FNCA 2010 Workshop on Radiation Oncology

Open Lecture on Peaceful Use of Nuclear Power

- Radiation Oncology in Asia and Role of Japan -

November 27th, 2010　9:30 – 13:30

Miyakezaka hall, Syakai bunka kaikan (Tokyo)

Hosted by Ministry of Education, Culture, Sports, Science and Technology of Japan (MEXT)

AND

National Institute of Radiological Sciences (NIRS)

FNCA2010 Workshop on Radiation Oncology
Open Lecture on Peaceful Use of Nuclear Power

- Radiation Oncology in Asia and Role of Japan -

【Simultaneous Interpreting（Japanese/English）】

Program	
Opening Ceremony (Welcome Remarks)	
9:30-9:45 (15min.)	Hayashi TOWATARI, Deputy Director-General, Research Promotion Bureau, Ministry of Education, Culture, Sports, Science and Technology of Japan (MEXT)
	Yoshiharu YONEKURA, President of National Institute of Radiological Sciences (NIRS)
9:45-10:05 (20min.)	**"Nuclear Technology Contributing Sustainable Development of Asia: FNCA Success Story"** Sueo MACHI, FNCA Coordinator of Japan
1. High-tech Radiation Therapy in Japan	
10:15-10:25 (20min.)	**"Radiotherapy Today in Japan"** Shogo YAMADA, President of Cancer Center, Professor and Chairman of Department of Radiation Oncology, Tohoku University Hospital
10:25-10:45 (20min.)	**"Intensity Modulated Radiation Therapy (IMRT)"** Kazuo HATANO, Director of Department of Radiation Oncology, Chiba Cancer Center
10:45-11:00 (15min.)	Break
2. Radiation Therapy in Asia	
11:00-12:00 (60min.)	**"FNCA Radiation Oncology Project in Asia"** Hirohiko TSUJII, FNCA Project Leader of Radiation Oncology / Executive Director, National Institute of Radiological Sciences (NIRS) Representatives：C.R. Beena Devi (Malaysia) Miriam Joy C. Calaguas (The Philippines) Pittaya Dankulchai (Thailand) Dang Huy Quoc Thinh (Vietnam))
12:00-12:20 (20min.)	**"IAEA/PACT: Building Self-Sustaining Cancer Control Capacity and Infrastructure in Asia & Pacific Region Using Radiation medicine as the Anchor"** Massoud Samiei, Head of the Programme of Action for Cancer Therapy (PACT), International Atomic Energy Agency (IAEA)
3. Special Lecture	
12:20-12:45 (25min.)	**"Carbon Ion Radiotherapy, What are the Differences?"** Tadashi KAMADA, Head of The Research Center for Charged Particle Therapy, National Institute of Radiological Sciences (NIRS)
Closing Ceremony (Remark)	
12:45-12:50 (5min.)	Hirohiko TSUJII, FNCA Project Leader of Radiation Oncology / Executive Director, National Institute of Radiological Sciences (NIRS)

L E C T U R E R S

Nuclear Technology Contributing Sustainable Development of Asia: FNCA Success Stories

【Sueo MACHI】

FNCA Coordinator of Japan

1988-1991: Director General, Takasaki Radiation Chemistry Research Establishment (TRCRE), Japan Atomic Energy Agency (JAEA) (Former JAERI)

1991-2000: Deputy Director General, IAEA

2000-2003: Executive Management Director, Japan Atomic Industrial Forum (JAIF)

2004-2007: Commissioner, Japan Atomic Energy Commission

【Overview】

Forum for Nuclear Cooperation in Asia (FNCA) is implementing 11 projects and one study panel aiming to achieve socio-economic development through cooperation among 10 FNCA countries by using nuclear technology.

For agriculture, projects on mutation breeding of crops, such as rice, to develop improved varieties in quality and on bio-fertilizer development for sustainable agriculture are in successful progress.

For health care radiation oncology project has been implemented to develop new protocols for treatment of uterine and head & neck cancer patients, achieving high recovery rate after 5 years. Advanced nuclear medicine project using PET are in progress collecting 200 PET images with interpretation.

