Efektivitas mikrokapiler digital sebagai alat ukur nilai viskositas darah untuk prediksi prognosis stroke iskemik akut = The effectiveness of novel digital microcapillary instrument in measuring blood viscosity to predict acute ischemic stroke outcome

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Abstrak

[ABSTRAK
Tujuan: Mendapatkan alat (Mikrokapiler Digital/MD) untuk mengukur viskositas darah dan plasma yang mempunyai presisi dan akurasi yang baik. Mengetahui peran viskositas darah dan plasma yang diukur dengan MD, faktor risiko dan determinan terhadap prognosis stroke iskemik akut berdasarkan National Institute of Health Stroke Scale (NIHSS), Modified Rankin Score (mRS), Interleukin 6 (IL-6), dan neuron-specific enolase (NSE). Penelitian tahap pertama meliputi uji presisi dan akurasi, sedangkan tahap kedua adalah uji prognosis.
Subjek penelitian: Subjek untuk uji presisi adalah 40 dewasa sehat yang melakukan Medical Check Up (MCU). Subjek untuk uji akurasi dan prognosis adalah 135 pasien stroke iskemik akut onset ≤ 3 hari, usia 35 – 74 tahun.
Pengukuran dan intervensi: Presisi dinilai dengan coefficient of variation (CV), interrater variability Cronbach Alpha dan coefficient of reliability Bland Altman. Akurasi dinilai dengan uji diagnostik. Uji prognosis meliputi analisis bivariat dilanjutkan dengan analisis multivariat cox proportional hazards regression.
Hasil: Dari penelitian tahap pertama, didapatkan CV sebesar 0,04, nilai interrater variability Cronbach Alpha dan mean difference Bland Altman adalah baik. Sensitivitas dan spesifisitas MD untuk viskositas darah adalah 88,9 % dan 88,9 %, sedangkan untuk viskositas plasma adalah 100 % dan 84 %. Rumus prediksi untuk konversi viskositas darah MD ke satuan poise adalah y = 0,846x + 0,614, dan untuk viskositas plasma adalah y = 1,072x + (-0,160). Pada uji tahap kedua, didapatkan faktor determinan antara lain: fibrinogen merupakan faktor determinan perubahan viskositas darah dan plasma; viskositas darah merupakan faktor determinan perburukan kondisi klinis (National Institute of Health Stroke Scale/ NIHSS dan modified Rankin Scale/mRS); viskositas darah dan diabetes melitus (DM) merupakan faktor determinan prognosis stroke iskemik akut berdasarkan interleukin 6 (IL-6); dan HDL merupakan faktor determinan prognosis stroke iskemik akut berdasarkan neuron specific enolase (NSE).
Simpulan: MD memiliki presisi dan akurasi yang baik. Viskositas darah merupakan faktor determinan perburukan kondisi klinis baik akut maupun pasca perawatan.
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ABSTRAK
Objectives: To design a simple and portable instrument (Digital Microcapillary) for

measuring blood and plasma viscosity values with high precision and accuracy. To assess the roles of these values, the risk and determining factors in predicting the outcome of acute ischemic stroke assessed using National Institute of Health Stroke Scale (NIHSS), modified Rankin Scale (mRS), interleukin 6 (IL-6), and neuron specific enolase (NSE). The first stage of this study included precision and accuracy tests, while the second stade was the prognostic test.
Research subjects: 40 healthy adults admitted for Medical Check Up (MCU) were recruited for the precision test while the subjects for accuracy and prognostic tests were 135 acute ischemic stroke patients, either inpatients or outpatients, aged 35 – 74 years old, with up to 3 days stroke onset.
Measurement and intervention: The precision was assessed by calculating coefficient of variation (CV), Cronbach Alpha interrater variability, and Bland Altman coefficient of reliability, while the accuracy was assessed using diagnostic test. The prognostic test included bi- and multivariate analyses using Cox proportional hazards regression.
Results: The results of the first stage study were that the CV was 0.04; Cronbach Alpha interrater variability and Bland Altman mean difference values were excellent. The prediction formula used to convert blood viscosity value measured with digital microcapillary to poise unit was $y = 0.846x + 0.614$, and the formula for plasma viscosity was $y = 1.072x + (-0.160)$. The sensitivity and specificity of Digital Microcapillary for blood viscosity measurement were 88.9 % and 88.9 %, respectively and for plasma viscosity measurement were 100 % and 84 %, respectively. The second stage of the study showed that the variables proven to be the determinants were: fibrinogen as the determinant of blood and plasma viscosity, blood viscosity as the determinant of clinical outcome (NIHSS and mRS), blood viscosity and diabetes mellitus as the determinants of acute ischemic stroke outcome indicated by blood IL-6 level, and HDL as the determinant of acute ischemic stroke outcome indicated by NSE level.
Conclusions: Digital Microcapillary has high precision and accuracy. Blood viscosity is a determining factor in the ischemic stroke outcome, both acute and one month after hospital discharge., Objectives: To design a simple and portable instrument (Digital Microcapillary) for
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