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INTRODUCTION

Appendiceal tumors are extremely rare, accounting for less than 1% of all gastrointestinal malignancies, with mucinous neoplasms representing the most common subtype (1). The majority of cases are asymptomatic and are identified incidentally in appendectomy specimens, although a minority may present with pseudomyxoma peritonei in advanced stages (1,2). Low-grade appendiceal mucinous neoplasms are characterized by mucin-producing epithelium and typically lack infiltrative or destructive invasion. In contrast, high-grade mucinous neoplasms

Appendix and ovarian mucinous neoplasia; 10-years of single center experience

Abstract

Aim: To evaluate the incidence and clinical characteristics of mucinous neoplasms in appendiceal and ovarian specimens, and to assess the necessity of appendectomy in ovarian mucinous neoplasms.

Materials and Methods: This retrospective study reviewed all appendiceal and ovarian surgical specimens obtained over a 10-year period. Cases in which mucinous neoplasia was identified were analyzed in detail with respect to clinical history, prior appendectomy or oophorectomy, and histopathological features. Descriptive statistics (mean, standard deviation, median, frequency, percentage, minimum, and maximum) were used for data analysis.

Results: A total of 970 surgical cases were examined. Of these, 59.18% (n=574) involved appendiceal specimens, 40.72% (n=395) ovarian or tubo-ovarian specimens, and 0.1% (n=1) involved concurrent appendiceal and ovarian resection. Mucinous lesions were identified in 1.22% (n=7) of appendiceal specimens and 0.76% (n=3) of ovarian/tubo-ovarian specimens, representing 1.03% of all specimens. Among these cases, the mean age was 48.8±19.15 years; four patients were male and six female. None had a prior history suggestive of mucinous neoplasia. Among female patients, mucinous neoplasms were localized to the appendix in 50% (n=3) and to the ovary in 50% (n=3); ovarian cases involved the right ovary in one patient and the left ovary in two patients. No evidence of malignancy or extra-organ involvement was identified in any case.

Conclusion: Invasion and infiltration are critical prognostic factors in mucinous neoplasms. The role of appendectomy in the management of ovarian mucinous tumors remains controversial. In this study, no causal association was observed between appendiceal and ovarian mucinous neoplasms. Based on these findings, appendectomy for staging or prophylactic purposes is not recommended in cases without evidence of appendiceal pathology.

Keywords: Mucinous neoplasia, appendiceal mucinous lesion, ovarian neoplasia, appendectomy

may follow a more aggressive clinical course and can lead to pseudomyxoma peritonei due to associated genetic alterations and molecular mutations (3).

Ovarian mucinous neoplasms similarly represent a small subset, comprising less than 5% of ovarian tumors. These neoplasms are most often diagnosed at an early stage and demonstrate a 5-year survival rate approaching 90%. However, advanced-stage disease is associated with poor outcomes due to the limited responsiveness of mucinous tumors to conventional chemotherapy regimens (4). A major clinical challenge in

advanced disease is determining whether the ovarian mucinous tumor is a primary neoplasm or a metastasis. Most metastatic mucinous tumors in the ovary originate from the gastrointestinal tract, particularly the colorectum or appendix (5).

Studies have shown that in mucinous neoplasms, spontaneous or perioperative rupture of the cystic component and subsequent dissemination of mucin into the peritoneal cavity are associated with an increased risk of recurrence and metastasis (6). For this reason, advanced diagnostic evaluation is recommended to determine whether the gastrointestinal tract is the primary site in cases of ovarian mucinous neoplasms. However, intraoperative macroscopic differentiation is often unreliable, necessitating the use of diagnostic algorithms; even then, definitive distinction is frequently not possible, and research on gene and protein expression profiles is ongoing (4,5).

Additionally, the clinical behavior of appendiceal mucinous neoplasms varies according to their pattern of spread. When both dissemination characteristics and cytological features are considered, a clear classification system—particularly for low-grade mucinous neoplasms—has not yet been fully established (7). This diagnostic uncertainty is similarly reflected in therapeutic decision-making, which may vary depending on tumor stage, the extent of peritoneal metastasis, and the location of the primary tumor (3).

The aim of this study is to determine the frequency and clinical characteristics of mucinous neoplasms identified in appendiceal and ovarian specimens, and to contribute to the literature regarding whether appendectomy should be performed in cases of ovarian mucinous neoplasms, a topic that remains under debate in contemporary clinical practice.

