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RESEARCH ARTICLE

Minimally Invasive Mesh Rectopexy versus Perineal Rectosigmoidectomy in the Elderly: a Retrospective Comparative Analysis

Jordan Martucci[1], Aubrey Swinford[1], Brian Williams[1], Abhinav Gupta[1], Kyle Graham Cologne[1], Sarah Elizabeth Koller[2], Marjun Philip Duldulao[1], Joongho Shin[1], Sang Won Lee[1]

[1]Keck Hospital of University of Southern California, Department of Colorectal Surgery, California, United States of America
[2]Los Angeles General Medical Center, Department of Colorectal Surgery, California, United States of America

ABSTRACT

Aim: The aim of this study was to compare early and intermediate perioperative outcomes after rectal prolapse repair in elderly patients undergoing either minimally invasive mesh rectopexy or perineal rectosigmoidectomy (PR).

Method: This retrospective comparative analysis evaluated the outcomes of elderly patients (age ≥70 years) who underwent surgical correction of full-thickness rectal prolapse at a single tertiary hospital between 2010 and 2023. Patients included in the study had undergone either minimally invasive rectopexy (MIR) or PR (Altemeier procedure). The primary outcomes assessed were 30-day mortality and complication rates.

Results: A total of 55 patients were included, with 42 who underwent MIR and 13 who underwent PR. The average age of all the patients was 79.8±6.4 years, and the average body mass index was 22.5±3.7. Most patients (49, 89.1%) were women. Patients who underwent MIR had a significantly lower 30-day complication rate than those who underwent PR (11.9% vs. 53.8%, respectively; p=0.001). No deaths occurred in either group within 30 days of the procedure. Patients who underwent PR had similar recurrence rates to those who underwent MIR, with a median interval to the first documented recurrence of 6.0 months (range: 0.2-24.5 months). The rate of normal bowel function achieved at the most recent follow-up was significantly higher in patients who underwent MIR than in those who underwent PR (76.2% vs. 30.8%, respectively; p=0.003).

Conclusion: The MIR approach to prolapse repair is safe and feasible in elderly patients, with a lower 30-day complication rate and comparable mortality rates than PR. Additionally, early functional outcomes are better after MIR.

Keywords: Rectal prolapse, rectopexy, perineal rectosigmoidectomy, minimally invasive surgical techniques, perioperative care

Introduction

Rectal prolapse is a debilitating condition characterized by the full-thickness protrusion of the rectum through the anal canal. Although it can occur at any age, it most commonly develops in elderly women beyond the seventh decade of life. Surgical repair is required for definitive management, and perineal approaches have traditionally been considered "safer" for elderly patients. However, this claim has limited supporting data, and perineal approaches have been associated with higher long-term recurrence rates than transabdominal repairs.[1,2] Historically, surgical dogma has supported the notion that perineal approaches, such as perineal rectosigmoidectomy (PR; Altemeier) and mucosal sleeve resection (Delorme), should be reserved for elderly or high-risk patients deemed poor candidates for surgery.[2,3] Conversely, intra-abdominal approaches have been preferred for younger, healthier patients.[4-6]

In recent years, these views have been challenged as surgical and anesthetic techniques have improved. Multiple studies suggest that transabdominal rectopexy may be safer for elderly, high-risk patients than previously believed.[7-10] Additionally, minimally invasive abdominal procedures in the elderly have

Address for Correspondence: Jordan Martucci,
Keck Hospital of University of Southern California, Department of Colorectal Surgery, California, United States of America
E-mail: jordan.martucci@med.usc.edu **ORCID ID:** orcid.org/0009-0007-3971-750X
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been shown to be safe compared with both open and perineal approaches.[11-14] Contemporary data indicate that major complication and mortality rates are similar for minimally invasive rectopexy (MIR) and PR in both younger and older patients, suggesting that age alone should not dictate the choice of treatment.[15]

Recent large-scale studies evaluating early perioperative outcomes after prolapse repair in elderly patients have reported comparable early postoperative outcomes between laparoscopic transabdominal approaches and traditional perineal approaches.[10,16] However, despite these improved outcomes, perineal repairs remain the most commonly performed procedures for rectal prolapse in elderly patients, although the use of minimally invasive approaches has increased.[10] The aim of this study was to compare perioperative outcomes in elderly patients undergoing rectal prolapse repair with either minimally invasive mesh rectopexy or PR.

