

## Incidence of Malignancy in Appendicectomy Specimens

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### Abstract

**Objective:** To study the incidence of malignancy as well as neoplasia in the appendicectomy specimens routinely sent for histopathology. **Methods:** We conducted this retrospective cohort study of 947 patients diagnosed with acute appendicitis with subsequent appendectomy in the period between 1 January 2018 and 31 December 2022 (5 years) at Ibra hospital, North Sharqiya, Sultanate of Oman. We analyzed the clinical data of the cohort including demographic information, diagnosis, pre-operative imaging, histological diagnosis and incidence of malignancy in appendicectomy specimens. **Results:** The median age of patients was 36.4 years (range 13-80 years). The male-to-female ratio in the appendicectomy cohort was 1.03:1. Post-operative histology revealed out of 947 cases just 8(0.8%) cases were diagnosed as cancer. Acute appendicitis 851(89.9%) and negative appendicectomy 88(9.3%). **Conclusion:** The incidental identification of appendiceal cancers in the resected specimens after acute appendicitis is not uncommon. It is recommended to consider such diagnosis when dealing with acute appendicitis in older patients with longer symptom history and in the presence of peri-appendiceal mass.

**Keywords:** Acute appendicitis- neoplasia- malignancy- appendicular mass- histopathology.

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### Introduction

Acute appendicitis is one of the most common causes of acute abdomen in adults with an estimated lifetime risk of 7-8% [1]. The highest incidence of appendicectomy is in the second and third decades of life, with the incidence less common in both extremes of life [2]. The etiology includes the presence of luminal obstruction by fecaliths, lymphoid hyperplasia, impacted stool, parasitic infestation, and rarely by appendicular or caecal cancer [3]. Luminal obstruction by neoplasms is usually seen in the elderly and the estimated incidence of appendicular tumors was 0.12 cases per 1,000,000 people per year [4, 5]. However, recent large database studies have reported the incidence to be as high as 97 cases per 100,000 people [6]. It is unclear whether this increase reflects an actual change in disease occurrence or simply a more identification and reporting [7]. The five main histopathological subtypes of appendicular neoplasms are as follows: neuroendocrine neoplasms, mucinous neoplasms, goblet cell adenocarcinomas, colonic-type (non-mucinous) adenocarcinomas and signet-ring cell adenocarcinomas [8]. Clinical management is highly dependent on tumor type, histological grade, pathological stage & the status of resection margins, and may range from radical surgery to systemic chemotherapy or surveillance [9].

Surgeons usually do not suspect neoplasms of the appendix before surgery, and these are found either during surgery or on pathological examination later. Although there are studies in the literature on the biological behavior of appendiceal tumors, the evidence contains various inconsistencies, and limited data exist on the long-term outcomes of appendiceal neoplasms [9].

The aim of this study was to identify the incidence of malignant tumors found in appendicectomy specimens in patients with a provisional diagnosis of acute appendicitis and to assess their prevalence as well as their clinical significance.

### Materials and Methods

We conducted this retrospective study was conducted in 2023, in the department of general surgery, Ibra Hospital, Oman on patients who had open or laparoscopic appendicectomy between January 2018 to December 2022 (5 years). We retrieved all patients' information from the hospital's computerized system. We ensured an adequate level of confidentiality of the research data. We will categorize the results of histopathology as neoplastic, inflammatory & negative appendectomies. Our practice was to use computed tomography when the ultrasound was inconclusive, or not in consistency with the clinical

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findings or laboratory investigations. Age alone was not a criterion for the selection of imaging modalities.

## Results

The total number of cases was 947 patients. Among these, 480 were males (50.68 %) and 467 were females (49.31%). The mean age of the cohort was 22.26 years. Patients aged 12 years or less were 182 (19.2%). Patients aged more than 12 years to 60 years were 755 (79.7%). Patients older than 60 years were 10 (1.1%). The median age in the entire cohort was 20 years, and the maximum age was 85 years.

Open surgery was used for 281 cases, laparoscopic surgery for 664 cases and conversion from laparoscopic to open surgery was resorted to in two cases. Out of the 947, eight patients were diagnosed as having neoplasms. Out of those, one was adenocarcinoma (female, age of 72 years) and the rest of cases were carcinoid tumor (four were males & three were females). In carcinoid tumor, mean age was 43.3 years, with a maximum age 47 years with male to female ratio of 1 to 1.3. The incidence of neoplasia was 0.84% (n=8). Acute inflammation was present in 89% of cases. The incidence of negative appendicectomy was 9.3% (88 cases).

