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1. 

Global Longitudinal Strain Predicts Adverse Left Ventricular Remodeling After ST-segment Elevation Myocardial Infarction

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Background: Global Longitudinal Strain (GLS), assessed using 2-dimensional speckle-tracking echocardiography, is a sensitive marker of left ventricular (LV) systolic dysfunction. In ST-segment elevation myocardial infarction (STEMI), GLS has been shown to predict adverse LV remodeling. However, its added predictive value over other echocardiographic variables remains uncertain.

Objective: To determine whether GLS provides additional prognostic value over other echocardiographic variables in patients with STEMI, using adverse LV remodeling as a surrogate endpoint for post-MI mortality.

Methods: This was a single center, prospective observational study. Patients aged >21 years who were admitted for STEMI were screened. Recruited patients underwent echocardiography within 48-72 hours of STEMI and at 6 months follow-up. Echocardiography analysis was done offline using TOMTEC system. GLS were measured using TOMTEC AutoSTRAIN©analysis. Adverse LV remodeling was defined as an increase in LV end-diastolic volume (EDV) ≥15% over 6 months.

Results: 94 patients (mean age 53 ±11 years, 93.6% male, BMI 25.8 ±4.0 kg/m2, 45.7% anterior STEMI, 37.6% hypertension, 20.4% diabetes, 23.7% dyslipidaemia, 64.5% current smoker) were recruited. 75.3% of patients received thrombolysis, 8.6% underwent primary percutaneous coronary intervention (PCI), and 16.1% had late PCI due to either late presentation or spontaneous ST-segment resolution. Adverse LV remodeling occurred in 32 patients (34.0%).

The baseline LV ejection fraction and GLS for patients without versus those with adverse LV remodeling were 51.4 ±9.2% vs. 47.5 ±10.2% (p=0.064), and -13.2 ±4.6 vs. -10.9 ±4.1 (p=0.023) respectively. Univariate analysis showed that septal and lateral e’ velocity, septal a’ velocity and GLS were associated with adverse LV remodeling. In multivariate analysis, only GLS was independently predictive of adverse LV remodeling (HR 1.20, 95% CI 1.06 – 1.35, p=0.004). Using a cut-off of −12.6, GLS had sensitivity of 71.9%, specificity of 54.8%, negative predictive value of 79.1%, positive predictive value of 45.1% and accuracy of 60.6% in predicting adverse LV remodeling.

Conclusions: In our study, GLS was the sole echocardiographic parameter that predicted adverse LV remodeling in patients with STEMI.

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anticoagulant therapy had been prescribed in 4 out of 38 patients in the intervention group and 2 out of 40 patients in the control group (10.5% vs 5.0%, p=0.425).

**Conclusions:** Our preliminary results showed that among patients ≥55 years of age with a recent cryptogenic stroke or TIA, 30-day smartphone electrocardiogram recording significantly improved the detection of AF as compared with the standard repeat 24-hour Holter monitoring. However, there was no change in clinical practice in response to detection of AF.

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3. **Prevalence of Atrial Fibrillation Detected by Single-Lead ECG among Senior Citizens at Northern Regions of West Malaysia in 2018**

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**Background:** Atrial fibrillation (AF) is the most common sustained cardiac arrhythmia encountered in clinical practice. Current guidelines recommend opportunistic AF screening with pulse taking or ECG rhythm strips in patients ≥65 years of age. Systematic screening for AF at the community level with smartphone-based single-lead ECG (SL-ECG) has been studied and shown to pick up undiagnosed AF. The experience and data on the use of SL-ECG in community AF screening in the Asia Pacific region is scarce and may potentially identify undiagnosed AF for early treatment and stroke prevention.

**Objective:** This is a prospective cross-sectional community-based study to assess the feasibility of community screening for AF using SL-ECG among senior citizens at Northern regions of West Malaysia. We aim to study the prevalence of AF detected by SL-ECG, total burden of AF among senior citizens at northern regions of West Malaysia and the predictors of AF.

**Methods:** The study was conducted from 1st January 2018 to 31st December 2018. All consented senior citizens age 65 years old and above at northern regions of West Malaysia who had attended the selected clinics or community program were assessed by an interview questionnaire, followed by anthropometric measurements and then SL-ECG was performed. The ECGs are classified into three groups, namely sinus rhythm, AF and uninterpretable. Participants with uninterpretable SL-ECG will be referred for conventional 12-lead ECGs.

**Results:** There were 2149 senior citizens consented to the study. Out of 2149 participants, 173(8%) were diagnosed with AF. 147 (6.8%) of them were detected via SL-ECG while 22 (1%) were self-reported and 4(0.2%) were detected via conventional 12-lead ECG. Out of 49(2.3%) newly diagnosed AF, 45(2.1%) were detected by SL-ECG while 4(0.2%) were detected via conventional 12-lead ECG. Using multiple logistic regression, the predictors of AF include state (p=0.001), gender (p=0.028), diabetes mellitus (p=0.017), heart failure (p=0.001), valvular heart disease (p=0.001), stroke (p=0.001) and thyroid disease (p=0.001).

**Conclusions:** The prevalence of AF among senior citizens at Northern regions of West Malaysia was higher compared to the Western population. The opportunistic screening for AF detection by using SL-ECG in elderly were effective and feasible to be carried out.

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4. **Utility of 2-Dimensional Speckle-Tracking Echocardiography to Predict Severity of Coronary Artery Disease in Patients With Non ST-Elevation Acute Coronary Syndrome and Apparent Normal Global and Segmental Systolic Function**

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**Background:** In Non-ST-elevation acute coronary syndrome (NSTE-ACS), 2-dimensional (2D) speckle-tracking echocardiography (STE) may help to predict significant coronary stenosis or occlusion. The diagnostic value of STE (analysed using PhilipQlab) in Asians with NSTE-ACS and normal global and regional systolic function has not been reported.

**Objectives**

1. To determine the correlation of Global Longitudinal Strain (GLS) with CAD severity in NSTE-ACS patients with normal LVEF.

2. To determine if GLS can prognosticate severity of CAD in comparison with TIMI and GRACE score.

3. To evaluate if Territory Longitudinal Strain (TLS) can be used as a predictor for myocardial territory involved.

**Materials and Methods:** 200 AMI subjects admitted to Sarawak Heart Centre from May to September 2017 were screened. 45 patients with NSTE-ACS and normal left ventricular systolic function based on LVEF (≥55%) and WMSI (=1.0) were enrolled. Coronary angiography was performed during index admission. STE was done using PhilipQlabs version 10.0 for GLS and TLS. Syntax score was calculated with online calculator.

**Results:** Majority were males (87%) with mean age of 57±8 years. 28.3% had diabetes. Majority had hypertension (58.7%), dyslipidaemia (52.2%) and smoking (52.2%) as risk factors. 34.8% had single vessel disease (SVD) and 65.2% multi-vessels disease (MVD). Those with SVD and MVD had mean GLS of -20.9%±3.54% and -17.9%±4.47% respectively (p value =0.021). Syntax scores of 22 (63%) and 23 (37%) correlated with mean GLS of -20.7±3.37% and -15.9±4.36% respectively (Spearman’s r =0.435). ROC curves for GLS vs TIMI vs GRACE score for predicting Syntax score were 0.811, 0.624 and 0.687 respectively. GLS of -18.4% had 73.3% sensitivity and 72.4% specificity in predicting Syntax score. TLS for Left Anterior Descending (LAD) territory had AUC 0.715. LAD TLS of -20.7% has 72.2% sensitivity and 70% specificity in predicting LAD myocardial territory involvement.

**Conclusions:** In patient with NSTE-ACS and normal LVEF, GLS predicted severity of CAD and correlated moderately with Syntax score. GLS cut off of -18.4% is sensitive in predicting Syntax score. TLS was useful to predict involvement of the LAD territory only.

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5. **Stingless Bee Propolis Alleviates Diabetic Cardiomyopathy: Antioxidative Modulation Through esRAGE-AGE Interaction**

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Background: Diabetes mellitus, a state of chronic hyperglycemia, triggers excessive production of advanced glycation end-products (AGE), leading to oxidative stress and eventually diabetic cardiomyopathy. Stingless bee propolis confers antioxidative and anti-ischemic effect. However, the effect of stingless bee propolis on diabetic cardiomyopathy is yet reported.

Objective: This study aims to determine the histopathological characteristics of diabetic heart in rats after propolis supplementation and its associated biochemical changes.

Materials & Methods: Male Sprague Dawley rats (n=8/group) were randomised into four groups: non-diabetic control (CTR), diabetic (DM), DM treated with metformin (DM+Met, 300mg/kg/day) and DM treated with propolis (DM+P, 300mg/kg/day). Single dose of streptozotocin (60mg/kg) was given intraperitoneally to induce diabetes. After four weeks of treatment, the rats were sacrificed, and the heart was harvested. The heart was processed, stained using Haematoxylin & Eosin and Masson's Trichrome, visualised and quantified for cardiomyocyte size and collagen volume fraction. The remaining heart was homogenised for quantification of AGE, esRAGE and composite oxidative stress ratio SOD/(GPx+CAT) using commercially available kit. All data was analyzed using one-way ANOVA with post-hoc Bonferroni correction and reported as mean (standard deviation).

Results: The cardiomyocyte size, μm² for CTR, DM, DM+Met and DM+P are 582(119), 856(193), 744(208), 598(216) respectively; correspondingly, the collagen volume fraction, % are 3.4(1.9), 12.8(2.0), 5.4(1.9) and 4.2(1.0) respectively; whereas AGE level, μ g/mg were 1.31(0.19), 1.44(0.26), 1.44(0.42) and 1.39(0.16) respectively. The heart of diabetic rats showed hypertrophic changes with an increase in fibrous tissue, most likely scarring from AGE accumulation. These changes were alleviated in DM+P group. DM group has higher oxidative stress composite ratio SOD/(GPx+CAT) compared to CTR 2.36(1.01) vs 1.87(0.42) which were nearly normalised in DM+P group 1.87(0.40). esRAGE assay showed DM had lower esRAGE level, ng/mg compared to CTR 0.20(0.18) vs 0.75(0.32); metformin or propolis supplementation increased esRAGE 0.53(0.26) vs 0.66(0.33). esRAGE sequesters excess AGE, preventing activation of oxidative stress. Propolis supplementation alleviated cardiac hypertrophy and fibrosis associated with preserved esRAGE, reduction in AGE and oxidative stress in the heart.

Conclusions: Stingless bee propolis exerts cardioprotective effect on diabetic cardiomyopathy by restoring esRAGE, thus reducing AGE and its downstream signalling involving oxidative stress.

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6. Left Ventricle Function Recovery After Revascularisation in Patients With Acute Myocardial Infarction (Single Vessel Disease): Comparison of 2D Strain Imaging With Standard Echocardiography

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Background: Evaluation of cardiac function is done pre and post percutaneous coronary intervention (PCI) to assess improvement after intervention. Assessment of cardiac function by measuring left ventricle ejection fraction (LVEF) is affected by intra- and inter-observer variability. Two-dimensional (2D) speckle tracking echocardiography (STE) enables assessment of global and regional LV strain more objectively. However, data on the use of STE to evaluate LV function post PCI is limited.

Objectives

1) To compare LV function assessment by echocardiography with global longitudinal strain (GLS) in acute myocardial infarction (AMI) patients with single vessel disease (SVD) 6 months post revascularisation.

2) To assess differences in territory longitudinal strain (TLS) 6 months post revascularisation.

Materials and Methods: 150 AMI patients admitted to Sarawak Heart Centre from 1st May to 31st August 2017 were screened. 28 patients with AMI and SVD were enrolled. All patients underwent PCI after echocardiography and STE assessment with PhilipQlab (version 10.0).

Simpson’s method was used for LVEF. Echocardiography and 2D STE were repeated 6 months post-PCI.

Results: Majority of the 28 subjects were males (82.1%) with mean age of 56±10 years. 32.1% of them had diabetes, 46.4% had hypertension, 32.1% had dyslipidaemia, and 67.9% were current smokers. 53.6% had STEMI. 52.6% of the PCI were done within 24 hours and 26.3% within 48 hours. All had SVD with 64.3%, 17.9% and 17.9% having LAD, LCX and RCA involvement respectively. There was no significant improvement in LVEF and GLS 6 months post revascularisation with change of mean LVEF from 50.8% (baseline) to 48.3% (6 months) (p=0.651) and GLS from 15.5% (baseline) to 16.8% (6 months) (p=0.22). However, LAD TLS showed an improvement from -15.2% to -17.8% (p=0.031). Changes in TLS were not significant for the RCA and LCX territories with p values of 0.178 and 0.32 respectively.

Conclusions: In AMI patients with single vessel disease, there might be improvement in LV function in the LAD territory based on TLS measurement, despite no apparent change in LVEF and GLS at 6 months.


7. Northern Sarawak Heart Failure Medication Titration and Education Programme with Outreach Clinics (NEW HEART) – Pilot Study

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Background: Heart failure remains one of the leading cause of hospital admissions. This can be attributed to lack of insight into the disease and poor optimization of medication therapy. Therefore there is a need for a dedicated team to resolve these issues.

Objective: Implement and evaluate effectiveness of a dedicated heart failure clinic in district setting with limited resources.

Materials & Methods: Dedicated heart failure clinic was established in Miri Hospital on October 2018 and data was collected from pre-designed manual heart failure forms. Patients were enrolled from wards and clinics by active referrals.

Results: In total, 35 patients were recruited during this pilot study. 29 were males and 6 were females. Age ranged from 27 to 82 years old with mean age of 45 years old. Predominantly were Iban followed by Chinese then Malay. Only 6 had Diabetes whereas 15 had Hypertension. 7 of them were non ischemic causes of heart failure while the rest ischaemic causes. 31 patients had HFrEF
ranging from EF of 14.5% to 43.5% where as 4 patients had HfPEF. 7
had atrial fibrillation whereas the rest were in sinus rhythm.

All patients were on at least beta blockers with 10 patients on
either ACEi or ARB during enrolment into the programme. It took
from 6 to 14 weeks to fully optimize patients on heart failure
medications as per guidelines. All patients were on at least 3 of
the heart failure medications at end of optimization. There were no
defaulters. Prior to enrolment, 9 patients had 1 previous hospital
admission for decompensation, 2 patients with 2 previous admissions,
1 with 3 previous admissions and 1 with 5 previous admissions.
Since enrolment, only 1 patient had repeated admissions for
recurrent decompensated congestive heart failure.

5 other patients had readmissions for acute exacerbation of
chronic obstructive airway disease. Only 2 patients from clinic were
directly admitted to ward for hyperkalemia and 1 patient for
symptomatic hypotension.

**Conclusion:** This ongoing pilot study shows the effectiveness of
a dedicated heart failure clinic in district setting in reducing re-
admissions as well as improving quality of life of patients.

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8.
**Safety and Efficacy of Sacubitril-Valsartan Initiation During and
After Acute Decompensated Heart Failure with Reduced Ejection
Fraction**

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**Background:** The PIONEER-HF trial has demonstrated the safety
of Sacubitril-Valsartan initiation during acute decompensated heart
failure (ADHF) compared to Enalapril. The efficacy outcome was also
addressed by the surrogate end point of reduction in NT-proBNP.
However, the safety and efficacy of Sacubitril-Valsartan initiation
during ADHF compared to initiation after ADHF was unknown.

**Objectives**

1) To compare the safety and efficacy of Sacubitril-valsartan
initiation during ADHF (inpatient) to initiation after ADHF
(outpatient).

2) To explore the echocardiogram parameters associated with
Sacubitril-Valsartan initiation during ADHF (inpatient) versus
after ADHF (outpatient).

**Methods:** We enrolled patients diagnosed with heart failure
with reduced ejection fraction (HFrEF) initiated on Sacubitril-
Valsartan from February 2017 to December 2018. The baseline
characteristics, echocardiogram parameters (changes in LVEF and
positive remodeling), composite safety outcomes (hypotension,
interruption of Sacubitril-valsartan and worsening of renal function),
and efficacy outcomes (cardiac death, readmission for heart failure) were
compared.

**Results:** Thirty-seven patients were identified out of which
21 patients started Entresto after ADHF (outpatient group) and
16 patients during ADHF (inpatient group). The median follow-up
duration was 196 days (IQR: 105 to 328 days). The baseline characteristics
were similar between the 2 groups. Outpatient groups achieved a
significantly higher maximally tolerable dose of Sacubitril-Valsartan
compared to inpatient group (median 400mg/day versus 200mg/day,
p=0.008) despite a similar starting dose (median 100mg/day versus
100mg/day, p=0.127). The composite efficacy outcomes were similar
between the 2 groups (4.8% versus 18.8%, p=0.296). The composite
safety outcome was similar between the groups (18.8% versus 4.8%,
HR5.70 p=0.054, 95%CI 0.967 to 33.60).

Both groups achieved a significant improvement in LVEF after
initiation of Sacubitril-valsartan therapy: mean LVEF 23.44±7.88%
to 34.30±13.88% (p=0.001) in outpatient group; mean LVEF 22.99±
11.31% to 38.81±13.91% (p=0.002) in inpatient group.

Reverse remodeling (reduction of LVEVS±15%) was similar between the 2 groups (61.9% versus 50.0%, p=0.506).

**Conclusions:** Among patients with HFrEF in ADHF, initiation of
Sacubitril-valsartan therapy during or after ADHF led to similar
safety and efficacy. Overall, there was a significant improvement in
LVEF and positive remodeling of the LV regardless of the timing of
initiation of therapy.


9.
**Heart Rate Optimization for Heart Failure Patients in Hospital
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**Background:** Heart rate (HR) optimization is important in
improving prognosis of heart failure (HF) patients. Heart rate of
less than 70 bpm has been recommended for further reduction in
mortality and readmission rate.

**Objective:** To identify the HR control of HF patients with beta-
blocker/ivabradine on admission, upon discharged, and during follow
up in medical clinic.

**Materials & Methods:** Consecutive patients admitted for heart
failure and followed up in medical clinic were identified. Patient’s HR
for each admission/follow up was collected in this study.

**Results:** A total of 160 patients admitted for HF between 1st July
2017 to 31st December 2018 were identified with 405 admission
analyzed. Majority were male patients (61.9%). The mean age was
57.4±12.6 years old (Range: 18 to 86 years old). From the total
admission, only 28.2% had achieved HR of < 70 bpm upon discharge.
The mean HR was 79.5±14.9 bpm, while the median HR was
80 bpm. A total of 65.5% of patients were discharged with beta-
blocker, with majority of them on bisoprolol 2.5mg (38.5%),
followed by 1.25mg (30.8%), while only 2.6% of patient is on
maximum dose of 10mg. Only 4.5% of patients were on ivabradine
on admission. From these 160 patients who were admitted to
hospital, 76 (47.5%) of them returned to be seen in the outpatient
clinic. At the final clinic visit, only 30.3% had HR of < 70 bpm.
The mean HR was 72.3±12.1 bpm with median heart rate of 72 bpm.
The dosage of bisoprolol was increased in most of the patients.
About half of the patients were on bisoprolol 2.5 mg followed by
13.2% on bisoprolol 5 mg. A total of 45 patients who came for follow
up were initiated on bisoprolol. Only one patient was not on beta
blocker during follow up. Dosage of ivabradine was increased to
maximal in 2 patients and another two patients were started on
ivabradine on follow up.