MATERIALS AND METHODS

This retrospective study included all patients who underwent appendiceal or ovarian surgery in a district hospital between 2015 and 2024. Data regarding demographic characteristics, prior history of mucinous neoplasia, previous appendectomy or oophorectomy, radiological or intraoperative evidence of malignancy in other organs, histopathological findings of mucinous neoplasia in the surgical specimens, and postoperative outcomes—including reoperation or disease progression—were obtained from hospital databases. Cases in which mucinous neoplasia was identified were examined in detail.

A comparative analysis between cases with and without mucinous neoplasia was not performed. This decision was based on the inability to reliably collect standardized comorbidity data over the long study period for patients without mucinous neoplasia, coupled with the small number of mucinous neoplasia cases in the overall sample. Therefore, the study was designed to descriptively present the characteristics of cases with mucinous neoplasia.

Data were evaluated using IBM SPSS Statistics for Windows (IBM SPSS for Windows version 22, IBM Corporation, Armonk, New York, United States). Descriptive statistical methods, including mean, standard deviation, median, frequency, percentage, minimum, and maximum values, were used for data analysis.

All patients who underwent appendiceal or tubo-ovarian surgery during the 10-year period were screened. Exclusion criteria were non-abdominal surgeries, patients referred without undergoing surgery, cases with incomplete or inaccessible data, and cases without authorization for the use of their medical information.

The study was conducted in accordance with the principles of the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. Ethical approval was obtained from the Kahramanmaraş Sütçü İmam University Medical Research Ethics Committee prior to the study (date: 16.09.2024, decision no: 02).

RESULTS

A total of 970 patients who underwent appendiceal or ovarian surgery between 2015 and 2024 were evaluated. The mean age of the study population was 31.12 ± 12.44 years. Of these patients, 350 (36.1%) were male and 620 (63.9%) were female, with mean ages of 31.42 ± 13.54 and 30.95 ± 11.78 years, respectively. Appendiceal resection was performed in 59.18% (n=574) of cases, ovarian/tubo-ovarian resection in 40.72% (n=395), and both appendiceal and ovarian resection in 0.1% (n=1) (Table 1). Mucinous neoplasia was identified in 1.22% (n=7) of 575 appendiceal specimens and 0.76% (n=3) of 396 ovarian/tubo-ovarian specimens (Table 2).

Histopathological evaluation revealed no mucinous neoplasia in the single case that underwent concurrent appendectomy and oophorectomy, nor in two patients who underwent right hemicolectomy. Overall, mucinous neoplasia was detected in 10 cases, representing 1.03% of all specimens.

Detailed examination of the seven appendectomy cases and three oophorectomy cases with mucinous neoplasia showed a mean patient age of 48.8 ± 19.15 years. Of these, four were male and six were female, with mean ages of 47.5 ± 22.06 and 44.16 ± 17.10 years, respectively. None of the patients had a prior diagnosis or surgical history suggestive of mucinous neoplasia.

Among the female patients, mucinous neoplasia was located in the appendix in 50% (n=3) of cases and in the ovary in 50% (n=3), with one case involving the left ovary and two involving the right ovary. No mucinous neoplasia was identified in the fallopian tubes.

Radiological imaging and intraoperative findings revealed no evidence of malignancy in other organs or structures in any of the cases. Furthermore, none of the patients required reoperation or experienced postoperative disease progression.

Table 1. Demographic characteristics and surgical distribution of all appendix and ovarian procedures performed in the district between 2015–2024

		Total (n=970)	
		n (%) 970 (100)	
Age (years)	Min-Max (Median)	12-91 (28)	
	Mean±Sd	31.12±12.44	
Gender		Male	Female
		350 (36.1)	620 (63.9)
	Min-Max (Median)	13-83 (29)	12-91 (28)
	Mean±Sd	31.42±13.54	30.95±11.78
Surgery	Appendectomy	572 (58.97)	
		348 (35.88)	224 (23.09)
	Right hemicolectomy	2 (0.21)	
		2 (0.21)	0 (0)
	Oophorectomy/salpingectomy	395 (40.72)	
		0 (0)	395 (40.72)
	Appendectomy and oophorectomy	1 (0.1)	
		0 (0)	1 (0.1)

Table 2. Demographic characteristics and surgical distribution of cases with mucinous neoplasia detected during appendix and ovarian procedures performed in the district between 2015–2024

		Cases with Mucinous Neoplasia (n=10)	
		n (%) 100 (100)	
Age (years)	Min-Max (Median)	31-80 (38-41)	
	Mean±Sd	48.8±19.15	
Gender		Male	Female
		4 (40)	6 (60)
	Min-Max (Median)	31-80 (38-41)	33-77 (36-49)
	Mean±Sd	47.5±22.06	49.66±19.13
Surgery	Appendectomy	7 (70)	
		4 (40)	3 (30)
	Right hemicolectomy	0 (0)	
	Oophorectomy/ alpingectomy	3 (30)	
		0 (0)	3 (30)
	Appendectomy and oophorectomy	0 (0)	

