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ARTYKUŁ ORYGINALNY / *ORIGINAL ARTICLE*

Diagnosis of malignant pericarditis: a single centre experience

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Abstract

Background: Malignancy is the most common cause of effusive pericarditis with a haemodynamically significant amount of pericardial fluid. Early diagnosis and management of malignant pericarditis may significantly improve outcomes.

Aim: To evaluate retrospectively the rate and clinical presentation of malignant pericarditis among patients undergoing invasive treatment, with a view to identification of optimal diagnostic modalities to distinguish this group among other patients.

Methods: We studied 191 patients (100 men and 91 women, median age 57 years, range 19–88 years) with effusive pericarditis who underwent invasive treatment in the National Institute of Tuberculosis and Lung Diseases in Warsaw in 1982––2008 due to a significant amount of pericardial fluid and/or echocardiographic evidence of cardiac tamponade. Pericardiocentesis was performed in 93 cases, pericardioscopy in 61 cases, and substernal pericardiotomy in 37 cases. Pericardial fluid was sent for examination in all patients, and a pericardial specimen was obtained in 96 patients. The patients were divided into 3 groups: Group 1 included patients with malignant pericarditis (malignant cells found in the cytological examination of the pericardial fluid and/or neoplastic infiltration in the histological examination of the pericardial specimen), Group 2 included patients with probable malignant pericarditis (pericardial fluid without malignant cells with histologically confirmed malignancy at some other location), and Group 3 included patients with non-malignant pericarditis (negative cytological examination of pericardial fluid and histological examination of the pericardial specimen, with no evidence of malignancy during hospitalization and one-year follow-up).

Results: Malignancy was found in 111 (58%) of 191 patients, including 66 (35%) patients with definite malignant pericarditis and 45 (23%) patients with probable malignant pericarditis. Lung cancer, including adenocarcinoma, was the most common type of malignancy, present in 44 (67%) patients. Non-malignant pericarditis was found in 80 (42%) patients. Among patients with the diagnosis of malignancy (Groups 1 and 2), a positive result of the cytological examination of the pericardial fluid was obtained in 52 cases (sensitivity of 46%). Among patients without malignancy, a negative result of the cytological examination of the pericardial fluid was obtained in all 80 cases (specificity of 100%). Malignant infiltration was found in 20 of 44 patients with the diagnosis of malignancy (sensitivity of 46%) and in none among 52 patients without malignancy (specificity of 100%). Compared to patients with non-malignant pericarditis, patients with malignant pericarditis significantly more commonly presented with tachycardia of > 100 bpm in a resting electrocardiogram (ECG) (in 77% of patients with malignant pericarditis vs. 43% of patients with non-malignant pericarditis, p = 0.01), low QRS amplitude (52% vs. 34%, respectively, p = 0.03), electrical alternans (19% vs. 3%, respectively, p = 0.001), echocardiographic evidence of cardiac tamponade (67% vs. 34%, respectively, p = 0.0001), enlarged mediastinal lymph nodes by chest computed tomography (CT) (90% vs. 29%, respectively,

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p < 0.00001), pericardial thickness > 8 mm by chest CT (62% vs. 16%, respectively, p < 0.0001), and bloody pericardial effusion (94% vs. 43%, respectively, p < 0.0001). Levels of carcinoembryonic antigen (CEA) and cytokeratin fragment-19 (CYFRA 21-1) in the pericardial fluid were higher in patients with malignant pericarditis compared to patients with non-malignant pericarditis, with median values of 40.8 ng/mL vs. 0.9 ng/mL, p < 0.0001, and 162.85 ng/mL vs. 13.35 ng/mL, p < 0.0001, respectively.

Conclusions: 1. Malignancy was found in 58% of patients undergoing invasive treatment due to large pericardial effusion. 2. Cytological examination of the pericardial fluid and histological examination of a pericardial specimen showed high specificity (100%) but low sensitivity (46%) in the diagnosis of malignant pericarditis. 3. The most important predictors of malignant pericarditis included tachycardia of > 100 bpm as revealed by the physical examination and ECG, echocardiographic evidence of cardiac tamponade, presence of enlarged mediastinal lymph nodes (> 1 cm) and thickened pericardium (> 8 mm) by chest CT, bloody pericardial effusion, and elevated levels of CEA (> 5 ng/mL) and CYFRA 21-1 (> 50 ng/mL) in the pericardial fluid.