**Conclusion:** Achievement of heart rate < 70 bpm was still
inadequate despite the beta blocker usage has increased during
follow up. Further up-titration of beta blocker or earlier initiation of ivabradine on discharge should be considered.

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10. A Review of Discharge Medications in Patients Admitted with Acute Decompensated Heart Failure in a Tertiary Referral Centre

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Background: National guidelines for heart failure recommend prescription of certain classes of drugs to improve prognosis in patients admitted with acute decompensated heart failure (ADHF). It has been noted during clinical follow up such patients are discharged with different treatment regimes.

Objective: To determine the relationship between drug treatment regimes in patients admitted to a tertiary referral centre with ADHF and their medium term clinical outcomes post-discharge, defined as 90-day mortality and hospital readmissions.

Methods: 94 cases with a discharge diagnosis of ADHF were recruited from October 2017 until August 2018. Cases were analyzed retrospectively for their medications at discharge. Patients were followed-up for 90 days via phone.

Results: Out of 94 patients, 8 patients died during admission. 86 patients were being analysed for clinical outcomes. 22 (26%) patients were discharged without a single type of guideline recommended medication for heart failure (GRM). 33 (38%) patients were discharged on one type, 22 (26%) patients discharged with two types and 10 (12%) patients were discharged with three or more types of GRM. The main reasons for not being discharged with all GRM were chronic kidney disease, obstructive lung disease, bradycardia and hypotension. The 90 days mortality rate was higher in patients discharged with ≤1 class of GRM drugs compared to patients with discharged on ≥2 classes of GRM drugs. (14.5% vs 6.5%; OR 2.25; 95%CI 0.51, 9.96; p=0.28). The 90 days readmission rate for ADHF was also higher for patients discharged with ≤1 class of GRM drugs (20.0% vs 12.9%; OR 1.55; 95%CI 10.539, 4.457; p=0.416). Overall, patients with discharged with ≤1 class of GRM drugs had also a higher 90-day event rate (27.3% vs 19.4%; OR 1.78; 95%CI 0.797, 3.993; p=0.16).

Conclusions: Discharging ADHF patients with ≤2 class of GRM drugs was associated with lower 90 days readmission rates and mortality.

Even at a tertiary referral centre, every effort should be made to ensure patients admitted with ADHF are discharged on GRM.

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11. Prognostic Value of N-Terminal Prohormone of Brain Natriuretic Peptide (NT-ProBNP) and Killip Score in Patients with Acute Decompensated Heart Failure (ADHF): A Sarawak Tertiary Centre Experience

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Background: Mortality and readmission due to heart failure is contributing to increase healthcare burden. NT-proBNP is known for its role in diagnosis of heart failure. Higher Killip score was found to be associated with more inpatient death among ADHF patients in Sarawak General Hospital. There are limited data on usage of NT-proBNP and Killip score to prognosticate post discharge clinical outcome.

Objective: We aim to explore association of admission NT-ProBNP and Killip score with 90-day mortality and readmission outcome.

Materials & Methods: 68 patients with a primary diagnosis of ADHF were recruited between December 2017 to October 2018 in Sarawak General Hospital. NT-proBNP samples were collected within 24hours from diagnosis. Patients were prospectively follow up for 90 days from discharge. ROC curve analysis was applied to determine the cut-off value of NT-proBNP with optimal sensitivity and specificity. Factors (Age, gender, hypertension, diabetes, dyslipidemia, admission BP, heart rate and EF) were investigated for their role in affecting the discriminative value of NT-proBNP. Chi-square analysis was used to compare differences in outcomes between patients with NT-proBNP readings >5055pg/ml and those with higher Killip score.

Results: Patients recruited had a median age of 63+/-.17years old and 57% are male. 36(54%) patients had admission Killip score of >2. 16 (28%) patients recorded cumulative event of death and readmission in 90 days post discharge. The median value of NT-proBNP recorded in the cohort was 4115 pg/ml. ROC analysis identified NT-proBNP as a useful tool in determining 90-day clinical outcome (AUC=0.694, p=0.024). At the level of 5055 pg/ml, NT-proBNP had a sensitivity and specificity of 66% and 69%. Performance of NT-proBNP significantly improved in subpopulation of patients who are less than 65 years old, male gender and those with admission systolic blood pressure >100mmHg respectively (AUC up to 0.871, p= 0.004). A combination of Killip score >2 with NT-proBNP >5055 pg/ml showed almost 5-fold increase in risk of developing 90-day event (OR 4.5714, 95% CI 1.3-15.7, p=0.0158).

Conclusion: Objective assessment using NT-proBNP and clinical parameter of Killip scoring during admission are potentially useful in determining 90-day outcome in patients with ADHF.


12. Dilated and Hypertrophic Cardiomyopathy in A Tertiary Hospital in Malaysia: A Descriptive Study

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Background: The most prevalent non-ischemic cardiomyopathies are hypertrophic (HCM) and idiopathic dilated cardiomyopathy (DCM). There are no published data regarding these conditions for the Malaysian population.

Objective: To describe the presenting features, clinical characteristics, management and outcome of individuals diagnosed with HCM and DCM.

Materials & Methods: Patients diagnosed at a tertiary medical centre with HCM or DCM were recruited into the study. Primary DCM and HCM were determined by strict echocardiographic criteria. For DCM patients, ischaemic pathogenesis had to be excluded by coronary imaging. Patients with disease due to endocrine, immunologic, drug toxicity, persistent tachycardia and other causes were excluded.

Results: 118 patients were diagnosed with either HCM or DCM (M: F = 1:87; mean age 55 years) over a 3-year period.
Abstracts

13. A Decade of Failures. Predictive Factors for All-Cause Mortality at Admission, 1 and 3 Years After Hospitalization for Acute Decompensated Heart Failure (ADHF)

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Background: Heart failure is a complex syndrome. Although advancing therapies has somewhat reduced the mortality rate of patients with heart failure, it remains unacceptably high and a challenge to identify those at greatest risk of death.

Objective: Identify predictors of all-cause mortality after admission for acute decompensated heart failure (ADHF).

Materials & Methods: A retrospective observational study involving 3819 patients' first admission to National Heart Institute from 2009 to 2018 was analyzed using descriptive, ROC curve and Cox regression.

Results: Mortality at admission, 1 and 3 years following ADHF were 4%, 12.9% and 34.9% respectively. Using multivariate analysis, predictors for increased in-hospital mortality were NTProBNP ≥ 5500pg/ml (Odds Ratio, OR1.77, Confidence Interval, CI1.5-2.7, p<0.001), hyponatraemia, Na<135mmol/L (OR2.20, CI1.5-3.2, p<0.001), Urea≥7mmol/L (OR1.43, CI1.1-1.8, p<0.001), heart rate≥100bpm (OR2.34, CI1.8-3.1, p<0.001), NTProBNP≥5500pg/ml (HR2.32, CI1.78-3.03, p<0.001), Uric Acid≥500umol/L (HR1.36, CI1.06-1.76, p<0.001), Urea≥7mmol/L (HR1.44, CI1.16-1.79, p<0.001). Discharge medications associated with lowered mortality were BB (HR0.54, CI0.35-0.83, p<0.005), ACEi/ARB+BB (HR0.41, CI0.26-0.65, p<0.001) and ACEi/ARB+MRA (HR0.47, CI0.32-0.70, p<0.001) and BB+MRA (HR0.64, CI0.42-0.98, p<0.041).

Conclusions: Predictors associated with mortality were varied for different timeline. Mortality risk was consistently higher across the board when patients had lower SBP, elevated NTProBNP and Urea. ADHF patients should be prescribed with at least ≥ 2 disease modifying heart failure medications to improve their future outcomes.

14. The Use of Guideline Based Medication in Heart Failure Patients

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Introduction: Guidelines on heart failure advocate use of Angiotensin-converting enzyme inhibitors/Angiotensin Receptor Blocker, beta blocker and Mineralocorticoid Receptor Antagonist among patients with heart failure. These had been shown to reduce mortality and readmission rate among heart failure patients.

Objectives: To study the use of guideline based medications among patients admitted for heart failure in Tengku Ampuan Rahimah Hospital, Klang.

Methodology: A retrospective observational study involving patients admitted at Tengku Ampuan Rahimah Hospital, Klang for decompensated congestive cardiac failure. We analysed the use of heart failure medications in this cohort.

Results: Out of the 102 patients recruited between July 2017 to November 2017. From our data, a significant number of our patients had inadequate use of guideline-based medication. Angiotensin-converting enzyme inhibitors were used in 34.6% while beta blockers were used in nearly half of the cohort. Spironolactone was the main Mineralocorticoid Receptor Antagonist used in the cohort but used only in 26.7% of patients. Main obstacle of non-usage of this medicine were mainly due to presumed low blood pressure and renal impairment.

Conclusion: Guideline based medicine usage was low in this cohort and this may contribute to high mortality and high readmission rate among heart failure patients.

doi:10.1016/j.ijcard.2019.11.019
Background: Left ventricular non-compactation cardiomyopathy (LVNC) is a rare primary genetic cardiomyopathy. Its aetiology varies with an embryogenic and non-embryogenic hypothesis. Presenting symptoms include heart failure, palpitations, chest discomfort and giddiness. Its diagnosis relies heavily on cardiac imaging such as echocardiography and cardiac magnetic resonance imaging (CMR). However, there are no established gold standards to diagnosis with few case reports regarding LVNC, especially in South-East Asia.

Objective: To understand the clinical characteristic and imaging features of LVNC patients in Malaysia.

Materials & Methods: A retrospective single centre study was carried out between August 1998 and October 2017 at the National Heart Institute of Malaysia. Both echocardiogram and CMR were performed. Only those with a compacted to non-compacted ratio of more than 2.3 detected through CMR were included.

Results: A total of eight patients were included in our study. The mean age is 39.7 years with the range of 23 to 54 years at presentation equally split between male and female. Four patients have no underlying medical histories. The most common presentation was dyspnoea (85%) and chest pain (42%). ECG showed LVH in five patients. Majority of our patients had apical region trabeculations/fibrosis via echocardiogram which may have led to initial and early diagnosis. CMR confirmed diagnosis in all our patients. Mean duration of follow up was 6.3 years. Four of our patients had implanted cardiac devices; two with cardiac resynchronization therapy with defibrillator, one with an implantable cardioverter defibrillator and another with a dual chamber pacemaker. One patient refused a left ventricular assisted device implantation and defaulted subsequent follow up. One patient had passed away during follow up; of whom had the lowest LVEF (20%) as well as the highest ratio of compacted to non-compacted myocardium (1:3.6) in CMR. CMR should be performed for all patients suspected with LVNC on echocardiogram for confirmation of diagnosis. Early diagnosis and symptom directed therapy is crucial in long term management and preventing complications in LVNC.

Conclusion: Our case series on adult population LVNC is the largest in SEA. CMR should be performed for all patients suspected with LVNC on echocardiogram for confirmation of diagnosis. Early diagnosis and symptom directed therapy is crucial in long term management and preventing complications in LVNC.

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17. Assessment of Myocardial Tissue Characterization in Hypertension with Left Ventricular Diastolic Dysfunction

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Introduction: Left ventricular diastolic dysfunction is characterized by alterations in LV diastolic filling and is a strong predictor of cardiovascular events and heart failure. Hypertension is commonly associated with diastolic dysfunction. The progression of hypertensive heart disease involves myocardial fibrosis and alteration in left ventricular geometry that precede the functional changes, initially being asymptomatic. The LVDD is part of this continuum being defined by the presence of left ventricular diastolic dysfunction without signs and symptoms of heart failure. It is associated with cardiovascular morbidity and mortality.

Objectives: To assess the relationship between the presence of myocardial interstitial fibrosis as reflected by the increase in mean Native T1 obtained from cardiovascular magnetic resonance (CMR) value and alterations in LVDD evaluated by Doppler echocardiography in subjects with diagnosis of hypertension.

Methods: This was a retrospective study of 75 patients with hypertension. All patients underwent CMR and thoracoscopic echocardiography examinations. Native T1 mapping was acquired using MOLLI 3(2)/3(2)/5 FA 50 sequence. Mean Native T1 measurement was performed at the midventricular septum of the short axis slice. Doppler echocardiography is used to obtained transmural peak velocity procedures are warranting further needs in improvement of cardiac care. Extracorporeal shockwave myocardial revascularization (ESMR) therapy has been showing beneficial effects on angina symptoms and hospitalization rates in patients with refractory angina.

Objective: To identify the effects of ESMR therapy on patients with refractory angina from myocardial perfusion aspect as evidenced by cardiac imaging.

Materials & Methods: Retrospective analysis was made in patients who underwent for ESMR therapy from 2010 to 2018 in single center, Malaysia. Patients who have done either multiple percutaneous coronary intervention or coronary artery bypass graft operation with unresolved and ongoing angina (Canadian Cardiovascular Society angina class II to IV) are included. Total of nine sessions (3 sessions per week for 3 cycles at intervals) with 500 shocks in each session was delivered. We analyzed the effects of ESMR on myocardial perfusion.

Results: Total 98 patients who received ESMR therapy are analyzed. Mean age of 65.99 +/- 10.12 years with male gender predominance-80% of all patients. Previous percutaneous coronary intervention was done in 92.3% of patients while 32.5% of all patients has undergone coronary artery bypass graft operation. According to perfusion scan, area of reversible perfusion defects are noted as follows: left anterior descending artery in 72.4%, left circumflex artery in 37.8% and right coronary artery in 43.9% of all patients. More than two coronary artery perfusion abnormalities noted in 49% of patients. Ejection fraction at rest recorded as 47.92 +/- 17.8 percent with overall average improvement of ejection fraction post ESMR analyzed as 52.55 +/- 18.14 percent. Improvement in ejection fraction was noted in 57% of patients post ESMR therapy. 69.1% of patients are responding well to therapy which is evidenced by improvement in coronary perfusion on post ESMR perfusion scan.

Conclusion: For patients with refractory angina, ESMR therapy shows improvement in overall left ventricular ejection fraction as well as coronary perfusion according to our single center analysis.

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Results: There were 75 patients in the study, 53% were female. Mean age was 60.2±/−15.4 years. Mean left ventricular ejection fraction was 62.1±/−9.1%. Small majority of the cohort has comorbidities (coronary artery disease 6.4%, diabetes mellitus 26.9% and atrial fibrillation 15.4%). There were an incremental value of mean Native T1 observed in different grades of diastolic dysfunction; normal diastolic function has lowest value and restrictive pattern showed highest value (Figure 1) at both 1.5T and 3.0T scanner. There were significant correlation between Native T1 and grade of diastolic dysfunction (r value = 0.39 (3.0T), r value = 0.53 (1.5T), p value < 0.05).

Conclusion: Increasing degree of myocardial fibrosis as measured by Native T1 is associated with worsening diastolic dysfunction even in asymptomatic hypertensive patients.

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18. Impact of Visual Assessment of Stress Cardiac Magnetic Resonance Imaging in Patients with Known or Suspected Coronary Artery Disease in Real World Practice: A Single Centre Experience


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Background: Visual assessment of stress cardiac magnetic resonance (CMR) imaging is routinely used in daily clinical practice but its accuracy may be influenced by confounding factors (e.g., operator experience, inadequate vasodilator stress). Quantitative assessment method is more time consuming, require third-party software and not routinely used.

Objectives: To explore the impact of visual assessment of ischemic burden from stress CMR imaging to routine clinical practice.

Methods: We conducted a retrospective, single centre, all-comers study of stress CMR performed between February 2013 and December 2016. A total of 109 patients were identified. After excluding 24 patients who were lost to follow up, data from 85 patients were available for analysis. The primary endpoint was a composite of cardiovascular death, non-fatal myocardial infarction and revascularization ≥90days at 2 years.

Results: The mean age was 61.1±9.3 years, mean Left Ventricular Ejection Fraction 58.5±12.7% and male gender 68(80%).

The baseline cardiovascular disease risk factors were dyslipidemia 51(60%), hypertension 41(48.2%) and diabetes mellitus 17(20%). The commonest indication for stress CMR was to ascertain the functional significance of coronary lesions, 27(31.8%). All studies had rest perfusion imaging. 56% were reported by a level 3 operator and mid RV (3.99 ± 0.56 vs 3.2 ± 0.46 cm) RA volume in systole (53.8 ± 14 ml) and RA area in systole (17.6 ± 7 cm2). There were no differences between footballers and amateur sportsmen in their systolic blood pressure (125 ± 10 vs 129 ± 12 mmHg) and diastolic blood pressure (71 ± 9 vs 71 ± 7 mmHg).

Conclusion: Negative stress CMR carries good 2-year prognosis. Visual assessment of stress CMR images may still have a role in a busy clinical practice with adequate operator training and vasodilator stress.

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Background: Regular exercise is associated with cardiac remodelling. We examine if there were any differences in cardiac remodelling of the right ventricle (RV) between professional football players and amateur sportsman (vigorous intensity exercise of METS 6 and above for at least 75 minutes a week).

Objective: To compare adaptive changes in the right ventricle between professional footballers and sportsmen.

Materials And Methods: 20 professional football players, 25 amateur sportsmen with no past medical problems were selected. They were evaluated by two-dimensional echocardiography and tricuspid annular plane systolic excursion (TAPSE), right ventricular ejection fraction (RVEF), right ventricle basal dimension, right ventricle mid dimension and tissue doppler systolic wave of tricuspid valve (TDVs).

Results: There were significant difference between the mean pulse of the footballers compared to the amateur sportsman (49 ± 5 vs 63 ± 11 bpm ), TAPSE (2.43 ± 0.29 vs 2.18 ± 0.27 cm) RV dimension at the basal (4.37 ± 0.39 vs 3.89 ± 0.53 cm) and mid RV (3.99 ± 0.56 vs 3.2 ± 0.46 cm) RA volume in systole (53.8 ± 14 ml) and RA area in systole (17.6 ± 7 vs 15.4 ± 3.1 cm2).

Conclusion: Exercise causes adaptive changes in right ventricles and these adaptive changes are dependent on the intensity and duration of exercise, where there are differences in the RV function and RV dimensions of the two distinct groups. These values could be used in the clinical assessment of Malaysian athletes and also those who enter amateur sports events in Malaysia and would be useful in understanding the physiologic cardiac adaptations in these two cohorts.