In the field of industry, project on radiation processing of chitosan and starch have developed commercial technology to produce plant growth promoter.

The study panel on nuclear power started in 2004 to have issued the Joint Communiqué by Ministerial Level Officials of FNCA countries emphasizing that nuclear power should be promoted for mitigation of CO2 emission and energy security and it should be included in CDM of Kyoto Protocol. Cooperation is focused on the infrastructure development of nuclear power introduction.

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Radiotherapy Today in Japan

【Shogo YAMADA】

President of Cancer Center, Professor and Chairman of

Department of Radiation Oncology, Tohoku University Hospital

1975: Graduate, Tohoku University School of Medicine

1984-1996: Associate Professor, Department of Radiology Tohoku University, School of Medicine

1996: Professor, Department of Radiology, Tohoku University School of Medicine

【Overview】

The number of CT, MRI, PET and equipments for radiotherapy in Japan is extremely large in the world. However, the ratio of cancer patients who take radiation therapy in Japan is only 25 %. On the other hand, that of Europe and USA is about 60 %. One reason of this difference is the variation of cancers, for example the number of stomach cancer, which is radioresistant, is far large in Japan. One more reason is the dissimilarity of the decision method of cancer treatment, for example surgeons decide treatment method for almost all cancer patients and only inoperable patients receive radiation therapy in Japan. However, recently the situation is changing, because the treatment results of radiation therapy are exceedingly improved by the rapid progression of radiotherapy technique and patients demand their function reservation by radiotherapy for QOL.

Today the number of cancer patients who select radiation therapy is rapidly increasing in Japan. I will present here the progress of radiation therapy in recent years and the relatively small number of specialists for radiation therapy in Japan.

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Intensity Modulated Radiation Therapy (IMRT)

【Kazuo HATANO】

Director, Department of Radiation Oncology, Chiba Cancer Center

1981-1983: Trainee Doctor, National Hospital Medical Center
(Present: National Center for Global Health and Medicine)
1983-1986: Head, Department of Radiology, Haibara General Hospital
1986-1990: Technical Official, Ministry of Health and Welfare,
National Hospital Medical Center
1991-1992: Assistant Professor, Department of Radiology, Chiba University School of Medicine
1992-1993: Fellow for Radiation Oncology and Nuclear Medicine, Medical University of Pennsylvania Hahnemann, U.S.
1993-1994: Lecturer, Department of Radiology, Chiba University School of Medicine
1994-Now: Director, Department of Radiation Oncology, Chiba Cancer Center

【Overview】

Intensity-modulated Radiation Therapy (IMRT) enabled us to deliver a higher dose to the target with acceptable low dose of normal tissues. Approximately ten years pass since it is applied a clinical use in Japan, from Apr 2010, become the insurance adaptation for all localized malignant tumors. A lot of patients for a brain tumor, head and neck cancer and prostate cancer have been treated with IMRT. Treatment outcome improvement is obtained for the brain tumor and the QOL improvement such as salivary secretion after treatment, the decrease in visual loss is obtained in the head and neck cancer patients. In prostate cancer, PSA failure free survival rate improvement is obtained with a decrease in rectal bleeding. We talk about the characteristics, treatment outcome and problems about IMRT.

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FNCA Radiation Oncology Project in Asia (1)

【Hirohiko TSUJII】

FNCA Radiation Oncology Project Leader

Executive Director of National Institute of Radiological Sciences (NIRS)

1962-1968: The Hokkaido University School of Medicine, Japan

1972-1974: Resident, Department of Radiotherapy, St. Vincent Hospital and Medical Center of New York, U.S.A.

