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Epidemiology of malignant peritoneal mesothelioma: A population-based study

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ABSTRACT

Background: Malignant peritoneal mesothelioma (MPeM) is a rare cancer of the mesothelial cells in the peritoneum with poor prognosis. Earlier reports from other countries indicate an incidence of 0.2–3 new cases per million per year. No previous studies have examined the national epidemiology of MPeM in Nordic countries. This study aimed to clarify the epidemiology of MPeM in Finland over a 12-year period.

Methods: The data consisted of cancer notifications, laboratory notifications, and death certificate information in the Finnish Cancer Registry (FCR) and Statistics Finland (SF) of all MPeM patients from 2000 to 2012 in Finland. We also collected data on occupational disease compensations from the Workers' Compensation Center (WCC) of Finland. Any missing information was collected from the respective patient's file of every patient obtained from health institutions that had treated the patients.

Results: Between January 1, 2000 and December 31, 2012, 90 new MPeM cases (56 males, 34 females) occurred in Finland. Median annual incidence was four new cases, which corresponded to 0.74 new cases per million per year. MPeM was deemed an occupational disease in 21 patients (23.3%). 71 patients (78.9%) of whom had a known cause of death, with a median survival of 4 months. The number of deaths linked to other disease than mesothelioma was 28/74 (37.8%).

Conclusions: Our study indicates that MPeM in Finland is rare and fatal, which is in accordance with previous reports from other countries. MPeM is also a fatal disease, since most of the patients died due to MPeM.

1. Introduction

Malignant peritoneal mesothelioma (MPeM) is a rare cancer of mesothelial cells in the peritoneum [1–3]. Beyond the peritoneum, mesothelial cells are found in the pleura, pericardium and tunica vaginalis of the testes [1,4]. The incidence of MPeM is reportedly 0.2 to 3 cases per million people per year [1,5]. The RARECARE database indicates an incidence of MPeM in Europe, from 1995 to 2002, of 1.2 to 1.3 cases per million people per year [6]. The little information available suggests that MPeM is reportedly more common among men [2,5,7]. The most significant risk factor for MPeM is exposure to asbestos [7,8]. In Finland, cytoreductive surgery (CRS) and hyperthermic intra-abdominal chemotherapy (HIPEC) have been performed to MPeM and pseudomyxoma peritonei since 2007. Performing HIPEC is centralized to two centers in Finland.

Due to the rarity of the disease knowledge of the treatment of MPeM is limited. Mainly due to the same reason the knowledge of the oncogenesis and the microenvironment of the cancer is limited [1]. Little is known about the epidemiology of MPeM at the national level in recent years. In addition, few epidemiological studies of MPeM worldwide are available and most of them are epidemiological cohort studies of work-related asbestos exposure [9].

To date no studies have examined the national epidemiology of MPeM in the Nordic countries. This population-based cohort study will clarify the epidemiology of MPeM in Finland.

Our aim was to report the incidence, epidemiology and expression of MPeM in Finland between January 1st, 2000 and December 31st, 2012.

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2. Methods

This was a retrospective population-based study. The data consisted of cancer notifications, laboratory notifications, and information on death certificates in the Finnish Cancer Registry (FCR) and Statistics Finland (SF) of all patients diagnosed with MPeM between 2000 and 2012. We also collected information on work-related disease compensations from the Workers' Compensation Center (WCC) of Finland. All Finnish hospitals, laboratories and doctors are obliged to notify the FCR on all new or suspected cancer cases. The FCR has maintained a registry of all cancers diagnosed in Finland since 1953 and the FCR's coverage of solid tumors is reportedly as high as 99% [10]. Additional and missing information was collected from the respective patient's files, obtained from the health institutions where the patients received treatment. We produced the database and verified patient survivals in February 2013.

We collected the following patient data: date of birth, gender, profession at time of diagnosis, date of diagnosis, morphology of the cancer, primary site of the cancer, method of diagnosis, staging of the cancer, type and duration of treatments received, beginning date of treatment, present status of the patient, date of death, cause of death (main or other) according to the diagnoses in the 10th version of the International Statistical Classification of Diseases and Related Health Problems (ICD10), municipality of stay, reason for not receiving active cancer treatment, and confirmed or suspected occupational diseases. The ICD10-codes used in the searching process were C45.1 for MPeM, C45.7 for mesothelioma of another site, C45.9 for unspecified mesothelioma, C45.0 for pleural mesothelioma, and C80 for unspecified malignant neoplasm.

2.1. Ethics

This study was approved by the Heart and Lung Center of Helsinki University Hospital, the National Institute of Health and Welfare, Statistics Finland, and as well by the Ethical Committee of Helsinki and Uusimaa Hospital District.