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20. A Study of Familial Hypercholesterolaemia in Young Acute Coronary Syndrome


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Introduction: Acute Coronary Syndrome (ACS) is associated with high morbidity and mortality as well as significant burden to health care system. In our region, the burden is higher as patient tend to present at younger age. One of the contributing factors is Familial Hypercholesterolaemia (FH), a genetically inherited condition. Understanding and improving knowledge on FH can potentially lead to better patient’s management.

Objective: To assess the proportion of Familial Hypercholesterolaemia in young ACS and its clinical characteristic.

Methods: This retrospective study consecutively recruited patients from a single centre and data was taken from its Percutaneous intervention (PCI) registry database. All patients of the age of 40 and below were included. Information on demographic, smoking status, past medical history, presence of corneal arcus or tendon xanthoma, baseline level of total cholesterol and LDL-C, indication for PCI, ejection fraction, syntax score and outcome on discharge were recorded. Dutch Lipid Clinic Network Criteria was used to classify FH and non-FH. The data was statistically analyse using descriptive and correlation analysis.

Results: A total of 30 patients were included in this study. Subjects were predominantly Malay 80% (N=24), male 96.7% (N=29) with mean age of 36 ± 3.26. Risk factors include smoking 60% (N=18), diabetes 33.3% (N=10) and family history of ischaemic heart disease 46.7% (N=14). STEMI was the main indication for PCI 63.3% (N=19) and the mean EF on presentation was 46±10.8 % with mean syntax score of 12.9±8.1. Subjects with FH (N=18, 60%) have mean total cholesterol of 5.8±2.4 mmol/L and LDL-C of 4±2.7 mmol/L. STEMI was the main indication for PCI 67% (N=12) and they presented with mean EF of 48% and mean syntax score of 14.

Subjects with FH presented with higher EF but higher syntax score compared to non-FH but it was statistically not significant.

Conclusion: FH is common in young ACS patients. Trend showed the possibility of more complex lesion at presentation in FH group. However, larger data set will be required to prove its significance.

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21. Pattern and Predictive Factors of Infective Endocarditis in Pahang: A Five Year Retrospective Study


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Introduction and Objective: Infective endocarditis (IE) is a disease contributed by infection affecting the endocardial lining and is associated with major morbidity and mortality.1 The implication can be devastating and contributed to socio-economic burden due to prolonged admission, invasive procedure and expensive treatments. In addition, high prevalence of intravenous drug user (IVDU) shift the paradigm of infective endocarditis as the incidence was observed among even younger patients. 2 Thus, our study is to determine current incidence of infective endocarditis together with its predisposing and predictive factors among population in Pahang.

Method: This is a retrospective cohort by analyzing case records for patients admitted to Hospital Tengku Ampuan Afzan (HTAA) diagnosed with infective endocarditis from January 2014 till June 2017 based on modified Duke’s Criteria.

Result: A total of 55 patients were included with predominantly male gender (87.3%) and Malay ethnicity (96.4%). Median age was reported at 35 years-old (SD: 11.6) with durations for hospitalization of 26 days (SD:17). In term of symptoms, patients predominantly presented with fever less than two weeks (60%), reduced exercise tolerance (54.5%) and auscultation of new murmur clinically (30.9%). Interestingly 50.9% complained of weight loss with 18% were reported with hepatomegaly. For risk factors, 58% were active intravenous drug user (IVDU) with concomitant hepatitis C of 45.5%. For non IVDU, chronic rheumatic heart diseases (CRHD) accounts for 23.6% of the cohort while End Stage Renal Failure (ESRF) accounted for 16.4%. For IVDU, MSSA accounted for 80% of cohort followed by Group G Streptococci (12%) and MRSA (8%). However for non IVDU, MSSA accounted for 50% cases followed by MRSA (21.4%) and Group G Streptococci 14.3%. Commonest valve affected in IVDU was Tricuspid valve (46.4%) and Mitral valve for non IVDU (47.4%). In term of complication, both groups were reported with similar mortality of 25% however, severe valvular complications (62.5%) were observed in IVDU groups with more emboli episodes (62.5%) and cardiogenic shockers (40.6%).

Conclusions: In conclusion, IVDU is an essential predictive factors and is associated with various complications, thus warranted for aggressive preventive measurement to reduce the morbidity.

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22. Infective Endocarditis at A Tertiary Referral Centre in A Developing Country: Aetiology, Microbiology and Risk Factors for Embolic Complications and Mortality


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Background: The incidence of infective endocarditis (IE) presenting at tertiary referral centres (TRC) in developing countries has been increasing over the years. In Borneo, data on IE remains scarce, with rapid development in this region likely to result in more patients presenting to TRCs.

Objective: To describe the epidemiology, microbiology and risk factors of patients presenting with IE at a TRC in Borneo, and their relationship with embolic complications and mortality.

Materials and Methods: We retrospectively reviewed 43 patients admitted to our centre with IE (36 definite and 7 probable IE by Modified Duke Criteria) over 2016 and 2017. Data on demographics, microbiology, valve pathology, blood biochemistry, surgery and outcomes were collected and analysed.

Results: Majority (77%) of the patients were male, with a mean age of 46 + 16 years. The major cardiac predispositions were rheumatic heart disease (44%) followed by valvular prosthesis (14%). Mitral valves were affected in 58% followed by aortic valves 39.5%; 10% had vegetations located at multiple sites. Blood culture was positive in only 66% of cases with Streptococcus viridans accounting for the majority (42%), followed by Staphylococcus aureus (7%). Symptomatic embolic complications occurred in 30%; with independent predictors being mitral valve location of the vegetation and baseline vegetation size (p = 0.044 and 0.031 respectively with logistic regression modelling). 1 year mortality rate was 44.2% of which 37% was during index admission. There was significant association between underlying cardiac pathology with mortality (p = 0.006) with prosthetic valve endocarditis having the
worst prognosis. Mortality was also significantly higher in patients with indications for early surgery ($p = 0.02$). Those who underwent surgery during index admission had reduced mortality rate compared to those who did not, with an odds ratio of 0.17 (95% CI 0.02 - 1.36; $p = 0.054$).

**Conclusion:** IE is prevalent in our population with a significant mortality rate. Majority of cases were caused by Streptococcus viridans. Vegetation size and location at mitral valve were independent predictors of embolic complications, whereas prosthetic valve endocarditis and those with indications for early surgery were associated with a higher mortality.

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23. **Community Screening for Risk Factors of Premature CAD and Sudden Cardiac Death**

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**Introduction:** CVD remains the number 1 cause of death in Malaysia. The mean age of presentation for ACS is ten years younger than Europeans. Based on NCVD ACS Registry, up to 25% of patients presenting with ACS were below the age of 50. Aims: We aim to screen young people for the presence of risk factors for premature coronary artery disease (CAD) and sudden cardiac death (SCD).

**Method:** We screened male and female aged 18 to 50 without pre-existing cardiovascular disease conducted in several locations throughout Lembah Kelang, between July 2017 to November 2018. Participants invited to attend the screening via social media or organisations. Participants filled questionnaire detailing history, personal profile and cardiac risk factors and symptoms. They were then subjected to examination for weight, height, blood pressure, random blood glucose and total cholesterol. Those with abnormal results were advised to seek further consultation and treatment.

**Result:** A total of 666 subjects participated. Mean age of participants were 42.4 ± 14.9 years, with female predominance (48.0% male). 96.3% have no previous diagnosis of CVD. 29.3% have positive family history of SCD or premature CAD. Pre-existing diagnosis of Hypertension, Diabetes Mellitus and Dyslipidaemia were 9.8%, 8.3% and 9.3% respectively. 12.9% were active smokers. 30.5% reported history of hypertension. 9.8%, 8.3% and 9.3% respectively. 12.9% were active smokers. 30.5% reported history of hypertension. 9.8%, 8.3% and 9.3% respectively. 12.9% were active smokers. 30.5% reported history of hypertension. 9.8%, 8.3% and 9.3% respectively. 12.9% were active smokers.

**Conclusion:** We screened male and female aged 18 to 50 without pre-existing cardiovascular disease conducted in several locations throughout Lembah Kelang, between July 2017 to November 2018. Participants invited to attend the screening via social media or organisations. Participants filled questionnaire detailing history, personal profile and cardiac risk factors and symptoms. They were then subjected to examination for weight, height, blood pressure, random blood glucose and total cholesterol. Those with abnormal results were advised to seek further consultation and treatment.


24. **Pulse Wave Velocity in Assessing Arterial Stiffness in Patients With Mild-To-Moderate Renal Impairment**


**University Teknologi MARA Sungai Buloh**

**Background:** Arterial damage in chronic kidney disease (CKD) is characterized by aortic stiffness. This is seen in elderly patients with advanced CKD. We aimed to study arterial stiffness between subjects with arterial stiffness and early CKD is not well established.

**Objective:** We aimed to study arterial stiffness using PWV among patients with chronic kidney disease (CKD) stage 2 to 4 and normal renal function in younger-age population.

**Method:** Patients with confirmed CKD stage 2 to 4 were recruited from various clinics from Universiti Teknologi MARA Medical Center, Sungai Buloh. Sociodemographic and anthropometric indices were recorded on recruitment. Each patient underwent carotid-femoral (aortic) PWV measurement to determine arterial stiffness. PWV is determined using SphygmoSore XCEL.

**Results:** 87 patients with CKD stage 2–4 and 87 control patients were recruited. The mean age was 47 ± 5.4 years. CKD patients had a higher mean PWV (7.8 m/s ± 1.7) than healthy controls (5.6 m/s ± 1.0) ($p < 0.001$, 95% CI −2.59, −1.77). There was significant difference of mean PWV between control (5.6 m/s ± 1.0) and CKD stage 2 (7.6 m/s ± 1.5) ($p < 0.001$, 95% CI −2.40, −1.49). Our results showed a stepwise increase in PWV from control subjects, CKD stage 2 through stage 4 ($p < 0.001$). The mean difference of PWV between CKD stage 2 (7.6 m/s, + 1.5) and stage 4 (9.0 m/s, + 0.8) was 1.43 ($p < 0.001$, 95% CI −2.50, −0.35). There was significant difference of mean PWV between diabetes mellitus (DM) (8.2 m/s ± 1.8) and non-DM (7.3 m/s ± 1.3) patients with CKD stage 2–4 ($p = 0.022$, 95% CI −1.50, −0.12). Multiple linear regression analysis showed only age ($β = 0.076$, $p = 0.014$), mean arterial pressure (MAP) ($β = 0.031$, $p = 0.007$) and diuretics usage as the combination antihypertensive medication ($β = 0.839$, $p = 0.018$) were independently correlated with PWV ($r^2 = 0.249$, $p < 0.001$).

**Conclusions:** This study shows that arterial stiffness as assessed by PWV occurs early in CKD patient and increased arterial stiffness occurs in parallel with decline of glomerular filtration rate in patients with mild-to-moderate CKD of younger age population.

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25. **Burden of Familial Hypercholesterolaemia in Acute Coronary Syndrome Population in North Kuala Lumpur**

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**Introduction:** Familial Hypercholesterolaemia (FH) is an established risk factor for developing atherosclerotic cardiovascular disease. Early detection might improve morbidity and mortality, hence reducing economic burden by preventing coronary artery disease.

**Abstracts**

The prevalence of CVD risk factors. There were also significant proportion of subjects having cardiac symptoms. There were also significant proportion of subjects having cardiac symptoms.
However, its information in South East Asian region, which has high rate of diabetes, hypertension and consanguinity is scarce.

**Objective:** To describe the characteristic of FH among acute coronary syndrome (ACS) patients who had percutaneous intervention (PCI) in a single centre cohort.

**Methods:** All patients who were admitted to our centre for PCI were screened through our PCI registry database. Diagnosis of FH was made using the Dutch Lipid Clinic network Criteria (DLCC). Patient with DLCC score of three and above and below three will be categorised as FH and Non-FH respectively. Statistical analyses were performed via univariate and multivariate techniques.

**Results:** A total of 498 patients were included in this study. Patients were predominantly male, 88% (N=438) with mean age of 55.17±10.35. They were mainly Malays, 70.5% followed by Chinese, 17.1%, Indian 11.4% and others 1%. Our cohort has 34% of smoker and 48% of diabetes. The proportion of patients with FH and non-FH with ACS was 56% and 44% respectively. Of the FH patients, 2.4% has definite FH, 11% has probable FH and 42.4% has possible FH. The FH group was younger (53 vs 57 p = 0.005), has higher BMI (28 vs 27 p < 0.05) and lower systolic blood pressure (126mmHg vs 130mmHg p < 0.05) as compared to non-FH.

**Conclusion:** The proportion of FH among ACS patients in this high-risk cohort is high. Screening of FH in ACS patients is therefore clinically important and potentially beneficial.

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26. Outcomes of Patients Admitted to a District General Hospital with Acute Decompensated Heart Failure. A Retrospective Cohort Analysis

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**Background:** Acute Decompensated Heart Failure (ADHF) is a major determinant of healthcare expenditure related to heart failure. Despite advances in treatment, the prognosis of heart failure remains poor.

**Objective**
1. To describe the baseline characteristics of patients admitted to a District General Hospital with ADHF
2. To compare patient characteristics and 1 year outcomes
3. To compare treatment regimens on discharge.

**Methods:** Between 1st June 2016 and 31st May 2017, 174 patients were admitted with ADHF to Hospital Bintulu, Sarawak. Complete Data Sets of 143 patients were used in the analysis of the primary outcome which was defined as all-cause mortality and readmission for ADHF at 1 year post admission. Guideline Directed Therapy (GDT) was defined as both Beta Blocker and ACE/ARB therapy on discharge.

**Results:** The mean Age was 63±14.5years-old, 56% were male, 68% were Hypertensive, 31% Diabetics, 45% current or former smokers. On admission, mean Systolic BP 143±30mmHg, mean Heart Rate 96±26bpm, 71% were in Sinus Rhythm, 60.9% in Killip Class ≥ 1. 51.7% had an EF<40%.

The mean length of hospital stay was 4.1±7.1 days. In hospital mortality during the index admission was 6.3%.

On Discharge, 37% of patients were given GDT. 48.5% were given either Beta Blocker or ACE/ARB. 12.6% of patients were not given any heart failure therapy.

36% of patients were readmitted within 1 year. The mean duration of readmission was 7.5±7.1days. 50.6% of patients met the primary outcome, with 32.2% 1 year all-cause mortality.

On multivariate analysis, patient factors that were associated with the primary outcome were current/former smoker (P=0.040) and Advanced age (P = 0.023 OR 1.021 CI 1.003-1.039).

GDT on discharge did not seem to improve the primary outcome (P=0.638). No improvement was seen in the subgroup of patients with EF<40% either (P=0.743).

Survival of patients with EF<40% was significantly lower than EF≥40% (P = 0.012).

**Conclusions:** Patients admitted with ADHF in a DGH were young and had multiple co-morbidities.

The majority of patients admitted with ADHF died or were re-admitted within 1 year of index admission. GDT seemed to show no difference in mortality or readmission in patients with EF<40%.

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27. Diagnostic Accuracy of NT-proBNP and ST2 in Detection of Moderate to Severe Asymptomatic Left Ventricular Diastolic Dysfunction: Evaluation of The Role of Biomarkers in Screening of Diabetic Patients at Primary Healthcare Settings

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**Background:** Left ventricular (LV) dysfunction, including asymptomatic LV dysfunction, has been shown to be more prevalent in patients with Type 2 diabetes mellitus (DM), and once progress to overt heart failure, carry worse clinical outcomes, compared to those without DM. The use of NT-proBNP and ST2 is well established in overt heart failure, carry worse clinical outcomes, compared to those without DM. The use of NT-proBNP and ST2 is well established in heart failure diagnosis and prognosis, but their inclusion in screening in asymptomatic DM patients has limited data.

**Objective:** To assess ability of NT-proBNP and ST2 in detecting moderate to severe asymptomatic LV diastolic dysfunction (aLVDD) in DM patients without pre-existing adverse cardiovascular events.

**Materials and Methods:** A total of 324 patients who attended diabetic clinic follow-up at 5 primary healthcare settings were screened for eligibility.

Out of 324 patients screened, 111 patients who met the eligibility criteria were enrolled. LV ejection fraction (LVEF) obtained was preserved in all subjects. For each subject, clinical data was collected and ECG was performed. Blood samples were taken and sent for laboratory analysis for HbA1c, renal and lipid profiles. Plasma levels of NT-proBNP and ST2 were determined using commercially available point-of-care systems. Echocardiography was performed to obtain parameters of LV dimensions, LV volumes and LV diastolic dysfunction, and referenced against internationally recognised parameters.

**Results:** There were 64 (57.7%) female patients. Mean age was 58.80 (7.46); mean duration of DM was 10.28 (5.62). On ROC
analysis, NT-proBNP showed higher AUC compared to ST2 in distinguishing moderate to severe aLVDD from mild aLVDD to normal LV function (AUC=0.665; p=0.047 vs AUC=0.361; p=0.094). The diagnostic accuracy was found significantly higher with age ≥60 (AUC=0.780; p=0.017), DM duration < 10 years (AUC=0.733; p=0.039) and hypertension (AUC=0.670; p=0.042).

Based on Youden Index, the cut-off value for NT-proBNP was found to be similar (> 107 pg/ml) in all other study subgroups except age≥60 (> 162 pg/ml).

Conclusions: NT-proBNP was found to be more strongly associated with moderate to severe aLVDD compared to ST2. We recommend DM patients who were found with NT-proBNP ≥ 107 pg/ml during screening in our population to undergo further cardiovascular assessment.

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28. Mortality Outcome in Chronic Heart Failure Population in Malaysia

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Introduction: Chronic heart failure is an important global health problem affecting all continents. It is associated with high mortality and disease burden which contributes to an increase in healthcare expenditure. There were very few data on outcomes in heart failure cohort from low and middle income countries and Malaysia is one of them.

Objectives: To identify the incidence of mortality and cause of death among chronic heart failure patients in Malaysia.

To identify the incidence of mortality and cause of death among chronic heart failure patients in Malaysia.

Methods: This was a retrospective single centre study conducted in UiTM Medical Specialist Center, Sg Buloh. Transthoracic echocardiography reports between 2013-2015 were reviewed and those with documented ejection fraction of less than 45% were included in the study. The demographic details were recorded from patient’s medical charts. Medications prescribed are recorded from the online pharmacy ordering system. Each of the identified individuals data were sent to Clinical Research Centre in Hospital Kuala Lumpur for data matching with official national death record system from 2013-2016.

