Auris Nasus Larynx 40 (2013) 7–10

Contents lists available at SciVerse ScienceDirect

Auris Nasus Larynx

journal homepage: www.elsevier.com/locate/anl

The use of sodium hyaluronate-carboxymethylcellulose to prevent postoperative mastication pain from harvesting of temporalis fascia

Joong Ho Ahn *, Myung Joo Shim

Department of Otolaryngology, University of Ulsan College of Medicine, Asan Medical Center, Seoul, Republic of Korea

ARTICLE INFO

Article history:
Received 9 August 2011
Accepted 13 January 2012
Available online 27 February 2012

Keywords:
Temporal muscle
Fascia
Postoperative pain
Hyaluronic acid

ABSTRACT

Objective: To evaluate the anti-adhesive and anti-inflammatory effects of sodium hyaluronate-carboxymethylcellulose (HA-CMC) in reducing postoperative pain after temporalis fascia harvest during tympanomastoid surgery.
Materials and methods: Between January and December 2009, 27 patients underwent tympanoplasty and open cavity mastoidectomy involving the harvesting of temporalis fasciae (more than 3 × 4 cm). At the end of surgery, patients were injected with 1.5 g HA-CMC or normal saline around the fascia harvest area. Beginning immediately postoperatively and for 2 months after surgery, patients scored their pain in the temporal area on a visual analogue scale (VAS).
Results: There were no significant postoperative complications, such as bleeding or hematoma, in either control group. VAS scores of both groups decreased over time and were negligible after 2 months. VAS scores of the HA-CMC and control groups differed significantly ($p < 0.001$ by repeated measures ANOVA for all VAS scores).
Conclusion: HA-CMC can decrease immediate postoperative pain arising from tissue adhesion and inflammation, thus reducing postoperative mastication pain.

1. Introduction

During tympanomastoid surgery, the temporalis fascia is most commonly used for myringoplasty due to its large quantity, reduced blood supply, relative resistance to infection, and lower metabolic rate, and because no separate incision is required for harvest [1]. To harvest the temporalis fascia, a surgeon must dissect between the temporalis muscle and adjacent tissues. After incision and grafting of the fascia, the traumatized temporalis areas are electrocauterized to control bleeding, but are not otherwise manipulated. Many patients who undergo tympanoplasty accompanied by temporalis fascia harvest complain of dull pain in the ipsilateral temporal area during mastication or even while resting. However, these complaints are usually disregarded by the surgeon or even by patients because postoperative mastication pain is a minor complication compared with other complications such as facial palsy and postoperative wound infection.

We supposed that postoperative mastication pain may arise from direct injury to the temporalis muscle and/or from postoperative tissue adhesion. Adhesion formation is a complicated process. Although its pathophysiology is understood, it has not yet been solved. Adhesions can result from mechanical tissue damage, tissue ischemia, or the presence of foreign materials. In addition, two areas of injury must be in contact with each other. Both fibrinogenesis and fibrinolysis are activated, with a distortion of the dynamic balance between these two processes leading to adhesion formation [2,3].

Sodium hyaluronate, a nonsulfated glycosaminoglycan polysaccharide, is known to be inert, safe and easy to use, and remains at a biological site over extended periods of time [4,5]. Chemically modified sodium hyaluronate-carboxymethylcellulose (HA-CMC) is a bioresorbable agent shown to greatly reduce the incidence and degree of postoperative adhesions in patients, including those undergoing radical debulking procedures during abdominal and gynecological surgeries [6,7]. We have therefore evaluated the anti-adhesive effects of HA-CMC in reducing postoperative mastication pain after large temporalis fascia harvest during tympanomastoidectomy.

2. Materials and methods

2.1. Patients

This prospective, single-blinded study was carried out on patients who underwent tympanoplasty with open cavity mastoidectomy from January to December 2009 in the Department of

* Corresponding author at: Department of Otolaryngology, Asan Medical Center, University of Ulsan College of Medicine, 388-1 Pungnap-2 dong Songpa-gu, Seoul 138-736, Republic of Korea. Tel.: +82 2 3010 3717; fax: +82 2 489 2773.
E-mail address: meniere@amc.seoul.kr (J.H. Ahn).

0385-8146/$ – see front matter © 2012 Elsevier Ireland Ltd. All rights reserved.
doi:10.1016/j.anl.2011.12.002

Otolaryngology, Asan Medical Center, Seoul, Republic of Korea. Total 27 patients (16 male and 11 female) underwent tympanoplasty and open cavity mastoidectomy and the mean age was 48.0 ± 13.7 years (from 26 to 69 years).

We performed open cavity mastoidectomy when (1) the matrix of cholesteatoma had grown so extensively, that it looked unable to be eradicated from canal wall up technique, (2) the mastoid cavity was so contracted that we decided to carry out open cavity mastoidectomy for complete removal of the remaining disease, (3) there was suspiciously large dehiscence over labyrinth such as facial nerve or lateral canal from CT scan, and (4) the patients had received tympanomastoidectomy previously with failure. In this study, patients were included if (1) a large area of temporalis fascia (more than 3 × 4 cm) was harvested for coverage of the cavity after open cavity mastoidectomy and meatoplasty, (2) they had no problems with mastication before surgery, (3) the ear was available for follow-up for a minimum period of 2 months. Patients were excluded if (1) their ears had undergone previous tympanomastoid surgery, (2) they could not express their extent of pain or dullness, and (3) they showed delayed healing or postoperative complications such as infection or hematoma.