Materials and Methods

This was a retrospective cohort study evaluating the outcomes of elderly patients (age ≥70 years) undergoing the surgical correction of full-thickness rectal prolapse. Patients included in the study underwent surgical repair at a single tertiary hospital between 2010 and 2023 either through MIR or PR (Altemeier). Patients who underwent robotic or laparoscopic mesh rectopexy via either anterior or posterior approaches were categorized into the MIR group.

All procedures were performed by board-certified colorectal surgery attendings with appropriate experience and expertise in rectal prolapse management. A retrospective chart review was performed to obtain relevant demographic and preoperative data. This study approved by the University of Southern California Institutional Review Board (approval number: HS-17-00058-CR008, dated: 7/11/2024). Additionally, intraoperative, perioperative, and postoperative outcomes were collected using the electronic health record and available procedural and operative reports. Only patients with at least one follow-up visit were included, and those who underwent a Delorme procedure were excluded from the analysis.

The primary outcomes evaluated included 30-day mortality and complication rates. Individual complications were analyzed, and a composite variable-"any complication"-was defined for cases where any complication was reported within 30 days of surgery.

Intraoperative variables assessed included operative duration, concurrent pelvic prolapse procedures performed, estimated blood loss (EBL), and intraoperative complications. Additional operative details specific to MIR were also evaluated, including the type of repair (ventral vs. posterior), minimally invasive approach used (robotic vs. laparoscopic), type of mesh utilized, and whether conversion to an open procedure was required.

The length of stay (LOS) at the hospital was recorded for each group. Other postoperative outcomes assessed included patient-reported functional outcomes, prolapse recurrence rates, time to recurrence (if applicable), and 30-day readmission rates.

Statistical Analysis

All statistical analyses were performed using IBM SPSS software version 28.0 (IBM Corp., Armonk, NY, USA). Continuous variables were described using the mean and standard deviation, whereas categorical variables were reported as frequencies and percentages. The student's *t*-test was used to compare continuous variables between two groups, and the chi-squared test was used to compare categorical variables. For comparisons involving three or more groups, analysis of variance was conducted. A two-tailed p-value of <0.05 was considered statistically significant.

Results

A total of 55 patients were included in the study, with 42 who underwent MIR and 13 who underwent PR. The average age of all the patients was 79.8±6.4 years, and the average body mass index (BMI) was 22.5±3.7. The majority of patients (49, 89.1%) were women.

Patients who underwent PR had a significantly higher average BMI than those who underwent MIR (25.0±3.9 vs. 21.9±3.4, respectively; p=0.016). Patients who underwent PR also had higher rates of medical comorbidities than patients who underwent MIR. Specifically, patients who underwent PR had significantly higher rates of diabetes, chronic obstructive pulmonary disease (COPD), congestive heart failure (CHF), coronary artery disease or prior myocardial infarction (CAD/MI), arrhythmia, and chronic kidney disease (CKD) and were more likely to be on chronic blood-thinning medications (Table 1). All the patients reviewed were classified as American Society of Anesthesiologists (ASA) class 2 or 3 (40% and 54.5%, respectively), with three patients (5.5%) classified as ASA class 4. Patients who underwent PR had higher rates of ASA class 3 and 4 than patients who underwent MIR, although this difference did not reach statistical significance (p=0.108). No other demographic differences were observed between the two groups. Further details of the demographic and comorbid conditions are presented in Table 1.

The average operative duration was significantly longer for MIR than for PR (155.5±73.9 vs. 87.1±41.5 minutes, respectively; p=0.003). However, hospital LOS was nearly identical between the two groups (2.64±0.96 vs. 2.62±1.66 days, respectively; p=0.954). Three patients (5.5%) underwent an additional concurrent pelvic organ prolapse procedure-one patient who underwent MIR (2.4%) and two patients who underwent PR (15.4%) (p=0.071).

The average EBL was low in both groups but was significantly lower for MIR than for PR (17.9±23.7 vs. 41.0±58.0 mL, respectively; p=0.050). Intraoperative complications were rare, with only one patient (1.8%) experiencing an intraoperative complication, specifically, an iatrogenic bladder injury in a patient who underwent MIR, which was successfully managed with primary repair intraoperatively. Details of the intraoperative variables between the two groups are presented in Table 2.