Key words: pericarditis, lung cancer, malignancy, diagnosis, computed tomography, cardiac tamponade, carcinoembryonic antigen, cytokeratin

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INTRODUCTION

Among the most common causes of cardiac tamponade, malignancies play a major role [1, 2]. Malignant pericarditis tends to recur [2] and is associated with a very poor prognosis [1–3]. Differential diagnosis in patients with cardiac tamponade included complications of cardiac interventional and surgical procedures [2, 4–6], hypothyroidism [1, 7], viral infections [1] and tuberculous pericarditis, particularly in the areas of high tuberculosis incidence (Africa and Southeast Asia), in HIV-infected patients [8], and in patients receiving biological and immunosupressive drugs [9].

Although emergency treatment of impending cardiac tamponade should invariably lead to evacuation of excess pericardial fluid [1], further management and prognosis is largely dictated by the aetiology of effusive pericarditis. Early diagnosis and management of pericardial effusion may significantly improve outcomes also in malignancies [10, 11]. Thus, the aim of the present study was to evaluate retrospectively the rate and clinical presentation of malignant pericarditis among patients undergoing invasive treatment, with a view to identification of optimal diagnostic modalities to distinguish this group among other patients.

METHODS

In 1982–2008, 191 patients (100 men and 91 women) with effusive pericarditis underwent invasive treatment in the National Institute of Tuberculosis and Lung Diseases in Warsaw. Median age was 57 (range 19–88) years. Indications for invasive treatment included (1) a significant amount of pericardial fluid (> 20 mm by echocardiography) and no diagnosis of the cause of pericarditis; (2) echocardiographic evidence of impending cardiac tamponade; and (3) clinical presentation of cardiac tamponade with a significant amount of pericardial fluid confirmed by echocardiography. Pericardiocentesis was performed in 93 cases, pericardioscopy in 61 cases, and substernal pericardiotomy in 37 cases. Pericardial fluid was sent for examination in all patients, and a pericardial specimen was obtained in 96 patients. The patients were divided into three groups:

- Group 1 — malignant pericarditis: patients with malignant cells found in the cytological examination of the pericardial fluid and/or neoplastic infiltration in the histological examination of the pericardial specimen);
- Group 2 — probable malignant pericarditis: patients with pericardial fluid without malignant cells but histologically confirmed malignancy at some other location;
- Group 3 — non-malignant pericarditis: patients with negative results of cytological examination of pericardial fluid and histological examination of the pericardial specimen, and with no evidence of malignancy during hospitalisation and one-year follow-up).

In these patient groups, we analysed selected symptoms and signs, imaging study findings, examination of the pericardial fluid, and levels of carcinoembryonic antigen (CEA), cytokeratin fragment-19 (CYFRA 21-1), and neuron-specific enolase in the pericardial fluid, as described previously [12].

Variable distributions in the compared groups were tested for normality using the Shapiro-Wilk test. Differences in the distribution of the evaluated variables between the study groups were tested using the Mann-Whitney U test and the median test. Differences in the rates of the evaluated symptoms and signs were tested using the χ^2 test. P < 0.05 was considered statistically significant.

RESULTS

Malignant pericarditis: 66 (35%) patients, including 28 women and 38 men, median age 53 (range 26–81) years. Malignant cells were found in the pericardial fluid in 46 patients, malignant infiltrate was identified in the pericardial specimen in 14 patients, and in 6 patients, the diagnosis of a malignancy was confirmed in the examination of both the pericardial fluid and the pericardial specimen. Lung cancer was the most common cause of malignant pericarditis, noted in 44 (67%) cases, including adenocarcinoma in 26 (39%) cases. Of the remaining patients, pleural mesothelioma and primary pericardial mesothelioma were found in 4 patients each, breast cancer in 3 patients, and kidney cancer, stomach cancer, ovarian cancer, colon cancer, pancreatic cancer, uterine cancer, and lymphoma were found in 1 patient each. In 4 cases, we were unable to identify the origin of a disseminated malignancy.

