Enhanced Recovery after Surgery (ERAS) Helps Elderly Maintain Their Activities of Daily Living and Improve Quality of Life Following Major Colorectal Surgery–with Comparable Surgical Outcomes to Younger Patients

Varut Lohsiriwat MD, PhD*

** Colorectal Surgery Unit, Division of General Surgery, Department of Surgery, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand*

Objective: *This study aimed to evaluate surgical and functional outcomes following the application of enhanced recovery after surgery (ERAS) in elderly undergoing colorectal resection.*

Material and Method: *A prospectively collected database of elderly patients (age ≥75 years) undergoing elective colorectal surgery under ERAS pathway in Siriraj Hospital from 2011 to 2015 was reviewed. Surgical outcomes of such patients were compared to those of younger patients. Patient-reported outcome measures were compared between their pre-operative status and postoperative status by activities of daily living (ADL) using modified Barthal index (MBI: 0 = totally independent to 100 = totally dependent) and health-related quality of life (HR-QoL) using 100-mm visual analog scale.*

Results: *This study included 30 elderly patients with median age of 78 years, Charlson Comorbidity Index of 7 and CR-POSSUM predicted mortality of 3.5%. Compared to younger patients, the elderly had a non-significant higher rate of complications (31% vs. 15%; p = 0.06) and longer postoperative stay (5 days vs. 4 days; p = 0.12) but comparable time to tolerate solid diet and time to first defecation. Average ADL-MBI was following: 99 at baseline vs. 96 (p = 0.045), 97 (p = 0.023), 97 (p = 0.07) and 98 (p = 0.07) at 1, 3, 6, and 12 months after surgery, respectively. HR-QoL showed a recovery to an extent equal to or better than their pre-operative scores: 56 at baseline vs. 55 (p = 0.78), 59 (p = 0.75), 64 (p<0.001) and 72 (p<0.001) at 1, 3, 6, and 12 months after surgery, respectively.*

Conclusion: *Although the elderly are inherently susceptible to significant comorbidities and high predicted mortality, the application of ERAS in such patients achieved the same time to gastrointestinal recovery as compared to younger patients. Additionally, the elderly could maintain their ADL and exhibit better HR-QoL after surgery.*

Keywords: *Enhanced recovery after surgery, Colon, Rectum, Elderly, Surgery, Function, Activities of daily living, Barthal index, Quality of life*

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With advances in medicine and healthcare system, people's life expectancy and the number of elderly population have increased. According to the projection of World Health Organization in 2013, it was estimated that the number of people aged 60 or over will be 1.2 billion in 2025 and could be double by 2050[1]. Inevitably, many of aging people are subjected to an operation. Unfortunately, major surgery in the elderly often results in a reduction in their functional capabilities[2-4]. As a result, modern surgical care in the elderly should focus on both surgical outcomes and postoperative function.

Enhanced recovery after surgery (ERAS) is a modern perioperative care pathway designed to minimize surgical stress response and facilitate the recovery of organ function[5]. A recent systematic review has shown the feasibility and beneficial effects of ERAS in elderly including shortened hospital stay and deceased postoperative complications[6]. However, a comprehensive study of the functional recovery and health-related quality of life (HR-QoL) in the elderly

Correspondence to:
Lohsiriwat V, Department of Surgery, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand.
Phone: +66-2-4198005, Fax: +66-2-4121370
E-mail: bolloon@hotmail.com

undergoing major abdominal surgery using an ERAS pathway is limited. The objective of this study is, therefore, to evaluate surgical outcomes and functional outcomes following the application of ERAS in elderly undergoing colorectal resection.

Material and Method

After obtaining approval from the Siriraj Institutional Review Board, a prospectively collected database of elderly patients (age ≥75 years) undergoing elective colorectal resection under an ERAS protocol between February 2011 and March 2015 in the Division of General Surgery, Department of Surgery, Faculty of Medicine Siriraj Hospital, Bangkok, Thailand was reviewed. The ERAS protocol using in our institute has been previously described[5,7,8]. Patients were discharged from the hospital with the following criteria: no fever, adequate pain control with oral analgesic, good ambulation and satisfactory recovery of gastrointestinal function. All patients were operated on and taken care of by the author and his team.