Of the 42 patients who underwent MIR, 32 (76.2%) underwent ventral mesh rectopexy (VMR), whereas 10 (23.8%) underwent posterior mesh rectopexy (PMR). Twenty-seven patients (64.3%) underwent a laparoscopic approach, whereas the remaining 15 (35.7%) underwent a robotic approach. Nine patients (21.4%) received a synthetic mesh, 32 (76.2%) received a biologic mesh, and 1 patient (2.4%) had a hybrid mesh incorporating both biologic and synthetic components. No patients (0%) required intraoperative conversion to an

Table 1. Demographics and comorbid conditions

Outcome, [n (%)]	Overall (n=55)	Minimally invasive (n=42)	Altemeier (n=13)	p-value
Age	79.8 (6.4)	79.8 (6.7)	79.9 (5.6)	0.986
Body mass index (kg/m^2), avg. (SD)	22.5 (3.7)	21.9 (3.4)	25.0 (3.9)	**0.016**
Women	49 (89.1)	39 (92.9)	10 (76.9)	0.107
Tobacco use	4 (7.3)	3 (7.1)	1 (7.7)	0.964
Alcohol use	14 (25.5)	11 (26.2)	3 (23.1)	0.822
Diabetes	10 (18.2)	5 (11.9)	5 (38.5)	**0.030**
Hypertension	31 (56.4)	23 (54.8)	8 (61.5)	0.667
Hyperlipidemia	7 (12.7)	6 (14.3)	1 (7.7)	0.533
COPD	5 (9.1)	2 (4.8)	3 (23.1)	**0.045**
Congestive heart failure	2 (3.6)	0 (0)	2 (15.4)	**0.010**
CAD/MI	6 (10.9)	2 (4.8)	4 (30.8)	**0.009**
PAD	3 (5.5)	2 (4.8)	1 (7.7)	0.684
Arrhythmia	4 (7.3)	1 (2.4)	3 (23.1)	**0.012**
CVA/TIA	7 (12.7)	5 (11.9)	2 (15.4)	0.742
CKD/ESRD	4 (7.3)	1 (2.4)	3 (23.1)	**0.012**
Liver disease/Cirrhosis	2 (3.6)	1 (2.4)	1 (7.7)	0.371
Thyroid disease	7 (12.7)	7 (16.7)	0 (0)	0.115
Colorectal cancer	3 (5.5)	1 (2.40	2 (15.4)	0.071
Other cancer	10 (18.2)	9 (21.4)	1 (7.7)	0.262
Psychiatric diagnosis	4 (7.3)	2 (4.8)	2 (15.4)	0.197
Malnutrition	3 (5.5)	3 (7.1)	0 (0)	0.322
Rheumatologic disorder	10 (18.2)	10 (23.8)	0 (0)	0.052
Blood thinners	20 (36.4)	11 (26.2)	9 (69.2)	**0.005**
Prior abdominal surgery	32 (58.2)	22 (52.4)	10 (76.9)	0.117
ASA class				0.108
Class 1	0 (0)	0 (0)	0 (0)	
Class 2	22 (40.0)	19 (45.2)	3 (23.1)	
Class 3	30 (54.5)	22 (52.4)	8 (61.5)	
Class 4	3 (5.5)	1 (2.4)	2 (15.4)	

avg.: Average, SD: Standard deviation, COPD: Chronic obstructive pulmonary disease, CAD: Coronary artery disease, MI: Myocardial infarction, PAD: Peripheral artery disease, CVA: Cerebrovascular accident, TIA: Transient ischemic attack, CKD: Chronic kidney disease, ESRD: End-stage renal disease, ASA: American Society of Anesthesiologists

open procedure. Further details of the intraoperative MIR variables are presented in Table 3.

Overall, the 30-day postoperative complication rate for all patients was 21.8%. Patients who underwent MIR had a significantly lower early complication rate than those who underwent PR (11.9% vs. 53.8%, respectively; p=0.001). The most commonly reported complication was urinary retention (9.1%), followed by ileus/constipation (5.5%). Other complications, each occurring at a rate of 1.8%, included delirium, arrhythmia, rectal bleeding, respiratory failure, and sepsis. Of these, only urinary retention was significantly higher in patients who underwent PR than in patients who underwent MIR (23.1% vs. 4.8%, respectively; p=0.045). The rates of other complications were similar between the two groups.