Probable malignant pericarditis: 45 (23%) patients, including 19 women and 26 men, median age 55 (range 18––77) years. Cytological examination of the pericardial fluid yielded a negative result in all patients in this group. Malignancy identified at a distant location included lung cancer in 24 (53%) patients, breast cancer in 3 patients, pleural mesothelioma in 3 patients, ovarian cancer in 2 patients, and oesophageal cancer, colon cancer, thymoma, lymphoma, acute lymphoblastic leukaemia, chronic lymphocytic leukaemia, and malignant melanoma in 1 patient each. Adenocarcinoma was diagnosed in 6 cases, but the origin of the malignancy could not have been identified due to a disseminated disease.

Non-malignant pericarditis: 80 (42%) patients, including 44 women and 36 men, median age 62 (range 21–88) years. Malignant cells were identified in the cytological examination of the pericardial fluid in none of these patients. Histological examination of a pericardial specimen was performed in 52 patients, and identified unspecific inflammatory infiltrate in 20 patients, fibrous tissue in 24 patients, fragments of pericardial tissue with ecchymoses in 5 patients, a fragment of normal pericardium in 2 patients, and a tuberculous granulomas in 1 patient. The final diagnosis in this group included idiopathic pericarditis in 21 (26%) patients, tuberculous pericarditis in 21 (26%), bacterial pericarditis in 13 (16%), viral pericarditis in 10 (13%), pericarditis related to a collagen vascular disease in 6 (8%), Dressler syndrome in 5 (6%), mycobacterosis-related pericarditis in 2 (3%), uraemic pericarditis in 1 (1%) patient, and pericarditis related to hypothyroidism in 1 (1%) patient.

Diagnostic value of the cytological examination of the pericardial fluid and histological examination of the pericardial specimen in the diagnosis of malignant pericarditis. Among 111 patients with the diagnosis of a malignancy (Groups 1 and 2), a positive result of the cytological examination was obtained in 52 cases. A negative result of the cytological examination of the pericardial fluid was obtained in all 80 patients without the diagnosis of a malignancy (sensitivity 46%, specificity 100%, positive predictive value [PPV] 100%, negative predictive value [NPV] 58%). Histological examination of a pericardial specimen was performed in 96 cases, including 44 patients with the diagnosis of a malignancy and 52 patients without a malignancy. Malignant infiltrate was identified in 20 of 44 patients with the diagnosis of a malignancy and in none of the patients without a malignancy (sensitivity 46%, specificity 100%, PPV 100%, NPV 68%).

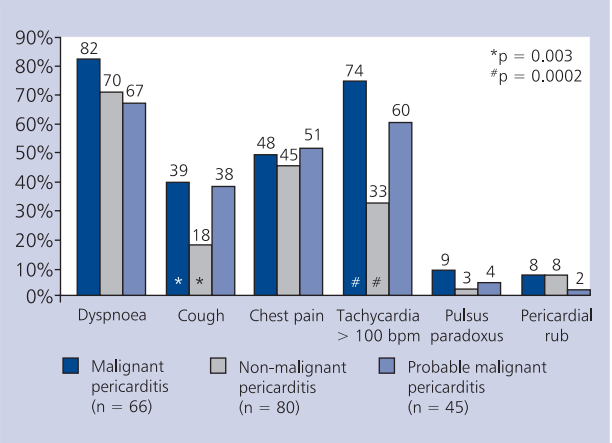

Figure 1. Rates of selected signs and symptoms of effusive pericarditis in the examined patient groups

Assessment of the value of specific diagnostic methods in predicting malignant pericarditis. History and physical examination findings are shown in Figure 1. Among patients with malignant pericarditis, cough and tachycardia > 100 bpm were found to be significantly more common compared to the patients with non-malignant pericarditis.

Results of the imaging studies are shown in Table 1. Chest X-ray showed pleural involvement and parenchymal lung lesions significantly more commonly among patients with malignant pericarditis than among those with non-malignant pericarditis. Compared to the patients with non-malignant pericarditis, patients with malignant pericarditis also presented significantly more frequently with tachycardia > 100 bpm, low QRS amplitude and electrical alternans in the electrocardiogram (ECG), and evidence of cardiac tamponade in the echocardiographic examination.

