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Toho Journal of Medicine Vol. 8 No. 4 掲載論文の紹介

Efficacy of Fractal Analysis for Objective and Quantitative Evaluation of Echocardiographic Still Images: A Retrospective Study

Takeuch T, Komatsu F, Urita Y, Yamazaki J

Toho J Med 8 (4): 119—128, 2022

要約 :

Introduction: Fractal analysis can be used to quantify data from medical images by calculating the fractal dimensions of structures. The method is based on the self-similarity of biological structures. We hypothesized that the fractal dimensions calculated from ultrasonographic images would fluctuate in heart disease. We investigated the application of fractal analysis for quantitative evaluation of ultrasonographic images of the myocardium.

Methods: A total of 1000 individuals who underwent echocardiography between January 2003 and December 2020 were enrolled in this retrospective study. Participants were categorized as “diseased,” with reduced left ventricular ejection fraction (LVEF), and normal. Causes of reduced LVEF included ischemic heart disease, cardiomyopathy, valvular heart diseases, arrhythmia, or unknown etiologies. Fractal dimensions were calculated from echocardiographic images acquired in motion mode. The region of interest was set as the ventricular septum or posterior wall in systole or diastole, respectively. Fractal analysis was performed using the box-counting method.

Results: The fractal dimension of the ventricular septum and posterior wall were significantly larger in systole than in diastole among normal participants. The fractal dimension of the ventricular septum was larger in diastolic outline mode among diseased participants. However, the fractal dimension of the ventricular septum and posterior wall was decreased in systolic outline for the diseased group.

Conclusions: Fractal analysis of echocardiographic images may be useful for performing quantitative evaluations of myocardium impairment. This noninvasive method using still images is easily applicable in clinical settings.

KEYWORDS: echocardiography, fractal dimension, left ventricular ejection fraction, still image

Preoperative Nutrition Index and Prognosis in Unresectable Pancreatic Cancer Treated with Palliative Bypass Surgery Based on the Intraoperative Diagnosis

Tsuchiya M, Washizawa N, Maeda T, Ishii J, Kimura K, Matsumoto Y, Okada R, Funahashi K, Otsuka Y

Toho J Med 8 (4): 129—137, 2022

要約 :

Introduction: Pancreatic cancer is often detected at an advanced stage, when patients frequently become malnourished due to obstructive jaundice and poor oral intake. Preoperative nutritional disorders have been determined to result in postoperative complications centered on infectious diseases; therefore, decisions to perform bypass surgery may be difficult.

Methods: This study investigated the correlation between the Prognostic Nutrition Index (PNI) and modified Glasgow Prognostic Score (mGPS) and the prognosis among patients with pancreatic cancer scheduled to undergo resection. In total, 20 patients diagnosed with unresectable (UR) pancreatic cancer during laparotomy and who underwent gastrointestinal or biliary bypass surgery (Bp group) were compared to 104 patients who underwent radical surgery during the same period (R group).

Results: Six patients in the UR group were determined to have locally advanced disease, whereas 14 patients developed metastasis (UR-M). The PNI of the Bp group was significantly lower than that of the R group. The Bp group (median PNI, 47.1) included several UR-M patients with a short postoperative treatment period and poor prognosis. The Bp group mGPS tended to be abnormal, with a higher rate of cachexia than the R group.

Conclusions: Long-term continuation of postoperative treatment in cases where preoperative PNI and mGPS are satisfactory may lead to good prognosis. Although the PNI of the Bp group tended to be lower than that of the R group, few serious complications were noted to occur after palliative bypass for UR pancreatic cancer, which seemed to be feasible in all cases.

