

# Peran faktor metabolik, neuropati perifer, inflamasi, infeksi dan hemostasis terhadap oksigenisasi jaringan serta pengaruhnya terhadap proses penyembuhan luka kaki diabetik = Role of metabolic factors peripheral neuropathy inflammation infections and hemostasis in tissue oxygenation and diabetic foot wound healing process

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## Abstrak

### <b>ABSTRAK</b><br>

Luka kaki diabetik (LKD) merupakan komplikasi kronik diabetes yang meningkatkan mortalitas dan morbiditas, serta menurunkan kualitas hidup. Komplikasi makro dan mikrovaskular/mikrosirkulasi mempunyai pengaruh besar terhadap kejadian LKD dan proses penyembuhannya. Kondisi mikrosirkulasi dapat dinilai melalui pemeriksaan transcutaneous perfusion oxygen (TcPO<sub>2</sub>). Kondisi mikrosirkulasi dipengaruhi oleh HbA<sub>1c</sub>, glukosa darah sewaktu, neuropati, fibrinogen, PAI-1, hsCRP, indeks MMP-9, indeks TcPO<sub>2</sub>, dan indeks TcPCO<sub>2</sub>, yang akan memengaruhi terbentuknya jaringan granulasi.

Penelitian ini bertujuan untuk mengetahui peran HbA<sub>1c</sub>, GDS, neuropati, fibrinogen, PAI-1, hsCRP, indeks MMP-9, terhadap indeks TcPO<sub>2</sub>, indeks TcPCO<sub>2</sub>, dan indeks granulasi, serta mengetahui peran serta indeks TcPO<sub>2</sub> dan indeks TcPCO<sub>2</sub> terhadap indeks granulasi pada luka kaki diabetik. Sebanyak 68 subjek LKD tanpa penyakit arteri perifer di RS dr. Cipto Mangukusumo dan beberapa rumah sakit jejaring, pada Desember 2015?Desember 2016, diberikan perawatan standar dan dipantau setiap minggu sebanyak 4 kali. Pada pemantauan ke-1, ke-2, dan ke-3, dilakukan dokumentasi LKD, pengambilan darah vena sebanyak 7,7 mL untuk pemeriksaan fibrinogen, PAI-1, hsCRP, MMP-9, dan TIMP-1, darah arteri sebanyak 2 mL untuk pemeriksaan analisis gas darah, serta pemeriksaan TcPO<sub>2</sub> dan TcPCO<sub>2</sub> dengan menggunakan TCM TOSCA/CombiM monitoring systems buatan Radiometer. Pada pemantauan ke-4, hanya dilakukan dokumentasi LKD.

Pengukuran luas luka dan jaringan granulasi dinilai berdasarkan hasil dokumentasi fotografi dengan menggunakan program ImageJ. Penilaian neuropati menggunakan pemeriksaan interval RR dan kecepatan hantar saraf. Data laboratorium lainnya diperoleh dari data sekunder rekam medis. Kemudian dilakukan analisis data dengan menggunakan path analysis (analisis lajur) pada data repetitif dan SPSS pada data nonrepetitif.

Berdasarkan analisis didapatkan hubungan antara peningkatan glukosa darah sewaktu, fibrinogen, dan PAI-1 dengan penurunan indeks TcPO<sub>2</sub>. Didapatkan juga hubungan antara beratnya neuropati motorik dan sensorik, peningkatan glukosa darah sewaktu, fibrinogen, PAI-1, dan hsCRP dengan penurunan indeks granulasi. Tetapi, indeks granulasi tidak dipengaruhi oleh indeks TcPO<sub>2</sub>. Indeks TcPCO<sub>2</sub> tidak memiliki hubungan terhadap semua variabel tersebut, kecuali hsCRP dan indeks TcPCO<sub>2</sub> tidak memengaruhi indeks granulasi.

Indeks TcPO<sub>2</sub> pada LKD dipengaruhi oleh kadar glukosa darah sewaktu, fibrinogen, dan PAI-1, tetapi tidak memengaruhi tumbuhnya jaringan granulasi. Tumbuhnya jaringan granulasi dipengaruhi oleh glukosa darah sewaktu, neuropati motorik dan sensorik, peningkatan kadar fibrinogen, PAI-1,

dan hsCRP. Selain itu, indeks TcPCO<sub>2</sub> tidak memengaruhi indeks granulasi

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<b>ABSTRACT</b><br>

Diabetic foot wounds/ulcer (DFU) is chronic complication of diabetes, which increases mortality and morbidity, and lower quality of life. Macro and microvascular/microcirculation complications has a great influence on DFU and healing process. Microcirculation condition can be seen from transcutaneous perfusion oxygen (TcPO<sub>2</sub>). The growth of granulation tissue in the healing process is determined by microcirculation condition, among others influenced by HbA<sub>1c</sub>, random blood glucose, neuropathy, fibrinogen, PAI-1, hsCRP, MMP-9 index, TcPO<sub>2</sub> index, and TcPCO<sub>2</sub> index.

This study aimed to investigate the role of HbA<sub>1c</sub>, random blood glucose, sensory, motoric, and autonomy neuropathy, fibrinogen, PAI-1, hsCRP, MMP-9 index, TcPO<sub>2</sub> index, TcPCO<sub>2</sub> index, and granulation index, as well as the relationship between TcPO<sub>2</sub> index, TcPCO<sub>2</sub> index and granulation index in diabetic foot wounds.

As much as 68 subjects DFU without peripheral arterial disease, in Cipto Mangunkusumo Referral National Hospital, on December 2015-December 2016, were given standard management of diabetic foot ulcer and monitored once a week for four times. In the 1st, 2nd, and 3rd monitoring, DFU was documented, then 7.7 mL of venous blood was taken for fibrinogen, PAI-1, hsCRP, MMP-9, and TIMP-1 examination, also 2 mL arterial blood for blood gas analysis, and then examination of TcPO<sub>2</sub> and TcPCO<sub>2</sub> was performed using TCM4 TOSCA/CombiM monitoring systems made by Radiometer. In the 4th monitoring, only DFU was documented. Wound and granulation size was measured through photographic documentation using ImageJ program. Neuropathy was diagnosed based on RR interval and nerve conduction velocity study. Other laboratory data were obtained from medical records. The data were analysed by path analysis for repetitive data and SPSS for nonrepetitive data. From analysis, there is a significant correlation between the increasing random blood glucose (RBG), fibrinogen, and PAI-1 with the decreasing of TcPO<sub>2</sub>, also found a significant relationship between the severity of sensory and motoric neuropathy, the increasing levels of RBG, fibrinogen, PAI-1, and hsCRP with the decreasing of granulation index. But, TcPO<sub>2</sub> index does not influence granulation index. TcPCO<sub>2</sub> index does not have significant correlation with all these variables, except hsCRP. Moreover, TcPCO<sub>2</sub> index also does not influence granulation index.

TcPO<sub>2</sub> index of DFU is affected by RBG, fibrinogen, PAI-1, but does not affect the growth of granulation tissue. Granulation tissue's growing is influenced by the sensory and motoric neuropathy, increased levels of fibrinogen, PAI-1, and hsCRP. Furthermore, TcPCO<sub>2</sub> index does not influence granulation's growth.