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Risk Scoring Systems in Patients Planned for Laproscopy Who Have Suspected Acute Appendicitis: A Single-Center Retrospective Study

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KEYWORDS

Appendicitis; imaging; laparoscopy

Abstract

Background: There is at present disagreement over the best way to evaluate patients who have appendicitis; in the Department of General Surgery at Meenakshi Medical College, Hospital and Research Institute, Kanchipuram, there are no national guidelines that may be used to guide clinical management. We looked into the possible advantages of proven risk score systems for individuals who might have appendicitis. **Techniques**: Enrolled were patients between the ages of 16 and 45 who were having a diagnostic laparoscopy because they may have appendicitis. The negative appendicectomy rate (NAR) was the main objective. The Adult Appendicitis Score (AAS) and the Appendicitis Inflammatory Response Score (AIRS) were the secondary objectives, together with their false negative rate (FNR) and specificity. **Results:** There were 361 patients in all, 188 (52.1%) of them were female. 287 individuals (79.5%) had appendicectomies. 6.6% was the NAR. During laparoscopy, females had more alternative diagnoses than males, and the former group had a lower likelihood of undergoing appendicectomy (67.6% versus 92.4%, P<0.001). Sixty-two patients (17.2%) underwent pre-operative imaging; computed tomography was the most often used modality, with a specificity and FNR of 83.3% and 12.6%, respectively. The FNR and specificity of the AIRS in males were 7.3% and 44.4%, respectively. The AAS had a 35.7% FNR and 66.7% specificity in females**. Conclusions**: A low NAR but a substantial incidence of needless laparoscopies were linked to the clinical judgment-based stratification of individuals with probable appendicitis. Risk scoring doesn't seem to be beneficial for young girls in whom routine pre-operative imaging may be considered.

Introduction

Acute appendicitis, which affects around one in ten people at some point in their lives, continues to be the most common condition in the world needing emergency surgery.[1] Acute appendicitis also has detrimental social and economic effects, as it frequently affects young, working adults.[2,3] In affluent countries, acute appendicitis is no longer only a disease of the young; research have shown that the incidence of the condition is still greater among younger individuals, especially men. However, it is also commonly found in middle-aged and older adults.[3]

The most prevalent imaging modality is computed tomography (CT) scanning. Although current guidelines encourage the use of CT in patients older than 40 years old because of the higher risk of diverticulitis and malignancies, there are still worries about the long-term effects of subjecting younger patients to ionising radiation.[4] There are dangers involved with using laparoscopy as a diagnostic tool. These hazards include the possibility of operational complications or an increased incidence of negative appendicectomies, which involve the removal of an appendix that is histologically sound.[5]

To reduce the number of young patients enduring needless scans or procedures and to standardise diagnostic paths, a variety of appendicitis grading systems have been created. It's unclear which scoring system is better, if any, and what place these systems have in standard medical care, though, because there are

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so many of them. [6] The Adult Appendicitis Score (AAS) is the most effective for women, while the Appendicitis Inflammatory Response Score (AIRS) is the most effective for males, according to a new multicenter study that included almost 5,000 patients with suspected appendicitis who were under 45 years old. The research team evaluated 15 distinct scoring methods. These findings served as the foundation for a sex-specific flowchart that advised CT screening in women with an AAS score of at least eight and in males with an AIRS score of at least two before surgery. The research aimed to assess the usefulness of the AAS and AIRS grades as well as the outcomes of patients having diagnostic laparoscopy for probable appendicitis.

Methodology

Electronic data were used to identify patients during the ages of 16 and 45 who underwent laparoscopic surgery at our facility between January 3, 2023, and January 3, 2024, for suspected or radiologically confirmed acute appendicitis. Electronic patient data were mined for pertinent clinicopathological characteristics. The Meenakshi Medical College, Hospital and Research Institute, Kanchipuram, Department of General Surgery's institutional review board authorised the investigation. Patients' informed consent was not required for this study because it was accepted by the hospital management of the department of general surgery at Meenakshi Medical College, Hospital and Research Institute, Kanchipuram, as a quality assurance program. Patients were treated during the study period based on the receiving surgeon's clinical discretion. Although it wasn't done frequently, pre-operative imaging was taken into consideration in cases of unusual or delayed presentations. Moreover, there was no standard appendicitis rating system in place. At our facility, the conventional procedure for suspected appendicitis is laparoscopic surgery. As open surgery is usually reserved for cases in which an appendiceal cancer has been preoperatively diagnosed, this patient group was deemed irrelevant to the study's objectives. Therefore, patients having a laparoscopic procedure—with or with no conversion—were considered; individuals having an open procedure were not.