All data were recorded including patient demographics (age, gender, body mass index: BMI, American society of Anesthesiologists class: ASA, Charlson Comorbidity Index: CCI[9], the ColoRectal Physiological and Operative Severity Score for the enUmeration of Mortality and Morbidity: CR-POSSUM[10]), and operative details (procedure type, operative time and blood loss). Surgical outcomes were the incidence of postoperative complication (according to the Clavien-Dindo classification system), gastrointestinal recovery (time to resumption of solid diet and time to first defecation) and length of postoperative hospital stay. Surgical outcomes of elderly patients were compared to those of younger patients. Patient-reported outcome measures in the elderly were compared between their pre-operative status and postoperative status (at 1, 3, 6 and 12 months): (1) activities of daily living (ADL) using modified Barthal index (MBI: 0 = totally independent to 100 = totally dependent) and (2) health-related quality of life (HR-QoL) using a 100-mm visual analog scale.

All data were prepared and compiled using Statistical Package for the Social Sciences program (SPSS®) version 18.0 for Windows (SPSS Inc., Chicago, IL). Values are expressed as median (interquartile range: IQR) or number (percentage). Continuous variables were compared using the t-test or Mann-Whitney U test. Categorical variables were compared using the Pearson Chi-square test or Fisher's exact test. A *p*-value of less 0.05 was considered statistically significant.

Results

This study included 30 elderly patients with median age of 78 years (range 75 to 86). They had median Charlson Comorbidity Index of 7 (range 6 to 10) and CR-POSSUM predicted mortality of 3.5% (range 1.9 to 16.8). Compared to younger patients (n = 130), the elderly had non-significant higher rate of complication (31% vs. 15%; $p = 0.06$) and longer postoperative stay (5 days [IQR 4 to 7] vs. 4 days [IQR 3 to 5]; $p = 0.12$) but comparable time to tolerate solid diet (2 days [IQR 1 to 3] vs. 2 days [IQR 1 to 3]; $p = 0.25$) and time to first defecation (2 days [IQR 2 to 3] vs. 2 days [IQR 2 to 3]; $p = 0.68$).

Average ADL-MBI was following: 99 at baseline vs. 96 ($p = 0.045$), 97 ($p = 0.023$), 97 ($p = 0.07$) and 98 ($p = 0.07$) at 1, 3, 6, and 12 months after surgery, respectively (Fig. 1). Of note, 22 patients (73%) returned to their pre-operative ADL status and 18 of 25 totally independent patients (ADL-MBI of 100) maintained their totally independent status at 1 year postoperatively. No protracted decline in ADL (>10% change of ADL-MBI) was noted in this series. HR-QoL showed a recovery to an extent equal to or better than their pre-operative scores: 56 at baseline vs. 55 ($p = 0.78$), 59 ($p = 0.75$), 64 ($p<0.001$) and 72 ($p<0.001$) at 1, 3, 6, and 12 months after surgery, respectively (Fig. 2). There was one (3.3%) death in the elderly group.

Discussion

The main findings of this comparative study are that, despite the fact that the elderly were inherited to significant comorbidities and high predicted mortality rate, the application of ERAS in such patients resulted in comparable surgical outcomes to younger patients e.g. one-day longer hospitalization and equivalent time to gastrointestinal recovery. Additionally, the elderly could maintain their activities of daily living and exhibit better health-related quality of life after surgery.

This study did not compare the elderly patients managed with ERAS vs. traditional care because it seems to be unfair and unethical for such patients as a systematic review of 16 studies in 2014 has shown that ERAS is safe and beneficial in the elderly undergoing colorectal surgery[6]. In fact, the present study further highlights the fact that, within an ERAS protocol, the elderly reasonably maintained their ADL and had better HR-QoL after surgery. About three-quarters of our patients returned to their pre-operative ADL status and remained totally independent. Although none of our patients experienced a protracted decline in ADL (>10% change of ADL-MBI) at the end of study, some authors

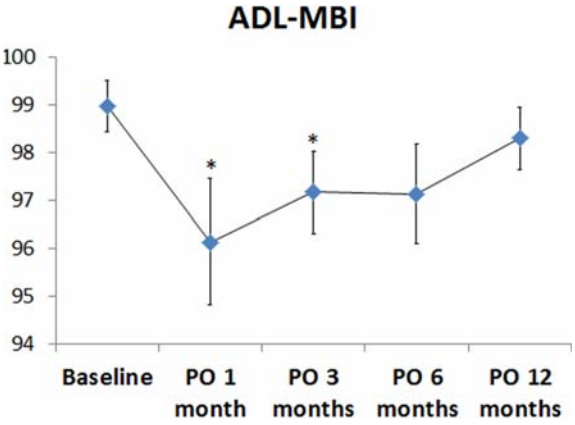

Fig. 1 Average activities of daily living based on modified Barthal index (ADL-MBI: 0 = totally independent to 100 = totally dependent) before and after surgery (*p<0.05 compared to baseline).