## Discussion

In this study, the rate of neoplasia in the appendicectomy specimens was 0.84% (Table 1). This rate is less than the rate reported in recent studies [10, 11], however, it is more than the rate reported before [6]. Other researchers also reported this trend of increasing incidence and they attributed this increase to the increased diagnosis of low-grade neuro-endocrine tumors (NETs) due to changes in pathological classification systems [7].

In this study, we identified eight cases as neoplastic; out of them seven are NETs with a percentage of 89.9% of all tumours identified. Other authors [12] also reported this. We reported one elderly female to have adenocarcinoma, which is a similar finding in the study carried out by McCusker et al, where they noticed that all adenocarcinoma cases were elderly, with a female predominance [4]. The mean age of the eight cases diagnosed as malignant neoplasms was 43.3 years, with a significant increase of age among malignant cases. Other studies reported a similar finding [6].

The presence of appendicular neoplasia represents a detrimental outcome parameter. The preoperative diagnosis is difficult. Clinical examination cannot elicit

specific finding and abdominal US & CT abdomen are likely to miss a small tumor in the appendix in the setting of acute presentation [9].

Previous studies have failed to identify radiological factors that may predict the presence of underlying neoplasia in patients presenting with acute appendicitis [12]. It has been argued that malignancies should also be suspected in all patients presenting with an underlying inflammatory mass or abscess, especially in older patients [7]. Appendicular adenocarcinomas are associated with poorer oncological outcomes compared to other neoplasms. Our understanding of these tumors and treatment options has dramatically improved in recent years, and many patients have improved survival due to more aggressive surgical treatments and improved systemic treatment options [13].

Neuroendocrine tumor forms 80% of all appendicular tumors. The appendix is the most common localization of carcinoid tumors in the gastrointestinal tract with a rate of 40-50% [1-3]. Eighty percent of the carcinoid tumors localized to the appendix are smaller than 1 cm, and 5% are larger than 2 cm. Carcinoid tumors can be seen in all ages, but in adult age and in female gender, they are more frequently detected [2, 3]. It is known that these tumors secrete many gastrointestinal peptides and hormones, especially 5- hydroxytryptamine. In addition, Iodine 131 iodobenzylguanidine scintigraphy is particularly useful in the detection of metastatic carcinoid tumors [13]. About 90% of carcinoid tumors are benign, and most cases are less than 1 cm and the prognosis deteriorates if the size of the tumor is greater than 2 cm [13]. The risk of metastasis in tumors smaller than 1 cm is 2%, while in lesions greater than 2 cm this rate reaches 80%. A 5-year survival of appendicular carcinoid tumors is above 90% [14]. Appendicectomy alone represents an adequate treatment for appendiceal carcinoid tumors less than 1 cm size [2].

The treatment of tumors between 1 and 2 cm in diameter is controversial [6]. Right hemicolectomy is performed in the treatment of tumors larger than 2 cm, especially tumors with invasion of lymphatic ducts, serosa & mesoappendix, presence of regional lymph node metastasis, mucinous carcinoid tumors and childhood carcinoid tumors [14]. In contrast to other appendicular tumors, adenocarcinomas more often present with a clinical picture of acute appendicitis and standard treatment is a right colectomy. Despite the lack of enough data, many oncologists recommend adjuvant 5-FU-based chemotherapy particularly for patients with node-positive [12].

Table 1. Histo-Pathology Results of the Studied Appendicectomy Specimens

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Acute Appendicitis	851	89.9	89.9	89.9
	Adenocarcinoma	1	0.1	0.1	90.0
	Carcinoid tumor	7	0.7	0.7	90.7
	Negative	88	9.3	9.3	100
	Total	947	100	100	

The table represents the result of histopathological examination of appendicectomy specimens removed with the diagnosis of acute appendicitis

## Author Contribution Statement

Deep Parkash: designed the research helped to collect summarize the clinical data. Hamed H. Al Aamri: wrote the final version & gave critique. Simran Parkash & Elsayed G. Abdelwahab: collected the data & carried out the statistical analysis. Ayman Albatanony is the corresponding author, conceptualization, project administration & reviewing the manuscript. All authors read and approved the final manuscript.

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### General

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### Data Availability

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request & after approval of ministry of health, Oman.

### Approval & registration

the study was approved by ministry of health, Oman: center of studies & research (<https://www.mohcsr.gov.om>) and was registered under number 27088 on July, 27th, 2023. The study was not a part of an approved student thesis.

### Ethical Declaration

the ethical committee in research & study centre, north Sharqiya governorate, Oman approved the study.

### Conflict of Interest

The authors declare no conflict of interests

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