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Research article

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Surprise in hernia sacs: Malignant tumor metastasis

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Ethics Committee Approval
The study was approved by the Hatay Mustafa Kemal University Non-interventional Clinical Research Ethics Board (approval number: 37, date: 17.06.2021).
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No conflict of interest was declared by the authors.

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Abstract

Background/Aim: Malignant tumors are rare in the hernia sac, and there are very few studies on this subject in the literature. We aimed to investigate the malignancies in surgically resected hernia sacs and their clinicopathological features in the last ten years in our institution.
Methods: The hernia sac specimens sent for pathological examination between 2010 and 2021 were included in this retrospective cohort study. The age and gender of the patient, the type of hernia and known malignancy history of all patients were recorded. Cases with malignancy in the hernia sac were selected and their slides were re-evaluated. The cases with and without malignancy in the hernia sac were compared in terms of age, gender and known cancer history.
Results: There were 455 hernia sac specimens belonging to 448 patients which underwent pathological examination between 2011 and 2021. Malignancy was detected in ten (2.20%) hernia sacs. Eight were malignant tumor metastases (1.75%). The remaining two were secondary involvement of another malignancy. Five malignant tumors were ovarian serous carcinoma, one was vulvar squamous cell carcinoma, one was appendiceal mucinous cystadenocarcinoma, one was malignant melanoma metastasis, one was undifferentiated pleomorphic sarcoma, and one was non-Hodgkin lymphoma. The incidence of hernia sac malignancy was similar in male and female patients (3.5% and 1.4%, respectively; P=0.190). There was a known cancer history in 70% (n=7) of ten patients with malignancy in the hernia sac. The incidence of malignancy in the hernia sacs of patients with a known cancer history was significantly higher (P<0.001). Malignancies were present in 0.95% (n=2) of inguinal hernias, 1.67% (n=2) of abdominal hernias and 5.45 % (n=6) of incisional hernias. Gross pathology was detected in the macroscopic examination of all malignant inguinal hernias, but not in any of the abdominal hernias.
Conclusion: We recommend the microscopic examination of hernia sacs, even if there is no macroscopic abnormality, especially in the elderly and/or patients with a history of malignancy, in order to detect incidental metastases.

Keywords: Hernia sac, Incidental, Malignant tumor, Metastasis, Pathological findings

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Introduction

Malignant tumors are rare in the hernia sac. Urachal carcinoma, malignant mesothelioma, and umbilical cord liposarcoma are primary tumors of the hernia sac and are extremely rare. Malignant tumor in the hernia sac may occur as a metastasis or the secondary involvement of another cancer. Most metastatic tumors are malignant epithelial tumors, and colorectal carcinoma metastasis is most frequently observed in the hernia sac [1-6]. Metastases originating from ovarian, prostate, pancreatic, appendix, peritoneum, endometrium, and stomach cancers have also been reported [1-4, 7-14]. Rarely, the hernia sac may be the first presentation of an unknown malignancy. Clinicopathological correlation and detailed immunohistochemical studies are required to determine the origin. Although some authors are strong advocates of routine histological examination of hernia sacs, others suggest that hernia sacs should be discarded after gross examination [9]. There are a very few studies on malignant tumors in the hernia sac in the literature. Those that have been published are usually case reports [1-4, 9, 10]. In these studies, the rate of malignant tumor detection in the hernia sac ranged from 0.07% to 0.7% [1-4, 9, 10].

We aimed to investigate the malignancies in surgically resected hernia sacs and their clinicopathological features in the last ten years in our institution.

Materials and methods

The hernia sac specimens sent for pathological examination between 2010 and 2021 were included in this retrospective cohort study by examining the pathology database of Hatay Mustafa Kemal University. Our routine practice is to perform a histologic examination of every hernia sac material sent to our pathology laboratory, even if gross pathology is not detected. The age, gender, symptoms, type of hernia and known malignancy history of all patients were recorded. The cases with and without malignancy in the hernia sac were compared in terms of age, gender and known cancer history. Cases with malignancy in the hernia sac were selected and their slides were re-evaluated. Primary tumor focus, macroscopic features of the hernia sac, and histopathological features of the tumor were evaluated in these cases.