KEYWORDS: unresectable pancreatic cancer, palliative bypass, preoperative nutrition, Prognostic Nutrition Index (PNI), modified Glasgow Prognostic Score (mGPS)

Prognosis of Alpha-Fetoprotein-Produced Gastric Cancer in the Japanese Population: A Systematic Review of Case Reports

Nanba N, Oba M, Kikuchi Y, Shimada H

Toho J Med 8 (4): 138—143, 2022

要約 :

Introduction: Alpha-fetoprotein (AFP)-produced gastric cancer has a poor prognosis because of frequent hepatic metastases. Most reports of AFP-produced gastric cancer are single case reports from Japan. Therefore, we systematically reviewed Japanese reports on AFP-produced gastric cancer to evaluate the clinical significance of the AFP values.

Methods: We reviewed the clinical characteristics and prognostic significance of AFP-produced gastric cancer from reports in the Japan Medical Abstracts Society databases from 1987 to 2019. We evaluated the association between the prognosis of patients and AFP values.

Results: One hundred and eleven papers showed AFP-produced gastric cancer cases ($n = 304$). Among the 304 cases, 102 cases included the AFP value (>20 mg/dL), prognosis, histology, and distant metastasis. AFP values were significantly higher in patients with hepatic metastases, but there were no differences in AFP values based on gender, age, tumor depth, and metastatic factors. The median overall survival was 16 months. Univariate analysis showed that tumor depth ($p = 0.021$) and distant and hepatic metastases ($p < 0.001$) were associated with poor prognosis. Multivariate analysis showed that tumor depth was an independent risk factor for reduced overall survival. The AFP value itself was not associated with poor prognosis.

Conclusions: Although tumor depth was independently associated with poor prognosis, the AFP value itself was not independently associated with poor prognosis. Tumor depth and distant metastasis are useful in predicting the survival of patients with AFP-produced gastric cancer.

KEYWORDS: alpha-fetoprotein, gastric cancer, prognosis

The Difference of Behavior for Undergoing Mammography Examination between Residents in Area with Organized Screening Program and Those in Areas without It: A Cross-Sectional Study in Serbia

Tanigaki K, Hatakeyama Y, Matsumoto K, Onishi R, Seto K, Hasegawa T

Toho J Med 8 (4): 144—153, 2022

要約 :

Introduction: Periodical mammography screening is considered to contribute to the early detection of breast cancer and reduction in its mortality. Since 2012, the organized mammography screening (organized screening) program has been introduced in Serbia. This survey was conducted to assess the relationship between the introduction of organized screening and the behavioral difference in women undergoing mammography examinations.

Methods: Females aged 50-69 years living in regions with and without the program (opportunistic screening) were interviewed. Participants were categorized into one of the four stages of concern and behavior toward breast cancer examination: Stage 1 (unconcerned), Stage 2 (concerned), Stage 3 (occasional practice), and Stage 4 (regular practice).

Comparisons between the organized screening group and opportunistic screening group were conducted using the chi-square test. The logistic regression model was used to adjust influence by socioeconomic factors.

Results: Among 1,204 participants, 622 (51.6%) were from the organized screening group and 582 (48.4%) were from the opportunistic screening group. The percentage of Stage 2 or higher was significantly higher in the organized screening group than in the opportunistic screening group (adjusted odds ratio [AOR] 1.36, 95% confidence interval [CI] 1.02-1.82). The percentage of Stage 3 or higher and Stage 4 was also significantly higher in the organized screening group than in the opportunistic screening group (AOR 1.42, 95% CI 1.13-1.80 and AOR 1.34, 95% CI 1.03-1.76, respectively).

Conclusions: This study revealed that the introduction of organized screening was related to the behavioral difference in women in the early diagnosis of breast cancer compared with opportunistic examinations even after adjusting for considerable socioeconomic factors. These findings suggested the must expand coverage of the organized mammography screening program.

KEYWORDS: breast cancer, organized screening, mammography examination, Serbia, behavior

Mechanophysiological Analysis of Active Compression-Decompression Cardiac Massage Technique Using the Physical Heart Simulator

Goto A, Kambayashi R, Chiba K, Nunoi Y, Izumi-Nakaseko H, Kawai S, Takei Y, Matsumoto A, Lurie KG, Sugiyama A

Toho J Med 8 (4): 154—160, 2022

要約 :

Introduction: Active compression-decompression cardiac massage (ACD-CM) technique can achieve higher cardiac output than standard cardiac massage (S-CM). We explored unknown mechanisms of ACD-CM leading to its efficacy other than the enhancement of venous return and cardiac filling.

