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Histopathological and morphometric evaluation of sciatic nerve with the change of pain sensation in diabetic neuropathy rat receiving exercise therapy and metformin

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Diabetic peripheral neuropathy increases the risk of inflammation and degeneration of peripheral nerve fibers. Aerobic walking exercise increases the blood glucose stabilization and might improve inflammation. The aim of the study was to evaluate the histopathological changes on small nerve fiber in skin paws and sciatic nerve due to chronic hyperglycemia. Spraw-Dawley (SD) rat weighing 150-200 g divided into normal and DM groups, which induced by low doses of streptozotocin (45 mg/kg BW) i.p combining with high fat diet (60% calories from fat). After induction, all rats were further divided into control with exercise (CEX), DM, DM exercise and DM exercise combined with metformin by oral gavage for 8 weeks observation. Pain response was measured by heat pad analysis. Pathological evaluation of skin paws by HE and immunofluorescence staining for PGP 9.5, TNF-α and IL-6 antibody. Morphometry of sciatic nerve was stained by toluidine blue and observed by 400x magnification of light microscope. It was found the reduction of epidermal thickness accompanied by the damage of stratum corneum and flattening of basal lamina layer in skin paw within DM group ($p<0.05$). Morphometric measurement showed the smallest axon diameter in DM group ($p=0.03$). The PGP 9.5 and TNF-α were also significantly overexpression in DM group compared with the control group. The significant increase of IL-6 in DM and CEX could be correlated with the change of pain sensation in small nerve fiber. Both of attenuation of thickness in skin paws and flattening of basal lamina could be correlated with the reduction of axon diameter in sciatic nerve fiber in DM group. Improvement of inflammatory markers in DM exercise group may also correlates with the alleviation of pain sensation. Conclusively, decrease of mean time thermal latency for pain response and epidermal thickness in DM group might be correlated with the decrease of print length and stance phase time. Walking aerobic exercise has an effect to increase epidermal thickness compared with DM metformin group.

Biography

Chiung-Chi Peng has completed her PhD from Graduate Institute of Medical Science, Taipei Medical University, Taiwan. She is currently a Professor of Graduate Institute of Clinical Medicine, Taipei Medical University. She has published more than 45 papers in reputed journals and has been serving as a Reviewer of several scientific journals.

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