RINGKASAN

Pengaruh Oksigen Hiperbarik terhadap Proses Penyembuhan Cedera Tulang Rawan Sendi Lutut pada Tikus Putih Jantan (*Rattus norvegicus*)

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Oksigen Hiperbarik (OHB) adalah merupakan salah satu modalitas terapi yang dapat digunakan untuk merangsang penyembuhan luka, termasuk cedera tulang rawan sendi. Banyak penelitian yang membuktikan tentang pengaruh OHB pada penyembuhan cedera tulang rawan sendi, akan tetapi prosesnya tetap belum dapat dijelaskan. Sedangkan tulang rawan sendiri adalah merupakan jaringan yang unik, karena ia merupakan jaringan yang tidak memiliki basal membran, avaskuler, serta hanya bergantung pada difusi untuk nutrisinya.

Penelitian ini ditujukan untuk membuktikan proses penyembuhan cedera tulang rawan sendi oleh OHB pada tikus putih (*Rattus norvegicus*). Ada tiga Indikator penyembuhan cedera tulang rawan sendi yang dipakai, yaitu : jumlah kondrosit yang mengekspresikan TGF-β, jumlah kondrosit itu sendiri dan ketebalan tulang rawan sendi.

Tiga puluh Rattus norvegicus terlebih dahulu dilakukan transeksi ligamen krusiatum anterior dan menisektomi agar terjadi ketidakstabilan pada sendi lutut. Setelah itu diberikan aktifitas fisik yang menekan tulang rawan sendi berupa lari. Tikus dilarikan diatas Rotarod dalam 10 – 15 menit sehari selama 4 minggu dengan kecepatan 8 – 10 putaran per menit. Pada aktifitas lari ini, diharapkan akan terjadi penipisan tulang rawan sendi akibat ketidakstabilan sendi lutut. Tiga puluh tikus tersebut kemudian dibagi menjadi tiga kelompok, sehingga tiap kelompok terdiri dari sepuluh tikus. Kelompok 1 adalah merupakan kelompok kontrol yang tidak mendapat perlakuan terapi OHB. Kelompok 2 dan 3 masing-masing mendapat terapi OHB satu seri (sepuluh hari) dan dua seri (duapuluh hari). Semua tikus kemudian diperiksa secara imunohistokimia dan histologis untuk mengetahui jumlah kondrosit yang mengekspresikan TGF-β, jumlah kondrosit dan ketebalan tulang rawan sendi.

Dari data hasil penelitian menunjukkan bahwa terdapat peningkatan grafik jumlah kondrosit yang mengekspresikan TGF-β, jumlah kondrosit dan ketebalan tulang rawan sendi berturut-turut mulai dari kelompok 1,2 dan 3. Dari hasil uji statistika menunjukkan terdapat korelasi yang bermakna antara lama pemberian HBO dengan jumlah kondrosit yang mengekspresikan TGF-β ($p=0.000$, $r=0.604$), jumlah kondrosit ($p=0.000$, $r=0.854$) dan tebal tulang rawan ($p=0.000$, $r=0.931$).

Dengan demikian dapat disimpulkan bahwa OHB dapat merangsang penyembuhan cedera tulang rawan sendi melalui peningkatan jumlah kondrosit yang mengekspresikan TGF-β, jumlah kondrosit dan ketebalan tulang rawan sendi. Pada akhirnya diharapkan OHB dapat merangsang penyembuhan cedera tulang rawan sendi pada penderita osteoartritis.

SUMMARY

The Effect of Hyperbaric Oxygen in the Healing of Cartilage Injury on the Rat's Knee Joint

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Hyperbaric Oxygen (HBO) was believed as one of the modality to promote wound healing, including cartilage healing. Many author described the effect of HBO on cartilage healing, but the process remain not clear. Meanwhile, cartilage is a unique tissue, because it has no basement membrane, avascular and depend on diffusion for its nutrition.

This experimental study was performed to show the healing process of cartilage injury by HBO. There were three indicators for cartilage healing : the amount of chondrocytes that express Transforming Growth Factor- β (TGF-β), the amount of chondrocytes it self and the thickness of cartilage.

Thirty Rattus norvegicus which have been undergone combination of ACL transection and menisectomy were running on the *Rotarod* in 10 – 15 minutes for 4 consecutive weeks with 8 – 10 rounds per minute speed. After that they were assigned into three groups. Each group consists of ten rats. The first group as a control group were not send into the chamber (1st group), the second group were performed ten days of one series of HBO (2nd group), and the last group were performed twenty days of two series of HBO (3rd group). All groups were compared each other, by quantified the amount of chondrocytes that express Transforming Growth Factor- β (TGF-β), the amount of chondrocytes it self and the thickness of cartilage by imunohistochemical and histopathological investigation.

There were increases amount of chondrocytes that express TGF-β, amount of chondrocytes it self and thickness of cartilage in 1st, 2nd and 3rd groups. There were strong correlations between duration of HBO with the amount of chondrocytes that express Transforming Growth Factor- β (TGF-β) ($p=0.000$, $r=0.604$), the amount of chondrocytes it self ($p=0.000$, $r=0.854$) and the thickness of cartilage ($p=0.000$, $r=0.931$).

This study indicate that HBO can promote healing of cartilage injury by increasing amount of chondrocytes that express TGF-β, amount of chondrocytes and thickness of cartilage. These findings also suggest that HBO may be promote cartilage healing for patients with osteoarthritis.

ABSTRACT

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Hyperbaric Oxygen (HBO) was believed as one of the modality to promote wound healing, including cartilage healing. Many author described the effect of HBO on cartilage healing, but the process remain not clear. This experimental study was performed to show the healing process of cartilage injury by HBO in the rat's knee joint which undergone combination of Anterior Cruciate Ligament (ACL) transection and menisectomy.

Thirty Rattus norvegicus rat which have been undergone combination of ACL transection and menisectomy were assigned into three groups. Each group consists of ten rats. First group as a control group were not send into the chamber (1st group), second group were performed ten days of one series of HBO (2nd group), and the last group were performed twenty days of two series of HBO (3rd group). All groups were compared each other, by quantified the amount of chondrocytes that express Transforming Growth Factor- β (TGF-β), the amount of chondrocytes it self and the thickness of cartilage by imunohistochemical and histopathological investigation.

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Keywords : Hyperbaric Oxygen, Cartilage healing, Cartilage Injury