Methods: We assessed the effects of ACD-CM on pressure waves of the aorta, left ventricle, and left atrium compared with those of S-CM using the physical heart simulator. Cardiac massage was performed at a rate of 105 strokes/min with a depth of 5 cm.

Results: Cardiac output was 1.72 times greater with ACD-CM than with S-CM. The mitral valve closed just before the end of compression, and the aortic valve shut around the end of decompression with both maneuvers, indicating occurrence of mitral and aortic valve regurgitation. The opening duration of the mitral valve during compression and that of the aortic valve during decompression were significantly shorter with ACD-CM than with S-CM.

Conclusions: ACD-CM results in smaller time window of regurgitation for mitral and aortic valves, possibly contributing to the augmentation of cardiac output.

KEYWORDS: active compression-decompression, cardiac massage, heart simulator, mechanophysiology, pressure waveform

Laparoscopic Liver Resection with a SAND Balloon Catheter for a Large Mucinous Cystic Neoplasm of the Liver

Asai K, Watanabe M, Moriyama H, Kujiraoka M, Watanabe R, Shigeta K, Oka Y, Nagata T, Oharaseki T, Saida Y
Toho J Med 8 (4): 161—166, 2022

要約 :

A 48-year-old woman was referred to our department for managing the regrowth of a cystic lesion of the liver. MRI revealed an 11-cm multilocular cystic lesion occupying the left lobe. Given the lack of obvious malignant findings such

as intracystic nodules, we decided to perform laparoscopic liver resection (LLR). During the surgery, retracting the large hepatic cystic lesion proved difficult. We therefore aspirated the cystic contents using a SAND balloon catheter, after which the cyst wall could be managed. Ultimately, LLR could be performed fully after sequentially dissecting the Glissonian vessels toward the cystic wall. Given the presence of ovarian-like stroma below the cystic epithelium, the patient was diagnosed with mucinous cystadenoma of the liver with low-grade dysplasia. For the patient with a large mucinous cystic neoplasm of the liver, a SAND balloon catheter may prevent the leakage of cystic contents and is considered an effective device for facilitating LLR.

KEYWORDS: mucinous cystic neoplasm of the liver, laparoscopic liver resection, SAND balloon catheter

Cardiovascular Effects of Mongolian Medical Plant *Aconitum barbatum* in Rats

Chiba K, Kambayashi R, Goto A, Izumi-Nakaseko H, Takei Y, Matsumoto A, Gotov C, Tanaka K, Sugiyama A
Toho J Med 8 (4): 167—173, 2022

要約 :

Aconitum barbatum Pers. (*A. barbatum*) is a perennial herbaceous plant in Mongolian traditional medicine, which is used for treating palpitation but has occasionally induced bradycardia and/or cardiac arrest. We assessed the cardiovascular effects of the aqueous extract of the flower of *A. barbatum* on rats. The extract of *A. barbatum* was intravenously administered in doses of 0.1, 1, and 10 mg/kg; 10, 100, and 1,000 times greater than its clinically recommended dose, respectively. No animals exerted any lethal ventricular arrhythmias or hemodynamic collapse. *A. barbatum* showed negative chronotropic, inotropic, and dromotropic effects, along with hypotensive action *in vivo* (n = 4). *A. barbatum* hardly altered the isoproterenol-stimulated adenylyl cyclase activity of membrane preparations (n = 4) made from the left ventricle of two rats. Thus, *A. barbatum* has a wide range of safety margin, and its cardiovascular effects could be explained by a β -adrenoceptor independent mechanism, including Ca^{2+} channel blockade.

KEYWORDS: *Aconitum barbatum* , cardiovascular effects, adenylyl cyclase, safety margin
