

FC GAMMA RECEPTOR III GENE POLYMORPHISM IN ASSOCIATION WITH CHRONIC PERIODONTITIS IN MALAY SUBJECTS

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Introduction: Periodontal diseases possess a multifactorial nature. Where microbial and other environmental factors are held responsible for initiation and regulation of periodontal disease, strong supporting data now exists that genetic polymorphisms play an integral role in the predisposition and progression of periodontal diseases. Functional polymorphism of Fc gamma receptor III (FcγRIII) gene has shown a varying degree of association with periodontal disease across different populations across the world.

Objective: This study aims to identify a possible association between polymorphism of FcγRIII gene (genotype FcγRIIIa and FcγRIIIb) and chronic periodontitis.

Methods: This is a case control study involving 206 Malay subjects attending dental clinics Hospital Universiti Sains Malaysia. There were 103 subjects with chronic periodontitis and 103 healthy controls. Periodontal parameters that were recorded which included periodontal index, gingival index, clinical attachment loss, and alveolar bone loss. Buccal swab was taken to for DNA extraction. Allele specific PCR was performed for FcγRIIIa alleles (V & F) and FcγRIIIb alleles (NA1 & NA2). Data was analysed using SPSS version 18. Pearson chi-squared and Fisher's exact test were used to analyse the association of bi-allelic polymorphs of FcγRIIIa and FcγRIIIb genes and their genotypes with chronic periodontitis. The association of disease severity with respective genotypes was also analysed.

Results: The results showed that there was no significant different in the allelic frequency of FcγRIIIa gene ($P = 0.882$) and FcγRIIIb gene ($P = 0.261$) between chronic periodontitis and control groups. Heterozygous genotypes were prevalence in both FcγRIII gene however a significant association was found only for genotype FcγRIIIb NA1/NA2 with chronic periodontitis ($P = 0.004$). Nevertheless statistical analysis revealed no significant relationship could be found between FcγRIII genotypes and disease severity.

Conclusion: In conclusion the present study demonstrated that FcγRIII heterozygous genotypes are prevalent among Malay subjects however only FcγRIIIb NA1/NA2 possesses significant association with chronic

periodontitis. A consequence of such findings is that if the genetic basis of periodontal disease susceptibility can be understood, such information may have immense diagnostic and therapeutic value towards immune-inflammatory diseases like periodontitis.

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QUALITY OF LIFE AND ILLNESS EXPERIENCE AMONG NEWLY DIAGNOSED BREAST CANCER MALAY AND CHINESE WOMEN IN KELANTAN

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Introduction: Breast cancer (BC) is the most common cancer among women in Malaysia.

Objective: The aim of this thesis is to explore QOL, factors associated with the QOL changes and illness experience among Malay and Chinese women newly diagnosed with BC in Kelantan.

Methods: Utilising mixed method research, the data was collected at two phases, Phase 1 (November 2010 - April 2011) and Phase 2 (May 2011 - October 2011). During Phase I, 73 newly diagnosed BC women; Malay ($n = 58$) and Chinese ($n = 15$) were recruited from two main public hospitals in Kelantan. In Phase II, 62 women were followed-up and 11 women were lost to follow-up due to death. QOL was measured using the Malay version of the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30) and its breast-specific module (QLQ-BR23). Socio-demographic and medical data were also collected. Using purposive sampling, 39 semi-structured interviews involving Malay ($n = 10$) and Chinese ($n = 10$) were conducted to explore QOL narration and illness experience.

The findings showed no association between ethnicity and QOL domains score. In Phase I, both Malay and Chinese women have satisfactory global QOL and all aspects of functioning with scores ranging from 60.34 to 91.11. During Phase 2; physical, cognitive and social functioning were decreased in both Malay and Chinese women. However, Malay women experienced more symptoms of nausea and vomiting ($P = 0.002$), dyspnoea ($P = 0.004$), constipation ($P < 0.001$)

and breast-specific symptoms ($P = 0.041$), thus lower QOL compared to Chinese. This study found lower household income ($P = 0.053$), present of co-morbidity ($P = 0.031$) were the predictors of negative changes in QOL and late stages of BC ($P = 0.013$) was predictor of positive changes in QOL.