Chest computed tomography (CT) findings are shown in Table 2 and Figure 2. Among patients with malignant pericarditis, enlarged mediastinal lymph nodes (> 10 mm) and pericardial thickening > 8 mm were found more frequently compared to the patients with non-malignant pericarditis.

The evacuated pericardial effusion was bloody in 94% of patients with malignant pericarditis and 43% of patients with non-malignant pericarditis ($p < 0.0001$).

Median CEA level in patients with malignant pericarditis was significantly higher compared to the patients with non--malignant pericarditis (40.8 ng/mL [range 0–305] vs. 0.9 ng/mL

Table 1. Chest roentgenogram, electrocardiography, and echocardiography findings in the examined patient groups

Examen	Malignant pericarditis	Non-malignant pericarditis	Probable malignant pericarditis
Chest X-ray			
Enlarged cardiac silhouette	61/64 (95%)	72/77 (94%)	41/44 (93%)
Pleural involvement	49/64 (77%)*	44/77 (57%)*	36/44 (82%)
Parenchymal lung lesions	37/64 (58%)**	30/77 (39%)**	20/44 (45%)
Electrocardiography			
Tachycardia > 100 bpm	49/64 (77%)&	34/79 (43%)&	25/45 (56%)
Low QRS amplitude	33/64 (52%)#	27/79 (34%)#	19/45 (42%)
Electrical alternans	12/64 (19%)$	2/79 (3%)$	6/45 (13%)
Non-specific ST-T changes	50/64 (78%)	52/79 (66%)	36/45 (80%)
Arrhythmia and conduction disturbances	23/64 (36%)	36/79 (46%)	20/45 (44%)
Echocardiography			
Maximum fluid thickness [mm]: median (range)	27 (6–55)	25 (4–60)	32 (7–50)
Evidence of cardiac tamponade	44/60 (67%)@	28/77 (34%)@	23/45 (51%)

*p = 0.015, **p = 0.026, &p = 0.01, #p = 0.031, $p = 0.001, @p = 0.0001

Table 2. Chest computed tomography in the examined patient groups

Chest computed tomography	Malignant pericarditis	Non-malignant pericarditis	Probable malignant pericarditis
Number of patients	29	48	22
Maximum fluid thickness [mm]: median (range)	21 (1–70)	35 (10–60)	20 (5–50)
Pericardial thickness [mm]: median (range)	10 (2–55)	4 (2–50)	4 (2–10)
Pericardial thickness > 8 mm: number of patients (%)	16/26 (62%)*	7/43 (16%)*	4/21 (19%)
Mediastinal lymph nodes > 10 mm	26/29 (90%)**	14/48 (29%)**	14/22 (64%)
Parenchymal lung lesions	19/29 (66%)$	14/48 (29%)$	10/22 (45%)
Pleural involvement (fluid or infiltrate)	23/29 (79%)#	21/48 (44%)#	20/22 (91%)

