Original Article

An innovative form, scaffold type of thread lift: its satisfactory performance and safety

一種創新形式的支架型提線：其令人滿意的性能和安全性

GS Jung and H Song

The purpose of this study was to evaluate the outcomes and safety of the new scaffold type polydioxanone thread lift. Thread lift and rejuvenation surgery were performed on four different areas: tear trough, nasolabial fold, cheek hollow, and marionette line; each group consisted of 12 patients using Cavern® threads. The procedure lasted about 7 minutes on average, and patients were able to return to work immediately afterwards. Facial rejuvenation using scaffold type thread Cavern® is a safe and effective procedure. This method produced good cosmetic results, a shorter operation time, less morbidity, and a faster recovery than the other method.

Keywords: Ageing face, face lift, facial rejuvenation, thread lift

Introduction

A youthful face has the general appearance of high-rounded fullness, while the ageing process is characterised by a look of depletion and sagging, leading to a tired look. The current understanding of the ageing process remains largely empirical, given that it is based on the effectiveness of treatments designed to satisfy the requirements of patients for a younger appearance. Lifting turns an aged face into a more youthful one.

With advances in medical technology, patients expect procedures to be minimally invasive, quick, simple, and to have a quick recovery rate. Thread lift is a method of facial rejuvenation that meets patients’ such needs.

Department of Plastic and Reconstructive Surgery, School of Medicine, Kyungpook National University, Daegu, Republic of Korea
GS Jung, MD

Medical College of Georgia, Augusta University, Augusta, GA, USA
H Song, Medical Student

Correspondence to: Dr. GS Jung

Department of Plastic and Reconstructive Surgery, School of Medicine, Kyungpook National University, 130 Dongdeok-ro, Jung-gu, Daegu 41944, Republic of Korea

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The barbed-type thread, which is usually used in thread lift, pulls up on the tissues. The cavern threads, which are based on a new concept, are scaffold threads that can effectively lift tissues due to their large mass or volume (Figure 1).

We performed thread lift on 80 patients using the scaffold type thread (Cavern®, NEO Dr. INC, Republic of Korea), and hereby report the results of the successful operations. The purpose of this study was to evaluate the outcomes and safety of the thread lift using Cavern®.

**Methods**

Thread lift and rejuvenation surgery were performed on four different areas: tear trough, nasolabial fold, cheek hollow, and marionette line; each group consisted of 12 patients using Cavern® threads from October to December 2017. All patients underwent follow-up for over three months. Patients who had active systemic or local infections, local skin diseases that could alter wound healing, psychiatric illness, soft tissue augmentation or implant materials were excluded from the study. Postoperative outcomes and complications were investigated.

The study conformed to the Declaration of Helsinki. Written consent was obtained from each patient for both the surgery and publication of the results.

**Cavern® thread**

The Cavern® thread is made up of a polydioxanone (PDO), and is in the shape of a spring. The thread is inserted into sagging area, and adds volume by maintaining its spring form. The thread is more effective in collagen synthesis, as it stimulates various sites of the skin in multiple directions (Figure 2).

![Figure 1](image1)

(a) The scaffold type thread, Cavern®, which is a new concept of thread, is made of polydioxanone (PDO), and is shaped in the form of a screw. (b) Schematic drawing of the operative procedure. The red lines indicate the sites of thread insertion. The procedure can be performed on the transverse brow furrows, vertical and horizontal glabellar furrows, tear trough, palpebromalar groove, cheek hollow, nasolabial fold, and marionette line.

![Figure 2](image2)

Cavern® lift mechanism (a) aged skin; (b) thread is inserted into lower subcutaneous layer; (c) collagen is formed around the thread; (d) collagen is maintained (blue).
Surgical procedure

First, the sites of thread insertion and puncture were determined. Wrinkled areas or areas requiring additional volume were marked. Following the induction of local anaesthesia in the infraorbital nerve, mental nerve, 1% lidocaine with 1:200,000 epinephrine were injected into puncture sites for local anaesthesia and along the designated line. Puncture was performed on the previously marked puncture site using a 21-gauge needle, and the Cavern® thread was inserted into the subcutaneous layer. Thinner threads were used for the tear trough and palpebromalar groove, while thicker threads were used for the cheek hollow, nasolabial fold, and marionette lines (Figure 3). The procedure took an average of seven minutes and was completed with brief compression to stop bleeding. Patients were able to return to work immediately post-treatment.