The study was approved by the Hatay Mustafa Kemal University non-interventional Clinical Research Ethics Board (approval number: 37, date: 17.06.2021) and conducted according to the ethical standards of the Helsinki Declaration.

Statistical analysis

All data were analyzed in the SPSS 21 package program (SPSS Inc., Armonk, NY, US). The number, and the frequency of the qualitative data were given. The median, interquartile range (IQR), minimum (min) and maximum (max) values of the quantitative data were given. The Fisher-exact test was used to compare qualitative data. The Mann-Whitney U test was used in the analysis of the quantitative values between the two groups. A value of $P<0.05$ was considered significant.

Results

There were 455 hernia sac specimens belonging to 448 patients who underwent a pathological examination between 2011 and 2021. An average of 2.6 paraffin blocks was prepared per case. The median age of the patients was 52.95 (IQR: 42-65, min:1 max:97) years. Of 448 patients, 170 (37.9%) were female and 278 (62.1%) were male. Twenty-three percent (n=103) had umbilical hernias, 46.9% (n=210) had inguinal hernias, 1.3% (n:6) had femoral hernias, 24.6% (n=110) had incisional hernias, 0.9% (n=4) had ventral hernias, 3.1% (n=14) had epigastric hernias and 0.2% (n=1) had parastomal hernias.

Malignancy was detected in ten (2.20%) hernia sacs. Eight were malignant tumor metastases (1.75%). The remaining two were secondary involvement of another malignancy. Five of ten cases (50%) were ovarian serous carcinoma metastases, one was squamous cell carcinoma of the vulva (10%), one was appendix mucinous cystadenocarcinoma metastasis (10%), one was malignant melanoma metastasis (10%), one was undifferentiated pleomorphic sarcoma (UPS) (10%) and one was non-Hodgkin lymphoma (NHL) (10%) (Table 1). NHL and UPS were considered secondary involvement of another malignancy.

Six of the ten cases were female (60%) and four were male (40%). In the general cohort, the incidence of hernia sac malignancy was similar between the male and female patients (3.5% and 1.4%, respectively; $P=0.190$).

The median age of the patients with and without malignancy in the hernia sac were 60.70 (IQR: 51.2-66; min:45, max:88) years, and 52.77 (IQR: 41-65; min:0, max:97) years, respectively ($P=0.277$).

In the entire cohort, the rate of patients with a known cancer history was 6% (n=27). The incidence of malignancy in the hernia sacs of patients with a known cancer history was significantly higher ($P<0.001$). Twenty of 438 patients (4.6%) without a tumor in the hernia sac had a known cancer history. There was a known cancer history in 70% (n=7) of ten patients with malignancy in the hernia sac. Of these, four had a history of ovarian serous carcinoma, one had a history of vulvar squamous cell carcinoma, one had a history of appendiceal mucinous adenocarcinoma, and one had a history of malignant melanoma. Postoperative ovarian cancer was detected in one patient. In these cases, the classification of tumor origin in the hernia sac was confirmed by clinical and histomorphological comparisons and limited immunohistochemical studies (Figure 1). Two (20%) patients had a suspicion of malignancy before the operation, and three (30%), during the operation. Two of the five patients with no suspicion of malignancy in the hernia sac had a metastatic mass in the peritoneal tissue. The median time between the first primary tumor diagnosis and the presentation of hernia sac malignancy was 23 (range: 7-51) months.

Gross pathology was observed in 50% (n=5) of hernia sacs macroscopically. Malignancies were present in 0.95% (n=2) of inguinal hernias,1.67% (n=2) of abdominal hernias (umbilical+ventral+epigastric), and 5.45 % (n=6) of incisional hernias (Table 2). Gross pathology was detected in the macroscopic examination in all malignant inguinal hernias, but in none of the abdominal hernias (Table 1).