Overall, two patients (3.6%) were readmitted within 30 days of discharge, both of whom had undergone PR, whereas no patients who underwent MIR required readmission (15.4% vs. 0%, respectively; p=0.010). There were no deaths (0%) in either group within 30 days of the procedure. Further details of the 30-day postoperative outcomes are presented in Table 4.

A binary logistic regression analysis was performed to examine the association between treatment type (MIR vs. PR) and 30-day postoperative complications, adjusting for the presence of diabetes, COPD, CHF, CAD/MI, arrhythmia, and CKD/ESRD. The results indicated that patients who underwent PR had significantly higher odds of experiencing postoperative complications than those who underwent MIR [adjusted odds ratio (OR)=28.42, 95% confidence interval=2.70-298.75, p=0.005]. None of the other comorbidities significantly affected the likelihood of postoperative complications within 30 days.

For all the patients included, the median follow-up interval was 4.6 months (range: 0.6-80.3 months). Eight patients (14.5%) experienced a documented prolapse recurrence during follow-up. Patients who underwent PR had a higher recurrence rate than patients who underwent MIR (30.8% vs. 9.5%, respectively); however, this difference did not reach statistical significance (p=0.058). The median interval to the first documented recurrence was 6.0 months (range: 0.2-24.5 months), which was similar between the two groups.

A separate binary logistic regression analysis was performed to assess factors associated with recurrence. Although diabetes

Table 2. Perioperative variables

Outcome	Overall (n=55)	Minimally invasive (n=42)	Altemeier (n=13)	p-value
Operative duration, min. [avg. (SD)]	139.3 (73.4)	155.5 (73.9)	87.1 (41.5)	**0.003**
Concurrent pelvic prolapse procedure, [n (%)]	3 (5.5)	1 (2.4)	2 (15.4)	0.071
EBL, mL [avg. (SD)]	22.4 (33.6)	17.9 (23.7)	41.0 (58.0)	**0.050**
Intraoperative complication, [n (%)]	1 (1.8)	1 (2.4)	0 (0)	0.574
Hospital LOS [avg. (SD)]	2.63 (1.14)	2.64 (0.96)	2.62 (1.66)	0.954

min.: Minute, avg.: Average, SD: Standard deviation, mL: Milliliter, EBL: Estimated blood loss, LOS: Length of stay

Table 3. Minimally invasive approach intraoperative variables

	Overall (n=42)
Procedure performed, [n (%)]	
Ventral mesh rectopexy	32 (76.2)
Posterior mesh rectopexy	10 (23.8)
Approach, [n (%)]	
Laparoscopic	27 (64.3)
Robotic	15 (35.7)
Mesh used, [n (%)]	
Synthetic	9 (21.4)
Biologic	32 (76.2)
Hybrid	1 (2.4)
Conversion to open, [n (%)]	0 (0)

(adjusted OR=2.46, p=0.428), COPD (adjusted OR=3.715, p=0.368), and type of procedure (adjusted OR=6.27, p=0.056) showed trends toward higher odds of recurrence, none reached statistical significance. Other comorbidities, including CAD, CKD, arrhythmia, and CHF, also did not significantly impact the recurrence risk.

The rate of normal bowel function at the most recent follow-up visit was 65.5% for all patients and was significantly higher for patients who underwent MIR than for those who underwent PR (76.2% vs. 30.8%, respectively; p=0.003). The individual patient-reported functional outcomes assessed included regular bowel movements, obstructive defecation, fecal incontinence, constipation, and diarrhea. Patients who underwent MIR reported a significantly higher rate of regular bowel movements than patients who underwent PR (78.6% vs. 46.2%, respectively; p=0.025) and a significantly lower rate of constipation (0% vs. 38.5%, respectively; p<0.001). The rates of other functional outcomes were similar between the two groups. Further details of the functional outcomes and recurrence rates are presented in Table 5.

Discussion

In recent years, growing evidence has supported the use of transabdominal approaches for rectal prolapse repair over traditional perineal approaches, including for elderly and frail patients. The results of the current study are consistent with these findings, demonstrating that MIR is a safe surgical treatment for full-thickness rectal prolapse in the elderly, with lower postoperative complication rates, lower early readmission rates, and improved long-term functional outcomes than PR. Additionally, the study found comparable mortality and early to intermediate recurrence rates between the two groups.