*p < 0.0001, **p < 0.00001, $p < 0.0001, #p < 0.0005

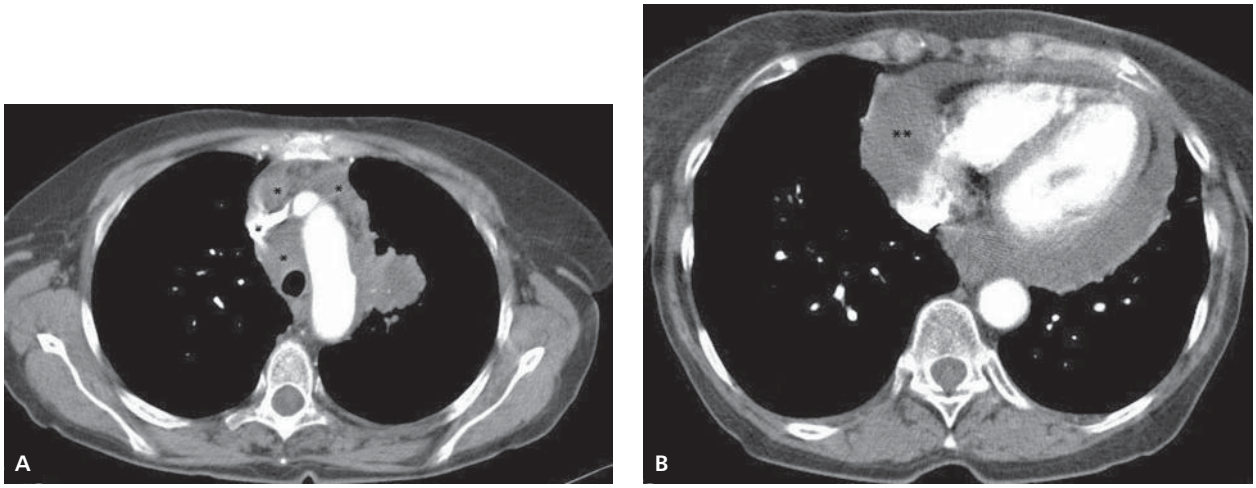

Figure 2. L.M., a 62-year-old women. Chest computed tomography with contrast enhancement, mediastinal window; **A.** Lung tumour in the left upper lobe. Enlarged mediastinal nodes are also seen (*); **B.** Pericardial effusion (**)

[range 0–129], respectively, $p < 0.0001$). CEA level in the pericardial fluid was above 5 ng/mL in 67% of patients with malignant pericarditis and 9% of patients with non-malignant pericarditis.

Median CYFRA 21-1 level in patients with malignant pericarditis was significantly higher compared to the patients with non-malignant pericarditis (162.85 ng/mL vs. 13.35 ng/mL, respectively, $p < 0.0001$). The proportion of patients with CYFRA 21-1 level in the pericardial fluid above 50 ng/mL was 73% among patients with malignant pericarditis and 21% among patients with non-malignant pericarditis.

Median neuron-specific enolase level in patients with malignant pericarditis was significantly higher compared to the patients with non-malignant pericarditis (20 μg/L vs. 3 μg/L, respectively, $p = 0.01$), but no significant difference was found between the 2 groups in regard to the proportion of values above the upper reference limit (67% vs. 30%, respectively).

DISCUSSION

In our study, malignancy was found in 58% of patients undergoing invasive treatment for effusive pericarditis. Malignancy was thought to be a definite cause of pericardial effusion in 35% of patients, and considered a probable cause in 23% of patients, as malignant cells were not identified in the pericardial fluid, and malignant infiltrate was not found in the pericardial specimen. In other studies, malignancy was reported as the aetiology of pericarditis in 20–76% of patients with pericardial effusion [1, 2, 13], mostly in patients with large effusions (> 2 cm) and more commonly among patients treated in 1970–2000 compared to those hospitalised after 2000 [2]. Studies by Maisch et al. [13] and Posner et al. [14] suggest that in 30–50% of patients with established malignancy and pericardial effusion, effusive pericarditis may have a non-malignant nature. In such cases, causes include radiation-induced pericarditis, and infective pericarditis complicating malignancy [13, 14].

In our study population, adenocarcinoma of the lung was the predominant cause of malignant pericarditis, similarly to other reports [1, 3]. Of note, primary pericardial mesothelioma was diagnosed in 4 patients, a rare neoplasm that might pose particular diagnostic and therapeutic problems [15].

Among non-malignant causes of effusive pericarditis in our study population, tuberculous pericarditis was diagnosed in 26% of patients. This rate is much higher compared to that reported in most European countries and the United States, where tuberculous pericarditis is identified in about 4–7% of patients with a haemodynamically significant effusion [1]. However, incidence of tuberculosis in the Polish population (19.7/100,000 in 2010) [16] is higher compared to the United States (3.6/100,000) [17]. As recently reported by Kuś et al. [18], the proportion of subjects infected with tuberculosis in the population of the Mazovian voivodeship, as determined by a positive result of the Quantiferon-TB Gold In-Tube test, was 23%.

Sensitivity of the cytological examination of the pericardial fluid and histological examination of the pericardial specimen for the diagnosis of malignant pericarditis in our study population was similar at 46%. According to other authors, sensitivity of the cytological examination of the pericardial fluid was 41–75%, depending on the histological type of the malignancy [19], and sensitivity of the histological examination was 24–85%, depending on the number of obtained specimens and collection technique [1, 13].