1974-1985: Lecturer, Department of Radiology, Hokkaido University School of Medicine

1978-1979: Research fellow, the University of New Mexico, U.S.A.
(Participated in pi-meson treatment project in Los Alamos)

1982-1983: Visiting researcher, Paul Scheller Institute, Switzerland
(Participated in pi-meson treatment project)

1985-1988: Associate Professor, Department of Radiology, Hokkaido University School of Medicine

1989-1989: Associate Professor, University of Tsukuba

1989-1994: Professor and Director, Proton Medical Research Center, University of Tsukuba

1999-2001: Director, Division of Radiation Health, National Institute of Radiological Sciences (NIRS)

1994-Now: Director, Research Center for Charged Particle Therapy, National Institute of Radiological Sciences (NIRS)

2001-Now: Professor, Chiba University Graduate School of Medicine

2005: Princess Takamatsu Cancer Research Fund Prize

2005: Nice Step Scientist Prize form National Institute of Sciences and Technology Policy

2008-Now: Executive Director, National Institute of Radiological Sciences (NIRS)

【Overview】

FNCA radiation oncology project was launched in 1993 to develop and establish the effective treatment methods for predominant cancers in East and South-east Asia, to improve the treatment outcomes, and to contribute to the public welfare of the region. Currently, 9 countries are participating in this project: Bangladesh, China, Indonesia, Japan, South Korea, Malaysia, the Philippines, Thailand, and Vietnam.

The main activity of this project is to conduct international multicenter clinical studies of radiation therapy and chemotherapy for cervical cancer and nasopharyngeal cancer, which are predominant in Asian region. Fourteen hospitals in the nine countries noted above are participating in the studies. In the clinical studies, specialists on radiation therapy from each country build treatment protocols. They treat patients according to the protocols, and evaluate the treatment outcomes.

We have conducted three clinical studies for cervical cancer since 1995. In the first clinical study, we standardized radiation therapy, because it had differed widely in Asian countries. The results of

the standardized protocol were favorable. In the next study, we tried a new treatment using accelerated hyperfractionation radiation therapy. In the third clinical study, we conducted a combined chemotherapy and radiation therapy (chemoradiotherapy) to further improve the treatment outcomes. The results of chemoradiotherapy were favorable, which were comparable with those of other studies in Europe and the United States. From the results, it was suggested that chemoradiotherapy using our protocol was safe and effective for cervical cancer patients in Asian region. This protocol treatment has been widely disseminated among Asian countries. The results of the three clinical studies have been published in international medical journals.

We have been conducting two clinical studies for nasopharyngeal cancer since 2005. This tumor has a high incidence of neck lymph node metastasis, and distant metastasis to the bones or lungs also occur frequently. Therefore, it is important not only to control the head and neck lesions, but also to prevent distant metastasis. For this purpose, we treat patients with the combination of concurrent chemoradiotherapy and adjuvant chemotherapy.

The National Institute of Radiological Sciences (NIRS) has participated in this project from the beginning and has been playing major roles. The data center of the clinical studies has been placed in NIRS. The data center has compiled and analyzed the clinical data and evaluated the safety and efficacy of the protocol treatments. In addition, NIRS has been conducting activities of physical quality assurance/quality control (QA/QC) of radiation therapy, such as measurement of radiation doses of treatment machines at facilities participating in the clinical studies.

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FNCA Radiation Oncology Project in Asia (2)

- Radiation Therapy in Malaysia, South East Asia -

【C.R. Beena Devi】

Senior Consultant Clinical Oncologist, Head of Department of Radiotherapy, Oncology & Palliative Care, Sarawak General Hospital

1989-1990: Senior Registrar Manipal Medical College, India

1990-1991: Assistant Professor, Manipal Medical College, India

1992: Hospice Doctor for Singapore Cancer Society

1992-Now: Consultant Clinical Oncologist, Department of Radiotherapy& Oncology, Sarawak General Hospital

1996-Now: Adjunct Lecturer, UNIMAS

2006-Now: Senior Consultant Clinical Oncologist, Department of Radiotherapy & Oncology, Sarawak General Hospital

【Overview】

Malaysia, located in South East Asia consists of Peninsular Malaysia which lies to the south of Thailand, and East Malaysia which is situated north of Borneo Island. It is a multicultural society with a population of 22.5 million in which Malays and other natives make up 65.8%, Chinese 25.4%, Indians 7.5%, % and other races 1.3 %. In 2003, the cancer incidence for both sexes per 100,000 population in Peninsular Malaysia is 112.3, 42.6 in Sabah and 63.3 in Sarawak.

The five most common types of cancers in men in Peninsular Malaysia are lung, nasopharynx, colon, leukemia and rectal cancer. For women, the common cancers are breast, cervix uteri, colon, corpus uteri and rectal cancer.

