

Contents lists available at [ScienceDirect](http://www.sciencedirect.com)

Asian Pacific Journal of Tropical Medicine

journal homepage: [www.elsevier.com/locate/apjtm](http://www.elsevier.com/locate/apjtm)

Document heading doi: 10.1016/S1995-7645(14)60083-3

# Prevention effect of medical self-crosslinking sodium hyaluronate gel on epidural scar adhesion after laminectomy

Hua Liu<sup>1\*</sup>, Hai-Feng Li<sup>1</sup>, Jian-Yuan Wang<sup>2</sup><sup>1</sup>Orthopaedic Department of PLA 474 Hospital, Xinjiang 830011, China<sup>2</sup>Spinal Surgery Department of First Affiliated Hospital of Xinjiang University, Xinjiang 830011, China

## ARTICLE INFO

### Article history:

Received 10 December 2013

Received in revised form 15 January 2014

Accepted 15 May 2014

Available online 20 June 2014

### Keywords:

Animal

Hyaluronic acid

Laminectomy

Induced potentials

Somatosensory

## ABSTRACT

**Objective:** To analyze the effect and medical self-crosslinking sodium hyaluronate gel on epidural scar adhesion after laminectomy. **Methods:** A total of 24 New Zealand L5 laminectomy rabbits were randomly divided into four groups, group A as the control group without any treatment; group B covered by sodium hyaluronate gel; group C and group D covered by 0.5 and 1.0 mL medical self-crosslinking sodium hyaluronate gel. All rabbits were scored at various time points after 2, 4, 6, 8, 12 weeks, then the formation of scar was observed. **Results:** In Groups B, C, D loose scar tissue occurred after 2 weeks of the operation, scar tissues were significantly less than that in group A, with mild inflammatory reaction. After 8 weeks, the scar tissues of group B were significantly more than that of groups C, D. After two weeks, group B, C were back to the preoperative level; After 4 weeks, group D was back to the preoperative level; After four weeks, the CSEP of group A was increased significantly, which was significantly higher than that in groups B, C, D. The motor function score of group A, group B and group C were the same as preoperative, but that in group D it was decreased significantly, and then it gradually recovered. After 4 weeks it kept a stable level. The motor function score of group A was decreased gradually after the operation, which kept a stable level after 4 weeks, the motor function score was significantly lower than that in groups B, C, D. **Conclusions:** Determination of somatosensory evoked potentials is sensitive indicator of spinal cord injury; Application of medical self-crosslinking sodium hyaluronate gel is effective on epidural scar adhesion after laminectomy.

## 1. Introduction

Laminectomy is one of the most common surgical procedures of spine surgery. Due to the formation of a large amount of scar tissue postoperative laminectomy defect often severely affects the outcome of spinal surgery. Special materials covering the spinal dural and prevention of postoperative adhesions become a research hotspot. Currently semi-fluid biomaterial hyaluronic acid, chitosan, biofilm or bone tissues were adopted, each of them has its own characteristics, but there still are defects. Because self-crosslinking sodium hyaluronate can maintain the physical and chemical properties of the original hyaluronic

acid clumps and extend degradation time *in vivo*, it has been used in general surgery and gynecology for anti-adhesion<sup>[1-3]</sup>. In this study, the application of medical self-crosslinking sodium hyaluronate gel in treatment of epidural scar adhesion after laminectomy is explored.

## 2. Materials and methods

### 2.1. Experimental animals and agents

24 adult New Zealand white rabbits, aged 4 to 5 months were selected, which were provided by the Institute of Experimental Animal Center of our hospital. All rabbits had no spine and disc disease confirmed by MRI. Medical sodium hyaluronate gel and self-crosslinking sodium hyaluronate were purchased from Hangzhou Xiehe Medical Supplies Ltd., kept at room temperature avoid light.

\*Corresponding author: Liu Hua, Associate Chief Physician, Orthopaedic Department of PLA 474 Hospital, Xinjiang 830011, China.  
Tel: 15981745233  
E-mail: hworejwkd@163.com  
Foundation project: It is supported by Xinjiang Medical University (YG2011032).

