am Coll Surg* 2010; **210**: 491-495 [PMID: 20347742 DOI: 10.1016/j.jamcollsurg.2010.01.009]
 - 41 **Kimura A**, Sugimoto T, Kitamori K, Saji N, Niida S, Toba K, Sakurai T. Malnutrition is Associated with Behavioral and Psychiatric Symptoms of Dementia in Older Women with Mild Cognitive Impairment and Early-Stage Alzheimer's Disease. *Nutrients* 2019; **11** [PMID: 31434232 DOI: 10.3390/nu11081951]
 - 42 **Choi YJ**, Shin DW, Jang W, Lee DH, Jeong SM, Park S, Han KD, Park YG. Risk of Dementia in Gastric Cancer Survivors Who Underwent Gastrectomy: A Nationwide Study in Korea. *Ann Surg Oncol* 2019; **26**: 4229-4237 [PMID: 31605346 DOI: 10.1245/s10434-019-07913-8]
 - 43 **Shim EJ**, Noh HL, Lee KM, Hwang H, Son KL, Jung D, Kim WH, Kong SH, Suh YS, Lee HJ, Yang HK, Hahm BJ. Trajectory of severity of postoperative delirium symptoms and its prospective association with cognitive function in patients with gastric cancer: results from a prospective observational study. *Support Care Cancer* 2019; **27**: 2999-3006 [PMID: 30607674 DOI: 10.1007/s00520-018-4604-4]
 - 44 **Hwang H**, Lee KM, Son KL, Jung D, Kim WH, Lee JY, Kong SH, Suh YS, Lee HJ, Yang HK, Hahm BJ. Incidence and risk factors of subsyndromal delirium after curative resection of gastric cancer. *BMC Cancer* 2018; **18**: 765 [PMID: 30053850 DOI: 10.1186/s12885-018-4681-2]
 - 45 **Honda S**, Furukawa K, Nishiwaki N, Fujiya K, Omori H, Kaji S, Makuuchi R, Irino T, Tanizawa Y, Bando E, Kawamura T, Terashima M. Risk Factors for Postoperative Delirium After Gastrectomy in Gastric Cancer Patients. *World J Surg* 2018; **42**: 3669-3675 [PMID: 29850948 DOI: 10.1007/s00268-018-4682-y]
 - 46 **Aizawa K**, Kanai T, Saikawa Y, Takabayashi T, Kawano Y, Miyazawa N, Yamamoto T. A novel approach to the prevention of postoperative delirium in the elderly after gastrointestinal surgery. *Surg Today* 2002; **32**: 310-314 [PMID: 12027195 DOI: 10.1007/s005950200044]
 - 47 **Katai H**, Mizusawa J, Katayama H, Morita S, Yamada T, Bando E, Ito S, Takagi M, Takagane A, Teshima S, Koeda K, Nunobe S, Yoshikawa T, Terashima M, Sasako M. Survival outcomes after laparoscopy-assisted distal gastrectomy versus open distal gastrectomy with nodal dissection for clinical stage IA or IB gastric cancer (JCOG0912): a multicentre, non-inferiority, phase 3 randomised controlled trial. *Lancet Gastroenterol Hepatol* 2020; **5**: 142-151 [PMID: 31757656 DOI: 10.1016/S2468-1253(19)30332-2]
 - 48 **Kim HH**, Han SU, Kim MC, Kim W, Lee HJ, Ryu SW, Cho GS, Kim CY, Yang HK, Park DJ, Song KY, Lee SI, Ryu SY, Lee JH, Hyung WJ; Korean Laparoendoscopic Gastrointestinal Surgery Study (KLASS) Group. Effect of Laparoscopic Distal Gastrectomy vs Open Distal Gastrectomy on Long-