Figure 1: A: Serous carcinoma metastasis (Hematoxylin-eosin X40) and immunohistochemical studies show that tumor cells are positively stained with p53 (above right). B: Well-differentiated squamous cell carcinoma metastasis is observed (Hematoxylin-eosin X40). C: Melanoma metastasis (Hematoxylin-eosin X40). In the immunohistochemical study, it is seen that tumor cells are positively stained with Melan-A (above right).

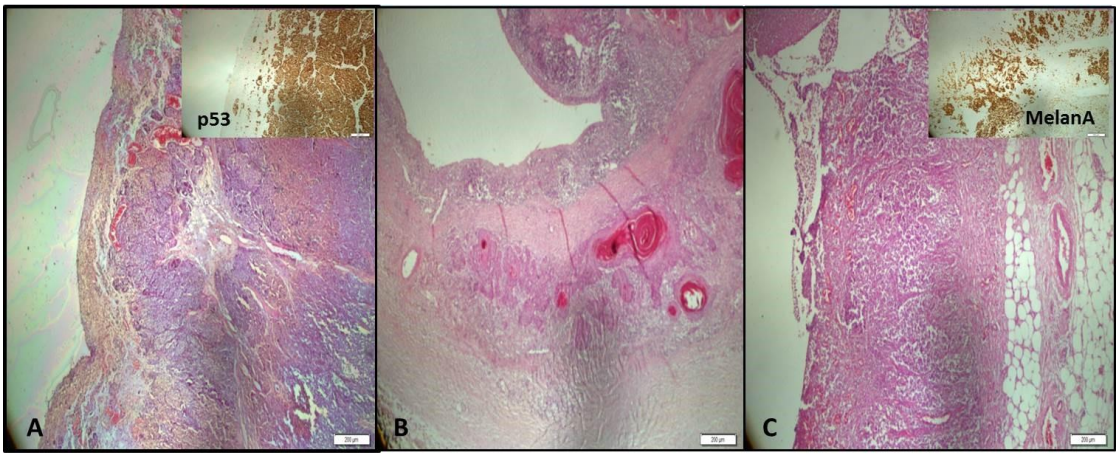

Table 1: Clinicopathological features of patients with malignancy in the hernia sacs

Case no	Gender	Age	Complaint	Hernia type	Diagnosis	Primary site	Macroscopic abnormality	Known cancer history
1	F	45	Abdominal pain	Incisional	Serous carcinoma	Ovary	Absent	Present
2	F	59	Abdominal pain	Incisional	Serous carcinoma	Ovary	Present	Present
3	F	60	Abdominal pain, vomiting	Umbilical	Serous carcinoma	Ovary	Absent	Absent
4	F	53	Abdominal swelling	Incisional	Serous carcinoma	Ovary	Absent	Present
5	F	58	Abdominal pain	Incisional	Serous carcinoma	Ovary	Absent	Present
6	F	88	Pain	Incisional	Squamous cell carcinoma	Vulva	Present	Present
7	M	61	Abdominal pain	Incisional	Mucinous adenocarcinoma	Appendix	Present	Present
8	M	81	Abdominal swelling	Epigastric	Malign melanoma	Skin	Absent	Present
9	M	52	Inguinal swelling, pain	Inguinal	Undifferentiated pleomorphic sarcoma	-	Present	Absent
10	M	49	Abdominal pain	Inguinal	Non-Hodgkin Lymphoma	Lymph node	Present	Absent

Table 2: Distribution of malignancy by hernia types in our cohort

Hernia type	Count	Malignant diagnosis in hernia sac n(%)
Incisional	110	6 (5.45)
Inguinal	210	2 (0.95)
Femoral	6	0 (0.00)
Ventral+epigastric	4+13	1 (5.88)
Parastomal	1	0 (0.00)
Umbilical	103	1 (0.97)

