Annals of Medicine and Surgery 4 (2015) 321–323

Contents lists available at ScienceDirect

Annals of Medicine and Surgery

journal homepage: www.annalsjournal.com

Editorial

Do elderly patients have the most to gain from laparoscopic surgery?

Keywords:
Geriatric
Elderly
Older
Surgery
Laparoscopy

A B S T R A C T

Populations are aging worldwide, people are living longer, and the surgical needs of elderly patients are rising. Laparoscopic techniques have become more common with improved training, surgeon skill and evidence of improved outcomes. Benefits of laparoscopy include decreased blood loss, postoperative pain, and hospital length of stay; improved mobilization, quicker return to normal activity; and fewer pulmonary, thrombotic, and abdominal wall complications. Indeed, for many common pathologies laparoscopy has become the gold standard, unless contraindicated. It has been questioned as to whether elderly patients can reap the same benefits from laparoscopic surgery. The concern in elderly patients is that physiologic demands may outweigh the benefit seen in younger patients. This question stems from concerns related to longer operative times, increased technical challenge, as well as the impact of physiologic demands of pneumoperitoneum and patient positioning. However, with anesthesia and adequate perioperative cardiac care, there is no evidence that these factors lead to worse clinical outcomes in elderly patients. In contrast, perhaps elderly patients – with increased prevalence of multi-morbidity, geriatric syndromes and diminished physiologic reserve – have the most to gain from a laparoscopic approach.

1. Introduction

Populations are aging worldwide, people are living longer, and the surgical needs of elderly patients are rising. Laparoscopic techniques have become more common with improved training, surgeon skill and evidence of improved outcomes. Benefits of laparoscopy include decreased blood loss, postoperative pain, and hospital length of stay; improved mobilization, quicker return to normal activity; and fewer pulmonary, thrombotic, and abdominal wall complications [1–3]. Indeed, for many common pathologies laparoscopy has become the gold standard, unless contraindicated.

It has been questioned as to whether elderly patients can reap the same benefits from laparoscopic surgery. The concern in elderly patients is that physiologic demands may outweigh the benefit seen in younger patients. This question stems from concerns related to longer operative times, increased technical challenge, as well as the impact of physiologic demands of pneumoperitoneum and patient positioning [4,5]. However, with anesthesia and adequate perioperative cardiac care, there is no evidence that these factors lead to increased perioperative mortality in elderly patients [6]. In contrast, perhaps elderly patients – with increased prevalence of multi-morbidity, geriatric syndromes and diminished physiologic reserve – have the most to gain from a laparoscopic approach [7].

Concerns around the safety of laparoscopic surgery have led to the exclusion of elderly patients from randomized clinical trials (RCT). The surgical treatment of elderly patients is still a challenge as the use of laparoscopy in these patients has not been clearly defined and it is difficult to formulate evidence-based clinical recommendations extrapolating from RCT in younger patients. RCT of laparoscopic surgery for colorectal cancer excluded or under-represented the elderly, despite the fact that more than half of newly diagnosed patients with colorectal cancer are over 70 years old [8]. In this issue of *Annals of Medicine and Surgery*, Moug et al. [9] systematically review RCT that compared open to laparoscopic colorectal cancer surgery and comment on the inclusion and subgroup analysis for elderly patients.

2. Physiology of laparoscopy

The physiologic demands of laparoscopic surgery derive from carbon dioxide pneumoperitoneum, a state of increased intra-abdominal pressure, and patient positioning. The mechanical and metabolic demands of CO_2 pneumoperitoneum include acid-base and blood gas disturbances, alterations to pulmonary and cardiovascular physiology and splanchnic and renal hypoperfusion [2,10,11]. Pneumoperitoneum decreases functional residual capacity, lung compliance, and peak airway pressures, and absorbed intraperitoneal CO_2 causes hypercarbia and acidemia [12]. These concerns caused reluctance to offer laparoscopic procedures to the elderly. However, adjustments to minute ventilation will prevent deleterious effects in most patients [5]. Cardiac function may be altered by altered preload, afterload and contractility [12,13]. Careful patient selection is required, as those with underlying pulmonary and cardiac compromise may not tolerate these changes. Both increased intra-abdominal pressure and reduced cardiac function risk renal and hepatic hypoperfusion resulting in oliguria and transient hepatocellular injury [14,15]. Again, those with pre-existing renal or hepatic dysfunction would be most susceptible and a reduced insufflation pressure may be appropriate. Finally, laparoscopy frequently requires Trendelenberg or reverse Trendelenberg positioning for exposure and traction. Although Trendelenberg position reduces

http://dx.doi.org/10.1016/j.amsu.2015.09.007

hemodynamic stress by increasing venous return, it decreases lung compliance [2]. The opposite is true for reverse Trendelenberg position [2].

3. Clinical evidence

There are many reports of retrospective series of elderly patients treated with laparoscopic approaches for many pathologies. While these studies document the feasibility of undertaking laparoscopy in the elderly, they do not establish the efficacy of laparoscopy compared to traditional open approaches. Another group of studies were designed to compare laparoscopy in young versus elderly adults often concluding worse outcomes in the elderly [16–18]. This is an inappropriate comparison to evaluate the efficacy of laparoscopy for the elderly as baseline differences in these groups affect outcomes and elderly patients are known to experience worse surgical outcomes. The efficacy of laparoscopy in the elderly can only be evaluated through comparative studies of open and laparoscopic approaches.