- term Survival Among Patients With Stage I Gastric Cancer: The KLASS-01 Randomized Clinical Trial. *JAMA Oncol* 2019; **5**: 506-513 [PMID: 30730546 DOI: 10.1001/jamaoncol.2018.6727]
- 49 **Yamada H**, Kojima K, Inokuchi M, Kawano T, Sugihara K. Laparoscopy-assisted gastrectomy in patients older than 80. *J Surg Res* 2010; **161**: 259-263 [PMID: 19540522 DOI: 10.1016/j.jss.2009.01.032]
- 50 **Mikami R**, Tanaka E, Murakami T, Ishida S, Matsui Y, Horita K, Yamada M, Nitta T, Mise M, Harada T, Takeo M, Arai S. The safety and feasibility of laparoscopic gastrectomy for gastric cancer in very elderly patients: short-and long-term outcomes. *Surg Today* 2021; **51**: 219-225 [PMID: 32676846 DOI: 10.1007/s00595-020-02078-4]
- 51 **Anegawa G**, Nakashima Y, Fujinaka Y, Takahashi I. Laparoscopy-assisted distal gastrectomy for early gastric cancer poses few limitations for selected elderly patients: a single-center experience. *Surg Case Rep* 2016; **2**: 56 [PMID: 27259579 DOI: 10.1186/s40792-016-0183-0]
- 52 **Yoshida M**, Koga S, Ishimaru K, Yamamoto Y, Matsuno Y, Akita S, Kuwabara J, Tanigawa K, Watanabe Y. Laparoscopy-assisted distal gastrectomy is feasible also for elderly patients aged 80 years and over: effectiveness and long-term prognosis. *Surg Endosc* 2017; **31**: 4431-4437 [PMID: 28378081 DOI: 10.1007/s00464-017-5493-1]
- 53 **Yamamoto M**, Shimokawa M, Kawano H, Ohta M, Yoshida D, Minami K, Ikebe M, Morita M, Toh Y. Benefits of laparoscopic surgery compared to open standard surgery for gastric carcinoma in elderly patients: propensity score-matching analysis. *Surg Endosc* 2019; **33**: 510-519 [PMID: 30030615 DOI: 10.1007/s00464-018-6325-7]
- 54 **Inokuchi M**, Kumamaru H, Nakagawa M, Miyata H, Kakeji Y, Seto Y, Kojima K. Feasibility of laparoscopic gastrectomy for patients with poor physical status: a retrospective cohort study based on a nationwide registry database in Japan. *Gastric Cancer* 2020; **23**: 310-318 [PMID: 31332618 DOI: 10.1007/s10120-019-00993-1]
- 55 **Honda M**, Kumamaru H, Etoh T, Miyata H, Yamashita Y, Yoshida K, Kadera Y, Kakeji Y, Inomata M, Konno H, Seto Y, Kitano S, Watanabe M, Hiki N. Surgical risk and benefits of laparoscopic surgery for elderly patients with gastric cancer: a multicenter prospective cohort study. *Gastric Cancer* 2019; **22**: 845-852 [PMID: 30539321 DOI: 10.1007/s10120-018-0898-7]
- 56 **Sakuramoto S**, Sasako M, Yamaguchi T, Kinoshita T, Fujii M, Nashimoto A, Furukawa H, Nakajima T, Ohashi Y, Imamura H, Higashino M, Yamamura Y, Kurita A, Arai K; ACTS-GC Group. Adjuvant chemotherapy for gastric cancer with S-1, an oral fluoropyrimidine. *N Engl J Med* 2007; **357**: 1810-1820 [PMID: 17978289 DOI: 10.1056/NEJMoa072252]
- 57 **Sasako M**, Sakuramoto S, Katai H, Kinoshita T, Furukawa H, Yamaguchi T, Nashimoto A, Fujii M, Nakajima T, Ohashi Y. Five-year outcomes of a randomized phase III trial comparing adjuvant chemotherapy with S-1 versus surgery alone in stage II or III gastric cancer. *J Clin Oncol* 2011; **29**: 4387-4393 [PMID: 22010012 DOI: 10.1200/JCO.2011.36.5908]