The negative appendicectomy rate (NAR), which is characterised as a histological diagnosis that does not include acute appendicitis or appendiceal neoplasia following appendectomy, was the main focus of this investigation. Additionally, the 30-day morbidity and mortality rate, the effectiveness of the AIRS and AAS systems, and pre-operative imaging accuracy were considered. While reducing the misdiagnosis of people with appendicitis (false negatives), the optimum risk assessment for appendicitis would discover as many healthy individuals as low risk (true negatives). We therefore reported the performance of pre-operative imaging and the AIRS and AAS systems in terms of their false negative rate (FNR) [false negatives/(false negatives + true positives)] and specificity [true negatives/(true negatives + false positives)]. The grade of appendicitis was determined from the operation note, with inflamed or gangrenous appendicitis defined as uncomplicated and the presence of perforation, abscess or peritonitis defined as complicated. For all analyses, patients were stratified into two groups based on sex. AAS and AIRS were calculated retrospectively for females and males, respectively.

All statistical analyses were performed using IBM SPSS V. 23. The Chi-squared test was used for the comparison of categorical variables, whereas the Kruskal-Wallis test was used for the comparison of continuous variables. All tests were 2-tailed and a P value of <0.05 was considered statistically significant.

Results

Throughout the research period, 361 patients had laparoscopies for probable appendicitis; 188 (52.1%) of these patients were female. Table 1 displays the stratified operational demographics by gender. 79.5% of the 287 patients who underwent an appendicectomy had an operating surgeon's macroscopic diagnosis of appendicitis at the time of surgery. Differential diagnosis were found more frequently in female patients at the time of laparoscopy; compared to male patients, a substantially lower percentage of female patients had appendicectomy (67.6% versus 92.4%, $P<0.001$). Table 1 provides an overview of various possible diagnosis. We predict that only 3 out of these 74 patients (4.1%) would have needed operative intervention if such alternative diagnoses had been made prior to surgery. Among those with an appendicitis diagnosis, no difference in the grade of disease was noted between sexes. Of the individuals receiving appendicectomy, 263 patients (91.6%) had a pathological finding of appendicitis, and 5 patients (1.7%) had appendiceal neoplasms. With a higher percentage of females than males suffering excision of a normal appendix (9.4% versus 3.5%), this resulted in an overall NAR of 6.6%.

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Table 1 Operative demographics of patients undergoing diagnostic laparoscopy due to suspected appendicitis

Variable	Male	Female	P value
Number of patients	173 (47.9)	188 (52.1)	–
Number undergoing appendicectomy	160 (92.4)	127 (67.6)	<0.001
Grade of appendicitis			0.236
Uncomplicated	126 (78.8)	107 (84.3)	
Complicated	34 (21.2)	20 (15.7)	
Number of negative appendicectomies	9 (5.6)	12 (9.4)	0.217
Pathological diagnosis			0.202
Appendicitis	148 (92.5)	113 (89.0)	
Normal appendix	8 (5.0)	12 (9.4)	
Neoplasia	3 (1.9)	2 (1.6)	
IBD	1 (0.6)	0 (0)	

Table 2 The use of imaging in patients with suspected appendicitis

Variable	Male	Female	P value
Pre-operative imaging	38 (22.0)	24[§] (12.8)	0.021*
Imaging modality		0.262	
Contrast CT	30 (78.9)	16 (66.7)	
Non-contrast CT	1 (2.6)	4 (16.7)	
Ultrasound	6 (15.8)	4 (16.7)	
MRI	1 (2.6)	1 (4.2)	
Conclusion from imaging			0.046*
Appendicitis	31 (81.6)	14 (58.3)	
Inconclusive	7 (18.4)	10 (41.7)	

Table 3 Performance of the AIRS system in males aged <45 years

Variable	High-risk	Low-risk	P value
Number of patients	156 (90.2)	17 (9.8)	–
Pre-operative imaging	32 (20.5)	6 (35.3)	0.162
N° undergoing appendicectomy	145 (92.9)	15 (88.2)	0.484
Grade of appendicitis			0.431
Uncomplicated	113 (77.9)	13 (86.7)	
Complicated	32 (22.1)	2 (13.3)	
Negative appendicectomy rate	3.4%	26.7%	<0.001*
Pathological diagnosis			–
Appendicitis	137 (94.5)	11 (73.3)	
Normal appendix	5 (3.4)	3 (20.0)	
Neoplasia	3 (2.1)	0 (0)	
IBD	0 (0)	1 (6.7)	