Results: The qualitative finding supports the quantitative result that there was no difference with regards to the narration of QOL among Malay and Chinese women newly diagnosed with BC. Their narrations were multidimensional, encompassing aspects of physical, psychological, social and spiritual. Three main themes emerged on illness experiences which were uncertainty of the illness, transition process and fatalistic view of BC.

Conclusion: This study finding provides preliminary information to healthcare professionals on QOL, associated factors influencing change in QOL and in-depth understanding of illness experience. Thus, healthcare professionals could plan for appropriate symptoms management, education and supportive programme in order to meet the needs of BC women thus improving their QOL.

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INTRACRANIAL VOLUME MEASUREMENT FOR PRE- AND POST-OPERATIVE DECOMPRESSIVE CRANIECTOMY BASED ON COMPUTED TOMOGRAPHY BRAIN IMAGES USING OPEN SOURCE FRAMEWORK

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Introduction: Intracranial volume (ICV) is defined as the volume within the cranium, including the brain, meninges, and cerebrospinal fluid. Several methods of ICV measurement had been established and the manual method is considered the gold standard. However, obtaining the ICV via the manual method by assessing every slice of the computed tomography (CT) images is laborious and time consuming. Therefore, alternative methods which reduced the time in measuring the ICV without sacrificing their accuracy and reliability should be established.

Objective: The aim of this study was to evaluate techniques of ICV estimation for pre- and post-operative ICV of patients underwent decompressive craniectomy (DC).

Methods: A cross sectional study design was employed in 55 patients with CT head scans (41 males, 14 females) who were between 15 to 86 years old. All patients were scanned twice, using the Siemens Somatom Definition AS+ 128-slice (Siemens, Erlangen, Germany) at the Radiology Department,

Hospital Universiti Sains Malaysia. Ethical approval of the study was obtained from the Human Research and Ethics Committee of the Universiti Sains Malaysia. CT images with a slice thickness of 1 mm and a matrix of 512x512 pixels were retrieved and analysed using open-source MITK 3M3 framework/software application. The ICV was first measured by the manual method and then compared with estimated ICV calculated using Cavalieri and shape-based interpolation methods with 1-in-5 and 1-in-10 sampling strategies. The estimation on ICV using the Cavalieri method with 1-in-10 sampling strategy was repeated three times for reliability analysis using intraclass correlations coefficient (ICC). Bland-Altman plot was used to measure agreement between the manual and the Cavalieri method with 1-in-10 sampling strategy. The mean ICV (\pm SD) were 1341.1 mL \pm 122.1 and 1396.4 mL \pm 132.4 for pre- and post-operative CT data of DC patients, respectively. A one-way ANOVA analysis was conducted to compare ICV measurements using the different methods.

Results: No significant difference was found in ICV measurement using the manual, Cavalieri 1-in-5, Cavalieri 1-in-10, shape-based interpolation 1-in-5, or shape-based interpolation 1-in-10 methods for both pre- and post-operative ICV measurements; $P = 0.989$ and $P = 0.991$, respectively. The intrarater ICC showed a significant correlation; ICC = 1.00. Bland-Altman plot showed good agreement between the manual and Cavalieri methods.

Conclusion: In conclusion, the Cavalieri and shape-based interpolation methods gave comparable results in estimating ICV compared to the manual segmentation. Thus, these methods could be used in clinical settings for a rapid and reliable ICV estimation.

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SYNTHESIS AND PROPERTIES OF NANOSILICA PARTICLES FROM RICE HUSK FOR DEVELOPMENT OF NEW DENTAL COMPOSITES

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Introduction: This study was designed to examine the potential of silica synthesised from rice husk as filler for dental composites.

Methods: Three steps involved in the production of the dental composites. First, the silica is synthesised through the addition of phosphoric acid into sodium silicate derived from rice husk. The effect of addition of ethanol, pH and addition of water was optimised. At optimum conditions,

