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Toho Journal of Medicine Vol. 6 No. 1 掲載論文の紹介

Multifunctional Protein DJ-1 and Disease - 20 Years since the Isolation of the DJ-1 Gene, and Future Research -
Taira T

Toho J Med 6 (1): 38—8, 2020

要約 :

We have researched the initiation of DNA replication for many years, and as part of that research, we have performed functional analysis of the oncogene product c-Myc. Therefore, yeast two-hybrid screening was used to search for protein candidates that bind to the c-Myc protein and control its function.

DJ-1 was originally isolated as a c-Myc-binding protein. However, subsequent furthered studies revealed that it did not bind to c-Myc.

At that time, we were routinely performing focus formation analysis. Focus formation analysis was conducted to analyze focus formation efficiency by introducing various genes into mouse NIH3T3 fibroblasts or mouse embryonic fibroblasts in order to examine whether these genes promote carcinogenesis. The DJ-1 gene was used as a negative control. As a result of the experiment, we found that DJ-1 cooperates with *ras* to promote transformation of cells.

In 1997, DJ-1 was reported by us as being a novel oncogene that promotes cell carcinogenesis with *ras* cooperatively. DJ-1 was named after two students, Daisuke and Junko, who were researching this gene with me.

Furthermore, we have reported the following functions.

- 1, Significantly increased proteins in testis exposed endocrine disruptors.
- 2, Positive transcription regulator of androgen receptor.
- 3, Essential for fertilization.

In 2003, Bonifati et al. reported that DJ-1 (*PARK7*) is a causative gene for familial Parkinson's disease. Thus, it became clear that DJ-1 is a multifunctional protein with various biological functions.

Here, I introduce the findings we have clarified over the past to present of the function of DJ-1 as an oxidative stress defense factor and another functions.

Furthermore, I will introduce the new features of DJ-1 that have been reported in recent years, and introduce possible clinical diagnostic index and the therapeutic drug development based on the DJ-1 protein.

KEYWORDS: DJ-1 protein, neurodegenerative disease, Parkinson's disease (PD), oxidative stress

Differences between the Effects of Sevoflurane and Propofol Anesthesia on Insulin Sensitivity in Fasted Rats Undergoing Descending Colostomy

Sato K, Kawamura G, Yamada Y, Kitamura T

Toho J Med 6 (1): 9—19, 2020

要約 :

Introduction: Glucose metabolism is modified perioperatively, resulting in hyperglycemia. While surgical stress is the predominant factor for hyperglycemic responses, anesthesia also modifies glucose metabolism. We examined the effects of anesthetics on intraoperative insulin sensitivity in fasted rats.

Methods: Two experiments were carried out in this study. In experiment 1, fasted rats underwent descending colostomy under sevoflurane (n = 8) and propofol (n = 8) anesthesia without exogenous glucose administration. The surgery took approximately 30 min. Blood glucose, plasma insulin, tumor necrosis factor- α , and high-molecular-weight adiponectin levels were measured. Before and after surgery, insulin sensitivity was evaluated using the quantitative insulin sensitivity check index (QUICKI) in each rat. In experiment 2, fasted rats underwent descending colostomy under sevoflurane (n = 8) and propofol (n = 8) anesthesia with exogenous glucose administration. Subsequently, these rats

underwent the insulin tolerance test (ITT); we measured blood glucose levels 30 min after insulin administration.

Results: In experiment 1, rats under propofol anesthesia showed significantly lower blood glucose levels and significantly higher plasma insulin levels than rats under sevoflurane anesthesia before and after surgery. Rats under propofol anesthesia had a significantly lower QUICKI than rats under sevoflurane anesthesia. In experiment 2, rats under propofol anesthesia had less decreases in blood glucose levels during ITT than rats under sevoflurane anesthesia. Additionally, plasma tumor necrosis factor- α (TNF- α) levels under propofol anesthesia were significantly higher than those under sevoflurane anesthesia.

Conclusions: Propofol anesthesia impairs insulin sensitivity during surgery in fasted rats, compared with sevoflurane anesthesia; TNF- α might be involved in insulin resistance.

KEYWORDS: surgical stress, intraoperative glycemic control, glucose utilization, insulin, adipocytokine

Quantitative Mathematical Analysis of Thyroid Ultrasonography Using Fractal Dimension

Komatsu F, Kijima S, Kawagoe N, Maruyama K, Tsuboi K, Urita Y

Toho J Med 6 (1): 20—29, 2020

要約 :

Introduction: On the basis of the self-similarity of the human body, fractal dimensions can be calculated mathematically. Fractal analysis can also quantitatively express the density and complexity of a structure as a fractal dimension. We hypothesize that the fractal dimensions of ultrasonographic findings would change in thyroid disease. In this study, we explore the possibility of applying fractal analysis to the quantitative evaluation of ultrasonographic findings in thyroid tissue.

Methods: This retrospective study used data on 1205 patients who newly received thyroid ultrasonography between April 2004 and March 2016. Patients who were included had one or more of the following: normal thyroid, Graves' disease, Hashimoto's thyroiditis, subacute thyroiditis, adenomatous goiter, or papillary carcinoma. Furthermore, the fractal dimension of thyroid ultrasonography was calculated in sagittal pictures. The region of interest was set along the contour of the thyroid gland, excluding a film. Fractal analysis was performed using box-counting methods.