Currently Malaysia has 25 hospitals offering radiotherapy, of which 23 hospitals are in Peninsular Malaysia and two in East Malaysia. Of these hospitals, there are five public hospitals, three university hospitals and 17 private hospitals. About half of these hospitals are in the capital city. The Department of Radiotherapy, Oncology & Palliative Care, Sarawak General Hospital, however, is the only hospital in Malaysia which is ESMO accredited. The services offered from these hospitals range from basic treatment to the highly sophisticated SRS/SRT, IMRT, tomotherapy and cyberknife treatments. Most hospitals provide 3DCRT but IMRT service is only available in eight private hospitals and two public hospitals. Brachytherapy service is available only in some hospitals. Waiting time for treatment varies from public to private hospitals. Seventy percent of the workload is seen in public hospitals and the rest in private hospitals. The cost of treatment in government hospitals are heavily subsidized, partially subsidized in university hospitals and full payment in private hospitals.

The FNCA protocols for nasopharynx and cervix are widely practiced in both government and private hospitals.

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FNCA Radiation Oncology Project in Asia (3)

- The Impact of FNCA Activities in the Philippines -

【Miriam Joy C. Calaguas】

Medical Specialist III, Jose R. Reyes Medical Center, the Philippines
Chairperson, Dept. of Radiation Oncology St. Luke's Medical Center, The Philippines

Associate Professor, Dept. of Radiology, College of Medicine, University of the Philippines
Training Officer, Department of Radiotherapy, Jose R. Reyes Memorial Medical Center, the Philippines
National Project Leader for Radiotherapy, Forum for Nuclear Cooperation in Asia (FNCA)

【Overview】

A brief overview of the current status of radiotherapy in the Philippines will be presented. As an introduction, the leading causes of mortality in Filipinos will be reviewed. Cancer is a significant cause of mortality in the Philippines and the leading sites of cancer in males and females will be discussed. This will be followed by a discussion of the radiotherapy facilities in the country today in terms of number, location and availability of equipment. The radiotherapy team comprised of the radiation oncologists, physicists, and radiation technologists will also be introduced.

Since the beginning of the FNCA project on Radiotherapy, Philippines is one of the active participants along with 7-8 other countries. The FNCA research studies on Cervix Cancer and Nasopharyngeal Cancer have included Filipino patients in these studies. The results of these studies have impacted on the clinical outcomes of our patients in terms of decreasing treatment-related toxicities and improving local control and hopefully, even survival rates.

Throughout the period of this project, the Philippines has hosted the meetings on two occasions and during this times Open Lectures on several topics in Radiation Oncology were held to benefit the local team of radiation oncologists, medical physicists, radiologic technologists and nurses.

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FNCA Radiation Oncology Project in Asia (4)

- Radiation Therapy in Thailand -

【Pittaya Dankulchai 】

Radiation Oncologist, Division of Radiation Oncology,
Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand

1995-2001: MD, Radiation Oncology Division, Faculty of Medicine
Siriraj Hospital, Mahidol University, Bangkok, Thailand
2001-2004: General Practitioner, Ranong General Hospital, Ranong Province
2004-2007: Radiation Oncology Residency, Radiation Oncology Division, Faculty of Medicine
Siriraj Hospital, Bangkok Thailand
2007-Now: Instructor, Radiation Oncology Division, Faculty of Medicine
Siriraj Hospital, Mahidol University, Bangkok, Thailand

【Overview】

Thailand is a developing country in Southeast Asia, with 76 provinces in 5 parts that are northern, northeastern, central, eastern and southern part. The population of Thailand is about 70 millions. According to the report from the Bureau of Health Policy and Planning, Ministry of Public Health, the numbers of death in the year of 2008 is 397,327 and the death rate per 100,000 is about 628. The most common cause of death is cancer, which is 55,403 persons. The death rate from cancer per 100,000 populations is about 87. Female and male ratio is about 2 : 3.