DISCUSSION

Appendiceal and ovarian malignancies are known to be extremely rare, with mucinous neoplasms representing an even smaller subset of these tumors (8,9). In our study, out of 21.131 cases that underwent surgery for any reason over a 10-year period, 973 cases relevant to our research were examined, and all cases except 3 for which complete data was not available were analyzed. The incidence observed in our study is

consistent with the existing literature, with mucinous neoplasia identified in 1.03% of all specimens. Although meaningful demographic comparisons with previously published data require larger cohorts, the mean age of 48.8±19.15 years and the sex distribution of 60% female and 40% male among the seven appendectomy and three oophorectomy cases diagnosed with mucinous neoplasia in our cohort did not show significant differences in age and gender distribution and are consistent with the averages reported in the literature; these averages

describe approximately 49 years and an almost equal gender distribution (8,10).

Because the number of mucinous neoplasia cases was small relative to the total sample size, a comparative analysis between cases with and without mucinous neoplasia could not be reliably performed. This approach, which is also seen in similar studies in the literature, represents a limitation of the present study; however, the descriptive findings presented here contribute valuable data and may support future meta-analyses aimed at clarifying the clinicopathologic features of these rare tumors.

It is known that the presence of invasion and infiltration of adjacent structures in mucinous neoplasia is extremely important in prognosis, and aggressive resections are recommended in surgeries related to mucinous neoplasia, especially in gastrointestinal type ovarian mucinous neoplasia (11). However, it is still unclear whether or not appendectomy should be routinely added to adnexal resections. It has been stated in some studies that appendectomy is recommended to be added to surgery due to the possibility of a normal-looking appendix containing microscopic tumoral evidence, its aid in staging, its low morbidity and its relatively easy operation (12). However, there are also many publications emphasizing the relatively mild course, especially in low-grade and organ-limited mucinous neoplasms (7,13). In our study, mucinous neoplasia was detected in 1.22% of all appendix specimens and 0.76% of all ovarian/tubo-ovarian region specimens, and none of them had any malignancy-related findings in other organ structures on radiological images or surgical exploration. In addition, mucinous neoplasia wasn't detected in 1 case who underwent both appendectomy and oophorectomy and in 2 cases who underwent right hemicolectomy. Primary mucinous neoplasia can rarely be detected in the tubo-ovarian region (14). Therefore, in our study where we evaluated not only oophorectomy but also tubo-ovarian region resections, no mucinous neoplasia of tubal origin was detected. There was no history of previous diagnosis or operation that could be associated with mucinous neoplasia in any case associated with mucinous neoplasia, and no reoperation was required and/or progressive disease occurred in the postoperative period. Based on our findings, no causal relationship was found in appendix and tubo-ovarian region mucinous neoplasias in our study; similarly, one of the 3 cases with ovarian mucinous neoplasia was recorded as left and two as right ovary and it wasn't associated with the appendix, and when the spread pattern of high-grade appendix mucinous neoplasia is considered, no significant difference was found in terms of lateralization in the ovaries (3).

In terms of treatment and patient management, surgical and chemotherapy strategies vary according to disease stage and extent of spread, and cytoreductive surgery combined with hyperthermic intraperitoneal chemotherapy is recommended in cases with perforation or macroscopic tumoral dissemination (13,15). Although stage-oriented treatment remains essential,

several studies in which appendectomy was performed concurrently with ovarian surgery report that removing the appendix may facilitate differential diagnosis, improve staging, and potentially enhance survival; however, this approach may also increase postoperative morbidity (12,13,15). Furthermore, the risk of metastatic seeding following rupture of a mucinous lesion cannot be overlooked, and recent literature highlights emerging methods to minimize intraoperative contamination, as noted by Guzelyuz et al. (3,6).

The low incidence of mucinous neoplasia, a rare malignancy, in our data, and the inability of histopathological examinations to detail the main diagnosis at the molecular level constitute limitations of the study.

CONCLUSION

Based on these data and our findings, although confirmation in larger cohorts and with advanced molecular analyses is warranted, we recommend close postoperative surveillance rather than routine appendectomy for staging or prophylactic purposes during ovarian surgery in clinically and radiologically negative cases—provided there is no macroscopic evidence of perforation or mucin spillage.

Conflict of Interests

The authors declare that there is no conflict of interest in the study.

Financial Disclosure

The authors declare that there is no financial support.

Ethical Approval

The study protocol received approval from the Kahramanmaraş Sütçü İmam University Medical Research Ethics Committee prior to the study (date: 16.09.2024, decision no: 02).

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