amorphous spherical silica particles with a surface area of $\pm 364 \text{ m}^2/\text{g}$ and particle sizes ranging from 75 to 252 nm were selected to be used as filler for dental composites. The second step involved modification of silica nanoparticles, that was silanised with the silane γ -methacryloxypropyltrimethoxysilane (γ -MPS). The silanised silica nanoparticle was identified by FT-IR spectroscopy, ^{29}Si CP/MAS solid NMR spectroscopy and thermogravimetric analysis (TGA). It was found that the compatibility between silica and matrix was accordingly improved due to the hydrophobic surface. The third step involve the preparation of silanised silica nanoparticles which the percentage of weight content determined at 68 and 63 wt% and then mixed with a photoactivated BisGMA/TEGDMA (54/46 wt/wt) resin to form experimental dental composites, EX1 and EX2. The properties such as flexural strength, modulus, compressive strength, micro hardness, water sorption and solubility were tested and compared with three commercial products, Spectrum® TPH®3 (Density), Filtek™ Z250(3M ESPE) and Filtek™ Z350(3M ESPE). The data were statistically analysed with Kruskal – Wallis test with the level of significance $P = 0.05$ while their mechanical properties were referred to the ISO and ANSI/ADA No. 27 requirements.

Results: According to post hoc analysis, no statistical differences were found for flexural strength, flexural modulus, compressive strength, micro hardness, water sorption and solubility among experimental composite (EX1 and EX2). However, both experimental composites showed a significant difference with commercial composites for all the above properties except that EX2 shows no significant difference in compressive strength. Meanwhile, both experimental composites show no statistical difference for micro hardness and solubility properties. Comparing both of experimental composites, EX2 seemed to have better properties compared with EX1.

Conclusion: It is concluded that the physical and mechanical properties of experimental composites are highly influenced by the filler content, filler size, porosity and the distribution of filler particles. Overall, the experimental dental composites have a great potential to be improved in mechanical properties and produced in large scale for commercialisation, therefore provide the researchers a good motivation to conduct further research for the fabrication of dental composites using silica from rice husk.

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IN-VITRO BIOCOMPATIBILITY AND OSTEOGENIC POTENTIAL OF SYNTHETIC CALCIUM PHOSPHATE APATITE

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Introduction: Synthetic calcium phosphate apatite (CaP) has unique properties such as biocompatible, bioresorbable and the ability to promote bone formation. Among the bioceramics, CaP has excellent osteoconductivity, bioactivity and has ability to form a strong bone-cell interface by excellent cell bonding onto the material. It has been used widely in non- or low-load bearing applications due to its low mechanical properties.

Objective: The purpose of this study was to evaluate the biocompatibility and osteogenesis between two different CaP, the triphasic calcium phosphate apatite (TCaP) which is locally synthesised using commercial chemical and calcium phosphate bone replacement product, MIMIX™ (CMM) which is commercially available.

Methods: Two types of cells were used as an in vitro model. A model for biocompatibility evaluation is L929 mouse fibroblast cells, while human osteoblast cells for osteogenic potential studies. According to the ISO 10993-5:2009(E) Biological evaluation of medical devices – Part 5: Tests for in vitro cytotoxicity, one of the recommended cell lines is CCL-1 (NCTC clone 929 - American Type Culture Collection (ATCC)). The human osteoblast cell line is the one of the appropriate cell to evaluate the functioning properties on osteogenic potential of the material as the material will be a bone graft and implanted into the bone.

Three different methods were applied for biocompatibility evaluation. Cytotoxicity study was performed using MTT assay. Both TCaP and CMM extract were non toxic on L929 cells.

Results: The levels in MTT assay of both materials were more than 70% cell viability at the highest concentration (200 mg/ml). Cell proliferation conducted using Trypan Blue Exclusion Assay (TBEA) showed CMM extract proceeded more significantly with unexposed cell, than on TCaP extract. Meanwhile cellular morphology observation on L929 cells for both materials were viable, excellently differentiated, proliferated and grew well at day 7 of incubation. Cell density of TCaP material was observed to be higher compared to CMM on day 5 and day 7 with a direct contact method using VPSEM. These results showed TCaP and CMM were non toxic and biocompatible on L929 cells. Osteogenic potential evaluation was performed using Immunoblot analysis with ALP, BSP and Col I as osteoblastic differentiation markers. The analysis of bone formation at protein level showed there were expressions of ALP and BSP on day 3 and day 7 of incubation with TCaP, CMM and biological apatite-dried

human bone (DHB) extract on osteoblast cell. There was no expression from Col I as it was undetectable in all materials and unexposed cell.

Conclusion: In conclusion, TCaP and CMM are biocompatible and have the ability to promote osteoblastic differentiation of human osteoblast. These results suggested TCaP may be used as bone filler and bone replacement for bone regeneration or drug delivery agent.

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