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Table 4 Performance of the Adult Appendicitis Score (AAS) in females aged <45 years

Variable	High-risk	Low-risk	P value
Number of patients	108 (57.4)	80 (42.6)	–
Pre-operative imaging	10 (9.3)	14 (17.5)	0.094
Nº undergoing appendicectomy	78 (72.2)	49 (61.3)	0.112
Grade of appendicitis			0.390
Uncomplicated	64 (82.1)	43 (87.8)	
Complicated	14 (17.9)	6 (12.2)	
Negative appendicectomy rate	5.1%	16.3%	0.032*
Pathological diagnosis			–
Appendicitis	72 (92.3)	41 (83.7)	
Normal appendix	4 (5.1)	8 (16.3)	
Neoplasia	2 (2.6)	0 (0)	

Numbers in parentheses are percentages. *, statistically significant results.

Discussion

The ideal management of patients presenting with suspected appendicitis remains controversial and at present no national guidelines are available to direct clinical decision making. Over a 12-month period where patients were managed without the use of scoring systems or mandatory verification of the diagnosis with imaging prior to surgery, we found that a NAR of 6.6% was achieved. However, an alternative diagnosis was identified in over 20% of patients undergoing laparoscopy, the overwhelming majority of whom could have been spared an operation. The majority of alternative diagnoses were identified in females, of whom only 2/3 were found to have a macroscopic diagnosis of appendicitis. One possible tactic to lower the number of patients receiving negative appendectomy and needless laparoscopy is the routine use of pre-operative ultrasonography. A similar approach was implemented in The Netherlands in 2010, when recommendations suggested using ultrasonography as a first line of inquiry, with CT scans as a backup if needed.[7] The number of negative appendicectomies fell sharply from 16% before it was released to just over 3% after strictly sticking to these recommendations. Moreover, the documented incidence of negative laparoscopies—that is, those in which an appendix that is normal or a different diagnosis is discovered—was slightly higher than 3%.8 These statistics stand in stark contrast to the results of a multicenter UK research, which found that only 30% of patients had pre-operative imaging done.[9] It is interesting to note that our NAR was significantly smaller than the British research's and more in line with reports from other European countries, despite the fact that pre-operative imaging was employed even less frequently in this investigation.[9] Differences in the care of a macroscopically normal appendix, which was typically left in situ at our facility, could be one reason for this. When compared to diagnostic laparoscopy by itself, the removal of a macroscopically normal appendix is linked to greater risks of problems and lengthier hospital stays, with no discernible clinical advantage.[5]

Higher pressures on radiology departments could be a drawback to the widespread use of pre-operative imaging routines. By using scoring systems concurrently, these consequences could be lessened and imaging could be saved for patients with unusual presentations and unclear clinical diagnoses. Nevertheless, these scoring systems' introduction into standard clinical practice may be constrained by issues with their validity and effectiveness. The best models for predicting risks for males and females, respectively, were found to be the AAS and AIRS systems in a newest multicenter research including over 5,000 patients.[8] In spite of this, the identical research shown that these models' effectiveness varied depending on the system of healthcare. When applied to a mixed cohort of Irish, Italian, Portuguese, and Spanish patients, the FNR of the AIRS system increased from 2.4% to 32%, despite the fact that the system worked well in British males with a cut-off of ≤2. Comparably, in the mixed cohort, the FNR of the AAS system with a cut-off of ≤8 increased from 3.7% in British females to 17.5%. These statistics draw attention to the possible issues with projecting appendicitis risk prediction model results from one nation to another. While the AIRS system did rather well in the current study, with a FNR of 7.3% in males, the AAS system was linked to a FNR of 35.7% in females. This implies that even while the AIRS system might be effective use in stratifying the management of male

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patients with suspected appendicitis , the AAS may be of limited value in the pre-operative assessment of females.

Conclusion

In conclusion, our research indicates that the way young individuals with suspected appendicitis are currently treated is linked to a high rate of needless surgery, especially for female patients. Globally verified scoring methods seem to have limited utility in the female population, but they might be useful in stratifying the management of males. A policy of routine pre-operative imaging in young women, utilising low-dose CT, MRI, or ultrasonography depending on local resources and skill, should be taken into consideration. Pre-operative imaging could be beneficial for low-risk guys identified by the AIRS method.

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