

Acute Appendicitis in the Elderly: Current Update on Management: Review Article

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Abstract: Acute appendicitis in the elderly is a difficult condition to diagnose and treat due to its atypical clinical presentation, the co-morbidities that these patients have and the risk of developing complications like perforation. The diagnosis involves the use of imaging modalities like computerized tomography and the treatment is by performing an appendectomy. Laparoscopic appendectomy is slowly becoming the gold standard in the surgical treatment of acute appendicitis in the elderly. We have conducted this review article to look at the diagnosis and management of acute appendicitis in the elderly. The role of laparoscopic appendectomy in the surgical treatment of acute appendicitis in the elderly is also investigated.

Keywords: “Acute Appendicitis in the Elderly”, “Complicated Appendicitis in the Elderly”, “Investigations of Appendicitis in the Elderly”, “Laparoscopic Appendectomy” and “Open Appendectomy”.

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INTRODUCTION

Acute appendicitis is a common general surgical emergency that is seen in younger patients. In patients above the age of 60 years, it is seen in 5% to 10% of patients. The incidence of acute appendicitis in the elderly has been increasing due to the increased life span and better diagnostic and imaging modalities. The rate of complicated appendicitis is higher in the elderly patients due to the atypical presentation and the delay in diagnosis. The presence of comorbidities also influences the outcome of acute appendicitis in the elderly. (Cohen-Arazi *et al.*, 2017)

The definition of an elderly patient is unclear with the consensus of chronological age of 60 years and above. This definition of an elderly patient should reflect the chronological and biological age, independence level and health status. The clinical presentation includes lower abdominal pain, nausea and vomiting but the clinical signs may not be conclusive. The ability to sense pain and the absent fever response are more pronounced in the elderly. Laboratory investigation like leukocytosis, C-. reactive protein and neutrophil to lymphocyte ratio are not as sensitive in predicting complications like perforation. Imaging modality that is commonly used in the elderly patients is computerized tomography as it can diagnose other conditions that can cause acute abdominal

pain in the elderly and influence the treatment plan. (Lapsa *et al.*, 2021)

The treatment of acute appendicitis in the elderly is by performing an appendectomy. It can be performed as an open appendectomy or as a laparoscopic appendectomy. Open appendectomy is the current operation of choice, but laparoscopic appendectomy is slowly being performed as it is associated with reduced morbidity, mortality, early ambulation and reduced length of hospital stay. Conservative treatment with intra-venous antibiotics is not recommended in the treatment of acute appendicitis in the elderly due to lack of evidence on its efficacy. (Kot *et al.*, 2016; Pokharel *et al.*, n.d.)

The World Society of Emergency Surgeons (WSES) guidelines in the management and treatment of acute appendicitis have recommended imaging modalities like ultrasound, computerized tomography and magnetic resonance imaging to aid in the diagnosis of acute appendicitis in the elderly. Laparoscopic appendectomy is the recommended surgical procedure for acute appendicitis in the elderly due to its reduced length of stay and morbidity. conservative management is not recommended, and all patients should undergo colonic screening in the form of colonoscopy. (Fugazzola *et al.*, 2020)

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As there is no current consensus in the management of acute appendicitis in the elderly, we have conducted this review article looking into the diagnosis, and management of acute appendicitis in the elderly. We conducted a literature review using PUBMED, the Cochrane database of systemic reviews, Google scholar and semantic scholar looking for randomized control trials, non-randomized trials, observational and cohort studies, clinical reviews, systemic reviews, and meta-analysis from 1990 to 2024. The following keywords were used, “acute appendicitis in the elderly”, “complicated appendicitis in the elderly”, “investigation of appendicitis in the elderly”, “open appendectomy” and “laparoscopic appendectomy”. All articles were in English, and all articles were assessed by manual cross referencing of the literature. Commentaries, case reports and editorials were excluded from this review. Elderly patients above the age of 60 were included in this study and young adults and pediatric patients with acute appendicitis were excluded.

DISCUSSION

Diagnosis of Acute Appendicitis in the Elderly

The clinical presentation of acute appendicitis in the elderly is like younger patients, with symptoms of right lower abdominal pain, nausea and vomiting but they tend to present later after the onset of symptoms. The late onset of presentation predisposes these patients to complications like perforation of the appendix and abscess formation. Some of the factors that lead to late presentation include ignorance of symptoms, difficulty to assess medical facilities and the fear of hospitalization. (Gökakın *et al.*, 2013; Lee *et al.*, 2000; Moon *et al.*, 2012)

Blood investigation like full blood count to assess the presence of leukocytosis, raised C. reactive protein and urine analysis are useful initial investigations to aid in the diagnosis of acute appendicitis but further investigations may be required like renal profile and liver function test to assess the fitness of these patients for surgery. The use of imaging modalities like computerized tomography is essential in the elderly patients to not miss any other pathology. (Gammeri *et al.*, 2016)

There are numerous clinical scoring systems to diagnose acute appendicitis like the Alvarado, modified Alvarado, The RIPASA score, etc. These scoring systems have limitations in the diagnosis of acute appendicitis in the elderly as the atypical clinical presentation make scoring the patient difficult and hence the score may not be accurate to diagnose or rule out appendicitis. (Konan *et al.*, 2011; Shchatsko *et al.*, n.d.)