Results: There were 1177 patients with chronic heart failure identified with 270 (22.9%) incidence of death within the maximal 4 years of follow up. Mean age of death was 61.0±10.1 years. 70% of them were male. There is a higher incidence of death in patients with ejection fraction (EF) <25% as compared to EF between 25-45% (41% vs 19%, p value <0.05). Cardiovascular causes represent 67.4% of the death cohort with acute coronary syndrome remained as a leading cause (38%) followed by pump failure (29%) and sudden death (25%). Cumulative yearly mortality ranges from 4.0% in year 1 of follow up and went up to 22.9% at year 4 of follow up.

Conclusion: We demonstrated lower incidence of mortality as compared to other continents as published in InterCHF study. The major cause of cardiovascular death in our cohort is acute coronary syndrome which might reflect on the delay or suboptimal revascularization treatment that should be provided to the patients in which majority of them had heart failure secondary to ischaemic aetiology.

This statement is inferential at this stage but further study is needed in the future to address this question.

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29. Prevalence of Heart Failure in Type 2 Diabetes without Prior Cardiovascular Disease


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Background: Heart failure (both HFrEF and HfPEF) has been reported to be common among patients with diabetes mellitus. Indeed, diabetic cardiomyopathy has been known as an entity. However, most of the reported series included patients with ischemic heart disease. True prevalence of diabetic cardiomyopathy is not known in this region.

Objective: To estimate the prevalence of diabetic cardiomyopathy in an urban population seen in a tertiary center.

Materials & Methods: This was cross sectional study conducted in University Malaya Medical Center, between Jan 2018- Dec 2018. Diabetic subjects from endocrine clinic were screened to ensure fulfill inclusion and exclusion criteria prior enrollment into the study. Demographic data were collected. Specific data on diabetes mellitus (year of diagnosis, HbA1c level, medications and macrovascular/microvascular complication) were recorded. Blood sample for NT-proBNP was taken from study subjects. Echocardiography assessment on diastolic heart failure was performed.

Results: A total of 301 T2D patients were included and evaluated in this study. The mean age was 62.0 years (range 26.3-86.4) with more females (64.8%) than males. The majority (86.3%) had above the normal body-mass index (BMI), hypertension (77.1%) and hyperlipidemia (91.0%). A total of 83.1% had diabetes for more than 10 years and almost half (45.9%) had HbA1c above 8%. Albuminuria was absent in most (71.4%), half had normal renal function (51.8%) and one third had mild renal impairment (33.2%). About 37.9% of the patients have microvascular complications. The most used anti-diabetic was metformin (91.7%) and the least used (8.3%) was glucagon-like peptide-1 receptor agonists (GLP1-RA). About 75.4% of patients were on angiotensin-converting enzyme (ACE) inhibitors and angiotensin II receptor blockers (ARB), 90.37% on statins, 38.87% on anti-platelet. None of the included patients had LV function less than 50%. None of the patients has raised BNP level. LVpEF was present in 70.10% (mild 63.46%, moderate 5.98% and severe 0.66%) and had significant positive correlation with having hypertension and use of ACE/ARB.

Conclusion: Diabetic cardiomyopathy is mainly presented in the form of HfPEF in this high risk diabetic patients. As much as 70% of these diabetic patients have undiagnosed HfPEF.

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30. Efficiency and Safety of Computer Assisted Oral Anticoagulation Dosing System: Single Centre Experience

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Background: Warfarin is the most widely used anticoagulant to prevent stroke in patients with high risk of thromboembolism such as atrial fibrillation and mechanical valve replacements. Time in therapeutic range (TTR) of less than 65% is associated with
increased risk of thromboembolism and bleeding events compare to antiplatelets.

Objective: To study the safety and effectiveness of the DAWN AC computer-assisted oral anticoagulant dosage program compare to manual adjustment by doctors.

Method: In this retrospective study, we compared the use of physician dosing (year 2015) versus computer dosing (year 2017) in the management of patients in the warfarin clinic of the National Heart Institute, Malaysia. Our outcome measures are time in therapeutic range, thromboembolic events and major bleeds.

Results: A total number of 187 patients were recruited: 85 patients from manual dosing group in 2015 and 103 patients in computer assisted group in 2017. Most common indications for warfarin are atrial fibrillation, mechanical mitral valve replacement and mechanical aortic valve replacement. Mean CHA2DS2-VASc score were 2.54 ± 1.16 and 2.15 ± 1.16 in manual group and in computer assisted group respectively (p = 0.11). Mean HASBLED score were 1.16 ± 0.962 in manual vs 1.16 ± 1.03 in computer dosing (p = 0.95). Time in therapeutic range was not statistically significant different between two groups, with mean TTR of 78.7% in manual dosing vs 69.9% in computer assisted group (p = 0.17). Time in therapeutic range of INR above 70% is 56.5 % of patients in manual group, as compared to 54.4% in computer assisted group (p = 0.88). There was no new stroke in both groups during one year follow-up. There were 2.9% of major bleeding in computer assisted group, as compared to 1.1% bleeding in manual monitoring group (p = 0.63).

Conclusion: Computer assisted dosing system is as effective as manual dosing in term of TTR in patients taking warfarin. There was no statistically significant different in event rates in both groups.

There is numerically higher in bleeding in computer assisted group but it was not statistically significant. Computer assisted program can be safely implemented in the hospital and community clinics without direct supervision under physicians.

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31. The Association between CYP2C19 Genotype and Phenotype and the Impact on 1-year Outcomes Following Phenotype Guided-escalated Antiplatelet Therapy in Myocardial Infarction Patients with Drug Eluting Stents

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dBackground: Clopidogrel high on-treatment platelet reactivity (HPR) is an independent predictor of major adverse cardiovascular events (MACE) in myocardial infarction (MI) patients with drug eluting stents (DES). Despite published guidelines in which more potent ticagrelor, is preferred, clopidogrel remains the treatment choice in Malaysia due to cost reason. The use of point-of-care (POC) instruments in phenotype-guided escalated therapy (GES) could be explored.

Objective: To determine the 1-year clinical and economic outcomes of GES in patients post MI with DES.

Materials and Methods: Patients admitted between Sep-Dec 2017 with MI and DES, had POC platelet function testing (PFT)(Multiplate®) and CYP2C19 genotyping (Spartan Rx Assay) performed upon discharge. Patients with clopidogrel HPR were switched to ticagrelor. One year follow-up and budget impact analysis were assessed.

Results: Out of the 40 patients recruited, mean age was 56.08 ± 11.33 years and 92.5% were male. Approximately one third had wildtype(WT) CYP2C19 *1/*1 genotype, while the remaining had ≥1 loss-of-functional alleles(LOF) [WT: 30.0%; 1 LOF: 62.5%; 2 LOF: 7.5%]; (Percentage of clopidogrel HPR: 0% vs. 8% vs. 33.3%). None had ≥1 gain-of-function alleles. Clopidogrel reactivity (MEA ADP) was significantly higher in patients with more LOF compared to WT [median(IQR): WT vs. 1LOF vs. 2LOF: 246(268), 316(189.50) and 478(-) respectively, p = 0.06]. Aspirin HPR (MEA ASPI ≥300 AU·min⁻¹) made up 10.0% of the population. All three with clopidogrel HPR (MEA ADP≥600AU·min⁻¹), 10.7% of those who had ≥1 LOF, were switched to ticagrelor. All patients had normal on-treatment platelet reactivity and were alive at discharge. At 1-year, MACE were 12.5%. Significant associations were neither observed between presence of LOF and MACE (p = 0.627), nor between those who initially had clopidogrel HPR and MACE (p = 1.000). At 1-year, the cost of GES (including drugs, PFT and MACE) of 40 patients was lower compared to standard therapy (SDT) and guideline-recommended ticagrelor-for-all therapy (drugs and MACE) (RM 90,331.60 vs. RM 117,688 vs. RM 184,936).

Conclusions: Presence of LOF is significantly associated with clopidogrel HPR but only 10.7% were switched to ticagrelor due to HPR. CYP2C19 genotyping could not be used as a sole guidance in antiplatelet therapy. GES is more cost effective and had lower 1-year MACE compared to standard therapy.

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32. Quality of Life and Treatment Satisfaction Among Patients on Long Term Oral Anticoagulant in A Developing Country

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Background: Randomised phase III studies had proven the efficacy and safety profile of direct oral anticoagulant (DOAC) over warfarin in stroke and systemic embolism prevention for patients with atrial fibrillation (AF) and venous thromboembolism (VTE). Nevertheless, patients’ quality of life (QOL) and treatment satisfaction was not explored in these studies.

Objective: The primary objective of this study was to compare the QOL and treatment satisfaction of patients on long term warfarin versus DOACs in a tertiary hospital in Malaysia.

Methods: This is a cross-sectional study of patients with non-valvular AF (NVAF) or VTE on long term warfarin versus DOACs attending the cardiology clinic and anticoagulation clinic of University Malaya Medical Centre from 1 st July 2016 to 30 st June 2018. Patients’ QOL was assessed by using Short Form 12v2 Health Survey (SF12v2); while treatment satisfaction was assessed by using Perception of Anticoagulation Treatment Questionnaire 2 (PACT-Q2).

Results: Of 208 patients, 52.4% received warfarin and remaining 47.6% received DOACs. The warfarin group was significantly younger and had longer treatment duration (p < 0.001); while DOAC group had significant more underlying NVAF (p = 0.001) and polypharmacy (p = 0.003).

There was no significant difference in the score of physical component summary (PCS) (p = 0.083), mental component summary (MCS) (p = 0.665) and each domain of SF-12v12 (p = 0.058 – 0.953) between anticoagulant groups. There were no differences between the 2 groups of anticoagulants even after adjustment of age. The satisfaction
score was significant higher in DOACs group compared to warfarin group (p = 0.003); but there was no difference in the convenience score (p = 0.234).

Hospitalisation rate was significantly higher (p = 0.002) in warfarin group. Only 45.0% of patients achieved good time in therapeutic range (TTR).

Conclusions: Despite no significant difference in QOL, patients with AF or VTE who were treated with DOACs demonstrated better efficacy, safety, and satisfaction profile, as well as a relatively stable within-group QOL.

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33. Prior Antiplatelet Therapy and Clinical Outcomes in Acute Coronary Syndrome


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Background: Antiplatelet agents remain the mainstay of therapy in acute coronary syndrome (ACS). There is limited information on outcomes of prior antiplatelet (PAP) use in ACS patients.

Objective: To evaluate the impact of PAP use in patients presenting with ACS.

Materials & Methods: This retrospective observational cohort study included ACS patients who admitted to Hospital Serdang between January to December 2016. These patients were recruited through consecutive sampling. The rates of cardiovascular events (a composite of death, ACS, stroke or stent thrombosis) were assessed during hospitalization and until 30 days after discharge. PAP is defined as patients who use antplatelet agents within 30 days before admission for ACS treatment. Logistic regression was used to compare cardiovascular events during hospitalisation and after discharged.

Results: 457 patients were included [77.5% male, mean age 57.0 (1.6) years]. Among of them, 33.9% (n=155) had PAP. PAP users were associated with lower cardiovascular events compared with non-PAP users(2.6% vs 6.6%; adjusted OR 0.32, 0.10-0.99; p=0.048). Cardiovascular events after hospital discharge were similar in both groups (30.1% in PAP vs 20.9% in non-PAP; adjusted OR 1.55, 0.95-2.54, p=0.080).

Conclusions: Our study shows prior use of antiplatelet therapy was associated with lower risk of cardiovascular event during hospitalization. Further study will be beneficial to explore further the findings.

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34. Outcomes of Percutaneous Coronary Intervention in Significant Coronary Artery Disease Patients with Documented Poor and Normal Left Ventricular Ejection Fraction

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Background: Prognostic and risk assessment of acute coronary syndrome is a crucial role in weighing the necessity of invasive revascularization procedures. Reduced left ventricular ejection fraction (LVEF), multi vessel disease, more severe and proximal coronary lesions, older age, significant depression and more severe angina are predictors of poor outcome.

Objective: To identify the outcomes of patients with impaired and normal left ventricular function (with documented echocardiography) who underwent for per cutaneous coronary intervention for significant coronary artery disease.


Results: Out of total 18582 patients, documented echocardiography noted in 7248 patients. 1207 (16.7%) patients were diagnosed with impaired LV function (ejection fraction <40%) while 4366 (60.2%) patients had good LV function (ejection fraction >50%). The rest 1675 (23.1%) with LV function of 40-50% are excluded in this analysis. Similar mean age for both study groups (57.45 ± 10.38 years) with predominantly male patients. 23.9% patients with poor LV function and 22.2% patients with good LV function are active smokers. Diabetes was more commonly associated in impaired left ventricular patients (50.9% vs 44.0%). Hypertension and dyslipidemia were more commonly seen in patients with good LV function. Previous history of percutaneous coronary intervention in 598 (13.7%) patients from good LV function group and 173 (14.3%) individuals with impaired LV function. 579 (48.0%) impaired cardiac function patients presented with acute coronary syndrome whereas 1680 (38.5%) patients with normal LV function presented as it is. Immediate hospital outcome such as overall death rates (all-cause mortality) are more common in impaired LV function group (48.0%) than patients with preserved LV function (17.6%; p<0.05) than patients with preserved left ventricular function on long term follow up.

Conclusions: Coronary artery disease patients with documented poor left ventricular ejection fraction are carrying significant poor clinical outcomes in terms of both immediate and long term outcomes even with percutaneous coronary interventions.

doi:10.1016/j.ijcard.2019.11.039

35. Outcomes of Percutaneous Coronary Intervention in Significant Coronary Artery Disease Patients with Documented Poor and Normal Left Ventricular Ejection Fraction

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Conclusion: In our cohort, PCI group had poorer 30 days mortality outcome compared to PCI only (8.1 vs 4.0%). This result is consistent with other large randomised control trials (RCT) like TOTAL and TASTE.

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37. Comparison on Prevalence and Risk Profile of Non-obstructive and Normal Coronaries Patients Detected From Invasive Coronary Angiography: 2 Years Data From A Single Centre

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Background: Patients with normal and non-obstructive coronary artery disease (CAD) are not uncommonly encountered during invasive coronary angiography. Both have non-negligible rates of ischemia, with the non-obstructive CAD had a poorer prognosis.

Objective: To identify prevalence and risk profile of patients with non-obstructive and normal coronaries detected from invasive coronary angiography.

Methods: A retrospective, single centre study on all patients with non-obstructive CAD and normal coronaries who underwent invasive coronary angiography from 1 January 2017 to 31 December 2018. “Non-obstructive CAD” was defined as coronary artery luminal stenosis >20% till <50%. “Normal coronaries” was coronary artery luminal stenosis <20%.

Results: Out of 2860 patients who underwent invasive coronary angiography, 487(17.0%) patients had <50% coronary artery stenosis. Among them, 260(53.4%) had non-obstructive CAD and 227(46.6%) had normal coronary arteries. Mean age was 55.1±11.3 years for non-obstructive CAD patients and 50.7±11.9 years for normal coronaries. No significant difference between the two groups for gender, ethnicity, smoking history and dyslipidaemia. Non-obstructive CAD had significantly higher incidence of diabetes mellitus (64.9% in non-obstructive CAD and 35.1% in normal coronaries, p=0.002) and hypertension (54.6% in non-obstructive CAD and 41.4% in normal coronaries, p=0.004) compared to normal coronaries group. The commonest invasive angiogram indications for both groups were unstable angina(22.4%), NSTEMI(20.5%), positive/inconclusive exercise stress test(17%) and STEMI(10.3%). Among 13 patients with abnormal cardiac multislice computed tomography results, majority [11(84.6%)] had non-obstructive CAD. Out of 81 patients with positive exercise stress test results, 41(50.6%) had non-obstructive CAD. Patients who had left ventricular (LV) dysfunction with regional wall motion abnormality (RWMa), 63.1% had non-obstructive CAD and 36.9% had normal coronaries (p=0.005). Non-obstructive CAD had significantly higher usage of anti-platelet [non-obstructive CAD 173(64.1%), normal 97(35.9%), p=0.001] and statin [non-obstructive CAD 182(61.1%), normal 116(38.9%), p=0.002] prior to angiography, compared to normal group. No significant difference in usage of other CAD medications between both groups.

Conclusions: DM and hypertension are significant risk factors for non-obstructive CAD. Patients with LV dysfunction and RWMa are more likely to have non-obstructive CAD. Identifying these risk profile may help in decision of appropriate imaging modalities and intensification of medications.

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38. Impact of A Regional STEMI Network on Patient Outcomes in Malaysia

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**Background:** ST-elevated myocardial infarctions (STEMI) represent half of all acute coronary syndromes (ACS) suffered by Malaysians. Data from national registries show a low prevalence of primary percutaneous intervention (pPCI) across the country, despite it being superior in terms of revascularisation when compared to conventional thrombolitics. STEMI data analysis pre- and post-implementation of the MySTEMI Network is presented in this study.

**Objective:** We studied the impact of a regional STEMI network on patient outcomes utilising national registry databases. Secondary objectives were to study the difference in outcomes between MySTEMI and non-MySTEMI hospitals.

**Materials & Methods:** This was a retrospective cohort study based on the MySTEMI, NCVD-ACS and NCVD-PCI registries from 2014 to 2017. We collated data across the three registries and tabulated all patients requiring pPCI into a singular spreadsheet. Mortality was analysed at discharge and at 30-days, with deaths being verified from the National Registration Department of Malaysia. We performed descriptive and interrupted time series analysis, controlling for various confounders within the cohort. Results were presented as a timeline with significance taken at a level of p < 0.05.

**Results:** A total of 1,248 patients were admitted for pPCI under the MySTEMI Network since its inception in 2015 until 2017, increasing from the 970 patients seen in the previous two years. 710 patients were referred from spoke hospitals while 538 patients were admitted straight into hub hospitals throughout the study period. This resulted in a 12.5% increase in number of patients receiving pPCI within the MySTEMI hospitals, while in-patient mortality decreased by 6.2% post-implementation of the STEMI network. Mean in-patient mortality rate was also noted to be lower in MySTEMI hospitals when compared to non-MySTEMI hospitals (5.5% vs. 7.7%). However, an increasing trend was noted in 30-day mortality within the MySTEMI hospitals.

**Conclusions:** STEMI in Malaysia is at a consistent level. The implementation of a regional STEMI network has resulted in an increased number of pPCI cases performed. Patients tend to benefit in terms of early discharge and lower in-patient mortality. Evaluation of cost effectiveness would help justify the national implementation of this life saving program.

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39. A Single Centre Experience with Paclitaxel Drug Eluting Balloons Comparing Scoring Balloon and Non-Scoring Balloon for Lesion Preparation


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**Background:** Drug Eluting Balloons (DEB) are being used more frequently in both in-stent restenosis (ISR) and de-novo lesions with promising results. The theory of using scoring balloons in lesion preparation to enhance anti-proliferative drug delivery compared to regular balloons has yet to be properly investigated.

**Objective:** To compare the safety and efficacy of DEB using scoring balloon versus non-scoring balloon for lesion preparation in the treatment of both ISR and de-novo lesions.