The most significant difference between the study groups was the presence of enlarged mediastinal lymph nodes in chest CT in 90% of patients with malignant pericarditis, as compared to 27% of patients with non-malignant pericarditis. In 2010, Sun et al. [20] reported enlarged mediastinal lymph nodes in chest CT in 60.7% of patients with malignant pericarditis and only 6.5% of patients with non-malignant pericarditis. Until that publication, the only report regarding the diagnostic value of enlarged mediastinal lymph nodes in malignant pericarditis was published by our group [12]. In 2003, Cherian et al. [21] reported enlarged mediastinal lymph nodes in 100% of patients with tuberculous pericarditis but none of the patients with viral pericarditis and postcardiotomy syndrome. It may be thus suspected that the higher proportion of tuberculous pericarditis among patients with non-malignant pericarditis, the lower is the specificity of this finding. In our study population, similarly to a study by Prakash et al. [22], chest CT showed significantly increased pericardial thickness among patients with malignant pericarditis compared to those with non-malignant pericarditis. However, this observation should be interpreted with caution, as our study population included a relatively large number of patients with mesothelioma which is associated with marked pericardial thickening.

In our study population, patients with malignant pericarditis were characterised by a significantly higher CEA level in the pericardial fluid compared to patients with non-malignant pericarditis. High diagnostic value of CEA level in the pericardial fluid was initially reported by Koh et al. [23], and later confirmed in a study published previously by our group [24].

In the present study, CYFRA 21-1 level in the pericardial fluid was also found to be significantly higher among patients with malignant pericarditis as compared to those with non-malignant pericarditis. Elevated CYFRA 21-1 levels in the serum and pleural fluid were reported in patients with lung cancer and pleural mesothelioma [25]. Evaluation of CYFRA 21-1 level in the pericardial fluid reported in the present study is a novel approach. Apart from reports published by our group in 2005 and 2006 [12, 24], no data have been reported on this subject in the available scientific literature.

CONCLUSIONS

1. Malignancy was found in 58% of patients undergoing invasive treatment due to large pericardial effusion.
2. Cytological examination of the pericardial fluid and histological examination of a pericardial specimen showed high specificity (100%) but low sensitivity (46%) in the diagnosis of malignant pericarditis.
3. The most important predictors of malignant pericarditis included tachycardia of > 100 bpm as revealed by the physical examination and ECG, echocardiographic evidence of cardiac tamponade, presence of enlarged mediastinal lymph nodes (> 1 cm) and thickened pericardium (> 8 mm) by chest CT, bloody pericardial effusion, and elevated levels of CEA (> 5 ng/mL) and CYFRA 21-1 (> 50 ng/mL) in the pericardial fluid.

Conflict of interest: *none declared*

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Rozpoznawanie nowotworowego zapalenia osierdzia — doświadczenie jednoośrodkowe

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Streszczenie

Wstęp: Najczęstszą przyczyną wysiękowego zapalenia osierdzia (ZO), przebiegającego ze znaczącą hemodynamicznie objętością płynu, jest choroba nowotworowa. Wczesne rozpoznanie i leczenie nowotworowego ZO może istotnie poprawić rokowanie.

Cel: Celem pracy była retrospektywna ocena częstości i obrazu klinicznego nowotworowego ZO wśród chorych leczonych zabiegowo i próba określenia optymalnych metod diagnostycznych pozwalających odróżnić tę grupę chorych od pozostałych.

Metody: Badaną grupę stanowiło 191 chorych (100 mężczyzn i 91 kobiet, mediana wieku 57 lat, zakres 19–88 lat) z wysiękowym ZO, poddanych leczeniu zabiegowemu w Instytucie Gruźlicy i Chorób Płuc w Warszawie w latach 1982–2008 z powodu znacznej ilości płynu w worku osierdziowym i/lub echokardiograficznych cech tamponady serca. W 93 przypadkach wykonano zabieg perikardiocentezy, w 61 — perikardioskopii i w 37 — perikardiotomii podmostkowej. U wszystkich chorych uzyskano płyn osierdziowy do badań, w 96 przypadkach pobrano wycinek osierdziowy. Pacjentów podzielono na 3 grupy: 1 — nowotworowe ZO (komórki nowotworowe w badaniu cytologicznym płynu z osierdzia i/lub naciek nowotworowy w badaniu histologicznym wycinków z osierdzia), 2 — prawdopodobnie nowotworowe ZO (wysięk w osierdziu bez komórek nowotworowych w płynie oraz obecność potwierdzonego histologicznie nowotworu o innym umiejscowieniu), 3 — nienowotworowe ZO (negatywne badanie cytologiczne płynu osierdziowego i histologiczne wycinka pobranego z osierdzia, bez cech choroby nowotworowej w czasie hospitalizacji i rocznej obserwacji odległej).