- 58 **Yoshida K**, Kadera Y, Kochi M, Ichikawa W, Kakeji Y, Sano T, Nagao N, Takahashi M, Takagane A, Watanabe T, Kaji M, Okitsu H, Nomura T, Matsui T, Yoshikawa T, Matsuyama J, Yamada M, Ito S, Takeuchi M, Fujii M. Addition of Docetaxel to Oral Fluoropyrimidine Improves Efficacy in Patients With Stage III Gastric Cancer: Interim Analysis of JACCRO GC-07, a Randomized Controlled Trial. *J Clin Oncol* 2019; **37**: 1296-1304 [PMID: 30925125 DOI: 10.1200/JCO.18.01138]
- 59 **Bang YJ**, Kim YW, Yang HK, Chung HC, Park YK, Lee KH, Lee KW, Kim YH, Noh SI, Cho JY, Mok YJ, Ji J, Yeh TS, Button P, Sirzén F, Noh SH; CLASSIC trial investigators. Adjuvant capecitabine and oxaliplatin for gastric cancer after D2 gastrectomy (CLASSIC): a phase 3 open-label, randomised controlled trial. *Lancet* 2012; **379**: 315-321 [PMID: 22226517 DOI: 10.1016/S0140-6736(11)61873-4]
- 60 **Mizutani T**, Yamaguchi K, Mizusawa J, Ito S, Nishida Y, Yabusaki H, Boku N, Sano T, Yoshida K, Sasako M, Yoshikawa T, Terashima M; Stomach Cancer Study Group/Japan Clinical Oncology Group. A phase III trial to confirm modified S-1 adjuvant chemotherapy for pathological stage II/III vulnerable elderly gastric cancer patients who underwent gastric resection (JCOG1507, BIRDIE). *Jpn J Clin Oncol* 2018; **48**: 1101-1104 [PMID: 30346560 DOI: 10.1093/jcco/hyy152]
- 61 **Jeong JW**, Kwon IG, Son YG, Ryu SW. Could Adjuvant Chemotherapy after Surgery Benefit Elderly Patients with Advanced Gastric Cancer? *J Gastric Cancer* 2016; **16**: 260-265 [PMID: 28053813 DOI: 10.5230/jgc.2016.16.4.260]
- 62 **Tanahashi T**, Yoshida K, Yamaguchi K, Okumura N, Takeno A, Fujitani K, Fukushima N, Takiguchi N, Nishida Y, Boku N, Yoshikawa T, Terashima M. Questionnaire survey on adjuvant chemotherapy for elderly patients after gastrectomy indicates their vulnerabilities. *Gastric Cancer* 2019; **22**: 130-137 [PMID: 29799059 DOI: 10.1007/s10120-018-0834-x]
- 63 **Endo S**, Shimizu Y, Ikenaga M, Ohta K, Yamada T. Survival benefit of gastrectomy for gastric cancer in patients ≥ 85 years old: A retrospective propensity score-matched analysis. *Surgery* 2017; **161**: 984-994 [PMID: 27894711 DOI: 10.1016/j.surg.2016.10.012]
- 64 **Sohn IW**, Jung DH, Kim JH, Chung HS, Park JC, Shin SK, Lee SK, Lee YC. Analysis of the Clinicopathological Characteristics of Gastric Cancer in Extremely Old Patients. *Cancer Res Treat* 2017; **49**: 204-212 [PMID: 27384160 DOI: 10.4143/crt.2016.163]
- 65 **Chen K**, Pan Y, Zhai ST, Yu WH, Pan JH, Zhu YP, Chen QL, Wang XF. Totally laparoscopic versus open total gastrectomy for gastric cancer: A case-matched study about short-term outcomes. *Medicine (Baltimore)* 2017; **96**: e8061 [PMID: 28930841 DOI: 10.1097/MD.0000000000008061]
- 66 **Huang CJ**, Zhang RC, Mou YP, Zhou YC, Wang YY, Lu C, Xu XW. Short and long-term outcomes of laparoscopic total gastrectomy for gastric cancer: A single-center experience (retrospective cohort

