Department of Laboratory Medicine

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General Summary

We performed a wide range of research in clinical laboratory medicine, including practical research on infectious disease tests, biochemical tests, blood tests, physiological function tests, and clinicopathological tests. In addition, future subjects of our department will be of the development of collection methods of clinical information, medical safety measures, new development of brain function tests, application to clinical tests of mass spectrometry, and functional tests using stable isotope ^{13}C-labeled compounds.

Research Activities

Clinical Microbiology

We participated in medical education programs to provide basic clinical skills training for medical students. In addition, we were appointed to be examiners of objective structured clinical examinations for students in years 4 and 6. Basic, clinical, and epidemiological research on viral hepatitis, severe acute respiratory syndrome coronavirus 2, and *Streptococcus pneumoniae* was conducted, and our manuscript about the usefulness of pneumococcal vaccination was accepted for publication in the *Journal of Infection and Chemotherapy*. We also investigated the effects of metoformin, a widely used pharmacotherapy for the treatment of type 2 diabetes, on intestinal microflora in mice. Moreover, we attempted to perform the chromatographic analysis of the volatile organic compound patterns in exhaled breath from patients with inflammatory diseases.

Clinical Chemistry

We established a new method to evaluate high-density lipoprotein-mediated cellular cholesterol efflux capacity with stable isotope and reported this methodology and the related study results (J Lipid Res 2019; 60: 1959-67). Our clinical research provided the significant relevance of uric acid and homocysteine to renal function (estimated glomerular filtration rate), suggesting the possibility of these markers for the presumption of vascular disorder risk.

We also studied gastric emptying and fat digestive and absorptive function after various types of gastrectomy by ^{13}C-breath tests. Function-preserving gastrectomy attenuated rapid gastric emptying, which is usually seen after conventional gastrectomy. This attenuation might, in part, explain the mechanism of ameliorating postgastrectomy syndromes, such as diarrhea and dumping, after function-preserving gastrectomy.

Although we had previously reported that the fasting ^{13}C-glucose breath test (FGBT) was useful for the diagnosis of hepatic insulin resistance (HIR), there has been no report in an actual clinical setting. We, therefore, performed the FGBT in patients with heart disease to assess the difference in the diagnostic ability of HIR between the FGBT and homeostasis model assessment insulin resistance. We also assessed the relationship between the FGBT and known cardiovascular risk factors. These results of this study indicated the FGBT is more sensitive than homeostasis model assessment insulin resistance for evaluating HIR as a cardiovascular risk factor and is likely useful for managing patients to prevent cardiovascular disease.

Clinical Hematology & Oncology
We studied the pathophysiology of bone marrow failure syndrome.
We analyzed the clinical and laboratory data of aquired aplastic anemia (AA) patients who received immunosuppressive therapy to assess the optimal treatment for AA.
The Jikei University School of Medicine is a collaborative hospital of the National Cancer Center Hospital, which is a core hospital for cancer genomic medicine. Therefore, the following training was provided to the Information Utilization Strategy Office, Center for Cancer Genomics and Advanced Therapeutics (C-CAT) in National Cancer Center. The aims of training were 1) launch of molecular dynamics simulation for reducing gene mutation information to protein structural information, 2) significance of cancer genome mutation and review of cancer genome information management training survey results, and 3) source of genome analysis participation in expert panel conference to extract useful information for medical treatment from data. The knowledge and experience gained through the above training to the clinical laboratory technologists of the university hospital, and at the same time, utilize them for the education of medical students.

Clinical Psychiatry
We discussed a case of non-convulsive status epilepticus suffering from psychic problems and plan the submitting of the case report. We have conducted the study on epilepsy in adult taking Resilience into consideration. We examined the safety and efficacy of psychotropic drugs in several forms of psychosis associated with epilepsy.

Clinical Physiology
Continuing from last year, we conducted research on the accuracy of arrhythmia diagnosis by electrocardiogram automatic analysis, and started to compare the program software used in our hospital with the latest program software. In the area of arrhythmia, we continued our research related to catheter ablation of atrial fibrillation.
In addition, we developed a new scoring method for delayed angiography in cardiac MRI, analyzed the delayed angiography rate in patients with Fabry disease, and proved its usefulness.

Clinical Pathology & Clinical Cell Biology
An earthquake struck Japan on March 11, 2011. The Fukushima Daiichi nuclear power plant was severely damaged and emitted large amounts of radioactive pollutants world-

wide. We collected samples of animals, plants, fungi and lichens from Arctic and measured the radioactivity of ^{134}Cs and ^{137}Cs. Though no radioactivity of ^{134}Cs was observed, radioactivity of ^{137}Cs was observed in some samples of lichens and fungi.

Fibrosis of the liver is triggered by the production of TGF-β from sinusoidal cells and its activation. TGF-β released from cells is anchored mainly by Latency associated protein (LAP) in the extracellular matrix. LAP is cleaved by tissue-specific proteases to activate TGF-β. When the LAP fragment in blood is measured by ELISA using an antibody that recognizes the cleaved free LAP, the liver fibrosis activation can be evaluated by a blood test. In collaboration with RIKEN (Souichi Kojima, Visiting Professor; Yutaka Furuya, Senior Researcher), we were able to construct a new LAP-D antibody and construct a highly sensitive ELISA system (patent application).

Psychological Safety in Clinical Laboratory

We investigated psychological safety (PS) of clinical laboratory. As a result, an environment easy to ask for help was present, but no attitude toward activity was felt, a difference between the departments was present, the department with low PS was strongly aware of its' necessity, the number of mid-career engineers was the lowest. Since there is a difference in PS, it is necessary to think about what to do to improve PS.

Data Management on Clinical Examination

A major impact of a Fukushima nuclear disaster on hospitals was caused by lack of vision to retain human resources. To utilize point-of-care testing (POCT) in disaster settings, validation of the test results and secure data sharing system is a key.

A retrospective cohort study of rheumatoid arthritis patients revealed there seem two types of treatment unresponsiveness among the patients.

Publications

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