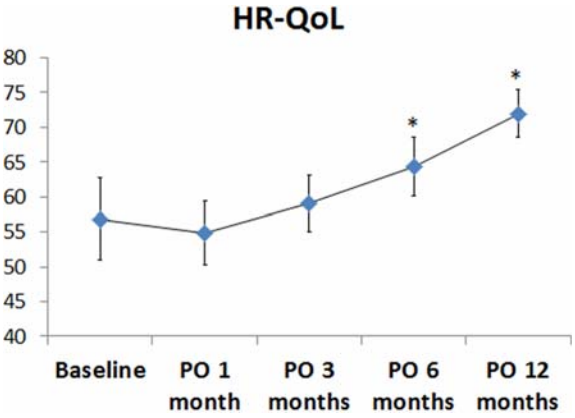

Fig. 2 Average health-related quality of life (HR-QoL) based on a 100-mm visual analogue before and after surgery (*p<0.05 compared to baseline).

reported that postoperative complication was an important risk factor for a profound reduction in functional recovery[4]. Interestingly, ERAS has been shown to reduce postoperative complication by 30% and 50% in elective and emergency colorectal surgery, respectively[7,11]. Therefore, ERAS should be a crucial part of perioperative care for reducing postoperative complication and improving patient's functional recovery.

Regarding the application of ERAS in the elderly patients in this study, there was no significant difference in an individual ERAS component or the application of ERAS between the elderly and the young. However, the elderly may have less compliance or few adherences to the protocol due to their comorbidities e.g. nonsteroidal anti-inflammatory drugs as a part of non-opioid analgesia cannot be used in those with coronary artery diseases and peripheral arterial occlusion[12]-which were more prevalent in the elderly. On the other hand, synthetic albumin infusion was more often used in the elderly to maintain their intravascular oncotic pressure and minimize extravascular fluid leakage. It was shown that a high compliance or adherence to ERAS protocol was associated with better outcomes[13].

Some limitations of this study should be addressed. First, this is a single-center study which included a relatively small number of patients. Thus, larger studies may be required to confirm the beneficial effects of ERAS on functional recovery after surgery in the elderly. Second, this study used a simple 10-mm visual analogue scale to evaluate HR-QoL in which we believed that it was time-saving and easy for the elderly to understand. More sophisticated questionnaires for HR-QoL, such as 12-item and 36-item Short Form Health Survey (SF-12 and SF-36), may give us more details on various aspects of HR-QoL affecting by surgery. Nevertheless, there was shown a closed correlation of HR-QoL between a 10-mm visual analogue scale and the SF-36 scale[14]. Third, this study mainly included elderly patients medically fit for major abdominal surgery. Therefore, the results may not be generalized to more frail patients. Notably, an ERAS protocol specially designed for frail patients could be of vital importance in optimizing its beneficial effects on surgical and functional outcomes. This may include a pre-habilitation program-a process of enhancing function recovery of patients before surgery and continuing into postoperative period[15]. Besides a surgical team, nutritionist and physiotherapist should have an active role in this multidisciplinary program.

Conclusion

This study has shown that the application of ERAS in elderly patients undergoing major colorectal surgery resulted in comparable surgical outcomes to younger patients. In terms of function recovery, the application of ERAS reasonably helps the elderly maintain their activities of daily living and their independency. The elderly exhibited equal or better health-related quality of life after surgery.

What is already known on this topic?

Enhanced recovery after surgery (ERAS), a modern perioperative care pathway designed to minimize surgical stress response and facilitate the

recovery of organ function, has beneficial effects on surgical outcomes in the elderly including shortened hospital stay and deceased postoperative complication.

What this study adds?