**Materials and Methods:** We retrospectively studied 624 patients and a total of 719 lesions treated at our institution in 2017 with either scoring balloon or non-scoring balloon lesion preparation followed by paclitaxel-coated SeQuent Please Neo DEB.

179 lesions treated with scoring balloon was compared to 445 lesions treated with non-scoring balloon which included semi-compliant and non compliant balloons for lesion preparation. Endpoints analysed were clinically driven target lesion revascularization rate (TLR) as a primary endpoint and Major adverse cardiac events (MACE) events at 1 year follow up.

**Results:** Percentage of stenosis pre-PCI was 87±12% improving to 19±12% post-PCI using a scoring balloon as opposed to a pre-PCI stenosis of 92±10% improving 18±14% post-PCI in the non-scoring group. There was no statistical significance in this aspect.

There was however a significant increase in flow limiting dissections when scoring balloon was used for lesion preparation, 10(5%) lesions as opposed to only 5(1%) in the non-scoring group (p=0.02). The scoring group had less non-flow limiting dissections 2(1%) compared to 24(4.6%) in the non-scoring group (p=0.023). Those that needed bail out stenting however were similar in both groups, 12(6%) in the scoring and 26(5%) in the non-scoring (p=0.576). TLR was required in 3(1.7%) of patients in the scoring group and 4(0.9%) in the non-scoring group (p=0.417). MACE at follow up was 9(4.5%) patients in the scoring group and 10(1.9%) patients in the non-scoring group (p=0.067).

**Conclusions:** Using a scoring balloon for lesion preparation is a promising technique and based on our study, there is no statistically significant difference in terms of TLR and MACE compared to non-scoring balloons. Additional numbers are needed to gain further experience in the use of scoring balloons for lesion preparation to achieve more accurate results.

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40. Factors and Outcomes Associated with Streptokinase-related Hypotension in Patients with ST Segment Elevation Myocardial Infarction (STEMI) in A Secondary Care Hospital in Malaysia

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**Background:** The most important determinant of hypotension in STEMI patients receiving Streptokinase is the rate of Streptokinase infusion. However, there is a paucity of data on the other factors associated with streptokinase-related hypotension.

**Objectives:** To determine the incidence, risk factors and outcomes of streptokinase-related hypotension.

**Method:** 134 STEMI patients presenting to Sibu Hospital from March 2016 till March 2018 who received intravenous Streptokinase were included. Hypotension was defined as a blood pressure (BP) of less than 90/60mmHg. Patients’ clinical characteristics, clinical reperfusion and in hospital mortality were recorded. Clinical reperfusion (CR) criteria was defined as the presence of at least 2 out of the following criteria post thrombolysis: (1) relief of chest pain
Patients in A Non-Cardiac Catheterization Laboratory Center

Patients on presentation to a non-cardiac catheterization lab center. Cardiologist density ratio of 7.5 per million population (pmp) falls of 73 cardiac catheterization labs are in public facilities and the local accessible in Malaysian public hospitals. As of 2015, only 15 (21%) medical therapy in reducing mortality [1, 2], it is not largely (STEMI) is one of the leading causes of death in Malaysia. While administration was significantly shorter duration of hypotension (12 vs 35 minutes) as compared to the former [p<0.05, OR 17; 95% CI (-12-58)]. The hypotensive cohort had a higher percentage of hypertension (67.7% vs 39.1%, [p<0.05, OR 3.26; 95% CI (1.6 - 1.63)], dyslipidemia (27.7% vs 7.2%, [p<0.05, OR 4.9; 95% CI (1.7-14.15)] and stroke (6.2% vs 0%), [p<0.05, OR 0.47; 95% CI (0.39-0.56)]. Time of onset of chest pain to Streptokinase administration was significantly shorter in the hypotensive cohort (45 vs 180 minutes), [p<0.05, OR 80; 95% CI (-23 - 293)]. There was no statistically significant difference in the rate of CR and mortality between the 2 cohorts.

Conclusions: Streptokinase-related hypotension has no effect on CR and mortality. Hypertension, dyslipidemia, stroke and early administration of Streptokinase are predictors of hypotension.

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41. Presenting Features of ST-elevation Myocardial Infarction (STEMI) Patients in A Non-Cardiac Catheterization Laboratory Center


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Introduction: ST-segment elevation myocardial infarction (STEMI) is one of the leading causes of death in Malaysia. While primary coronary intervention (PCI) is superior to thrombolysis or medical therapy in reducing mortality [1, 2], it is not largely accessible in Malaysian public hospitals. As of 2015, only 15 (21%) of 73 cardiac catheterization labs are in public facilities and the local cardiologist density ratio of 7.5 per million population (pmp) falls short of the European mean ratio of 58 pmp [3].

Objective: Determine factors associated with mortality in STEMI patients on presentation to a non-cardiac catheterization lab center.

Materials & methods: This is a retrospective observational study on patients diagnosed with STEMI in Selayang Hospital from 1st July 2018 to 31st December 2018. Data were extracted from the hospital information system and analyzed on SPSS v.23 using independent samples t-test and chi-square test.

Results: A total of 83 patients with STEMI were recruited with a male majority of 87% (n=72) and mean age of 52.7 years (range: 27-82 years). 10 (12%) recruits succumbed to STEMI with an 80% male majority. Higher Killip scores (p=0.016) and failure symptoms (p=0.037) were significantly associated with mortality. Systolic and diastolic blood pressures were also lower in the non-survivor group (p=0.003 & 0.019 respectively). Other factors including age, angina symptoms, smoking status, dyslipidemia, hypertension, diabetes mellitus, family history of MI and previous MI showed no significant differences between the survivor & non-survivor groups.

Conclusions: STEMI non-survivors presented with Killip scores of ≥3, failure symptoms and/or hypotension. Prompt referral for immediate intervention should therefore be prioritized for these patients.

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42. Comparison of Fasting Lipid Profile and Prior Lipid-Lowering Agent among Young and Older Myocardial Infarction Patients


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Background: Low-density lipoprotein cholesterol (LDL-C) is a prognostic biomarker for coronary artery disease, including Acute Myocardial Infarction (AMI). However, substantial gaps exist regarding the baseline fasting lipid profile (FLP) and prior lipid-lowering agent (LLA) among AMI patients in Malaysia. According to the National Cardiovascular Disease Database, Acute Coronary Syndrome (ACS) patients in Malaysia present at a younger age as compared to those from developed countries.

Objective: We aim to compare the FLP and prior LLA among young (<55 years) and older (≥55 years) patients admitted with AMI to a tertiary cardiology referral hospital.

Materials and Methods: This prospective, observational study involved AMI patients admitted to Sarawak Heart Centre (SHC) from August 2018 until January 2019. Consecutive AMI patients with FLP performed were recruited in this study.

Results: We recruited 191 AMI patients, with mean age of 56.4(10.63) years and 87% were male. A total of 88 patients (46.1%) were categorised as young AMI (age ≤55 years). Of young AMI patients, 78.4% were smokers, 42% had hypertension, 18.2% were diabetics and 38.6% had family history of cardiovascular disease. A total of 88.6% young AMI patients had first-time MI as compared to 66.0% older patients (p<0.001). Approximately 81.8% young AMI patients and 38.8% older patients were not on any LLA prior to admission (p<0.001). More young AMI patients had no documented hyperlipidemia as compared to older patients [72.7% vs 48.5%; p<0.001]. During discharge, 97.8% were prescribed with high-intensity statin. Young AMI patients had significantly higher mean total cholesterol [5.3(1.03) vs 4.7(1.57)mmol/L;p=0.001]; higher triglyceride [2.0(1.52) vs 1.6(1.22)mmol/L; p=0.033] and higher LDL-C [3.5(0.91) vs 3.0(1.31)mmol/L; p=0.002] than older patients. There were no significant difference in HDL-C between both groups [1.0mmol/L; p=0.635]. Significantly more young AMI patients presented with admission LDL-C≥2.6mmol/L, as compared to older patients (86.7% vs 61.0%; p<0.001). Patients who were active smokers (OR=10.16;95%CI=4.85-21.3; p<0.001) and those who had no prior LLA (OR=3.34;95%CI=1.54-7.25; p=0.002) were associated with MI presented at≤55 years.

Conclusions: Majority of young AMI patients had no documented hyperlipidemia and were not on any LLA prior to admission. They presented with significantly more lipid abnormalities as compared to older patients, highlighting the importance of primary prevention in this group of patients.

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Clinical Depression Among Post-acute Coronary Syndrome (ACS) Patients: A Prospective Single Tertiary Centre Analysis

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Background: Clinical depression is a known consequence of acute coronary syndrome (ACS). It is also known to carry an adverse outcome among these patients. Despite this, it is often under-recognized.

Objective: To investigate the prevalence of depression in post-ACS patients and factors associated with it.

Materials and Methods: Prospective cohort study conducted on 95 ACS patients admitted to cardiology ward University Malaya Medical Centre. Data collected with consent from patients through electronic medical record and PHQ-9, MAQ questionnaires. Depression outcome at 30-day obtained from hospital records and via phone call to the patient. Data analysed using SPSS 24.0. Chi-square test was used for comparison of categorical variables and independent t-test and Mann-Whitney U tests was used for comparison of continuous variables. Binary logistic regression was used to determine the independent associated factors for depression after adjusted with significant demographic variables and clinical characteristics. The strength of this association was presented in odds ratio (OR) and 95% confidence interval (CI). The significance level adopted was 0.05.

Results: Mean age of the study population is 60 years old. 72.6% were male and 27.4% female. Symptoms of depression (mild to severe) were present in 88.4% patients at baseline. Among the depressed patients, 22.6% of the patients were found to be severely depressed, 14.3% moderately-severely depressed, 15.5% moderately depressed, 27.4% mildly depressed and 20.2% minimally depressed. Depression at 30-day post discharge is more likely in women, diabetics and dialysis patients (p = 0.024, p = 0.001, p = 0.008 respectively). Patients with baseline moderate to severe depression are more likely to have moderate to severe depression at 30 days (p = 0.001). Patients with low adherence to medications at 30 days reported moderate to severe depression at 30 days (p = 0.007). Baseline depression is the strongest predictor of 30 days depression. Increase in one unit of PHQ-9 baseline score, the risk of developing severe depression after 30 days is increased by 29%.

Conclusions: Clinical depression is prevalent in our post-ACS patients. Associated factors are female gender, diabetics and dialysis patients. Depression at baseline predicts clinical depression at 30-day post discharge and is associated with low adherence to their medications.

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A Novel Local Machine Learning Algorithm to Predict Death in ACS Patients

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Background: Risk stratification for ACS patients allows for optimal treatment strategy. Current available scores derived from Western population may not be specific for Malaysia. Possible alternatives such as machine learning based models that are more patient specific could be used together with conventional risk scoring methods to predict mortality.

Objective: To determine feasibility of applying patient specific machine learning models consisting of comorbid diseases, lifestyle and demographic characteristics in predicting mortality after myocardial infarction (MI) in a Malaysian population. We aim to identify the significant variables in predicting mortality using a Malaysian population sample data set.

Methods: The study was conducted using University Technology Mara (UiTM) registry data from 600 patients with myocardial infarction 2013 to 2015. The Random Forrest (RF) is a non-linear model that constructs an ensemble of decision trees. RF variable importance feature and clinical input was used to identify significant variables in prediction of survival after MI. Primary outcome for model performance evaluation was AUROC on the untouched test set after the model development on the training set using full (42) predictor set. Secondary RF models were derived using varying predictor sets identified from RF model importance method.

Results: Patients specific RF models developed reported AUC value as follows: diabetes (AUC = 0.758, 6 predictors), hypertension (AUC = 0.879, 6 predictors), smoker (AUC 0.89 , 7 predictors), older patients (>65 years old) (AUC = 0.735 , 10 predictors) and female patients (AUC = 0.984, 11 predictors). Common predictor identified across all models was troponin.

Conclusions: This is the first Machine Learning algorithm using Malaysian dataset to predict mortality in patients with ACS. This is essential for identifying high-risk patients. Future study will incorporate larger data set to validate findings and comparison with existing conventional risk scoring methods.

Keywords: Cardiovascular disease; Prediction; Myocardial infarction; Machine learning; Random Forest

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Clinical Outcome and Predictors of Cardiovascular Event In Patients With Post Acute Coronary Syndrome


Hospital Serdang

Background: The incidence of cardiovascular events after Acute Coronary Syndrome (ACS) are among the most widely studied area in cardiology. Unfortunately, information regarding this field is still lacking from local data. Moreover, there is limited study on the predictors in determining adverse cardiovascular event post ACS. In a cohort of ACS patients, we investigated the risk of cardiovascular events during hospiatalisation and after discharge in the first year of ACS and to determine the predictors of cardiovascular event after ACS.

Objective: The primary objective of this study is to assess the incidence of cardiovascular events and to further determine predictors of cardiovascular event post ACS.

Materials and Method: A retrospective observational study was performed among patients diagnosed as ACS. A total of 457 patients who were admitted from 1st January till 31st January 2016 were recruited. The record were obtained by using healthcare records from Hospital Serdang. In this study, we define cardiovascular events as 1) composite of death, 2) recurrence ACS, 3) stroke and 4) stent thrombosis.
Result: A total of 457 patients were included in this study. Cardiovascular events occurred in 5.0% (n=23) during hospitalisation and 20.6% (n=94) after discharge. Ischemic heart disease (IHD) was found to be an independent predictor for cardiovascular event following ACS (adjusted odds ratio (OR) 1.87%; 95% confidence interval (CI) 1.01-3.47; p=0.47).

Conclusion: The risk of recurrence of cardiovascular events remains high after ACS. From our study, we concluded that the incidence of cardiovascular events post ACS is 20.6%. Results also showed patients with underlying IHD is an independent predictor of subsequent cardiovascular event post ACS.

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46. Feasibility of Outpatient Smartphone Electrocardiogram After a Cerebral Ischemic Event


Background: Smartphone electrocardiogram detection of Atrial Fibrillation (AF) has been demonstrated to be accurate and feasible in large community screening for AF under the supervision of healthcare providers. However, the performance of Smartphone Electrocardiogram recording in outpatient setting, especially in patient after stroke is unknown.

Objectives: (1) To assess the feasibility and adherence of outpatient smartphone electrocardiogram monitoring for 30 days (2) To assess the quality of electrocardiogram recording in outpatient basis without supervision.

Methods: A total of 2336 electrocardiograms were recorded from 38 patients with cryptogenic stroke using Kardia Mobile Cardiac Monitor (KMCM) (AliveCor®, Mountain View, CA). The KMCM is a pocket-sized smartphone electrocardiogram recorder that is used together with a mobile device application. The user places 2 fingers from each hand on the monitor for 30 seconds to take an electrocardiogram recording. The KMCM can then generate report of the electrocardiogram as Normal, Possible Atrial Fibrillation or Unreadable. In this study, patients were instructed to record electrocardiogram 3 times a day for 30 days. The adherence, quality of electrocardiogram and false positive atrial fibrillation was described.

Results: Mean adherence to smartphone electrocardiogram recording of 3 time a day for 30 days was 54.88±30.65%. Out of the 2336 electrocardiograms, 1951(83.56%) were reported as Normal, 331(14.17%) were Unreadable, and 54(2.31%) were reported as possible AF. Out of the 54 electrocardiogram of possible AF, 43 (79.63%) were false positive for AF and 11(20.37%) were true positive for AF. Mean adherence per patient per week showed a steady decline across the duration of KMCM recording (week 1: 62.53%; week 2: 56.51%; week 3: 52.87%; week 4: 42.41%) The mean number of non-interpretable electrocardiograms per patient per week were steady across the duration of KMCM recording (week 1: 2.7; week 2: 2.0; week 3: 1.8; week 4: 2.2).

Conclusions: Outpatient electrocardiogram recording using smartphone was feasible in patients with cryptogenic stroke. Generally, the quality of the smartphone electrocardiogram was good.

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47. Depression, Anxiety, Knowledge, Beliefs About Medication and Quality of Life Among Newly Anticoagulated Atrial Fibrillation Patients

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Introduction: Studies have reported psychological distress and poor knowledge among anticoagulated patients with AF. This may influence their quality of life and acceptance of anticoagulation therapy.

Objective: To assess patients’ level of depression, anxiety, knowledge of AF and its treatment, beliefs about medication and quality of life using validated questionnaires at baseline and 6-months follow up.

Methods: The Patient Health Questionnaire-9 (PHQ-9), Generalised Anxiety Disorder-7 (GAD-7), AF (knowledge scale, Beliefs about medication (BMQ) and Atrial Fibrillation Effect on Quality of Life (AFEQT) questionnaires were completed by 139 and 105 newly anticoagulated (either warfarin or a NOAC) AF patients, at baseline and six months follow up, respectively. The change in scores between baseline and follow-up were analysed in those who completed the questionnaires at both time points (n=105). The overall mean (SD) age was 72.0 (8.5), 43.9% female and 88.6% White ethnicity.

Results: At baseline, the overall median (IQR) depression and anxiety scores were 4.0 (1.0-8.0) and 1.0 (0-5.0), respectively. The mean (SD) AF knowledge score was 5.7 (1.7). Patients had positive perceptions about their medications evident by the mean (SD) positive necessity-concern differential 5.8 (4.1) and poor overall quality of life score, 66.7 (53.7-77.8). There were no significant differences in the scores for depression, anxiety and beliefs about medication over time. However, significantly higher proportions of patients answered correctly in the question assessing the consequences of AF and symptoms of AF improved at follow up compared to baseline (88.6% vs. 50.5%; p=0.001) and the symptoms score from the AFEQT questionnaire had significantly improved at follow-up compared to baseline (83.3 vs. 79.2; p=0.02), respectively.

Conclusion: Newly anticoagulated AF patients appear to have low levels of anxiety, depression, poor AF knowledge, positive perceptions about their medication and poor overall quality of life at baseline and these parameters remained the same 6-months later. However, significantly more patients were aware of the consequences of AF and symptoms of AF improved at follow up.

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48. Wolff-Parkinson-White Syndrome: Too Excited for Loss of Pre-excitation?

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Introduction: Wolff-Parkinson-White Syndrome (WPW) is characterized by pre-excitation on resting electrocardiogram and tachyarrhythmia. Thirty percent of WPW patients have concomitant Atrial fibrillation (AF) which can present with pre-excited AF that may degenerate into life threatening Ventricular Fibrillation.

Guidelines have suggested the use of exercise stress test to risk stratify WPW to look for the effective refractory period of the accessory pathway conduction. Loss of pre-excitation during exercise stress test makes pre-excited AF and therefore Ventricular Fibrillation unlikely. However, we illustrated a case of WPW that contradict such recommendation.