The most recent clinical practice guidelines from the American Society of Colon and Rectal Surgeons suggest that the gold-standard surgical procedure should be transabdominal rectal

Table 4. 30-day postoperative outcomes

Outcome	Overall (n=55)	Minimally invasive (n=42)	Altemeier (n=13)	p-value
Any 30-day complication, [n (%)]	12 (21.8)	5 (11.9)	7 (53.8)	**0.001**
Urinary retention	5 (9.1)	2 (4.8)	3 (23.1)	**0.045**
Ileus/Constipation	3 (5.5)	1 (2.4)	2 (15.4)	0.071
Delirium	1 (1.8)	1 (2.4)	0 (0)	0.574
Arrhythmia	1 (1.8)	0 (0)	1 (7.7)	0.070
Rectal bleeding	1 (1.8)	0 (0)	1 (7.7)	0.070
Respiratory failure	1 (1.8)	1 (2.4)	0 (0)	0.574
Sepsis	1 (1.8)	0 (0)	1 (7.7)	0.070
Readmission, [n (%)]	2 (3.6)	0 (0)	2 (15.4)	**0.010**
Mortality, [n (%)]	0 (0)	0 (0)	0 (0)	1.000

Table 5. Patient-reported postoperative functional outcomes

Outcome	Overall (n=55)	Minimally invasive (n=42)	Altemeier (n=13)	p-value
Any recurrence, [n (%)]	8 (14.5)	4 (9.5)	4 (30.8)	0.058
Interval to recurrence, months [med. (range)]	6.0 (0.2-24.5)	6.5 (0.1-12.5)	6.0 (1.5-24.5)	1.000
Total follow-up, months [med. (range)]	4.6 (0.6-80.3)	4.1 (0.6-80.3)	8.1 (0.9-17.8)	0.487
Functional outcomes				
Regular bowel movements	39 (70.9)	33 (78.6)	6 (46.2)	**0.025**
Obstructive defecation	1 (1.8)	1 (2.4)	0 (0)	0.574
Any fecal incontinence	12 (21.8)	8 (19.0)	4 (30.8)	0.371
Any constipation	5 (9.1)	0 (0)	5 (38.5)	**<0.001**
Diarrhea	2 (3.6)	1 (2.4)	1 (7.7)	0.371
Overall normal bowel function[a]	36 (65.5)	32 (76.2)	4 (30.8)	**0.003**

[a]Normal bowel movements reported without incontinence, constipation, or diarrhea at the time of the most recent follow-up. med.: Median

fixation with or without mesh in acceptable-risk patients.[17] This recommendation has also been supported by other societies and expert panels; however, these guidelines do not specifically target elderly patients. Notably, there is growing evidence that minimally invasive transabdominal approaches are being increasingly used to treat rectal prolapse in the elderly.[9,10] However, these same studies indicate that the perineal approach remains the most frequently performed procedure in this population. Interestingly, in the present study, a greater number of patients were treated with minimally invasive transabdominal approaches than with perineal approaches, which contrasts with previously observed trends. Since all patients in this study were managed at a single tertiary hospital, this contrast may be attributed to management bias within the group.

Regarding postoperative outcomes, the current study found that the overall 30-day complication rate for elderly patients who underwent MIR was significantly lower than for those who underwent PR. These findings were observed despite an average patient age of nearly 80 years and a substantial number of comorbid conditions in both groups, suggesting that MIR may be safer than PR. However, this finding must be interpreted with caution, as the PR group in this study had higher rates of multiple comorbid conditions, including diabetes, cardiovascular disease, and pulmonary disease, than the MIR group. This raises concerns about potential selection bias, which may have influenced the observed results. Nevertheless, the higher prevalence of comorbid conditions in the PR group is not unexpected and is consistent with findings from other studies assessing similar outcomes.[18,19] Despite this concern, the contemporary literature consistently reports lower rates of early postoperative complications with minimally invasive approaches, suggesting that our results are consistent with previous findings despite differences between the two groups.[10,16,20,21] Additionally, there were no (0%) 30-day mortalities reported in the current study. It is well established that mortality rates for these procedures are generally low, and multiple large database studies assessing mortality have found no significant difference in early postoperative mortality rates between patients undergoing perineal versus transabdominal approaches.[9,10,16,22]