Results: For the normal thyroid gland, there was a significant decrease in the fractal dimensions of both contour and concentration structures, with significant differences compared with the disease groups. Among the thyroid disease groups, papillary carcinoma had the highest fractal dimension. The fractal dimension of the thyroid gland increased with age in the normal group. There were no differences in fractal dimensions by gender.

Conclusion: Fractal analysis makes it possible to objectively determine the presence of chronic inflammation in thyroid tissue, but it is difficult to distinguish papillary carcinoma from benign goiter.

KEYWORDS: thyroid ultrasonography, fractal dimension, adenomatous goiter, papillary carcinoma

Relationships between Solar Ultraviolet Exposure Levels at Different Sites around the Body

Eto N, Asakura K, Nishiwaki Y

Toho J Med 6 (1): 30—40, 2020

要約 :

Introduction: Ultraviolet light (UV) has both beneficial and detrimental effects on the human body. To identify the optimal UV exposure levels, we would ideally need to know the actual levels of UV exposure at all body sites. However, attaching sensors to every site is not feasible, so a means of estimating the exposure levels on the basis of measurements made at a representative site is necessary. This study had two aims: to clarify the convertibility of UV exposure level measurements between several skin sites and to examine the effects of behavior and weather on the applicability of conversion factors among the sites.

Methods: UV exposure level measurements at skin sites (face, chest, wrists, legs, and shoulders) were made in 17 participants during the autumn and winter of 2016. The correlations (β -coefficients) between the UV exposure energy at each site were analyzed, and the influence of behavior and weather on the relationships between the UV exposure readings among the exposed skin sites was separately examined.

Results: We found a fairly strong relationship between the UV exposure measurements among the exposed body sites, and the β -coefficients for two conditions (restricted and unrestricted behaviors) were statistically significant in all sites. By contrast, the influence of weather conditions on the conversion factors was small and statistically insignificant.

Conclusions: It is possible to accurately estimate the UV exposure levels at various body sites on the basis of exposure measurements made at a representative site. This finding should be of great help in identifying the optimal UV exposure level.

KEYWORDS: exposure assessment, solar ultraviolet exposure level, body sites, conversion factors, optimal UV exposure level

Prediction of Fluid Responsiveness by Means of Stroke Volume Variation Measured by Pulse Wave Transit Time-Based Cardiac Output Monitoring

Sakamoto N, Terada T, Ochiai R

Toho J Med 6 (1): 41—47, 2020

要約 :

Introduction: Evaluation of the stroke volume and stroke volume variation (SVV), which could predict fluid responsiveness, is important for perioperative cardiovascular management. In this study, we evaluated fluid responsiveness using a noninvasive pulse wave transit time (PWTT)-based cardiac output monitor, the estimated Continuous Cardiac Output (esCCO).

Methods: Forty-six adult patients who underwent open abdominal surgery were included. Fluid loading with a 300 mL colloidal solution in 15 min was performed during surgery under general anesthesia. Fluid responsiveness was defined as a 10% or more increase in stroke volume index (SVI) measured by the esCCO. Several parameters were measured before and after fluid loading, and an SVV cutoff value for fluid responsiveness was calculated using the receiver operating characteristic (ROC) curve analysis.

Results: Fluid responsiveness was observed in 27 of the 46 patients. SVV and cardiac index exhibited significant changes in the responsive group. In addition, the area under the ROC curve was 0.904 (range, 0.819-0.988) for a 10% or more increase in SVI after fluid loading. The cutoff SVV value was 6.4%.

Conclusion: In this study, we successfully used the noninvasive monitor esCCO to show fluid responsiveness during general anesthesia for open abdominal surgery, and the esCCO-derived SVV has an excellent diagnostic value, which is evidenced by the high AUC of ROC curve analysis.

KEYWORDS: esCCO, stroke volume index, stroke volume variation, fluid responsiveness

A Case of Budd-Chiari Syndrome in Which Liver Stiffness Was Evaluated over Time before and after Percutaneous Transluminal Angioplasty

Shiozawa K, Yamamoto S, Matsui T, Baba T, Saigusa Y, Watanabe M, Maetani I

Toho J Med 6 (1): 48—53, 2020

要約 :

A 60-year-old female was diagnosed with secondary Budd-Chiari syndrome (BCS) after right lobectomy for hepatic hemangioma with stenosis of the inferior vena cava and membranous obstruction of the hepatic vein. Percutaneous transluminal angioplasty (PTA) was performed as treatment. Before PTA, upper gastrointestinal endoscopy showed

F2RC (-) varices in the descending part of the duodenum, and dynamic computed tomography showed hepatomegaly with irregular enhanced hepatic parenchyma in the arterial phase and intrahepatic and extrahepatic venous shunts in the left lateral segment in the equilibrium phase. After PTA, hepatomegaly was improved and the extrahepatic shunt in the left lateral segment was eliminated. Shear wave elastography (SWE) decreased from 2.45 to 1.67 m/s, and the volume of the liver decreased from 1,900 to 1,433 cc, from before PTA to one month after PTA, respectively. This indicates that SWE may be useful for therapeutic evaluation in BCS.

KEYWORDS: Budd-Chiari syndrome, percutaneous transluminal angioplasty, shear wave elastography, liver stiffness, portal hypertension