Wyniki: Spośród 191 pacjentów chorobę nowotworową stwierdzono w 111 (58%) przypadkach. U 66 (35%) osób była ona pewną przyczyną wysięku osierdziowego, a u 45 (23%) — przyczyną prawdopodobną. Wśród przyczyn nowotworowego ZO dominował rak płuca — 44 (67%) przypadki, w tym podtyp gruczolakoraka. Nienowotworowe ZO stwierdzono u 80 (42%) osób. Wśród chorych z rozpoznanym procesem nowotworowym (grupa 1 i 2) dodatni wynik badania cytologicznego płynu osierdziowego uzyskano w 52 przypadkach (czułość 46%). Wśród pacjentów bez choroby nowotworowej we wszystkich 80 przypadkach uzyskano ujemny wynik badania cytologicznego płynu osierdziowego (swoistość 100%). Naciek nowotworowy stwierdzono u 20 spośród 44 chorych ze zdiagnozowanym nowotworem (czułość 46%) i u żadnego spośród 52 pacjentów bez choroby nowotworowej (swoistość 100%). W grupie chorych z nowotworowym ZO istotnie częściej niż w grupie chorych z nienowotworowym ZO stwierdzano: tachykardię > 100/min w badaniu EKG (odpowiednio 77% i 43%; $p = 0,01$), niski woltaż zespołów QRS (odpowiednio 52% i 34%; $p = 0,03$), naprzemienność elektryczną (odpowiednio 19% i 3%; $p = 0,001$), cechy tamponady w badaniu ECHO serca (odpowiednio 67% i 34%; $p = 0,0001$), powiększone węzły chłonne śródpiersia w badaniu TK klatki piersiowej (odpowiednio 90% i 29%; $p < 0,00001$) i grubość osierdzia > 8 mm w badaniu TK klatki piersiowej (odpowiednio 62% i 16%; $p < 0,0001$), krwisty płyn osierdziowy (odpowiednio u 94% i 43%; $p < 0,0001$). Stężenie antygenu rakowopłodowego (CEA) i fragmentów cytokeratyny 19 (Cyfra 21-1) w płynie osierdziowym było istotnie wyższe u chorych z nowotworowym ZO niż nienowotworowym, a mediany wynosiły odpowiednio: 40,8 ng/ml i 0,9 ng/ml ($p < 0,0001$) oraz 162,85 ng/ml i 13,35 ng/ml ($p < 0,0001$).

Wnioski: 1. Wśród chorych leczonych zabiegowo z powodu dużej objętości płynu w worku osierdziowym u 58% stwierdzono chorobę nowotworową. 2. Badanie cytologiczne płynu osierdziowego i badanie histopatologiczne wycinka z osierdzia wykazywały wysoką swoistość (100%), ale niską czułość (46%) w rozpoznawaniu nowotworowego ZO. 3. Elementami szczególnie istotnymi w przewidywaniu nowotworowej etiologii wysięku osierdziowego były: tachykardia > 100/min w badaniu przedmiotowym i EKG, cechy tamponady serca w badaniu ECHO serca, obecność powiększonych (> 1 cm) węzłów chłonnych śródpiersia i grubość osierdzia > 8 mm w badaniu TK klatki piersiowej, krwisty płyn osierdziowy, podwyższone stężenie CEA (> 5 ng/ml) i Cyfra 21-1 (> 50 ng/ml) w płynie osierdziowym.

Słowa kluczowe: zapalenie osierdzia, rak płuca, nowotwory, diagnostyka, tomografia komputerowa, tamponada serca, antygen rakowo-płodowy, cytokeratyny

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