Common cancers in male are liver, lung, and head and neck cancer while cervix, breast and liver cancer are often presented in female. Moreover, the most common cancer leading to death is the liver cancer and the cancer of intrahepatic bile duct, which is also the most common cancer death in both sexes (31.9 males, and 12.9 females per 100,000.). The second cause is malignant neoplasm of trachea, bronchus, and lung that is also the second death rate in both sexes (18.6 males and 8.6 females per 100,000). The third rank in male is lip, oral cavity, and pharyngeal cancer (the death rate per 100,000 is 3.4) while breast cancer is the third rank in female (the death rate per 100,000 is 7.3).

Radiation Therapy in Thailand was started in Siriraj Hospital in 1935, with a superficial and deep x-ray machine (250 kV). Thereafter, the radiotherapy facilities were installed in many medical colleges including general hospitals. Nowadays, there are 26 radiotherapy facilities all over the country, 19 in the government public sector, and 7 in the private sector, respectively. About medical personnel, there are 93 radiation oncologists, 73 medical physicists, and 184 radiotherapists. The residency training program in radiation oncology and the master degree for medical physics have been held for the post graduated level since 1971 apart from the bachelor degree for radiotherapist. For external radiation equipment, there are 25 telecobalt machines, 3 low energy x-ray, and 35 linear accelerators. Moreover, regarding to linear accelerators, 14 machines with the intensity modulated radiation therapy (IMRT) capability, 5 machines with the stereotactic radiosurgery (SRS) capability (1 machine for x-knife), and 5 machines with the

image-guided radiation therapy (IGRT) capability. In addition, there are also one gamma knife, and one cyberknife machine. For the brachytherapy equipment, there are 28 brachytherapy machines, 22 of those belong to the high-dose-rate systems, and 6 belong to the medium and low-dose-rate systems.

Thailand had joined the FNCA project since the start. The impact of the study started from the standardization of the radiation technique. The protocol of accelerated hyperfractionation provided the choice for the cervical cancer patients who are not suitable for chemotherapy while the protocol on concurrent chemotherapy gives us the Asian dose of chemotherapy concurrently used with radiation. Most of all, the collaboration among the Asian delegates provides the good relationships among the participating countries which lead to the further cooperation.

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FNCA Radiation Oncology Project in Asia (5)

- Current Status of Radiotherapy in Viet Nam -

【Dang Huy Quoc Thinh】

Vice Director, Head of Radiation Oncology, Ho Chi Minh City Oncology Hospita

1988: Graduated from Ho Chi Minh City Medical School

1989-Now: Specialized in Oncology

1991-Now: Specialized in Radiation Oncology

1994-1995 Trained in Radiation Therapy in France

【Overview】

Viet Nam is a developing country which has achieved remarkable improvements in public health for the population approximately about 86 million in 2008. But at the same time cancer is the second most common non-communicable disease with an estimated 150.000 new cases and as many as 75.000 cancer deaths a year. Fortunately the government of VN is making cancer a priority and has approved a National Cancer Control Programme (NCCP) for the period 2006-2010 and forward up to 2020. As a result, VN has been selected as one of six PMDS countries of PACT/IAEA.

Population based cancer registry has been done in VN since 1998. The top 10 cancers compiled by IARC (Globocan 2002) show lung cancer (ASR=29,6), liver cancer (ASR =23,7) are the most common cancer in male, cervix cancer (ASR =20,3), breast cancer (ASR =16,2) are the most common cancers in female. Following are colon-rectal cancers, stomach and head & neck cancers.

The major constraints in RT are the lack of sufficient standard machines and human resources. Currently, the country owns only 19 linacs, 15 cobalt, 05 HDR units, 03 Gamma knife and 01 Cyberknife. So there are probably a large number of patients who are noted being treated due to a long waiting list for RT. In addition, Viet Nam currently has no medical physicist training capacities. It may influence the quality of RT.

A close partnership with international organization such as FNCA, PACT/IAEA, KIRAMS is considered an effective assistance in developing RT in Viet Nam.

