Report on “Radiation Disaster Recovery Studies”

Course Radiation Disaster Medicine
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○Radiation Disaster Recovery Studies

As the Great East Japan Earthquake happened of magnitude 9.0 happened on 11 March 2011, which caused vast damage in the region, following is a 15-metre tsunami which disabled the power supply and cooling system of three Fukushima Daiichi reactors, regarded as a nuclear accident. It was rated 7 on the INES scale because of high radioactive, which released over days 4 to 6, eventually a total of around 940 PBq (I-131 eq). The tsunami attacked an area of about 560 sq km and took over with around 1,817 people were presumed dead and finally the effects from the several explosions of the Fukushima Daiichi nuclear power plant after the total electric power loss, was the most serious and long-term effects for the people in Fukushima. The radioactive substances with a long half-life like Cesium-134 and 137 were released into the environment, which made around 17,000 people to evacuate to temporary houses, 34,000 in rental houses, and 57,000 still live outside of Fukushima prefecture.

During four years studying within the Phoenix Leader Education Program, it is very helpful to review and connect all the information we learnt about radiation and radiological recovery based on the experiences we had from Fukushima. As radiation is a difficult term to explain even though we are exposed to it from our surroundings in our natural environment. On the other hand, we also expose to radiation from the technology advancement we all get benefits from in medicine, industry, agriculture, etc. The point is people could not easily “see” radiation. Moreover, the knowledge about this source is not yet understood clearly as this field is still new. When a disaster happens, especially when it is related to radiological exposure, people would like to get more and more information about what would happen to their health. As we know if something is unclear, it will cause more anxiety, anger and people try to blame because they were not explained well. Therefore, the role of Health professionals should be aware in the relationship and corporation with others in the concept of information control in various ways such as: medicine, environment and society. Medical staffs, or doctors are expected to give proper information and participate in activities concerned to disaster-induced health. Moreover, radiation education should be provided specifically as it is different from ordinary medical practice. On the other hand, when a disaster happened due to inappropriate preparation, both scientists and publics confused and did not know what to do. Besides that, the existence of incorrect information pushed the situation to another information disaster, which was also created by mass media. Another important issue is psychological stress for both people evacuated away from Fukushima and the ones who stayed. That would lead to the concern about how we could recover to solve those problems not only in physical issues, but also to heal emotional wounds after shocking events. Therefore, it is necessary to discuss about the multiple dimensions of post-Fukushima disaster recovery, which should base on Radiation, Health and Population. Although there would be a lot of struggle for the recovery after a major nuclear accident, as we could realize that lacking of training and education in the field of radiation medicine and psychosocial issue, mental health care system, scientific risk communication and the huge impact on rebuilding the community should be considered.

○REFERENCE:

Seiji Yasumura (2014), “Public Health in Case of Nuclear Disaster”, Chapter 1 p2-11, p12-17, Chapter 2 p16-19

Masaharu Maeda and Misari Oe (2013), Disaster behavioral health: Psychological effects of the Fukushima nuclear power plant accident.

World Health Organization Report (2013) Health risk assessment from the nuclear accident after the 2011 Great East Japan Earthquake and Tsunami based on a preliminary dose-estimation.
IAEA, "Risk communication: more than facts and feelings", IAEA Bulletin, iaea.org

○Title of Doctoral Thesis

Characteristic expression of fukutin in gastric cancer among atomic bomb survivors.
ONCOLOGY LETTERS, 13(2):937-941, 2017.

○Summary of Doctoral Thesis

Introduction
Gastric cancer (GC) is the fifth most common malignancy in the world and the third cause of death for both men and women. Over 60% of GC worldwide occurs in Asian countries including Japan, China, Korea and Vietnam. While radiation is currently widely used in medicine, industry and nuclear power, the effect of radiation on GC development has been estimated on the basis of the Life Span Study (LSS) with excess relative risks (ERRs) per Gy of 1.20 for mortality and 1.32 for incidence. We previously performed Escherichia coli ampicillin secretion trap (CAST) using GC cell lines and GC tissue samples and found that the *FKTN* gene is overexpressed in GC. *FKTN*, which encodes fukutin protein, is responsible for Fukuyama-type congenital muscular dystrophy. Fukutin is presumably involved in the glycosylation of alpha-dystroglycan, which is involved in basement membrane formation. Although overexpression of fukutin has been reported in GC, its relationship with radiation exposure has not been studied. In the present study, we performed immunohistochemical analysis of fukutin to elucidate the association between fukutin expression and radiation-associated GC.

Materials and Results
This study included formalin-fixed and paraffin-embedded archival tissues from 278 patients with GC who underwent surgery. The patients were treated at Hiroshima Red Cross Hospital and Atomic-Bomb Survivors Hospital (HRCHABSH, Hiroshima, Japan) or Hiroshima University Hospital (HUH, Hiroshima, Japan). The HRCHABSH cohort included 192 GC samples, all from atomic bomb survivors in Hiroshima treated at HRCHABSH. They were classified into two groups: exposed at a short distance group and exposed at a long distance group. The HUH cohort included 86 GC samples, all from atomic bomb survivors in Hiroshima treated at HUH. The HUH cohort of 86 GC patients were LSS cohort members, and atomic bomb radiation doses were estimated by the DS02 system. They were classified into two groups according to the levels of exposed radiation dose: the high-dose-exposed group and the low-dose-exposed group.

Expression of fukutin was first analyzed in the HRCHABSH cohort. In non-neoplastic gastric mucosa, immunohistochemical analysis revealed weak staining of fukutin in intestinal metaplastic cells, but not in the normal gastric epithelial glands. In contrast, GC tissue showed stronger, more extensive staining of fukutin. In total, 102 (53%) of 192 GC cases were positive for fukutin. We next examined the relationship of fukutin expression to clinicopathologic characteristics. GC cases positive for fukutin were found more frequently in intestinal type GC cases than in diffuse type GC cases. We previously found that positive fukutin expression is frequently found in CD10-positive GC cases. Thus, we next analyzed association between fukutin expression and CD10 expression. We found that fukutin-positive GC cases were frequently found in CD10-positive GC cases. In contrast, fukutin expression was not associated with exposure status.

We next analyzed expression of fukutin in the HUH cohort, because the HUH cohort patients were LSS cohort members in which atomic bomb radiation doses were estimated correctly by the DS02 system. A total of 58 (67%) of 86 GC cases were positive for fukutin. As with the HRCHABSH cohort, GC cases positive for fukutin were found more frequently in intestinal type GC cases than in diffuse type GC cases. In this cohort, fukutin expression was associated with exposure status, but was not associated with CD10 expression.

Conclusion

Although in the first cohort from HRCHABSH, expression of fukutin was not associated with radiation exposure status, the second cohort from HUH showed significant association between fukutin expression and radiation exposure. Further studies with a larger cohort with precise radiation dose estimation will help clarify whether fukutin could be a potential biomarker to define radiation-induced GC in atomic-bomb survivors.

○Other theses published in academic research journals

1. Naito Y, Oue N, Pham TT, Yamamoto M, Fujihara M, Ishida T, Mukai S, Sentani K, Sakamoto N, Hida E, Sasaki H, Yasui W: Characteristic miR-24 expression in gastric cancers among atomic bomb survivors. Pathobiology, 82(2):68-75, 2015.
2. Oue N, Mukai S, Imai T, Pham TT, Oshima T, Sentani K, Sakamoto N, Yoshida K, Yasui W: Induction of KIFC1 expression in gastric cancer spheroids. Oncol Rep, 36(1):349-55, 2016.