Asbestos-Related Mesothelioma: Prevention, Early Detection, Treatment

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Abstract

Mesothelioma is a relatively rare disease, with ~1,000 cases of mesothelioma-related mortality annually in Japan. There is currently no standard diagnostic method for this disease worldwide. X-ray is commonly used for the assessment of a mass in a population exhibiting a risk factor and a tumor biopsy is typically performed only if this disease is suspected, since it is a highly invasive procedure. Thus, numerous patients with mesothelioma are diagnosed at a late stage. Since the early diagnosis of mesothelioma, an aggressive tumor is considered to be important for prognosis.

We previously reported that N-ERC/mesothelin might be a useful blood tumor marker for mesothelioma. Furthermore, our group examine the unique diagnose system from large-scale screening of construction workers in Japan. We predict that the incidence of mesothelioma will increase in Asian countries near future. Since, we will share the diagnosis system and knowledge of mesothelioma and establish the early diagnosis and treatment systems. Finally, we establish "International Environmental Carcinogenesis Prevention Research Center". From this center, we will organize international seminars of environmental carcinogenesis once a year and the education program of the diagnosis skill for mesothelioma. Furthermore, we prove more convenient and non-invasive method for the early diagnosis of mesothelioma.

INTRODUCTION

Mesothelioma is an aggressive malignant tumor, chiefly attributed to asbestos exposure. Asbestos is an environmental carcinogenesis and asbestos-related disease is global-scale environmental issue. It is known to be generally rare and difficult to diagnose [1]. X-rays are commonly used for the assessment of a tumor in populations at risk for developing the cancer. However, currently there are no effective and curative treatments except for surgery. Since, early diagnosis for mesothelioma is important for prognosis. After 2005, the Japanese government prohibits the use of asbestos. Thought, the incidence of mesothelioma is slowly increasing and is predicted to reach peak in 2030 in Japan [2]. The environment of the developing countries has changed by rapid economic growth. Since asbestos are still in use in these countries [3].

Previously, we reported that N-ERC/mesothelin could be a useful serum tumour marker for mesothelioma [4] and have developed an ELISA kit (IBL Co., Ltd. Gunma, Japan) for N-ERC/mesothelin in collaboration with IBL Co., Ltd [5]. Furthermore our group examine the unique diagnose system from large-scale screening of construction workers in Japan. We predict that the incidence of mesothelioma will increase in Asia near future. Since, we will share the diagnosis system and knowledge of mesothelioma and establish the early diagnosis and treatment systems.

A LARGE-SCALE RESEARCH SCREENING OF CONSTRUCTION WORKERS

To investigate effectiveness of N-ERC/mesothelin for early diagnosis and to propose a screening method in the population at risk, a 5-year large-scale research screening was started in 2007. As of November 2011, approximately 40,000 subjects affiliated with the Tokyo Doken National Health Insurance Association who had worked in Japan at construction sites with a risk of asbestos exposure agreed to participate in this study. Blood samples were collected annually and N-ERC/mesothelin levels were determined using the ELISA kit. Based on the results, along with the medical history and related data, we screened the participants to identify a high-risk population. Three participants developed mesothelioma. Sixty-six subjects were identified as a high-risk population, but have yet to develop mesothelioma. In conclusion, N-ERC/mesothelin may be a useful blood tumour marker for diagnosis of mesothelioma upon mass examination.
Central

of exposure deemed ‘dangerous’ to cause cancer involves some well-ventilated communication. In reality, the length and amount include risk evaluation along with risk management, as well as pointing to ‘risk.’ ‘Carcinogenic’ research for the future must there has been pathological and epidemiological evidence practical responses are decades behind, despite the fact that make the same kind of mistakes in the future? must we learn from these past mistakes in order that we do not then, should we approach such a critical problem? What lessons pioneering nation in chemical-induced carcinogenesis. How, caused by asbestos.’ This is truly ironic as Japan was a Japan has taken up and reported on wide scale ‘mesothelioma introduction of environmental pollutants. Recently, the media in Revolution of the latter half of the 18th century witnessed the cancer caused by aniline pigment factories, among others, were stimulated by chimney soot.’ One-hundred years later, bladder forty years ago. However, environmental carcinogens’ came to light in 1775 when the British surgeon Percival Pott reported on the renal carcinoma gene ERC, which is highly expressed in renal cancer in Eker rats [7]. We also reported that ERC is a homolog of the human megakaryocyte potentiating factor/mesothelin gene [8,9]. The human mesothelin gene product is a 71-kDa precursor protein, which is cleaved by a furin-like protease into a 40-kDa C-terminal fragment that remains membrane-bound and a 31-kDa N-terminal fragment (N-ERC/mesothelin) that is secreted into the bloodstream [10]. Therefore, N-ERC/mesothelin would be expected to serve as a specific and easily-measured biomarker of mesothelioma. We developed an enzyme-linked immunosorbent assay (ELISA) system that detects N-ERC/mesothelin [5] and recently reported that N-ERC/mesothelin may be useful for the early diagnosis of mesothelioma [4].

TREATMENT AND DIAGNOSIS

We previously reported on the renal carcinoma gene ERC, which is highly expressed in renal cancer in Eker rats [7]. We also reported that ERC is a homolog of the human megakaryocyte potentiating factor/mesothelin gene [8,9]. The human mesothelin gene product is a 71-kDa precursor protein, which is cleaved by a furin-like protease into a 40-kDa C-terminal fragment that remains membrane-bound and a 31-kDa N-terminal fragment (N-ERC/mesothelin) that is secreted into the bloodstream [10]. Therefore, N-ERC/mesothelin would be expected to serve as a specific and easily-measured biomarker of mesothelioma. We developed an enzyme-linked immunosorbent assay (ELISA) system that detects N-ERC/mesothelin [5] and recently reported that N-ERC/mesothelin may be useful for the early diagnosis of mesothelioma [4].

REFERENCES