- study). *Int J Surg* 2018; **51**: 109-113 [PMID: 29367040 DOI: 10.1016/j.ijso.2018.01.027]
- 67 **Kodera Y**, Yoshida K, Kumamaru H, Kakeji Y, Hiki N, Etoh T, Honda M, Miyata H, Yamashita Y, Seto Y, Kitano S, Konno H. Introducing laparoscopic total gastrectomy for gastric cancer in general practice: a retrospective cohort study based on a nationwide registry database in Japan. *Gastric Cancer* 2019; **22**: 202-213 [PMID: 29427039 DOI: 10.1007/s10120-018-0795-0]
- 68 **Suematsu H**, Kunisaki C, Miyamoto H, Sato K, Sato S, Tanaka Y, Yukawa N, Rino Y, Kosaka T, Akiyama H, Endo I, Masuda M. Laparoscopic Total Gastrectomy for Gastric Cancer in Elderly Patients. *In Vivo* 2020; **34**: 2933-2939 [PMID: 32871835 DOI: 10.21873/invivo.12123]
- 69 **Jung HS**, Park YK, Ryu SY, Jeong O. Laparoscopic Total Gastrectomy in Elderly Patients (≥70 Years) with Gastric Carcinoma: A Retrospective Study. *J Gastric Cancer* 2015; **15**: 176-182 [PMID: 26468415 DOI: 10.5230/jgc.2015.15.3.176]
- 70 **Sheng S**, Chen Y, Li C. Outcomes of Laparoscopic Total Gastrectomy for Elderly Gastric Cancer Patients. *J Cancer* 2018; **9**: 4398-4403 [PMID: 30519345 DOI: 10.7150/jca.26858]
- 71 **Jiang X**, Hiki N, Nunobe S, Nohara K, Kumagai K, Sano T, Yamaguchi T. Laparoscopy-assisted subtotal gastrectomy with very small remnant stomach: a novel surgical procedure for selected early gastric cancer in the upper stomach. *Gastric Cancer* 2011; **14**: 194-199 [PMID: 21347820 DOI: 10.1007/s10120-011-0023-7]
- 72 **Furukawa H**, Kurokawa Y, Takiguchi S, Tanaka K, Miyazaki Y, Makino T, Takahashi T, Yamasaki M, Nakajima K, Mori M, Doki Y. Short-term outcomes and nutritional status after laparoscopic subtotal gastrectomy with a very small remnant stomach for cStage I proximal gastric carcinoma. *Gastric Cancer* 2018; **21**: 500-507 [PMID: 28825149 DOI: 10.1007/s10120-017-0755-0]
- 73 **Japanese Gastric Cancer Association**. Japanese gastric cancer treatment guidelines 2018 (5th edition). *Gastric Cancer* 2021; **24**: 1-21 [PMID: 32060757 DOI: 10.1007/s10120-020-01042-y]
- 74 **Konishi H**, Ichikawa D, Itoh H, Fukuda K, Kakihara N, Takemura M, Okugawa K, Uchiyama K, Nakata M, Nishi H, Kosuga T, Komatsu S, Okamoto K, Otsuji E. Surgery for gastric cancer patients of age 85 and older: Multicenter survey. *World J Gastroenterol* 2017; **23**: 1215-1223 [PMID: 28275301 DOI: 10.3748/wjg.v23.i7.1215]
- 75 **Rausei S**, Ruspi L, Rosa F, Morgagni P, Marrelli D, Cossu A, Cananzi FC, Lomonaco R, Coniglio A, Biondi A, Cipollari C, Graziosi L, Fumagalli U, Casella F, Bertoli P, di Leo A, Alfieri S, Vittimberga G, Roviello F, Orsenigo E, Quagliuolo V, Montemurro S, Baiocchi G, Persiani R, Bencivenga M, Donini A, Rosati R, Sansonetti A, Ansaloni L, Zanoni A, Galli F, Dionigi G; Italian Research Group for Gastric Cancer (IRGGC). Extended lymphadenectomy in elderly and/or highly co-morbid gastric cancer patients: A retrospective multicenter study. *Eur J Surg Oncol* 2016; **42**: 1881-1889 [PMID: 27266816 DOI: 10.1016/j.ejso.2016.05.003]
- 76 **Park DJ**, Lee HJ, Kim HH, Yang HK, Lee KU, Choe KJ. Predictors of operative morbidity and mortality in gastric cancer surgery. *Br J Surg* 2005; **92**: 1099-1102 [PMID: 15931657 DOI: 10.1002/bjs.4952]
- 77 **Takama T**, Okano K, Kondo A, Akamoto S, Fujiwara M, Usuki H, Suzuki Y. Predictors of postoperative complications in elderly and oldest old patients with gastric cancer. *Gastric Cancer* 2015; **18**: 653-661 [PMID: 24874161 DOI: 10.1007/s10120-014-0387-6]
- 78 **Kurita N**, Miyata H, Gotoh M, Shimada M, Imura S, Kimura W, Tomita N, Baba H, Kitagawa Y, Sugihara K, Mori M. Risk Model for Distal Gastrectomy When Treating Gastric Cancer on the Basis of Data From 33,917 Japanese Patients Collected Using a Nationwide Web-based Data Entry System. *Ann Surg* 2015; **262**: 295-303 [PMID: 25719804 DOI: 10.1097/SLA.0000000000001127]
- 79 **Kunisaki C**, Miyata H, Konno H, Saze Z, Hirahara N, Kikuchi H, Wakabayashi G, Gotoh M, Mori M. Modeling preoperative risk factors for potentially lethal morbidities using a nationwide Japanese web-based database of patients undergoing distal gastrectomy for gastric cancer. *Gastric Cancer* 2017; **20**: 496-507 [PMID: 27553666 DOI: 10.1007/s10120-016-0634-0]



Published by **Baishideng Publishing Group Inc**
7041 Koll Center Parkway, Suite 160, Pleasanton, CA 94566, USA

Telephone: +1-925-3991568

E-mail: bpgoffice@wjgnet.com

Help Desk: <https://www.f6publishing.com/helpdesk>

<https://www.wjgnet.com>