Table 3: Review of the literature and summarizing key points

Article	Hernia count	Malignant diagnosis in hernia sacs n(%)	F/M	Median age	Known cancer history	No gross abnormality	Primary tumor site
Nicholson et al.[1]	22816	15 (0.07)	4/11	65	60%	0%	GIS 40%,ovary 20%,prostate 13%,mesothelium 13%,unknown 13%
Wang et al.[10]	1426	10 (0.7)	5/5	76.5	70%	50%	Cholangiocarcinoma 10%, CLL 20%, prostate 10%, peritoneum 10%, ovary 20% endometrium 10%, pleomorphic sarcoma 10%,pancreas 10%
Roberts et al. [9]	3117	11 (0.35)	9/2	68	30%	73%	Ovary or fallopian tube 45.5%, breast 9.1%, prostate 9.1%. unknown 36.3%
Val-bernal et al.[2]	8435	12 (0.14)	4/8	67	50%	25%	GIS 50%, gynecological 25%, lung 8.3%,peritoneum 8.8%, unknown 8.3%
Topal et al.[3]	556	9 (0.61)	7/2	60	66.7%	22.2%	GIS 55.5%,ovary 22.2%, epididymis11.1%, breast 11.1%
Zhang et al.[4]	4301	21 (0.49)	7/14	65	66.7%	40%	GIS 52%, pancreatobiliary 24%, gynecological 24%,
This Study	455	10(2.20)	6/4	60.7	70%	50%	Ovary 50%, vulva 10%, appendix 10%, melanoma 8.3%, NHL10%, pleomorphic sarcoma 10%

GIS: Gastrointestinal system, CLL: Chronic lymphocytic lymphoma, NHL: Non-Hodgkin lymphoma

Discussion

An abdominal hernia is a common condition and a surgically removed hernia sac is a highly common sample for pathologists. Malignant tumors in the hernia sac are very rare and may occur as the first finding in a patient with no previous history. In that case, like in any other pathological diagnosis, tumor histomorphology, immunohistochemical profile, clinical information, imaging findings, and serum tumor markers are all required to help identify the tumor origin. Until now, no definite common etiology was found for abdominal wall hernias and any type of cancer. However, obesity can be mentioned as the common denominator of these two separate diseases. There is evidence of a relationship between obesity and many different cancers, including breast, liver, colorectal, pancreatic, prostate, endometrial, and renal cell carcinoma [15-17]. Metabolic changes caused by obesity may directly or indirectly initiate cancer development [18]. On the other hand, it has been reported that obesity is a predisposing factor for abdominal hernias and increases the risk of recurrence [17, 19].

Although there is no proven cause and effect relationship between hernia and cancer, data are in support of this relationship. In addition to the publications advocating that cancer increases the risk of hernia, there is also literature showing that the hernia itself can cause cancer [17]. The pathway for tumor cells to spread into the hernial sac remains unclear. Lymphatic or hematogenous spread, direct invasion, and localized peritoneal carcinomatosis are possible mechanisms of metastasis. The hernia sac is not essentially a normal anatomical structure, and a voluminous tumor itself may cause a hernial sac with mass effect and increased intra-abdominal pressure [4, 17].

Especially advanced stage cancers may cause enlargement of the peritoneum with the formation of ascites or mucinous cancers causing pseudomyxoma peritonei with the effect of space-occupying mucin. As a result, the tumor mass can spread into the hernia sac with the effect of increased intra-abdominal pressure and gravity [4]. Sugarbaker [20] detected metachronous or synchronous inguinal hernia in 9.6% (n=17) of 178 pseudomyxoma peritonei cases secondary to mucinous neoplasm of the appendix. In addition to these, chemotherapy and/or radiotherapy may also be a risk factor for the development of incisional hernia [21].