Result: A 38-year-old gentleman who was premorbid well, presented with epigastric pain for one week associated with reduced effort tolerance. He had no family history of sudden cardiac death. Upon arrival to the emergency department, he was hemodynamically stable. Electrocardiogram (ECG) while on Amiodarone showed atrial flutter with 2:1 block at a rate of 150 bpm and loss of pre-excitation. Cardiac monitor showed atrial flutter with 2:1 block at a rate of 150 bpm and loss of pre-excitation.

He was planned for cardioversion but was first intubated for respiratory distress. However, the repeated ECG post intubation showed sinus rhythm with pre-excitation syndrome. Echocardiogram showed no congenital defect. He was started on intravenous (IV) Amiodarone. Shortly after IV Amiodarone, he developed increasing breathlessness and sweaty. ECG repeated while he was on Amiodarone showed atrial fibrillation (AF) which can present with pre-excited AF that may degenerate into life threatening Ventricular Fibrillation. Interestingly, the ECG repeated while he was on Amiodarone showed rate controlled AF with loss of pre-excitation. Urgent electrophysiology study confirmed orthodromic reentry tachycardia via left sided posterior mitral valve annulus accessory pathway. Radiofrequency ablation was done with the repeated electrocardiogram showing sinus rhythm and our patient remained asymptomatic since then.

Conclusion: Pre-excitation syndrome can be life threatening. Loss of pre-excitation may not be a good indicator for low risk stratification. Loss of pre-excitation on surface ECG may be due to latent accessory pathway or other factors that alter the in-vivo conduction property of the accessory pathway. Thus, we suggest electrophysiology study and radiofrequency ablation should be the definitive therapy in all patients with pre-excitation syndrome.

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51. Left Ventricular Thrombus: Patient Characteristics and Treatment from a Single Tertiary Centre's Experience


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Background: In an era of primary percutaneous coronary intervention (PCI) and fibrinolysis we anticipate lesser prevalence of ischaemic heart disease with poor ejection fraction. However, in developing countries where accessibility of primary PCI remains limited, patients presenting with acute ST elevation myocardial infarction (STEMI) continues to suffer from sequel of reduced ejection fraction (EF) heart failure. An important complication of reduced EF is formation of left ventricular (LV) thrombus in areas of akinesia or hypokinesia. Embolic events occur in 10–40% of these patients without anticoagulation, causing devastating impact on them.

Objective: The objective of our study is to report the number of LV thrombus in our patient cohort and to study their characteristics and treatment arms.

Methods: This is a retrospective study, where all patients that attended for echocardiography were studied. Patients were studied between January 2017 to December 2018. Patients with LV thrombus were initiated on treatment if appropriate, and were given regular echocardiography follow up at three-monthly interval till thrombus resolution.

Results: Out of a total of 5417 echocardiography done in our non invasive lab, we detected 23 patients with LV thrombus over the 24 months period. There was male predominance at 73.9% (17),
with mean age of 55 ± 9.6 years. 20 patients had ischaemic heart disease with two other thyroid cardiomyopathy and one spontaneous coronary artery dissection. Mean EF was 30.8% ± 10.6. 12 patients (52.2%) had diabetes, 13 (56.5%) had hypertension, five (21.7%) had chronic kidney disease and five (21.7%) had previous stroke or transient ischaemic attacks. 18 patients were given warfarin therapy while five were put on direct oral anticoagulants (DOACs) (three on dabigatran, two on rivaroxaban). Thrombus resolution occurred in four out of 23 patients, with mean time to resolution of 94.5±70.5 days. Of the four resolution, three were on warfarin.

Conclusion: LV thrombus remains under reported in patients with systolic dysfunction, rendering them vulnerable to cardio-embolic event without anticoagulation. Off label use of DOACs in LV thrombus has not been proven to be non inferior to warfarin. Further controlled studies are necessary to ascertain the efficacy and safety of LV thrombus treatment with DOACs.

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52. The TIMI Risk Scoring for Acute Coronary Syndrome Patients Managed in Hospital Putrajaya - A Retrospective Review

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Background: The Thrombolysis in Myocardial Infarction (TIMI) risk score for ST-elevation myocardial infarction (STEMI), Non-ST elevation myocardial infarction (NSTEMI) and unstable angina (UA) is a simple integer score for bedside risk assessment of patients with acute coronary syndrome (ACS). Early risk stratification at admission seems to be essential for a tailored therapeutic strategy.

Objectives: To describe the characteristics of TIMI risk score among the ACS patients managed in hospital Putrajaya and to determine admission triaging to either general ward or coronary care unit (CCU).

Methods: This is a retrospective review of patients with the diagnosis of ACS from September to December 2016.

Results: A total of 97 cases were reviewed; 26% (n=25) STEMI, 31% (n=30) NSTEMI and 43% (n=42) UA. Majority of patients were males 77% (n=75). Mean age at diagnosis were 57.55 (+ SD: 12.6) years; males 77% (n=75). Mean age at diagnosis were 57.55 (+ SD: 12.6) years; males 77% (n=75) females 60.68 years (+ SD: 13.5). Cardiac risk factors were hypertension (28%), diabetes (19%), hyperlipidemia (23%), family history of coronary artery disease (12%) and smoking (18%). 45% (n=44) of cases had 3 or more cardiac risk factors, 30% (n=29) had 2 risk factors, 18% (n=17) had only one and 7% (n=7) had no risk factors identified. Majority patients (30.5%, n: 22) with unstable angina and NSTEMI has TIMI score of 3. Mean age for STEMI patients were 56.52(+ 12.217) years and mean TIMI score were 4.04 (+ 1.369). Noted 96.8% (n: 62) patients with UA/NSTEMI with TIMI score of intermediate and high were admitted to general ward and only 3.2% (n:2) patients were admitted to CCU. Meanwhile 5 (20%) patients with STEMI were admitted to the ward following thrombolysis in emergency department.

Conclusion: Majority of ACS patients were in the intermediate and high risk category based on TIMI risk score. Most of the patients with TIMI risk score of intermediate and high were admitted to general ward instead of CCU. Not all patient with STEMI managed to do primary coronary intervention under STEMI network Hospital Serdang as patient were admitted after office hours.

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53. Comparison of Diastolic Function in Professional Footballers and Amateur Sportsman


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Background: Morphologic left ventricular (LV) changes in athletes are associated with altered diastolic properties.

Objective: Non athletes who regularly exercise and compete in regular amateur team sports competition may have the same altered diastolic properties, but this has never been investigated.

Materials and Methods: A total of 20 male professional footballers competing in the Malaysian Premier League and 25 male non-athletes from an amateur rugby club, free of cardiovascular disease underwent 2D echocardiography, doppler echocardiography and doppler tissue imaging.

Results: The footballers had a significantly higher LV ejection fraction (62% ± 5 vs 58% ± 8, P value <0.05) The footballers had a significantly lower E velocities compared to non-athletes (85.6 cm/sec ±15 vs 94 cm/sec ±16 p<0.05) but no significantly different A velocities (37.6 cm/sec ± 8.1 vs 40.6 cm/sec ±10.2) and no significant difference in E/A ratio (2.36 cm/sec ± 0.65 vs 2.47 cm/sec ± 0.76). There were also no difference in doppler tissue imaging septal e′ (12.8 cm/sec ± 2.1 vs 13.2 cm/sec ± 3.1 ) and a′ (6.5 cm/sec ± 1.1 vs 6.3 cm/sec ± 1.5)

Conclusion: In these two group, higher intensity and a scheduled training routine results in a lower E velocity. These values could be used in the clinical assessment of Malaysian athletes and also those who enter amateur sports events in Malaysia and would be useful in understanding the physiologic cardiac adaptations in these two cohorts.

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54. Use of DAPT Score in Malaysian Population


Universiti Teknologi MARA

Background: Dual anti platelet is a standard treatment for patient who has undergone percutaneous coronary intervention with a drug eluting stent. Current evidence suggests that dual anti-platelet mitigates the risk of stent thrombosis across the whole spectrum, from acute to very late events.

Objective: However, a prolonged duration of double anti-platelet increases the risk of bleeding, therefore the DAPT score is used as a tool to predict ischaemia vs bleeding.

Materials and Method: We performed an observational prospective study of patients who underwent PCI between 2013 to 2018 in UiTM Medical Specialist Centre, Sg Buloh.

Result: There were 1590 patients who underwent PCI between 2013 to 2017. 95% of patients received dual anti-platelet consisting of aspirin and clopidogrel while 4.1% received aspirin and ticagrelor. A further 0.9% received triple therapy consisting of aspirin, clopidogrel and an anticoagulant. The mean time on dual anti-platelet is for the high DAPT score was 14 months, while those in the low DAPT score was 12 months. There was a total of higher number
of patients in the high DAPT score group (1370) and lower number in the low DAPT score group (220). In the high DAPT score group, there were 4 patients who had upper GI bleed, compared to 1 patient in the low DAPT score group.

**Conclusion:** This study shows, that even though the patients were in the high DAPT score group, there were still on standard double anti-platelet duration (mean of 14 months) while the low DAPT group, the mean DAPT duration is 12 months. Although there was a significant difference in the numbers of upper GI bleed incidence between the two groups (p-value of <0.001), but the duration of DAPT is not significantly different. DAPT score may not be sensitive for Malaysian population and a more sensitive score is needed for this population.

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### 55. Infective Endocarditis: A Six Year Observational Study in a Secondary Care Hospital in Malaysia

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**Introduction:** Infective endocarditis (IE) is an uncommon infection with an annual incidence ranging from 3 to 7 per 100000 person years. However, the in-hospital mortality rate of IE is high, ranging from 15 to 30%.

**Methods:** Data was extracted from Medical Record Unit, Sibu Hospital. A total of 23 patients with diagnosis of IE from 1st January 2012 to 31st December 2017 were identified. Clinicoepidemiologic features, blood culture, complications and outcome are recorded onto a case report form.

**Results:** 60.9% of the cohort were male. The mean age was 46.7 (+/- 18) years. Major predisposing cardiac risk factors were cyanotic congenital heart disease (17.4%), rheumatic heart disease (8.7%) and previous history of IE (4.3%). Mean duration of symptoms before presentation was 29 (+/- 39) days. Blood culture was positive in 78.9% (n=18) patients. Staphylococci (34.8%) and Streptococci (34.8%) were the most prevalent organisms. Mitral valve was the most commonly affected (65.2%, n = 15), followed by tricuspid valve (21.7%), aortic valve (8.7%) and pulmonary valve (4.3%). Vegetation was seen on transthoracic echocardiogram in 19 (82.6%) of patients. Vegetation size of more than 15mm had a significantly higher percentage of complications 57.1% vs 42.8% (p=0.03). 60.9% of patients developed complications of IE. Systemic embolism was the most common complication (43%, n=10), followed by heart failure (34.8%, n=8), hospital acquired infection (30.4%, n=7) and acute kidney injury (17.4%, n=4). 6 (26.1%) patients required valve replacement. The inpatient mortality was 13%. The follow up at 1 year showed 26.1% of patients with NYHA class 1, 21.7% with NYHA class 2, 8.7% with NYHA class 3. 1 patient passed away of unknown cause and 3 patients had recurrent IE.

**Discussion / Conclusion:** IE is not common in our population. However it carries significant mortality and morbidity, with systemic embolism being the most common complications. A prospective study on IE conducted by Murdoch et al. showed that systemic embolism is the most common complication followed by heart failure, which is consistent with our cohort. The size of vegetation may predict complications and should prompt early referral for surgical intervention.

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### 56. Characteristics and Outcome of Patients with Infective Endocarditis in Hospital Selayang in 2018

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**Background:** Infective endocarditis (IE) is a significant clinical problem and remains a diagnostic and therapeutic challenge.

**Objective:** This study evaluates the characteristics and outcome of patients with infective endocarditis who presented to Hospital Selayang from January 2018 to December 2018.

**Materials & Methods:** This is a retrospective electronic medical record review of inpatients diagnosed with infective endocarditis using the modified Duke criteria. The outcome measured include IE complications (heart failure, embolic events), need for cardiothoracic intervention and in-hospital mortality rate.

**Results:** There were 26 patients in this study cohort, with male preponderance of 80.8%. The median age of study subjects is 49 (interquartile range: IQR 24.25). One third of our patients had preexisting structural heart conditions that predispose them to IE. Majority of patients (92.3%) had native valve endocarditis. The commonest valve affected is the mitral valve (50%). Culture positive IE accounts for 73% of cases, of which Streptococcus was the commonest organism (31.6%), followed by methicillin-sensitive Staphylococcus Aureus (21%) and Enterococcus fecalis (21%). Embolic events were reported in 26.9% of patients, and 34.6% developed heart failure. The median length of stay was 45 days. 38.5% of patients were referred for surgical intervention. In-hospital mortality rate is as high as 34.6%.

**Conclusions:** Infective endocarditis carries high morbidity and mortality. Early recognition of this clinical entity requires high index of clinical suspicion and is crucial, as timely antibiotic therapy with or without cardiothoracic intervention is critical for a favourable outcome.

**Keywords:** infective endocarditis, outcome, mortality
doi:10.1016/j.ijcard.2019.11.061

### 57. Heart Failure Admissions and its Associated Factors, Complications and Treatment


**Introduction:** Heart failure (HF) is a complex clinical syndrome in which abnormal heart function results in clinical symptoms and signs of reduced cardiac output.

**Objective:** To describe the factors associated with HF admissions, complications and treatment of the condition.

**Methods:** A retrospective analysis of all HF admissions to Hospital Putrajaya and Hospital Angkatan Tentera Tuanku Mizan, Kuala Lumpur

**Results:** There were a total of 187 admissions for HF; 57.8% (n=108) from HATTM and 43.3% (n=79) from Hospital Putrajaya. Majority of patients were males 55.6%(n=104) and Malays (82.9%, n=155). Median age of the patients is 64 (IQR 16) years old with
male 62 (IQR 16) and female 67 (IQR 18). The diagnosis of heart failure were classified as congestive cardiac failure 63.6% (n=117), left ventricular failure 25.5% (n=47), right ventricular failure 7.6% (n=14) and acute pulmonary oedema 3.3% (n=6). Decompensated HF was the frequent cause of HF admissions 75.3% (n=140) compared to acute HF with 24.7% (n=47). 60.5% (n=98) have left ventricular (LV) systolic dysfunction on echocardiogram, 27.8% (n=45) have LV diastolic dysfunction and 11.7% (n=19) have right ventricular dysfunction. Causes of HF were coronary artery disease 54.8% (n=102), hypertensive heart disease 51.6% (n=96), valvular heart disease 16.1% (n=30), pulmonary disease 17.7% (n=33), sleep apnoea 7% (n=13) and congenital heart disease 0.5% (n=1). Risk factors for HF include hypertension 87.2% (n=156), diabetes 67.6% (n=121), smoking 31.8% (n=57), obesity 25.1% (n=45), anaemia 19% (n=34) and thyroid disease 6.1% (n=11). Majority of HF patients developed renal dysfunction 57% (n=73), arrhythmias 50% (n=64), liver dysfunction 20.3% (n=26) and cerebral ischaemia 10.2% (n=13). HF treatment included diuretics 93.5% (n=173), beta-blockers 70.3% (n=130), ACE inhibitors 45.4% (n=84), spironolactone 20.5% (n=38), angiotensin II receptor blockers 16.2% (n=30), trimetazidine 16.2% (n=30), F-channel blockers 14.1% (n=26), and vasodilators 13% (n=24). The majority (61.9%, n=112) had single admission for HF per year; 25.4% (n=46) had two readmissions per year, and 12.7% (n=21) had ≥ 3 readmissions per year.

**Conclusion:** Congestive cardiac failure made up the majority of HF admissions. Coronary artery disease and hypertensive heart disease were common causes of HF. Renal dysfunction and arrhythmias were frequent complications. Majority of patients were treated with diuretics and beta-blockers but less than half received ACE inhibitors. More than a third of the patients had recurrent admissions for HF.

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### 58. Non-cardiovascular Causes of Death in Patients with Chronic Heart Failure

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**Introduction:** Despite progress in management of heart failure, the burden of heart failure is increasing from morbidity and mortality aspects. Unfortunately, there is no study done locally to date to define the underlying non-cardiovascular (CV) causes of death and its significant contribution towards death incidence among heart failure patients.

**Objectives:** To identify the incidence of mortality and non-CV cause of death among chronic heart failure patient.

**Methods:** This was a retrospective single center study conducted in UiTM Medical Specialist Center, Sg Buloh. Transthoracic echocardiography reports between 2013-2015 were reviewed and those with documented ejection fraction of less than 45% were included in the study. The demographic details were recorded from patient’s medical charts. Each of the identified individuals data were sent to Clinical Research Centre in Hospital Kuala Lumpur for data matching with official national death record system from 2013-2016.

**Results:** There were 1177 patients with chronic heart failure identified with 80% of them were has LVEF <40%. Over maximal 4 years period of follow up, there were one third (32.6% (n=88/270)) of death incidence due to non-CV causes. They are significantly older with mean age of death at 63.6±11.7 years (Mean age of death for cardiovascular cause group 59.8±10.2 years, p value=0.05) and majority (70%) of them are male. The leading cause is sepsis (60.2%) followed by functional decline (14.7%), malignancy (13.6%) and upper gastrointestinal bleed (12.5%). Gender and left ventricular systolic ejection fraction variation are not variables predictor for the underlying mode of death.

**Conclusion:** The non-CV causes disease has a significant contribution towards incidence of death in heart failure with reduced ejection fraction (HFrEF) and comparable to published clinical trial dataset. Data from current study also are consistent with published non-CV causes of death among heart failure with preserved ejection fraction (HFpEF) cohort. This study has uniquely highlighted the higher incidence of sepsis among Malaysian with HFpEF leading to death. However cumulative incidence of malignancy is relatively similar when compared to HFrEF in Framingham cohort but markedly lower when compared to HFpEF population.


### 59. A Contemporary Review of Percutaneous Trans-septal Mitral Commissurotomy (PTMC) Outcomes Amongst 41 Mitral Stenosis Patients in Borne on Malaysia


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**Background:** Percutaneous Trans-septal Mitral Commissurotomy (PTMC) is a nonsurgical, catheter-based treatment for rheumatic mitral stenosis. However, the indication depends on the severity and morphology of the mitral valves. In Malaysia, although rheumatic heart disease is still prevalent, the number of reported PTMC among tertiary heart centres are on decline. This pose challenge to maintain training and competence in PTMC among interventional cardiologists.

**Objectives:** To review the procedural and clinical outcome of PTMC among patients with mitral stenosis. Methods: It is a retrospective, single centre study. We reviewed a total of 41 patients who underwent PTMC from 2012-2018. Patient characteristic and echocardiographic variables were recorded at baseline, and compared post procedure. Clinical outcome at hospital discharge were assessed. Procedural success is defined as achievement of the following: mitral valve area (MVA) >1.5cm² and the absence of moderate/ severe mitral regurgitation (MR).