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IAEA/PACT: Using Radiotherapy as an Anchor to Build Self-sustaining Cancer Control Capacity and Infrastructure in Asia & the Pacific

【Massoud Samiei】

Head of the Programme of Action for Cancer Therapy (PACT),
International Atomic Energy Agency (IAEA)

Before joining PACT in 2005, Mr. Samiei was the Head of the European Region in the IAEA's Technical Cooperation Department for 16 years. He has broad international experience and knowledge in nuclear applications and technology for development, particularly in nuclear power, safety & security, research reactors, environmental remediation, and radiation technology in health, industry and environment.

【Overview】

The IAEA's cancer-related Technical Cooperation activities have enabled many developing countries to establish safe and effective radiation medicine capacity and infrastructure that provides higher quality treatment to their cancer patients. This, however, is far from sufficient to respond to the growing cancer epidemic. Expanding radiation medicine capacity alone is not enough to fight cancer. There is a need for an integrated and comprehensive approach to cancer within a public health systems through national cancer control programmes (NCCPs), as recommended by WHO, to integrate and align cancer prevention, surveillance, screening and early detection, treatment and palliative care activities and investments, as well as civil society action and training of professionals to combat cancer. This requires evidence-based planning and significant new resources. PACT was created within the IAEA in 2004 to address these gaps through partnerships. WHO and IAEA have since developed a **Joint Programme on Cancer Control** and are working together in several countries to implement these concepts. The IAEA's aim is to maximize the impact and effectiveness of radiation medicine. PACT has already mobilized significant funding to support this aim.

To facilitate the implementation of the Joint Programme and the achievement of its goals, PACT offers a multidisciplinary planning and assessment tool called **imPACT review**, which enables Member States to identify their capacity building needs in cancer control. In addition, eight NCCP pilot projects have been launched as **PACT Model Demonstration Sites** (**PMDS**) to showcase the synergies that international partners can achieve by working together with national counterparts to advance cancer control capacity building. PACT has also developed a Virtual University for Cancer Control linked to existing cancer training networks (**VUCCnet)** to address the shortage of cancer professionals

In addition, eight NCCP pilot projects have been launched as **PACT Model Demonstration Sites** (**PMDS**) to showcase the synergies that international partners can achieve by working together with national counterparts to advance cancer control capacity building. PACT has also developed a Virtual University for Cancer Control linked to existing cancer training networks

(**VUCCnet)** to address the shortage of cancer professionals.

In the Asia and the Pacific region, Mongolia, Sri Lanka, Vietnam and Yemen are PMDS countries. PACT works with several FNCA member countries and their cancer institutions.

In summary, PACT is a broad-based umbrella programme which is expected to play a vital role in enabling developing countries fight cancer effectively through partnerships and the Joint Programme.

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Carbon Ion Radiotherapy, What are the Differences?

【Tadashi KAMADA】

Director of Research Center for Charged Particle Therapy,
National Institute of Radiological Sciences (NIRS)

1979: Graduated with M.D from Hokkaido University School of Medicine Japan
1991: Lecturer, Department of Radiology, Hokkaido University School of Medicine
1994: Supervising physician, Research Center of Charged Particle Therapy, NIRS
2007: Director, Research Center for Charged Partide Therapy, NIRS

【Overview】

The main goal of radiotherapy is to deliver an effective dose to a given target volume, while the surrounding normal tissue should be spared as much as possible. Carbon ion beam has a definite range and the Bragg peak. In addition to this physical selectivity, at the Bragg peak, ionization is enormous and showing several biological advantages such as cell cycle independent effect or less repairable damages. Hence, we considered that carbon ion beam is the one of the most promising ion beams for realizing an ideal radiotherapy. Since 1994, more than 5500 patients have already received carbon ion radiotherapy at NIRS (National Institute of Radiological Sciences, Chiba, Japan). It has proven effective for many cancers which considered unlikely to be effectively treatable with other therapies. It is difficult to carry out the direct comparative study with other therapeutics, however it has gradually come to light that carbon ion radiotherapy is capable of: curing cancers that are incurable with other treatment with high probability, and curing in a shorter time and more safely than other modalities.

The future development and expansion of carbon ion radiotherapy requires further progress. The new NIRS system with respiration-gated scanning and a compact rotating gantry should be instrumental in that respect. It will provide us “less invasive and more effective carbon ion radiotherapy”.

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