Unsurprisingly, patients who underwent PR had significantly shorter operative durations than those who underwent MIR, which is one of the consistent benefits of the perineal approach. However, despite the longer procedure time, MIR was associated with lower average EBL compared with PR and had the same average hospital LOS. The evaluation of patients who underwent MIR in the current study showed that three-quarters of the patients underwent VMR, whereas approximately one-quarter underwent PMR. Although both options have been shown to have low recurrence rates,[23] the posterior approach has historically been associated with higher complication rates. Despite the inclusion of PMR in the MIR group, the 30-day complication rate remained acceptable and was overall lower than that of the PR group.

Importantly, the use of minimally invasive VMR has gained considerable popularity and support in recent years due to its low long-term recurrence rates, low mesh-related complication rates, and notable improvements in constipation symptoms than other commonly used techniques.[23,24] In the current study, most MIR procedures involved the use of biologic mesh. Although studies have shown that overall mesh-related complication rates are low for both biologic and synthetic mesh, biologic mesh may ultimately be safer due to lower rates of mesh erosion while maintaining similar durability of repair to synthetic mesh.[25-27]

One of the most important findings of this study was the improved functional outcomes observed in patients who underwent MIR compared with those who underwent PR. In fact, three-quarters of the patients who underwent MIR reported normal bowel function without any new, persistent, or worsening bowel complaints at their most recent follow-up visit. Other studies have shown similar findings, and it is well established that transabdominal approaches result in better long-term functional outcomes and lower recurrence rates. However, one unexpected finding was that patients who underwent PR reported higher rates of at least temporary constipation during follow-up. This contrasts with other studies assessing functional outcomes after transabdominal and perineal repairs.[28] As such, this finding should be interpreted with caution, as this was a retrospective study assessing long-term outcomes via chart review and reporting was not standardized for either group.

Regarding recurrence, the current study showed that the MIR group had a lower observed rate of prolapse recurrence; however, this finding did not reach statistical significance. It is possible that with a larger sample size, a statistically significant difference may have been observed, but at minimum, our study demonstrated comparable recurrence outcomes. Previous studies have shown that transabdominal approaches are generally preferred for appropriately selected patients due to their lower long-term recurrence rates than perineal approaches, a factor that remains paramount when evaluating prolapse repair outcomes.[1]

Study Limitations

This study has several key limitations that must be acknowledged. First, its retrospective design inherently limits the ability to establish causality between observed differences among groups and increases the potential for selection bias. Additionally, multiple surgeons contributed to the data, leading to inherent heterogeneity in surgical practice. Second, the

study's small sample size, coupled with the disproportionate number of patients undergoing MIR compared with PR, increases the likelihood of type II errors. Furthermore, the lack of long-term follow-up data and the absence of standardized follow-up reporting hinder the ability to correlate findings with long-term clinical outcomes. Despite these limitations, the study's evaluation of early 30-day morbidity and mortality rates provides reliable and clinically important insights.

Conclusion

The MIR approach to prolapse repair is safe and feasible in elderly patients, with a lower 30-day complication rate and comparable mortality rates than PR. Additionally, early functional outcomes were overall better after MIR. Although growing evidence continues to support the use of minimally invasive transabdominal approaches in elderly patients, their widespread adoption in surgical practice has been slow. Further large prospective studies with long-term follow-up are needed to better evaluate the findings of this study and to help establish best practice for elderly patients undergoing rectal prolapse repair.

Ethics

Ethics Committee Approval: This study approved by the University of Southern California Institutional Review Board (approval number: HS-17-00058-CR008, dated: 7/11/2024).
Informed Consent: Retrospective study.

Footnotes

Authorship Contributions

Surgical and Medical Practices: K.G.C., S.E.K., M.P.D., J.S., S.W.L., Concept: K.G.C., S.E.K., M.P.D., J.S., S.W.L., Design: B.W., A.G., S.W.L., Data Collection or Processing: J.M., A.S., B.W., A.G., Analysis or Interpretation: J.M., A.S., B.W., K.G.C., S.W.L., Literature Search: J.M., A.S., B.W., Writing: J.M., A.S., K.G.C., S.W.L.

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