**Results:** Of the 41 patients, 63% female; age range 19-67 year-old, mean of 39.5. Atrial fibrillation noted in 46%. History of stroke in 27%. Wilkens score <8 in 95%. Majority of procedure was performed on elective basis, with a few patients in pregnancy. PTMC were performed using the Inoue balloons. The mean MVA increased from baseline of 0.83cm² to 1.57cm². Seventy one percent of patients achieved MVA >1.5 cm². The mean trans-mitrail pressure gradient (TMPG) reduced from baseline 14.6mmHg to 6.38mmHg. Only 1 patient developed moderate MR. Therefore, overall procedural success is 68%. Among those patients whom did not achieve MVA >1.5cm², the baseline MVA was statistically smaller, 0.8cm² vs 0.85cm² (p = 0.014). With regards to clinical outcome, one mortality due to catheter induced left atrial perforation. Percidical tamponade observed in one patient. Otherwise, no other complications observed including stroke, arrhythmia and vascular site complication.

**Conclusions:** Our review showed procedural success of PTMC among mitral stenosis was 68%. High clinical success in majority of patients with few complications and low mortality.

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Percutaneous Coronary Intervention during Index Admission versus Pharmaco-invasive Strategy for Patients with Acute ST-Elevation Myocardial Infarction


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Background: The pharmaco-invasive strategy is one of the standards of care in patients with ST-elevation myocardial infarction (STEMI) but the optimal timing may not be achieved due to limitations. Hence a considerable number of patients underwent percutaneous coronary intervention (PCI) at a later timing during their index hospitalization. However, little evidence is available on the outcomes of this strategy.

Objective: This study aimed to compare the clinical outcomes of PCI during index admission with a pharmaco-invasive strategy for patients with STEMI.

Materials & Methods: This retrospective cohort study was conducted at Hospital University Sains Malaysia which is a tertiary care centre. Medical records of all STEMI patients who had PCI in the same admission from January 2013 to March 2018 were retrieved. Patients were divided into two groups: Pharmaco-invasive strategy group in which PCI was done up to 48hrs post fibrinolysis and PCI during index admission group that was done beyond 48 hrs of STEMI onset until patient’s discharge. The clinical outcomes of this study were the rate of Major Adverse Cardiac Event (MACE) and major bleeding at 30 days and six months post-PCI.

Results: A total of 91 STEMI patients were analysed. Twenty-nine (31.9%) patients were treated by pharmaco-invasive strategy and 62 (68.1%) patients underwent PCI during their index admission. At 30 days post PCI, the rate of MACE in the pharmaco-invasive and PCI during index admission group was 10.7% vs. 10.3% respectively (p = 0.958). While at six months it was 8.3% vs. 7.8% respectively (p = 0.94). The rate of major bleeding at 30 days was one (3.6%) vs. none respectively (p = 0.151) whereas, at six months, it occurred only in one patient (2.0%) of the PCI during index admission group.

Conclusions: The results suggest that PCI during index admission had similar clinical outcomes compared to the pharmaco-invasive strategy.

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Echocardiographic Quantification of Aortic Regurgitation in Transcatheter Valves: A Need for Refinement


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Background: Mild aortic regurgitation (AR) following transcatheter aortic valve implantation (TAVI) has been associated with a poor prognosis.

Objective: To improve understanding as to the pathophysiological mechanisms underlying this observation.

Methods: This study included 57 of 61 patients who underwent TAVI between November 2009 to July 2017. AR severity was defined irrespective of different mechanisms and types of transcatheter valve prosthesis. AR severity was determined from transthoracic echocardiogram based on the recommendations of VARC-II criteria and the EACVI/ASE. The AR-end-diastolic pressure drop (which reflects the coronary pressure head), total isovolumic time and left ventricular filling time (which reflects asynchrony and time for coronary filling), as well as diastolic dysfunction (which reflects left ventricular filling pressure) were also reviewed.

Results: 28 had none-to-trace AR, 26 had mild AR, and 3 had more than mild AR. A striking association was found between the severity of AR and diastolic dysfunction. The Pearson CHI-Square test was employed as a 3x3 test to evaluate AR severity grade grouped into none-to-trace, mild, and more than mild -versus- diastolic dysfunction grades 1, 2 and 3 showed p=0.024 (p<0.05). When a 2x2 test to evaluate AR severity grade grouped into no AR & AR present – versus – diastolic dysfunction grades 1 (physiological for age) and combination of grades 2 & 3 (likely raised left ventricular filling pressure), this showed an even greater association p=0.012 (p<0.05).

Conclusions: This analysis demonstrated that incremental degree of AR exerts significant haemodynamic effects, and even any trace degree of AR has haemodynamic implications. This supports the observation that mild AR has consequences that can erode the clinical benefit of TAVI. The quantification used to assess AR in native valves should not be applied to TAVI patients. We suggest to refine AR assessment in TAVI to include haemodynamic significance rather than just volumetric parameters. The physiological effect of AR on stiff ventricles following TAVI, in patients with previously stenotic valve, is very different from the physiological effect of native aortic valve regurgitation into dilated compliant ventricle. AR following TAVI may be mild in volume, but could be severe in haemodynamic and prognostic significance.

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Effects of Different Volume of Resistance Training on Bioimpedance Phase Angle, Muscular Strength, and Quality of Life among Diabetes Patients

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Background: Resistance training is now emerging as one way to manage the complications of diabetes mellitus. Different training volume may produce different effect size on muscular strength and quality of life of diabetic patients. Bioelectrical impedance which being used as biomarker for cancer and heart disease could also be a potential biomarker for diabetes mellitus through the value of phase angle by measuring integrity of cell membranes and function of cells.

Objective: The purpose of this randomized controlled trial is to compare the effects of two different resistance training volume on bioelectrical impedance phase angle, muscular strength, and quality of life after 12 weeks of training among patients with type 2 diabetes mellitus.

Materials & Methods: Thirty-three type 2 diabetes mellitus patients age 30-60 years old will be assigned randomly into 2 groups of resistance training: high-volume resistance training group (n = 11, 3 sets, 70% of the estimated one repetition maximum, perform until volitional muscular fatigue), low-volume resistance training group (n = 11, single set, 70% of the estimated one repetition maximum, perform until volitional muscular fatigue) and control group (n = 11). Bioelectrical impedance phase angle, muscular strength, and quality of life will be measured at the beginning, middle and end of the study.

Results: Two-way ANOVA with α = 0.05 will be used to analyze data collected in this study. This method will compare the baseline with the middle and post intervention data for every groups and will also compare both data between control and intervention groups.
Conclusions: Outcome of this study will determine the optimal dose and volume of resistance training for diabetic patients and determine the reliability of bioelectrical impedance phase angle as a biomarker to monitor diabetes complications.

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63. Strengthening Exercises for Functional Improvement in Respiratory Disorder - Randomized Control Trial

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Background: Even though exercises included in Conventional Pulmonary rehabilitation, effects of strengthening exercises on endurance and functional improvement is not clearly outlined.

Objective: This study has been conducted to analyze the effects of strengthening exercises added with conventional pulmonary rehabilitation for patients with respiratory disorders.

Materials & Methods: Thirty patients with respiratory disorders ranging from mild to moderate level were selected by randomization. Control group has been applied with Conventional Pulmonary Rehabilitation (CPR) techniques of Breathing exercises, thoracic expansion exercises and spirometric exercises. The interventional group is applied with strengthening exercise of Upper Limb and Lower Limb with Conventional Pulmonary Rehabilitation (SCPR). The CPR protocol is applied for 30–45 minutes per session for 12 weeks and SCPR protocol is applied for 45–60 minutes of sessions with weight loaded equipment with weights vary from 5 kg to 25 kg with 60 repetitions for 12 weeks. MRC breathless scale and 6 Minute walk test have been used as Measuring tools pre and post- exercise sessions. All the 30 patients completed the activity for 12 weeks as a study group.

Results: 6 Minute walk test have shown significant improvement in both groups (p < 0.05), but SCPR group has shown better improvement p (30 ± 10% versus 12 ± 10% [mean ± SD] in the CPR group, p < 0.005). Strengthening of upper and lower limb muscles has been noted as a factor increases the endurance in MRC breathless score as 20 ± 10% (p < 0.001) in SCPR, but CPR group has shown very lower level of improvement in endurance (5 ± 8% p > 0.05). The difference between SCPR and CPR in terms of functional improvement has been noted significantly (p < 0.01).

Conclusion: Increase in endurance by strengthening exercises has shown a better result compared to Conventional Pulmonary Rehabilitation in MRC breathless score and 6 Minute walk test. Thus the study has concluded that adding strengthening exercises with weight loaded equipment increases the endurance thereby breathless is reduced significantly in patients with respiratory disorders.

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64. Association of Diet Diversity and Lifestyle Practices with Hypertension among Adults in Klang Valley

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Background: Hypertension is one of the modifiable risk factors of cardiovascular disease and other chronic diseases.

Objective: The aims of this study is to determine the association of diet diversity and lifestyle practices with hypertension among adults in Klang valley.

Materials & Methods: A total of 334 participants were recruited from three main shopping malls in Gombak districts from May 2018 until June 2018. A structured self-administered questionnaire consisting socio-demographic background assessment, Semi-quantitative Food Frequency Questionnaire and International Physical Activity Questionnaire was used for data collection. SPSS version 25 was used for all the statistical analysis.

Results: The prevalence of hypertension was 44.6% (n = 149). The proportion of participants with low diversity of fruit consumption was significantly higher among the hypertensive group compared to non-hypertensive group (58% vs. 47%, χ2 = 4.269, p = 0.039). The binary logistic regression showed that participant with low diversity of fruit consumption is more likely to develop hypertension by 63% (OR=1.63, 95% CI= 1.04 - 2.54, p = 0.032). In addition physically inactive participants were more likely to develop hypertension by 86%, however the association was not significant (OR=1.86, 95% CI= 0.30 - 11.39, p = 0.504). Besides that, the proportion of alcohol consumption was slightly higher among hypertensive participants compared to non-hypertensive participants (7.4% vs. 5.9%).

Conclusion: Lack of diversity in consumption of fruits may contributes to hypertension. Increased the variety of fruits consumption should be advocated for the primary prevention of hypertension. Maintaining a healthy lifestyle may play indirect effect in prevention of hypertension.

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65. Is ABPM a Better Device for Monitoring Pregnancy than Sphygmomanometer?

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Background: Non-invasive ambulatory blood pressure monitoring (ABPM) are widely used to study clinical effects of circadian rhythm and blood pressure variability (BPV). BPV measures beat-to-beat BP fluctuations thus giving better understanding of the physiology and pathophysiological aspect of hypertension in both pregnant and non-pregnant women. BPV correlates with the prediction of end organ damage in hypertensive patients and it is independent from mean BP. Most of primary care clinics in Malaysia use automated office blood pressure or mercury sphygmomanometer as a standard equipment to measure BP. Which of the devices are better in managing BP in pregnancy?

Objective: To compare mean BP and BPV measured by ABPM and mercury sphygmomanometer among low risk pregnant women.

Materials & Methods: 47 low risk pregnant women from Klinik Kesihatan Ampang were included in the study. BPV was measured using ABPM at mid and third trimester for 4 hours. Prior to ABPM measurements, BP was measured using mercury sphygmomanometer thrice. Vasomedical-Biox-software (CB-1805-B) recorded BP and BPV using standard Deviation (SD) as the indices.

Results: Three (6.4%) pregnant women were complicated with hypertensive disease in pregnancy (HDP) by the 3rd trimester and another 93.6% were normotensive. Mean BP reading by ABPM has significant positive correlation with mean BP reading by sphygmomanometer for both systolic and diastolic BP (r = 0.64,
66. Epigallocatechin Gallate Supplementation Suppressed Antihypertensive Effect of Nadolol in Spontaneously Hypertensive Rats

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Background: Concurrent use of Camellia sinensis (green tea) and its main constituent, EGCC may lead to botanical-drug interactions and therefore therapeutic failure or drug toxicity. It has been reported that EGCC reduced plasma nadolol, an antihypertensive drug concentration in a normotensive model. Nevertheless, evidence on the effect of EGCC on pharmacological action of nadolol in hypertensive model has not been elucidated.

Objective: This study aims to investigate the impact of EGCC supplementation on the antihypertensive effect of nadolol in a model of essential hypertension, Spontaneously Hypertensive Rats (SHR).

Materials & Methods: Male SHR were pre-treated with oral EGCC (10 mg/kg body weight/day) for consecutive 14 days, and then followed by a single dose of oral nadolol (10 mg/kg body weight). Blood pressure was measured 8-hour after nadolol administration by using indirect tail-cuff plethysmograph method. Data were analysed using independent t-test, SPSS software version 24.

Results: Systolic blood pressure of SHR pre-treated with EGCC and received a single dose of nadolol was significantly higher than those did not pre-treated with EGCC (122.5 ± 0.55 vs 97.17 ± 3.1 mmHg, p<0.001).

Conclusions: EGCC supplementation significantly suppressed antihypertensive effect of nadolol. These evidences would be significant when considering nadolol dose adjustment or use of alternative agents for habitual green tea or EGCC consumers.

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67. The Study of Blood Hemodynamic and Thrombosis Formation in Bi-leaflet Mechanical Heart Valve of Different Configurations


Background: Bi-leaflet mechanical heart valve (MHV) device suffers from thrombosis formation issue. The abnormal blood flow through the MHV is said to be one of the factor of thrombus formation which is caused by the curvature angle design.

Objective: The study aims to investigate ramifications of the curvature angle of the bi-leaflet MHV.

Materials & Methods: The blood flow through the MHV was studied through fluid-structure interaction (FSI) technique with additional experimental work known as particle image velocimetry (PIV). A CT-scan data of the left ventricular heart was acquired and used to create a 3-D model used in the simulations. Five bi-leaflet MHV are designed with different curvature angle (no curved; 0.74° inward curved; 0.74° outward curved; 2.22° curved inward; 2.22° curved outward). For the PIV experiment, the heart model was made from Perspex blocks using CNC machining while the MHVs were made through rapid prototyping technique. Parameters such as the flow velocity, vorticity formation, wall shear and von Mises stress were compared among all leaflets configurations.

Results: For the velocity flow, Doppler velocity index (DVI) was compared for all leaflets configurations. 0.74° outward curved recorded the lowest DVI value of all configurations. The vorticity formed was the smallest in 2.22° inward curved design. In addition, the design’s wall shear was recorded the smallest as well with magnitude of 20.9 Pa. Finally, the von Mises stress experienced by the no curved leaflets configuration is the smallest of all designs.

Conclusions: The results show that the best leaflets among all designs proposed is leaflets with curvature angle of 2.22° inward curved. The design produced the smallest vorticity formation and lowest wall shear stress, which reduces the potential risk of thrombosis formation at the leaflets. Even though the DVI value obtained for this design is the third lowest among all five designs, it is still below the threshold value of possible stenosis formation for a mitral valve. The von Mises stress experienced by the leaflets is still within the elastic limit of pyrolytic carbon. Another important finding is that the von Mises stress shows the highest magnitude at the hinge regions, thus making it as a crucial region when designing the MHV.

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68. Combination of Stinging Bee Propolis and Metformin Prevented Diabetic-induced Cardiac Hypertrophy by Reducing Lipid Peroxidation: An Interplay Between AGE and esRAGE in Heart and Plasma

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Background: Diabetes mellitus accelerates accumulation of advanced glycation end-products (AGE) and eventually cardiac hypertrophy. Metformin is utilised as antidiabetic agent worldwide. Malaysian stingless bee propolis can alleviate diabetic cardiomyopathy. However, the effect of combined usage of metformin and propolis on diabetic heart is unknown.

Objectives: This study aims to identify the weight, histological and biochemical alteration of diabetic heart after combined metformin and propolis supplementation.
**Materials & Methods:** Four groups of male Sprague Dawley rats (n=8/group) was established as follows: normal control (CTR), diabetic (DM), diabetic treated with 300mg/kg/day propolis (DM+P) and diabetic treated with 300mg/kg/day metformin and 300mg/kg/day propolis (DM+Met+P). Diabetes was induced by one dose of intraperitoneal streptozotocin (60mg/kg). After four weeks, rats were weighed, blood was taken and processed, heart was harvested, weighted, processed and stained using H&E for visualisation. The remaining heart was homogenised. The homogenised heart and blood plasma were quantified for AGE, esRAGE and malondialdehyde (MDA) using commercially available kit. Data was analysed and reported where appropriate.

**Results:** Diabetic cardiomyocyte shows cellular disarray with extensive sarcoplasmic vacuolation which is normalised in DM+Met+P.

The heart weight corrected for body weight (HW/BW) for CTR, DM, DM+P and DM+Met+P are 2.7(0.4), 3.7(0.5), 2.8(0.4), 2.7(0.6) respectively; correspondingly, the heart AGE/plasma AGE ratio are 4.1(0.5), 5.2(1.1), 4.7(0.5) and 4.4(1.0) respectively; whereas heart esRAGE/plasma esRAGE ratio are 1.8 (1.0), 0.4(0.4), 0.9(0.3) and 1.4 (0.8) respectively. DM+Met+P and DM+P alleviate diabetes-induced cardiac hypertrophy as in DM group by reducing accumulation of heart AGE relative to plasma AGE. This can be explained by higher heart esRAGE relative to plasma esRAGE, thereby sequestrating heart AGE better than plasma AGE and prevented lipid peroxidation (MDA) by AGE. DM has higher MDA in heart, ng/mg compared to CTR 0.90(0.49) vs 0.56(0.16) and is normalised in DM+Met+P compared to DM+P 0.56(0.29) vs 0.72 (0.33).

**Conclusion:** Combination of stingless bee propolis and metformin exhibit cardioprotective effect on diabetic-induced cardiac hypertrophy by improving heart AGE and esRAGE relative to plasma AGE and esRAGE respectively, leading to reduction of lipid peroxidation in heart.

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**Materials & Methods:** This study used the REM sleep deprivation rat using the inverted flowerpot technique. Twenty-four (24) male Sprague–Dawley (6 – 8 weeks old) rats were used, which were equally divided into 3 groups: free-moving control rats (FMC), tank control rats (TC) and REM sleep-deprived rats (REMSd). Functionally, the aortic endothelium function was assessed using myograph study. The expression of endothelium-nitric oxide synthase (eNOS) was evaluated using Western blot. The ultrastructure of the aortic surface was observed using scanning electron microscope (SEM). The plasma levels of coagulation factors were also measured.

**Results:** In the aorta of REMsd group, there was an impaired endothelium-dependent vasorelaxation to acetylcholine with the presence of vasomotion; which absence in both control groups (FMC and TC). There was a significantly lowered of eNOS expression in REMsd as compared to FMC group. There were features of vascular endothelial damage on the aorta surface of REMsd group. Dense fibrin networks with rich interlacing and trapped red blood cells also were seen. The levels of fibrinogen and PAI-1 were significantly increased in REMsd, with significant decreased of tPA level.