This paper demonstrated that the application of enhanced recovery after surgery (ERAS) in elderly patients undergoing major colorectal surgery was beneficial to not only surgical outcomes but also functional recovery. ERAS reasonably helps the elderly maintain their activities of daily living and their independency. The elderly exhibited equal or better health-related quality of life after surgery.

Potential conflict of Interest

None.

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โปรแกรมส่งเสริมการฟื้นตัวหลังผ่าตัดสามารถช่วยให้ผู้สูงอายุที่เข้ารับการผ่าตัดลำไส้ใหญ่และไส้ตรงสามารถคงการทำกิจวัตรประจำวันและมีคุณภาพชีวิตได้เหมือนก่อนผ่าตัดและมีผลการผ่าตัดไม่แตกต่างกับผู้ป่วยอายุน้อยกว่า

วรุตม์ โล่ห์สิริวัฒน์

วัตถุประสงค์: *เพื่อประเมินผลการผ่าตัด ความสามารถในการทำกิจวัตรประจำวัน และคุณภาพชีวิตของผู้สูงอายุที่เข้ารับการผ่าตัดลำไส้ใหญ่และไส้ตรงภายใต้โปรแกรมส่งเสริมการฟื้นตัวหลังผ่าตัด*

วัสดุและวิธีการ: *ผู้ป่วยสูงอายุ (อายุตั้งแต่ 75 ปี) ที่เข้ารับการผ่าตัดลำไส้ใหญ่และไส้ตรงภายใต้โปรแกรมส่งเสริมการฟื้นตัวหลังผ่าตัด ในโรงพยาบาลศิริราชตั้งแต่ พ.ศ. 2554 ถึง พ.ศ. 2558 ถูกเปรียบเทียบผลการผ่าตัด เช่น ภาวะแทรกซ้อน การฟื้นตัวของระบบทางเดินอาหาร และระยะเวลารักษาตัวในโรงพยาบาลกับผู้ป่วยที่อายุน้อยกว่า และเปรียบเทียบความสามารถในการทำกิจวัตรประจำวัน และคุณภาพชีวิตของผู้ป่วยสูงอายุ ก่อนและหลังผ่าตัด*

ผลการศึกษา: *การศึกษานี้มีผู้ป่วยสูงอายุ 30 ราย อายุเฉลี่ย 78 ปี และเมื่อเปรียบเทียบผลการผ่าตัดของผู้ป่วยสูงอายุกับผู้ป่วยที่อายุน้อยกว่า จำนวน 130 ราย พบว่าผู้ป่วยสูงอายุมีภาวะแทรกซ้อนหลังผ่าตัดเพิ่มขึ้นแต่ไม่มีนัยสำคัญทางสถิติ (30% vs. 15%; p = 0.06) มีระยะเวลารักษาตัวในโรงพยาบาลนานกว่า 1 วัน (5 vs. 4 วัน; p = 0.12) แต่มีระยะเวลาการฟื้นตัวของระบบทางเดินอาหารหลังผ่าตัดใกล้เคียงกัน เมื่อเปรียบเทียบความสามารถในการทำกิจวัตรประจำวันและคุณภาพชีวิตของผู้ป่วยสูงอายุก่อนและหลังผ่าตัด พบว่าหลังผ่าตัดผู้ป่วยสูงอายุมีความสามารถในการทำกิจวัตรประจำวันได้ใกล้เคียงสภาวะเดิมก่อนผ่าตัดและมีคุณภาพชีวิตดีขึ้นหลังผ่าตัด*

สรุป: *แม้ผู้ป่วยสูงอายุมีโรคร่วมมากและมีความเสี่ยงในการเกิดผลการผ่าตัดไม่ดีมากกว่าผู้ป่วยอายุน้อย การใช้โปรแกรมส่งเสริมการฟื้นตัวหลังผ่าตัดในผู้ป่วยสูงอายุ มีผลการผ่าตัดที่ดีใกล้เคียงกับผู้ป่วยอายุน้อย นอกจากนี้การใช้โปรแกรมส่งเสริมการฟื้นตัวหลังผ่าตัด สามารถช่วยให้ผู้ป่วยสูงอายุสามารถคงการทำกิจวัตรประจำวันได้เหมือนก่อนผ่าตัดและมีคุณภาพชีวิตที่ดีขึ้นหลังผ่าตัด*