The use of computerized tomography to diagnose acute appendicitis in the elderly has seen a decrease in the rate of complicated appendicitis and this is useful to select which patients will require an urgent appendectomy. The use of computerized tomography is

also useful to rule out other causes like acute diverticulitis, cecal tumors, etc. The addition of oral and intra-venous contrast will further improve its diagnostic accuracy. (Hui *et al.*, n.d.; Vissers & Lennarz, 2010)

Risk Factors for Complicated Appendicitis

The risk factors for complicated appendicitis like perforation include the late onset of presentation, the presence of temperature above 38 degrees, the leukocyte shift to the left of more than 76%. These are the more common factors, and the risk of perforation is around 50% to 70% in the elderly population. Other factors include the male sex and the presence of symptoms like anorexia. Inadequate or improper examination of the abdomen is another factor that increases the risk of perforation, and the presence of obesity, preoperative hemoglobin and creatinine levels are also a factor. The presence of hypertension and heart failure are also additional factors for the risk of perforation. (Emektar *et al.*, 2022; Gal *et al.*, 2024; Poillucci *et al.*, 2021; Sheu *et al.*, 2007; Sirikurnpiboon & Amornpornchareon, 2015)

Other factors that can affect the risk of perforation and subsequently complicated appendicitis is the prolonged patient interval where there is a lag from the admission of the patient and subsequent diagnosis of acute appendicitis. As these patients will often undergo imaging in the form of a computerized tomography, this may then lead to a delay in performing an appendectomy in these patients. (Omari *et al.*, 2014; Segev *et al.*, 2015)

A retrospective study was conducted by Kara *et al.*, who evaluated the management, morbidity and mortality of acute appendicitis in the elderly, and they concluded that the median time from the onset of symptoms to admission to the hospital was 5 days and the rate of perforation was 45%. This study concluded that the delay in presentation was a factor in the risk of developing complicated appendicitis. (Kara, 2022)

Management of Acute Appendicitis in the Elderly

The management of acute appendicitis in the elderly is by performing an appendectomy, and the various methods include an open or laparoscopic appendectomy. Open appendectomy is performed via a Lanz incision and the common complications that are associated with the elderly include wound infection, post operative ileus and pneumonia. (McGowan *et al.*, 2011)

Laparoscopic appendectomy was introduced for the treatment of acute appendicitis in the elderly. It was found to be safe, effective and associated with reduced morbidity. Laparoscopic appendectomy was also associated with reduced analgesia usage and reduced length of hospital stay. (Wu *et al.*, 2017)

Laparoscopic appendectomy was compared with open appendectomy in the treatment of acute appendicitis in the elderly and it was found to be safe and effective. The post operative wound infection rate was

lower, but the operative time, conversion rate and length of hospital stay was longer due to the higher risk of complicated appendicitis in the elderly. Laparoscopic appendectomy is considered the treatment of choice for complicated and uncomplicated appendicitis. (Baek *et al.*, 2011; Kirshtein *et al.*, 2009; Masoomi *et al.*, 2012; Paranjape *et al.*, 2007)

Several single center and multi-centered studies have evaluated the efficacy of laparoscopic appendectomy in the treatment of acute appendicitis in the elderly. These studies concluded that laparoscopic appendectomy was safe to be performed in the elderly and the operative was comparable with open appendectomy and there was reduced post operative

ileus and vomiting. (Guller *et al.*, 2004; Southgate *et al.*, 2012; Yang *et al.*, 2017; Yeh *et al.*, 2011)

A systemic review and meta-analysis were conducted by Wang *et al.*, comparing laparoscopic versus open appendectomy in the elderly patient. Twelve studies were included in this study and the post operative mortality, wound infection rates and length of hospital stay were reduced in the laparoscopic appendectomy group, the operative time was longer than open appendectomy and the intra-abdominal abscess formation was similar between both methods. This study also concluded that laparoscopic appendectomy was feasible in the management of acute appendicitis in the elderly (Wang *et al.*, 2019).

Table I: Showing the intra-abdominal abscess rate between laparoscopic and open appendectomy

Study	Year	Study type	Laparoscopic appendectomy numbers	Open appendectomy numbers	Intra-abdominal abscess rate
Wu <i>et al.</i> ,	2011	Retrospective study	786	6	29.5%
Masoomi <i>et al.</i> ,	2012	Retrospective study	34,066	31,397	60.3%
Yang <i>et al.</i> ,	2017	Retrospective study	80	65	10.2%

Complicated Appendicitis in the Elderly

Complicated appendicitis in the elderly involves perforation of the appendix and this is seen in up to 30% - 70% of cases. The most common factor is the late presentation of elderly patients with acute appendicitis. The atypical or non-classical clinical presentation of acute appendicitis in the elderly is associated with a mortality rate of 10%, the operative time is prolonged, and it requires additional antibiotic usage. Post operative complications like wound infection, abscess formation and pneumonia are higher (Kraemer *et al.*, 2000; Rondelli *et al.*, 2019; Weinandt *et al.*, 2020).

Due to the high prevalence of complicated appendicitis in the elderly which is detected post operatively or when the specimen is sent for histology, conservative or non-operative management should not be recommended in the management of this condition. (Dhillon *et al.*, 2019)

CONCLUSION

Acute appendicitis in the elderly is a challenging condition to diagnose and treat as the clinical presentation is vague and atypical. The classical presentation may not be present, and these patients are at a high risk of developing complications like perforation of the appendix. The diagnosis of acute appendicitis in the elderly is usually delayed due to the use of blood investigations and imaging modalities like computerized tomography.

The treatment of acute appendicitis in the elderly is by performing an appendectomy with laparoscopic appendectomy being the current treatment of choice if the service is available. Surgery should not be delayed as these patients have a high risk of

developing complicated appendicitis. Non-operative management is not recommended as it may increase the risk of developing complicated appendicitis.

Performing an appendectomy in the elderly patient is not as routine as performing it in a normal adult, hence it is better that these cases be done by experienced general surgeons and not by junior surgical registrars.

Conflict of Interest: There is no conflict of interest.

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