**Conclusions:** This study has shown that REM sleep deprivation produced the vascular endothelial dysfunction, which may contribute to increase risk of cardiovascular disease in sleep deprivation.

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**Materials & Methods:** KitCs were isolated and magnetically sorted from 1-month (KitC1) and 18-month old (KitC18) C57/BL6N mice hearts by mechanical and enzymatic digestion. Clonal expansion of KitCs were performed by seeding the cells in 96-well plate at a density of 1 cell/2 wells. Human MSCs were isolated from Wharton Jelly as previously described. Statistical significance was determined using ANOVA with p<0.05.

**Materials & Methods:** KitCs from old mice were functionally competent for treatment needs to be answered, as most of the heart diseases affect old population.

**Objective:** Here, we assessed the in vitro functions and growth kinetics of cardiac C-kit cells (KitCs) from old mice and tested if biologically young umbilical cord mesenchymal stem cells (MSCs) could ameliorate or reverse the ageing effects on the growth kinetics of KitCs in vitro.

**Background:** Autologous stem cell therapy sparks interest and hope in regenerating damaged myocardium while avoiding immune-mediated graft rejection. However, the question whether autologous cells from aged patients is functionally competent for treatment needs to be answered, as most of the heart diseases affect old population.

**Objective:** Here, we assessed the in vitro functions and growth kinetics of cardiac C-kit cells (KitCs) from old mice and tested if biologically young umbilical cord mesenchymal stem cells (MSCs) could ameliorate or reverse the ageing effects on the growth kinetics of KitCs in vitro.

**Materials & Methods:** KitCs were isolated and magnetically sorted from 1-month (KitC1) and 18-month old (KitC18) C57/BL6N mice hearts by mechanical and enzymatic digestion. Clonal expansion of KitCs were performed by seeding the cells in 96-well plate at a density of 1 cell/2 wells. Human MSCs were isolated from Wharton Jelly as previously described. Statistical significance was determined using ANOVA with p<0.05.

**Results:** All sorted KitCs expressed SCA-1, CD105. Majority of the clonogenic KitC1 expressed CD166pos CD90low CD140neg, while clonogenic KitC18 were CD166neg CD90high CD140pos. Although clonally-expanded KitC18 showed comparable telomere length and telomerase activity to KitC1, KitC1 had higher proliferation rate with an average doubling time 17.2 ± 0.4-hr, than KitC18 which doubled every 25.0 ± 0.7-hr. Furthermore, KitC18 exhibited lower sphere formation capability, contained more senescent cells, and expressed lower gene expression, telomere length and telomerase activity and the number of senescence cells were observed in KitC18 after MSC coculture.
**Conclusions:** Clonal KitCs from the aged heart are phenotypically different from KitC from younger subjects and are functionally compromised. MSCs could improve the growth kinetics of aged KitC, but the effects were minimal.

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71. Shape Analysis of Short Axis View in Cardiac Magnetic Resonance Imaging: Cardiomyopathy Case Studies

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Background: Cardiac Magnetic Resonance (CMR) Imaging is a main modality to capture volumetric anatomical structures and functions of the heart for diagnosis and treatment planning. With its ability to acquire cross-sections of left ventricle (LV) and right ventricle (RV), Short Axis View plays role in volumetric analysis for cardiac contractile functions, especially in cardiomyopathy cases. Manual analysis of CMR is clinically common, however, human factors may hamper its accuracy and consistency. Shape analysis, one of computer vision techniques, has been used as geometric feature extractor to analyze segmented regions. Automatic segmentation of LV and RV that delineate anatomical structures based on predefined statistical parameters may efficiently support shape analysis and improve the performance of volumetric analysis in cardiac diagnostics.

Objective: Development of shape analysis algorithm for characterizing anatomical structures in CMR Short Axis View.

Materials & Methods: The algorithm was tested on CMR images in diastolic and systolic phases from 5 normal and 6 cardiomyopathy patients.

The algorithm consisted of 3 steps: image normalization, segmentation, and geometric feature extraction. Image normalization standardized input image into a well-distributed intensity image with properly localized object. Image enhancement techniques were used to improve the image quality. Statistical parameters were acquired for automatic inputs. Segmentation algorithm was generated based on combination of threshold-based segmentation and Connected Component Labelling (CCL) operator that labelled regions based on pixel connectivity. Region ranking was used to determine region of interest. Geometrical feature extraction was performed by measuring geometrical parameters on the region of interest. Shape analysis features were measured on LV and RV chambers and ventricular walls for further analysis.

Results: The algorithm was capable of localizing LV and RV chambers and ventricular walls in both diastolic and systolic phases for all tested CMR images. However, some erroneous regions occurred when segmenting ventricular walls where the intensity was mixed with the outer layer of the heart. In shape analysis, the automatic results were considerably close to those of radiologist manual delineation.

Conclusions: Automatic segmentation using threshold-based CCL operator has shown to be effective in localizing CMR regions. Quantification of LV and RV chambers and ventricular walls using this method tends to give promising results.

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72. Effect of Epigallocatechin Gallate (EGCG) on Blood Pressure and Endothelial Function in Angiotensin II-Infused Hypertensive Mice


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Background: Previous studies in recent years have shown that ingestion of epigallocatechin gallate (EGCG), the most abundant catechin found in green tea lowers arterial blood pressure in experimental animals as well as in humans. EGCG which has high antioxidant and anti-inflammatory properties gives beneficial effects in patients with cardiovascular diseases, especially those with hypertension. However, the effect of EGCG on the regulation of blood pressure in hypertensive subjects with compromised RAAS system is yet to be elucidated.

Objective: The present study aims to investigate if EGCG exerts antihypertensive effects in angiotensin II-infused hypertensive mice. Apart from that, this study aims to investigate if EGCG plays a role in improving endothelial dysfunction which is observed in angiotensin II-infused hypertensive mice.

Methods: Angiotensin II-infused C57BL/6j mice (8-10 weeks old) received oral administration of EGCG (50mg/Kg) for 14 days. Throughout the treatment period, the average systolic blood pressure of the mice is measured using the tail-cuff method. The vascular reactivity is investigated using aortic rings from C57BL/6j mice cultured with angiotensin II (10μM) + EGCG (1 μg) in Dulbecco’s Modified Eagle Medium (DMEM) for 24 hours. Isometric relaxation of the aortic rings to endothelium-dependent relaxing agonist, acetylcholine (3 nM–10 μM) and endothelium independent vasodilator, sodium nitroprusside (1 nM–10 μM) were determined.

Results: Infusion with angiotensin II increased the systolic blood pressure of the mice and this increase is continuous in angiotensin II-infused hypertensive mice. Ex-vivo treatment of aortic rings exposed to angiotensin II with EGCG. Ex-vivo treatment of aortic rings exposed to angiotensin II with EGCG for 24 hours significantly improved the impaired relaxations of the aortic rings compared to aortic rings without the treatment with EGCG.

Conclusion: This study shows that EGCG treatment exerts antihypertensive effect in angiotensin II-infused hypertensive rats. This antihypertensive effect is most probably due to the effect of EGCG in improving the endothelial function of the hypertensive mice as observed in the ex-vivo study.

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73. Gynura Procumbens Increases Antioxidant Enzymes Activity and Reduces Endothelial Inflammatory Markers Expression in Atherosclerotic Rat Model

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Background: Atherosclerosis is associated with endothelial development dysfunction, inflammation and reduction of antioxidant status.
**Gynura procumbens** (Lour.) Merr. has been reported to have anti-hyperlipidaemic, hypertensive, antioxidative, and anti-hyperglycemic properties. There is no research studied on its effect to prevent atherosclerosis development.

**Objective**: This study aimed to determine the effect of *G. procumbens* on antioxidant enzymes activity and endothelial inflammatory markers in atherosclerotic rat model.

**Materials & Methods**: Forty-eight female Sprague Dawley rats were divided into sham and ovariectomized groups. They were further divided into eight groups; control, 250GP, 500GP, atorvastatin (ATV); atherosclerotic; atherosclerotic+250GP; atherosclerotic+500GP; atherosclerotic+ATV. Treatment was given for 24 weeks. Body weight and blood pressure were measured at baseline and at monthly interval of six months. Antioxidant enzymes (CAT, GPx and SOD) activity in erythrocytes and expression of ICAM-1 and VCAM-1 in thoracic aorta were measured using commercially available ELISA kit (Elabscience Biotechnology, USA).

**Results**: There were increased pattern of body weight and blood pressure showed in atherosclerotic models at month 3 onwards compared to control in sham group and significantly with *G. procumbens* supplementation at 250 and 500 mg/kg. GPx and CAT activities were significantly decreased in atherosclerotic groups at month 3 and 6 but increases (p<0.05) with supplementation. ICAM-1 and VCAM-1 were highly expressed in atherosclerotic group, while reduced with *G. procumbens* extract supplementation at 250 and 500 mg/kg body weight.

**Conclusion**: *G. procumbens* extract with the dose of 500 mg/kg body weight improves the endothelial function in atherosclerotic condition might due of the antioxidant enzyme activity.

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**74. Establishment of High-fat Diet Induced Obesity with Myocardial Infarction Rat Model**

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**Background**: Long term of high fat diet (HFD) consumption in rats has been shown consistent pathologies with human obesity.

However, the model of HFD rats with a cardiovascular disease, particularly myocardial infarction (MI), is yet to be established.

**Objective**: Therefore, this study was aimed to establish an obese rat model with MI complication.

**Materials & Methods**: Male Sprague-Dawley rats were randomly divided into two main groups, i.e. rats fed with either normal standard diet (18% kcal, control, n=12) or obese rats (OB) fed with high fat diet (HFD, 60% kcal, n=18) for 12 weeks. At the eighth week of experiment, subsets from each group was divided for MI induction by isoproterenol (85 mg/kg.s.c for 2 days), and the diet regime was continued for another 4 weeks. A positive control group was treated with enalapril, an ACE inhibitor (10 mg/kg, n=6), while the rest of the groups received saline as control (n=24). After 12 weeks of the diet regime, all rats were sacrificed and their hearts were excised for cardiac performance, biochemical and histological studies. All data obtained was analyzed by one way ANOVA (post-hoc Tukey) to determine differences between groups.

**Results**: The obesity in rats were validated by increased body weight and lepint, a hormone indicator for obesity. The MI state was confirmed by increased level of cardiac injury marker serum troponin-T. The systolic blood pressure of OB+MI rats increased significantly (p<0.05). Langendorff-perfused rat hearts from OB+MI group had significantly (p<0.05) lower LVDP and its derivatives, suggesting impaired contractile function. Besides that, the OB+MI condition caused oxidative stress, as shown by NOX2 gene expression and 8-isoprostane level increment (p<0.05). In parallel to this, antioxidant enzymes such as superoxide dismutase (SOD) and glutathione were greatly reduced (p<0.05). Hypertrophy was clearly observed in OB+MI based from the H&E staining and increased ANP measurement (p<0.05). Sirius Red staining of collagen also showed increased fibrosis area in OB+MI rat hearts.

**Conclusion**: This study has established a HFD-induced obesity with MI condition in rat model, which is comparable to that of human.

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**75. Piper sarmentosum Inhibits Angiotensin II Receptor Type 1 and Promotes Angiotensin II Receptor Type 2 Expression in Cultured Endothelial Cells**

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**Background**: The renin-angiotensin system is a major physiological regulator of body fluid volume and blood pressure. The biological actions of angiotensin II (Ang II) have been attributed via Ang II receptor type 1 (AT1). Ang II receptor type 2 (AT2) opposes functions mediated by AT1 receptor. AT2 receptor is responsible for vasodilation and natriuresis, thus opposing the vasoconstrictor and antinatriuretic effects of Ang II mediated through AT1 receptor. *Piper sarmentosum* is an herb with antihypertensive and converting enzyme (ACE) inhibitory effects. However, *P. sarmentosum* effect on AT1 and AT2 receptors expression is still unknown.

**Objective**: To evaluate the effect of *P. sarmentosum* on AT1 and AT2 receptors mRNA expression in phorbol 12-myristate 13-acetate (PMA)-induced human umbilical vein endothelial cells (HUVECs).

**Materials & Methods**: HUVEC were divided into four groups: control, treatment with 200 μg/ml aqueous extract of *P. sarmentosum* (AEPS), ACE induction with 200 nM PMA and concomitant treatment with 200 nM PMA and 200 μg/ml AEPS. Following 24 hours of incubation, AT1 and AT2 receptors mRNA expression in all groups was measured using qPCR.

**Results**: Treatment with AEPS alone did not cause any change in AT1 and AT2 receptors mRNA expression compared to control. PMA upregulated AT1 mRNA receptor expression (P < 0.05) and downregulated AT2 receptor mRNA expression (P < 0.05) in HUVECs. Treatment of PMA-induced HUVEC with AEPS successfully reduced AT1 receptor mRNA expression (P < 0.05) and increased AT2 receptor mRNA expression (P < 0.05).

**Conclusions**: *P. sarmentosum* inhibits AT1 receptors mRNA expression and stimulates AT2 receptors mRNA expression in PMA-induced HUVEC. This partly explains the antihypertensive effect of *P. sarmentosum*.

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**76. Impact of Smoking on Lipid Profile Among Urban Malaysian Men**

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Background: Smoking and dyslipidemia are both associated with future cardiovascular disease (CVD) morbidity and mortality. Both smoking and lipid plays an important role in functional and structural change in arterial system which leads to CVD. However, the association between smoking and lipid profiles is lacking.

Objective: The current study wish to determine the relationship between smoking and lipid parameters among urban Malaysian men.

Methods: 310 men aged 40 to 83 years old were recruited. Subjects were divided into smoker (N=73) and non-smoker group (N=237). Their blood pressure (BP), height, weight and smoking history were measured and recorded. Blood samples were taken and sent for lipid profile and fasting blood sugar. Lipid profile includes total cholesterol (TC), triglyceride (TG), low density lipoprotein (LDL) and high density lipoprotein (HDL). Data were analysed via SPSS and P value< 0.05 was accepted as significant.

Results: The mean age was 54.45±9.77 years old for the whole subjects and no difference between groups in terms of age. Smoker group had significant increase in TC (6.01±1.22 vs 5.52±0.95 mmol/L, P<0.001), TG (2.31±2.24 vs 1.59±1.15, P<0.001), LDL (3.88±1.05 vs 3.52 ±0.83 mmol/L, P<0.001) and low HDL (1.19±0.29 vs. 1.31±0.35 mmol/L, P<0.01) when compared to non-smoker, which remained significant after adjustment for other factors (age, body mass index and ethnicity) except HDL. Smoking was also significantly associated with TC, TG, LDL and HDL (r=0.23, r=0.23, r=0.20, r=-0.14 respectively, P<0.05 for all).

Conclusions: Smoking was significantly associated with derangements of lipid profiles. Smokers may have added risk of future CVD.

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77. Generation of Zinc Oxide-Gold Textured Janus Nanowire for Bio-recognition

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Background: ‘Janus particle’ refers the generation of two particles in single system having different physical properties and two surfaces involved in the formation of Janus are having different chemistries. In this study, we created the Janus using a hybrid of Zinc Oxide (ZnO) and gold (Au) on the sensor surface towards making a high-performance DNA sensor. In the current work, we present a novel solution process which involve single-step process to synthesize Janus ZnO/Au textured film using sol-gel method.

Objective: Main of this work is to synthesis Janus ZnO/Au hybrid nanostructures as a platform matrix for high-performances DNA sensor. In order to improve the performance of the DNA biosensor, optimization of the structural and morphological properties of Janus ZnO/Au nanostructure is occurred to increase the surface to volume ratio for high affinity DNA strand binding. Besides that, optimization of the electrical properties of Janus ZnO/Au nanostructure is occurred to elevate the electrical, sensitivity, selectivity and stability properties of the DNA biosensor.

Material & Methods: Chemical route is used to synthesis ZnO thin films known as sol-gel method. The precursor used for synthesizing ZnO seed solution is zinc acetate dihydrate powder, [Zn(CH\textsubscript{3}COO)\textsubscript{2}.2H\textsubscript{2}O] which was purchased from Sigma Aldrich (98%; Sigma-Aldrich). The solvent used was isopropanol (IPA) and the sol- stabilizer is Monoethanolamine (MEA; 99%; Merck). Zinc acetate powder was measured and ensured that 1632 mg of zinc acetate powder was dissolved in 40 ml IPA solvent to obtain 0.2 mol of ZnO seed solution.

Results: The average grain size of the Janus ZnO/Au nano-textured wire is 41.60 nm. The developed device is able to detect low DNA concentration which is 1 x 10^{-13} mM which is associated with sensitivity of 8.54M\Omega\textsuperscript{-1}cm\textsuperscript{-2}.

Conclusions: Herein, we have generated a novel hybrid Janus pattern using ZnO and Au, which could have different physical and chemical properties as shown in other Janus materials. The developed biosensor with ZnO/Au nano-textured Janus nanowire was shown to have highly selective, sensitive, reproducibility, fast response and stable which is tailored for the usage for specifically recognizing DNA from pathogenic Leptospira.

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78. Identification of Novel Non-Protein Coding RNAs (ncRNAs) in Staphylococcus haemolyticus Biofilm

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Background: Staphylococcus haemolyticus is an opportunistic nosocomial bacterial pathogen often cause wide range of infections as simple as acne to serious infections like endocarditis, peritonitis and UTL. Its ability to form biofilms especially on medical devices is a major virulence factor associated with S. haemolyticus. Non-coding RNAs, the newly emerged class of RNAs, having increasing evidence on their role in the regulation of majority of the bacterial pathways including virulence and biofilm formation.

Objective: This study elucidates novel ncRNAs and also enables us to understand the adaptation of S. haemolyticus to the different environment.

Material & Methods: S. haemolyticus was cultured in specialized media to form biofilm. Total RNA was extracted and sequenced using Illumina platform. The transcriptome sequences were aligned with reference genome of S. haemolyticus using Bowtie2. Using genome viewer, un-annotated transcripts were selected and performed sequence search similarity in other organisms using Blastn and Rfam database respectively. The total RNA extracted from S. haemolyticus grown under different stress conditions, resolved on denaturing gel and trans-blot to nylon membrane for Northern hybridization.

Results: A total of 147 possible ncRNA candidates identified and after filtering through blastn, ORF search and Rfam, 64 were selected as most potential novel ncRNAs. 13 ncRNAs with the highest RPKM value has been chosen for Northern hybridization. Interestingly 68 of ncRNAs are specific to S. haemolyticus.

Conclusions: This is the pioneering study reveals 64 novel ncRNAs in S. haemolyticus. Further research need to be done to deeply understand the possible function of ncRNA of S. haemolyticus.

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