3. Results

During the study period 94 patients (60 males, 34 females) were diagnosed with MPeM per FCR clinical notifications. However, four patients were excluded from the data after going through the patients' files: two patients had tunica vaginalis testis and one patient pleura as the actual location of their mesothelioma, whereas one patient with adenocarcinoma was first misdiagnosed with MPeM. The final data included 90 patients (56 males, 34 females) who were diagnosed with MPeM. The mean incidence was 6,9 new cases per year (male 4.31, female 2.62). The median annual incidence was four new cases, which corresponds to 0.74 new cases per million per year in Finland. Fig. 1 shows the number of new MPeM cases in Finland from 2000 to 2012. The mean age during diagnosis was 67.4 years (male 66.7 years, range 37–92 and female 68.4 years, range 24–88).

The patientś professions have been divided into six different categories according to their characteristics. The most common professions were technical and household workers, and clerical workers (Table 1).

MPeM was deemed an occupational disease in 21 patients (23.3%) (male 19, female 2) and suspected in three patients (3.2%) (male 1, female 2). Additionally, in seven cases (7.4%) an occupational disease was related to another disease. Fig. 2 shows the number of new MPeM cases on patients with an occupational disease in Finland from 2000 to 2012. The median annual age at diagnosis of the patients classified with occupational disease was 66 years.

The diagnosis was made histologically from the primary tumor either by ultra-sound-guided thick needle biopsy, laparotomy or laparoscopy (60 cases, 66.7%) or from a metastasis (6 cases, 6.7%). In 23 cases (25.6%) MPeM was diagnosed microscopically only at autopsy. In one case (1.1%) the diagnosis was made clinically and involved a biopsy taken from the primary tumor; histological analysis served to confirm the diagnosis.

The histological subtype of the MPeM was reported in 34 (37.8%) cases (male 24, female 10). The most common histological subtype was epithelial (26 cases, 28.9%) (male 18/56, 32.1%, female 8/34, 23.5%) followed by biphasic (5 cases, 5.6%) (male 4/56, 7.1%, female 1/34, 2.9%) and sarcomatoid (3 cases, 3.3%) (male 2/56, 3.6%, female 1/34, 2.9%).

In the majority of the cases MPeM had spread beyond the regional lymph nodes (Table 2). 81 patients (90.0%) died, 74 (91.4%) of whom had a known cause of death. All of these 74 patients died of or with cancer.

Surgical treatment was given to 14 out of 90 patients (15.6%). 6 patients (6.7%) were radically operated whereas 8 patients (8.9%) got palliative surgical treatment.

Chemotherapy was given to 37/90 patients (41.1%). In 2 cases (2.2%) there was no certain information whether the patient had got chemotherapy or not. Radiotherapy was given to 14/90 patients (15.6%). In 2 cases (2.2%) there was no certain information whether the patient had got radiotherapy or not.

The survival time after the diagnosis was known on 79/90 patients (87.8%). The mean of the survival was 12.47 months and the median was 4.0 months (range from 0 months to 92 months). Fig. 3 shows the survival among men and women as a Kaplan-Meier figure.

The median survival of radically operated patients was 59.5 months (range 57 − 62 months). Respectively, on patients with a palliative operation, the median survival was 1.0 months (1–6 months), on patients who got chemotherapy 9.0 months (1–92 months) and on patients who got radiotherapy 2.0 months (2–15 months). Fig. 4 shows the different survivals among patients divided in groups by their treatment.

In 33/74 deaths the patients' death certificates indicated MPeM (IDC10 code C45.1) as the main cause of death. In four out of 74 deaths (5.4%), the main causes of death were mesothelioma of another site (ICD10 code C45.7), also in five (6.8%) unspecified malignant neoplasm (ICD10 code C80), and in two (2.7%) unspecified mesothelioma (ICD10 code C45.9). In these 11 cases, however, the patients' files and FCR notifications suggested that the main cause of death was actually MPeM. In two of the 74 deaths pleural mesothelioma (ICD10 code C45.0) was indicated as the main cause of death. Based on the patients' files and cancer notifications, however, both of the patients had really MPeM as their diagnosis.

As many as 28 out of 74 deaths (37.8%) were linked to some other disease than mesothelioma; 18 to pulmonary diseases, seven to cardiovascular ones, and three to others (Table 3).

4. Discussion

With only 90 new MPeM cases in Finland's population of 5.5 million over a 12-year period (a median annual incidence of 0.74 cases per million inhabitants), MPeM is a rare disease in Finland. Its incidence in Finland, reported here for the first time, is well in accordance with earlier reports from other countries [1,5].

This study also shows that MPeM is more common among men in Finland, which also supports earlier results on MPeM's distribution by sex worldwide [2,5,7]. Some researchers have suggested that MPeM's higher incidence among men is linked to either genetic factors or more frequent asbestos exposure [11]. Fig. 3 shows that the survival is better among female patients. The better survival among women has been stated also earlier in the literature [12].

One fourth of the MPeM cases occurred in patients diagnosed with an occupational disease. Occupational diseases were more common among men than among women which may be a consequence of men working more often in jobs with asbestos exposure such as technical and household workers. A Swedish study linking occupational data to