The study protocol was approved by the institutional Review Board of the Asan Medical Center, and all patients provided written informed consent.

2.2. Harvesting fascia

Following general endotracheal anesthesia, four quadrants of each ear canal were injected with a solution of 1% lidocaine and 1:200,000 epinephrine. A #15 blade was used to fashion a postauricular incision approximately 5 mm behind the postauricular crease and bleeding was controlled with electrical cauterization.

Once hemostasis was achieved, a small Paparella curved retractor was positioned to hold the auricle forward. The assistant placed a Cushing straight retractor under the upper part of the incision and pulled laterally, exposing the temporalis fascia. Before harvesting fascia, a greater than 3 × 4 cm sized incision was made on the temporalis fascia superiorly to the level of the linea temporalis and dissected the temporalis fascia free from the temporalis muscle using a periosteal elevator and Metzenbaum scissors. This tissue was then pressed between two slide glasses and placed on the back table in the open air for natural drying (Fig. 1). One senior surgeon carried out every surgery in this study. To avoid the selecting bias between HA-CMC and control group, another surgeon prepared all temporalis muscle fascia in the same way before the senior surgeon started to operate.

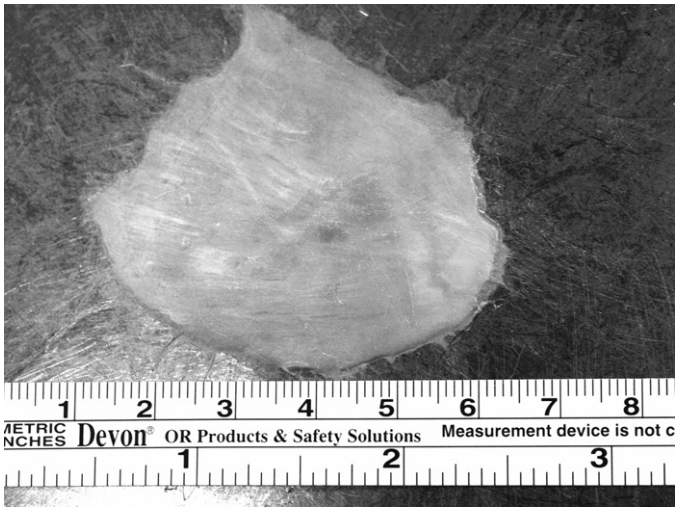

Fig. 1. Harvest of temporalis fascia during surgery. Large temporalis fascia (more than 3 × 4 cm) was harvested for grafting in tympanoplasty and open cavity mastoidectomy. After fascia harvest, bleeding was controlled with electrocauterization.

2.3. Application of HA-CMC

At the end of the surgery, the temporalis fascia was inserted for myringoplasty and coverage of the mastoid denuded surface. After packing the ear canal with cotton wicks, we alternately assigned patients into HA-CMC group (N = 14) who received 1.5 g of HA-CMC (Guardix®, Hanmi pharmaceutical co., Ltd., Seoul, Korea) and Control group (N = 13) who received the same volume of normal saline into the fascia harvest area before skin suture. For HA-CMC group, we applied HA-CMC (1.5 g) around the space where temporalis muscle fascia had been harvested. Since HA-CMC was viscoelastic solution prepared in a syringe, it was not difficult to deliver HA-CMC evenly on the harvested area.

Each patients did not know whether they had received HA-CMC or not during the operation under general anesthesia.

2.4. Evaluation of postoperative pain

Postoperative pain was evaluated using a visual analogue scale (VAS), with pain scored from "none (0)" to "very severe (10)". Patients were instructed to mark the point on the line corresponding to their perception of current pain. VAS scores were recorded daily for 1 week, and at the end of weeks 2, 3, 4, and 8.

2.5. Statistics

R version 2.6.1 was used to analyze data and draw survival curves (R Development Core Team, Vienna, Austria, http://www.R-project.org). Values were presented as means ± standard deviations. The analysis of variance (ANOVA) for repeated measures was used to compare VAS scores. Changes within and between groups were considered statistically significant when P values were <0.05.

3. Results

There were no significant differences between the HA-CMC and control group in patient age, sex, and side of operation. None of the patients experienced any postoperative complications, such as hematoma, wound infection, or facial palsy (Table 1).

Beginning immediately after surgery, patients in both the HA-CMC and control groups complained of dull pain in the temporal area during mastication. This pain decreased over time and became negligible after 2 months. The initial VAS scores were 2.9 ± 1.7 in the HA-CMC group and 3.9 ± 3.2 in the control group, decreasing to 0.6 ± 0.9 and 0.6 ± 1.0, respectively, 2 months after surgery. For those 2 months, however, VAS scores of the HACMC group differed

Table 1
Patient demographics. There were no significant differences between the HA-CMC and control groups.

	HA-CMC group (n = 14)	Control group (n = 13)	P-value
Age (years)	46 ± 11	53 ± 10	NS
Sex (Male:Female)	8:6	8:5	NS
Side (Right:Left)	9:5	8:5	NS
Postoperative complications	No	No	