3.1. Cholecystectomy

Gallbladder disease is common in the elderly and although laparoscopic cholecystectomy has become the treatment of choice in young patients, an audit of the American College of Surgeons – National Surgical Quality Improvement Project (ACS-NSQIP) database found that laparoscopic cholecystectomy is underused in elderly patients [19]. In the case of cholecystectomy for cholelithiasis, a small RCT comparing laparoscopic to open cholecystectomy in elderly patients found less postoperative pain and shorter length of stay in the laparoscopic group [20]. Many series aiming to assess laparoscopy for cholecystectomy combine acute and chronic gallbladder disease or compare outcomes for young versus elderly patients [21–24]. Several observational studies comparing laparoscopic versus open surgery for acute cholecystitis in elderly patients suggest a reduction in hospital length of stay, and equivalent or improved morbidity [25–28]. Indeed, a meta-analysis of 2 randomized and 11 non-randomized trials comparing open to laparoscopic cholecystectomy in elderly patients confirms the benefit of laparoscopy in this population in terms of reduced mortality and morbidity, including fewer cardiac and respiratory complications in the laparoscopic group [29].

3.2. Appendectomy

Laparoscopic appendectomy is the accepted procedure of choice for appendicitis in younger patients [1], and its use in the elderly is likewise supported by several large observational studies using national databases comparing laparoscopic and open appendectomy [30–33]. A cohort of 65,464 elderly patients from the Nationwide Inpatient Sample database comparing open to laparoscopic appendectomy found that laparoscopy had lower morbidity, in-hospital mortality, hospital charges, and length of stay for both perforated and non-perforated appendicitis [32]. Similarly, in a matched cohort using data from the ACS-NSQIP database laparoscopic appendectomy was associated with lower morbidity, length of stay, but similar mortality [33]. The evidence comparing laparoscopic to open appendectomy in elderly patients was synthesized in a recent meta-analysis. In this, laparoscopic appendectomy was associated with significant reductions in postoperative mortality, postoperative complications, and length of stay [34].

3.3. Colorectal procedures

Laparoscopy is the accepted treatment modality for many colorectal pathologies, including cancer [35,36], and many advocate it should be the procedure of choice for elderly patients. There are several large observational studies comparing open to laparoscopic colorectal procedures in the elderly. A cohort study of 8660 elderly patients undergoing segmental colectomy, ileocolectomy, or colorectal anastomosis identified from the ACS-NSQIP database found that laparoscopy decreased length of stay and risk of postoperative complications [37]. This more pronounced benefit gained by elderly patients undergoing laparoscopic surgery was observed in other studies. A cohort of 33,000 patients identified from the Netherlands Cancer Registry found the reduction in 1-year mortality with laparoscopic resection was greatest in those older than 75 [38]. Another study of 5914 patients with colon cancer using matched data from ACS-NSQIP found laparoscopic surgery lowered the risk of postoperative complications in elderly patients [39]. Similarly, data from RCT support these findings. A small RCT comparing laparoscopic to open resection for colorectal cancer in elderly patients found decreased rates of overall complications, ileus, and blood loss [40]. A retrospective analysis of another RCT found that patients older than 70 had an even greater benefit from laparoscopic resection in terms of fewer complications [41]. A third RCT found that elderly patients undergoing laparoscopic surgery had reduced morbidity and length of stay compared to open surgery and this advantage was more pronounced than in younger patients [42]. However, as stated in the synthesis by Moug et al. [9], large contemporary RCT of laparoscopic versus open surgery for colon and rectal cancer do not provide any evidence that elderly patients experienced better outcomes compared to younger people despite the fact that a large number of older people were included in these RCT. It is important to note that most of these RCT only included fit patients, as evidenced by the exclusion of patients with American Society of Anesthesiologists (ASA) score grade > 2, moderate heart failure, or obesity. These findings should not discourage the adoption of laparoscopy for colorectal procedures in elderly patients. Overall, there is consistent evidence from randomized and non-randomized studies supporting the benefits of laparoscopic colorectal procedures in elderly patients.

4. Conclusion

Laparoscopic surgery has become the treatment of choice for many common pathologies due to its many advantages including enhanced postoperative recovery and reduced complications. Laparoscopic surgery was initially withheld from elderly patients due to concerns over the unique physiological demands of pneumoperitoneum. However, with improved clinical evidence it is clear that laparoscopy also benefits this group. Indeed, it is the elderly who have the most to gain from laparoscopic techniques. The enhanced recovery offered by laparoscopy with reduced postoperative pain, improved mobilization, shorter hospital length of stay, and fewer complications may be most advantageous in this group with prevalent comorbidity and reduced physiologic reserve. Certainly, the evidence supports the use of laparoscopic surgery in the elderly and it should be offered unless specifically contraindicated. Research efforts should attempt to further define the outcomes of laparoscopic surgery in elderly patients by directly comparing open and laparoscopic techniques, and by identifying new techniques that will benefit this group. Pragmatic RCT that do not exclude elderly patients based on age, presence of comorbidities or subjective assessment of “fit for surgery” are needed to inform the care of this ever growing surgical population.

Ethical approval

Not applicable.

Funding

None.

Conflicts of interest

None.

Author contribution

Tyler R. Chesney: literature review and writing.
Sergio A. Acuna: literature review and writing.

Guarantor

Tyler R. Chesney.

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16 August 2015