Concerning Rise in the Incidence of Appendix Cancer: Critical Analysis of 22 Newly Diagnosed Appendix Cancer Patients Over a Four-Year Period at a Small Community Hospital in Delaware

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INTRODUCTION

The trend towards nonoperative management for acute appendicitis is steadily gaining traction in medical practice. However, more data is needed to investigate the impact this change will have on the detection of appendiceal malignancies. While rare, with an incidence hovering around 1 to 2 cases per 1 million individuals annually in the United States[1], recent research indicates these rates are increasing to as high as 1 in 1,000 individuals annually.[2] This is seen concurrently with a change in histological patterns from neuroendocrine tumors (NET) to low-grade appendiceal mucinous neoplasms (LAMN).

Appendix cancer is often found incidentally during abdominal surgeries or imaging scans, making the rising incidence all the more alarming. The 232% rise from 2000 to 2016 in the United States alone[1] is concerning, given the propensity for this malignancy to present as acute appendicitis and potentially leading to oversight or delayed diagnosis. It has become imperative to explore the potential implications of nonoperative management, especially considering that any patient may have an underlying appendiceal malignancy. It is crucial to explore how the evolving medical management of acute appendicitis may impact patient care and outcomes when the risk of appendix cancer must also be considered.

METHOD

In a retrospective review, we investigated and analyzed the medical records of patients who underwent an urgent appendectomy at our institution from January 1, 2019, through December 31, 2022. Within this dataset, we examined each case's clinical presentations, radiographic findings, and pathological characteristics. The study specifically focused on individuals who received a diagnosis of appendix cancer following their appendectomy based on the result of their pathology report. These patients had to have undergone surgical management for acute appendicitis to be included in the study.

Potential Risk Factors for Appendiceal Malignancy

Increased appendix size	History of colon cancer
Increased appendix wall thickness	History of inflammatory bowel disease
Unexplained anemia	Features of chronic appendicitis
Indeterminate imaging	Normal preoperative WBC count

Table 2: Potential risk factors for appendiceal malignancy in patients presenting with appendicitis [3,5,6]

RESULTS & DISCUSSION

Over the four-year period, there were a total of 668 appendectomies performed for suspected acute appendicitis. In 2019, 2020, 2021, and 2022, there were 182, 170, 157, and 159 appendectomies. An appendiceal tumor was identified in 4 (2.2%), 1(0.6%), 6 (3.8%), and 11 (6.9%) patients, respectively. Twenty-two (3.3%) appendix cancers were identified. The data is summarized in Table 1.

Year	*Number of Appendectomies*	*Number of Appendiceal Tumors*	*Malignancy Percentage*
2019	182	4	2.2%
2020	170	1	0.6%
2021	157	6	3.8%
2022	159	11	6.9%
Total:	*668*	*22*	*3.3%*

Table 1: Breakdown of appendectomies performed from 2019 - 2022 at Beebe Healthcare for acute appendicitis and the number of appendiceal malignancies identified

Further data analysis revealed that the average age was 56 (17-89) years, and 59% of patients were females. The most common tumor identified was a low-grade appendiceal mucinous neoplasm (LAMN), and 18% had a neuroendocrine tumor (NET). An invasive cancer was identified in 36% of patients with an appendix tumor. The most common form of presentation for those with an identified malignancy was acute appendicitis (77%).

While nonoperative management of acute appendicitis has proven to be non-inferior to appendectomy in standard cases, it does not accommodate for the increasing risk of appendiceal malignancy. Data regarding the differentiation of appendiceal neoplasm from acute appendicitis on imaging and the identification of potential risk factors has been inconclusive. There appears to be an increased incidence with age that peaks at 60-69 years.[3] In the older patient population, it is essential to assess the risk of malignancy compared to the risk associated with undergoing surgical intervention. However, it must be noted that this population is at greater risk for more aggressive appendiceal malignancies.[4] Additionally, patients under the age of 40 years account for 8.4% of appendiceal cancers and tend to have fewer comorbidities overall, decreasing the risk of surgery.[4] Additional risk factors to consider include appendix size and wall thickness. There was an identified 1.95 and 1.30 increased odds ratio of appendiceal malignancy for each 1-centimeter increase in appendix width and 1-millimeter increase in wall thickness, respectively.[5] This correlates to a 50% probability of malignancy with a wall thickness of 13.05 mm or width of 6.25 cm.[5] These measurements may be difficult to gather with certainty on imaging but may aid in risk assessment. Other signs and symptoms that should not be ignored include a history of colon cancer or inflammatory bowel disease, features of chronic appendicitis, unexplained anemia, normal preoperative white blood cell count, or indeterminate imaging for appendicitis.[3,6] These factors are summarized in Table 2.

The prognosis for appendiceal malignancy is dependent on the identification and grading of the tumor type, with average long-term survival ranging anywhere from 10% to 90%.[7] Prompt diagnosis and treatment are imperative. It is crucial to consider the risk of appendiceal malignancy in patients presenting with acute appendicitis when discussing treatment modalities to avoid a potential missed diagnosis.

CONCLUSION

The data gathered supports the fact that there is an increasing incidence of appendiceal tumors diagnosed in patients undergoing an appendectomy for acute appendicitis. It also substantiates the statement that the histology of these tumors has changed, and invasive cancers are becoming more common. Additional information and subsequent studies must be performed to evaluate the potential for missed malignancy when treating acute appendicitis nonoperatively. The most significant factor in deciding treatment management is patient education. The patient must be aware of the risks associated with surgical and nonoperative management. Patients may prefer nonoperative management due to decreased cost and avoiding surgical intervention. However, they must be counseled on the risk and long-term cost of missed appendiceal malignancy or recurrent appendicitis. Until further studies are performed to identify additional risk factors and to help predict the probability of missed malignancy in the nonoperative management of acute appendicitis, it is imperative that physicians and patients weigh the potential of appendiceal neoplasm in their decision-making process when recommending treatment for acute appendicitis.

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