Effectivity of Handmade Tubular Lyophilized Amnion Membrane as A Nerve Conduit in Repair of Peripheral Nerve Injury with 5 mm Gap in Rats

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ABSTRACT

Introduction. Peripheral nerve injury with 5–30 mm gap which is caused by direct injury cases (87%) or iatrogenic (12%) become a special concern because it may cause a serious disability in the future. Therefore, we need many kind of nerve repair methods without adding morbidity to the patient. One of the methods is entubulation method, by using natural or synthetic material.

Materials & Methods. This is an animal experimental research by using post-test only control group design in Pharmacology Laboratory Faculty of Medicine Universitas Padjadjaran Bandung in May 2012. In this study, we used 14 Wistar rats divided into 2 groups. After creating gap on sciatic nerve, nerve conduit is installed on treatment group by using handmade tubular lyophilized amnion membrane. Nerve conduit is not installed on control group. After 21 observation days, conduction test and histopathology examination were done. Data was analyzed using non-parametric statistical analysis Sign test.

Results. Result showed significant difference between two groups; the conduction test=0.016 (p<0.05), nerve growth to distal gap=0.063 (p<0.05), no radial direction of nerve growth=0.031 (p<0.05). Reaction of inflammation was minimal and there was no difference between two groups.

Conclusions. Handmade tubular lyophilized amnion membrane is effective as nerve conduit in repair of peripheral nerve injury with 5 mm gap.

Key words: Handmade tubular lyophilized amnion membrane, nerve conduit, peripheral nerve injury

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Effectivity of amnion membrane in nerve injury

Efektivitas Membran Amnion Liofilisasi (Handmade Tubular) sebagai Nerve Conduit di Perbaikan Cedera Saraf Perifer Tikus dengan Celah 5 mm

ABSTRAK

Pendahuluan. Cedera saraf perifer dengan gap sekitar 5–30 mm baik akibat cedera langsung (87%) maupun iatrogenik (12%) mendapat perhatian khusus karena dapat mengakibatkan kecacatan di kemudian hari. Untuk itu dibutuhkan metode perbaikan saraf dengan tanpa menambah morbiditas pada pasien, salah satunya dengan metode entubulasi, berbahan alamiah atau sintetik.


Hasil. Dari penelitian didapatkan perbedaan yang signifikan antara kelompok perlakuan dengan kontrol, uji konduksi sebesar 0,016 (p<0,05), pertumbuhan saraf hingga distal gap sebesar 0,063 (p<0,05), arah pertumbuhan saraf yang tidak radier sebesar 0,031 (p<0,05). Pada reaksi peradangan tampak minimal dan tidak terdapat perbedaan antara kedua kelompok.

Simpulan. Membran amnion liofilisasi efektif untuk digunakan sebagai nerve conduit dalam perbaikan cedera saraf perifer disertai gap 5 mm.

Kata kunci: cedera saraf perifer, membran amnion liofilisasi, nerve conduit

Introduction

Peripheral nerve injury as a relative complication which caused by direct trauma (87%) or iatrogenic, such as in tumor eradication surgery (12%), becomes a special concern because it may cause a serious disability in the future.1-5 The predilection for this kind injury is 81% in upper extremity and 11% in lower extremity.6

In mild nerve injury, recovery come spontaneously but in severe one (neurotemesis) with gaps there will be fibrous tissue across the gaps which can inhibit axonal regeneration from proximal to distal stump.1 To avoid this problem, bridge operation is therefore preferred to the gaps with purpose to facilitate axonal regeneration to distal stump.1,7

If regenerating units do not reach the endoneural environment of the distal stump (for instance, if they are blocked by scar tissue), then they will form neuromas that result in a loss of potential nerve function.2 Various surgical options and their outcomes for the management of peripheral nerve injury gaps. If the distance gap is ≥ 5mm, it will cause excessive tension that results in scar and poor vascularization at the repair site.6 For repair of gaps between 5-30 mm, the gold standard for bridging the proximal and distal stumps is still the nerve autograft.1-8 But if the gaps longer than 30 mm or for those very proximal ones in which the spinal nerve root has been or are likely avulsed from the spinal cord, the use of nerve transfers has emerged.2,7 Using nerve autograft to repair the gaps has several shortcomings including long surgery time, donor site morbidity with neuroma and scar tissue, the limited number and diameter of donor nerves inadequate lead to less optimal of nerve repair.2,3,8-11 Various results of using nerve autograft, and some studies reported unsatisfying results.2

This problem has led to the development of new techniques to bridge the nerve gap. One of them is utilizing a tubular nerve guidance channel or nerve conduit, such natural or synthetic guidance channels are being developed as alternatives to autografts. This