## 2.2. Animal model establishment and grouping

After instrument sterilization, they were anesthetized with 10% chloral hydrate 5 mL/kg by ear vein injection, lumbosacral back hair was cut, and then the hair root was removed with 8% sodium sulfide. The rabbits were fixed on the operating table at prone position, and lumbosacral was padded. The electrodes were pierced into subcutaneous of both hind limbs malleolus, parietal, midpoint of eyes, cheeks respectively. The first electrical stimulation was carried out, the latencies values of preoperative somatosensory evoked potentials (CSEP) was recorded. After sterilization, the skin and fascia was cut in 3 cm, blunt dissection was performed layer by layer, L5 lamina spinal dural was removed to expose area. Second electrical stimulation was carried out, the latencies values CSEP after laminectomy was recorded. Unusual CSEP rabbit was excluded and the new rabbit model was supplemented.

24 rabbits were randomly divided into four groups, group A (control group) injected with saline 0.5 mL, group B filled with sodium hyaluronate gel 0.5 mL, group C filled with medical self-crosslinking sodium hyaluronate gel 0.5 mL, group D filled with medical self-crosslinking sodium hyaluronate gel 1 mL. After filled up the incision was sutured layer by layer, gentamicin 80 000 units were given intramuscularly postoperative to prevent infection. The third electrical stimulation was carried out before awake, CSEP latencies values was recorded.

## 2.3. Indicators observation

### 2.3.1. Determination of somatosensory evoked potentials

The electrodes were pierced into subcutaneous of both hind limbs malleolus, parietal, midpoint of eyes, cheeks, respectively. Parameters were as follows: frequency 2.7 Hz, duration of 200 ms, filtered signal frequency: 2–2 000 Hz. the CSEP latencies values was measured and recorded 2, 4, 6, 8, 12 weeks preoperative, intraoperative, postoperative respectively.

### 2.3.2. Scored motion of hindlimb

Tarlov was used to measure rabbit hindlimb motor function 1 day preoperative and postoperative and 8 weeks after surgery. The standard was completely paralyzed limbs 0 points; Hindlimb could horizontally paddle was 1 point; Hindlimb could be moved but not weight-bearing 2 points; hindlimb could weight and walk but unstable 3 points; normal function 4 points.

### 2.3.3. General observation

Complete segmental spinal specimens were removed from one animal of each group 1 day and 2, 4, 6, 8, 12 week postoperatively, the epidural adhesion was observed. Refer to Rydell scoring criteria: no subdural and scar tissue adhesions was 1 point; Only a small membrane adhesion between the scar tissue and dura mater, easy to separate was 2 points; Dural and scar adhesions range less than 2/3

of aminectomy defect diameter was 3 points; Extensive and dense adhesions between the scar tissue and dura mater, could not blunt dissection, the range was greater than 2/3 of aminectomy defect diameter or scar tissue invaded into the nerve root was 4 points.

## 2.4. Statistical analysis

The data was analyzed with SPSS 13.0 software. Data were expressed as mean±SD values, and compared with single factor analysis of variance. Comparison between the two groups was carried out by SNK test method.  $P<0.05$  was regarded as statistically significant difference.

## 3. Result

### 3.1. General observation

Animals could be awake generally within about 40 min postoperatively, self foraging and drinking. All rabbits showed no incision infection. After two weeks, group A showed significantly scar tissue and obvious inflammatory response until 6 weeks, after 6 weeks the scar tissue remained the same, without change. Groups B, C, D had the formation of loose scar tissue after 2 weeks of the operation, scar tissues were significantly less than that in group A, with mild inflammatory reaction. After 6 weeks groups C and D were basically the same postoperatively. After 8 weeks, the scar tissues of group B gradually increased, which were significantly more than that of groups C, D. The difference was statistically significant ( $P<0.05$ ) (Table 1).

### 3.2. Somatosensory evoked potentials

CSEP in group D after anesthetized was significantly longer, which were slightly extended in the other groups. After 2 weeks, group B, C were back to the preoperative level; After 4 weeks, group D was back to the preoperative level; After 4 weeks, the CSEP of group A increased significantly, which was basically the same 6 weeks postoperatively, significantly higher than that in groups B, C, D. CSEP latency of each time period in each group showed no significant differences ( $P>0.05$ ) (Table 2).

### 3.3. Motor function score

The motor function score of group A, group B and group C were the same with preoperative, but that in group D it was decreased significantly, the difference was statistically significant, and then it was gradually recovered. After 4 weeks it kept a stable level. The motor function score of group A was decreased gradually after the operation, which was stable after 4 weeks, the motor function score was significantly lower than that in groups B, C, D, and the difference was statistically significant ( $P>0.05$ ) (Table 3).

Download English Version:

<https://daneshyari.com/en/article/3455405>

Download Persian Version:

<https://daneshyari.com/article/3455405>

[Daneshyari.com](https://daneshyari.com)