Pengaruh injeksi eksosom asal sel punca mesenkimal sumsum tulang pada tendinopati achilles tikus (Rattus norvegicus Berkenhout, 1769) Diabetes Galur Sprague Dawley berdasarkan analisis histologi dan ekspresi gen ADAM12 = Effect of injection of exosomes from bone Marrow-Derived mesenchymal stem cells on diabetic achilles tendinopathy of sprague dawley rats (Rattus norvegicus Berkenhout, 1769) based on histology analysis and ADAM12 gene expression

Daffa Raditya Fernanda, author

Abstrak

Tendinopati Achilles diabetes merupakan penyakit degeneratif akibat perubahan homeostasis jaringan tendon yang disebabkan oleh diabetes melitus tipe 2. Penyembuhan tendinopati Achilles diabetes sulit untuk dicapai karena terbatasnya kapasitas regenerasi tendon. Eksosom asal sel punca mesenkimal (SPM) sumsum tulang memiliki kemampuan dalam menghambat degenerasi jaringan sehingga berpotensi untuk mengatasi tendinopati Achilles diabetes. Efek eksosom SPM sumsum tulang terhadap tendon Achilles dapat diinvestigasi melalui perubahan ekspresi relatif gen a disintegrin and metalloproteinase domain 12 (ADAM12). Gen ADAM12 merupakan gen pendegradasi matriks yang terekspresi tinggi pada tendinopati Achilles diabetes. Penelitian ini bertujuan untuk mengetahui pengaruh injeksi 0,8 mL eksosom asal SPM sumsum tulang pada tendinopati Achilles tikus diabetes berdasarkan analisis histologi dan ekspresi gen ADAM12. Sebanyak 12 ekor tikus putih jantan galur Sprague Dawley dikelompokkan menjadi dua kelompok yang terdiri atas kelompok kontrol tendinopati (KK) dan kelompok eksosom (KE). Analisis histologi tendon Achilles posmortem hari ke-21 dilakukan dengan metode semikuantitatif skor Bonar dan histomorfometri kuantitatif luas area kolagen melalui pulasan Hematoksilin-Eosin, Alcian Blue, dan Masson’s Trichrome. Perubahan ekspresi gen ADAM12 diperiksa secara kuantitatif menggunakan qRT-PCR. Berdasarkan hasil penelitian, rata-rata skor Bonar KE (1,67 ± 1,282) ditemukan lebih rendah daripada KK (6,40 ± 2,195) secara signifikan (P = 0,001; P < 0,05). Analisis histomorfometri juga menunjukkan rata-rata luas area kolagen KE (85,15 ± 7,023) yang cenderung lebih tinggi dibandingkan KK (76,64 ± 9,237), tetapi tidak berbeda nyata (P = 0,103; P 0,05). Ekspresi gen ADAM12 KE mengalami perubahan sebesar 0,9 kali lipat lebih tinggi daripada KK, meskipun secara statistik tidak signifikan (P = 0,421; P 0,05). Dengan demikian, dapat disimpulkan bahwa injeksi 0,8 mL eksosom asal SPM sumsum tulang terbukti memiliki potensi dalam memicu perbaikan tendinopati Achilles diabetes pada hari ke-21.
.....Diabetic Achilles tendinopathy is a degenerative disease resulting from changes in tendon tissue homeostasis caused by type 2 diabetes mellitus. The cure of diabetic Achilles tendinopathy is difficult to achieve due to the limited regeneration capacity of the tendon. Exosomes from bone marrow-derived mesenchymal stem cells (MSC) can inhibit tissue degeneration so they have the potential to treat diabetic Achilles tendinopathy. The effect of exosomes from bone marrow-derived MSC on the Achilles tendon can be investigated through changes in the relative expression of a disintegrin and metalloproteinase domain 12 (ADAM12) gene. The ADAM12 gene is a matrix-degrading gene that is highly expressed in diabetic Achilles tendinopathy. This study aims to determine the effect of injection of 0.8 mL of exosomes from bone marrow-derived MSC on Achilles tendinopathy in diabetic rats based on histology analysis and

ADAM12 gene expression. A total of 12 male white Sprague Dawley rats were grouped into two groups consisting of the tendinopathy control group (KK) and the exosome group (KE). Postmortem Achilles tendon histology analysis on day 21 was carried out using the semiquantitative Bonar score method and quantitative histomorphometry of collagen area using Hematoxylin-Eosin, Alcian Blue, and Masson's Trichrome staining. Changes in ADAM12 gene expression were examined quantitatively using qRT-PCR. Based on the research results, the mean score of Bonar KE (1.67 ± 1.282) was found to be significantly lower than KK (6.40 ± 2.195) ($P = 0.001$; $P < 0.05$). The histomorphometric analysis also showed that the average collagen area of KE (85.15 ± 7.023) tended to be higher than KK (76.64 ± 9.237) but was not significantly different ($P = 0.103$; P 0.05). ADAM12 KE gene expression changed 0.9-fold higher than KK, although it was not statistically significant ($P = 0.421$; P 0.05). Thus, the injection of 0.8 mL of exosomes from bone marrow-derived MSC was proven to have the potential to trigger improvement in diabetic Achilles tendinopathy on day 21.