There are limited studies in the literature investigating malignant tumors in the hernia sac [1-4, 9, 10]. The incidence of cancer in the hernia sac in these cohorts ranged from 0.07 to 0.7%. In our study, malignancy was detected in ten (2.20%) of 455 hernia sacs. Our metastatic tumor rate in the hernia sac was 1.75% (n=8), which was above the rates reported in the literature. The reason for this may be that we are the only tertiary center hospital in the region and therefore the rate of cancer patients followed in our hospital is high. In the literature, it has been reported that patients with tumors in the hernia sac have a history of malignancy at rates varying between 30% and 66.7% [1-4,9,10]. However, no history of malignancy of the general cohort was mentioned in any of these studies. In the entire cohort, the rate of patients with a known cancer history was 6% (n=27). Twenty (n=20) of 438 patients (4.6%) without a tumor in the hernia sac had a known cancer history. There was a known cancer history in 70% (n=7) of ten patients with malignancy in the hernia sac (P<0.001). This indicates that the probability of finding cancer in the hernia sac is higher in patients with a history of cancer than in patients without.

Colon carcinoma metastasis is most frequently detected in the hernia sac [1-6]. Among studies investigating metastatic carcinomas in the hernia sac, Zhang et al. [4] presented the largest cohort with 21 cases. In their study, they found the most common metastases originating from the pancreaticobiliary and gynecological systems in the hernia sac. They reported that the primary focus was serous carcinoma of the ovary in female patients and gastrointestinal or pancreatobiliary malignancy in male patients [4]. Providing the second largest cohort, Nicholson et al. [1] reported the most common malignant formation as GIS (40%) and second as ovary originated malignancies (20%); however, the most common ovarian cancer metastasis in women in their cohort is 75%. In our study, ovarian serous carcinoma metastasis was found most (50%, n=5). Metastases originating from the GIS were detected only in 10%. This may be since 60% of our patients with malignancy were women.

Very few cases of squamous cell carcinoma (SCC) metastasis in the hernia sac have been reported in the literature [22-24]. Katsourakis et al. [23] and Quayumi et al. [24] reported cases of SCC in the bladder herniated into the inguinal canal. Best et al. [22] reported metastatic squamous cell carcinoma originating from the bladder in the hernia sac. Christofi et al. [25] reported a case of SCC originating from the cervix in the incarcerated small bowel tissue in the umbilical hernia sac in a 59-year-old patient. In our study, there was a case of SCC originating from the vulva in an incisional hernia sac in an 88-year-old female patient. In the patient's history, vulva SCC was diagnosed 14 months ago. In our review of the English literature (search: PubMed, date: 22.06.2021, key words: hernia, squamous cell carcinoma), no case of SCC metastasis of the vulva in the hernia sac was found so far.

Undifferentiated pleomorphic sarcoma (UPS) is very rare, and its incidence is 0.08-1 per 100,000 [26]. So far, pleomorphic sarcoma has been detected in abdominal wall hernia in only one case (search: PubMed, date: 22.06.2021, keywords: hernia, pleomorphic sarcoma) [10]. In our study, UPS was detected in the inguinal hernia sac in a 55-year-old male patient, as the second case in the literature.

The American College of Pathologists recommends the pathological examination of all resected hernia sacs and microscopic examination of all abdominal hernias but leaves the decision of microscopic examination of macroscopically normal inguinal hernias to the discretion of the pathologist/institution [27]. The study of Wang et al. [10] and Topal et al. [3] supports this view. Val-Bernal et al. [2], on the other hand, recommends pathological examination of all hernia sacs without distinguishing them as inguinal or abdominal hernias, and microscopic examination only for those with macroscopic pathology. Nemer et al. [28] recommended sampling only the sacs with patients older than 50 years of age, positive oncology history, or unusual gross findings. However, in the literature, it is remarkable that 22.2-73% of cases with malignancy in the hernia sac were not found to have gross pathology [1-4, 9, 10] (Table 3). In this study, there was no gross pathology in 50% of the cases with malignancy in the hernia sac. A gross macroscopic pathology was observed in all malignant inguinal hernias and in none of the abdominal hernias.

Conclusion

In conclusion, the incidence of malignancy in hernia sacs in this study was 2.2%, and the majority were metastatic tumors. While ovarian serous carcinoma metastasis is most common in female patients, no particular system dominance was detected in the male patients. We recommend the microscopic examination of hernia sacs, even if there is no abnormality in the macroscopic examination, especially in the elderly and/or patients with a history of malignancy, to detect incidental metastases.

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