Evaluation of patient satisfaction

Thread lift was performed on the tear trough, nasolabial fold, cheek hollow, and marionette line in 12 patients. The patients were followed up for over 3 months to monitor postoperative complications. Patient satisfaction at one and three months postoperatively was investigated. Patients gave 1 point for “very dissatisfied”, 2 points for “dissatisfied”, 3 points for “neither satisfied nor dissatisfied”, 4 points for “satisfied”, and 5 points for “very satisfied”.

Results

Tear trough

Of the 12 patients, two were men, and 10 were women. The mean age of the patients was 39.3 years (range: 32-45 years) (Table 1). All patients were followed up for 3 months. The mean satisfaction score was 4.6 points at one month and 4.5 points at 3 months (Figure 4). There were no major complications during the follow-up period. Ecchymosis was observed in one patient (8.3%), asymmetry in one patient (8.3%), and palpability in one patient (8.3%). Asymmetry was corrected through additional procedures, and ecchymosis and palpability spontaneously disappeared over time (Table 2).

Cheek hollow

Of the 12 patients, three were men, and nine were women. The mean age of the patients was 38.2 years (range: 29-55 years) (Table 1). All patients were followed up for three months. The mean satisfaction score was 4.2 points at one month and 4.1 points at three months (Figures 4 & 5). No major complications were reported.

Figure 3. Patient satisfaction scores. Scores of four points or higher (satisfied and above) were achieved for the tear trough, cheek hollow, nasolabial fold, and marionette line.

Figure 4. A 33-year-old woman underwent operation on the tear trough. (a) Preoperative photographic findings. (b) Postoperative 3-month photographic findings.
complications were found in the follow-up period. Ecchymosis was observed in one patient (8.3%), which gradually resolved over time (Table 2).

**Nasolabial fold**

The mean age of the 12 patients (one man, 11 women) was 35.2 years (range: 28-43 years) (Table 1). All patients were followed up for 3 months. The mean satisfaction score was 4.5 points at 1 month and 4.5 points at 3 months (Figure 4). No major complications were found in the follow-up period. Ecchymosis was observed in one patient (8.3%), and palpability in one patient (8.3%); however, these gradually disappeared over time (Figure 6).

**Marionette line**

All 12 patients were women. The mean age of the patients was 37.1 years (range: 31-49 years) (Table 1). All patients were followed up for 3 months. The mean satisfaction score was 4.4 points at one month and 4.3 points at 3 months (Figure 4). No major complications were found in the follow-up period. Ecchymosis was observed in two patients (16.7%) and palpability in one patient (8.3%), but all spontaneously disappeared over time (Figure 7).

**Discussion**

Skin ageing can be divided into intrinsic ageing due to the chronological ageing process and extrinsic ageing due to environmental factors. They occur through mechanisms such as volume loss caused by fragmentation, disorganisation of collagen fibres, the occurrence of the number of cells (fibroblasts and mast cells), shortening of capillary loops and abnormal nerve-endings due to a reduction of blood vessels, decreased collagen I synthesis, and increased fibril fragmentation. Therefore, it is necessary to accurately understand the causes of ageing and to perform the appropriate procedures to help the patient obtain a youthful face.²

With the discovery that facial lifts using PDO dissolvable threads are effective in the last several years, many people have begun to undergo PDO

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**Table 1. Patients characteristics**

<table>
<thead>
<tr>
<th></th>
<th>Tear trough</th>
<th>Cheek hollow</th>
<th>Nasolabial fold</th>
<th>Marionette line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women</td>
<td>10</td>
<td>9</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Men</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Total number</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Mean age (range)</td>
<td>39.3 (32-45)</td>
<td>38.2 (29-55)</td>
<td>35.2 (28-43)</td>
<td>37.1 (31-49)</td>
</tr>
</tbody>
</table>

**Table 2. Early and late complications**

<table>
<thead>
<tr>
<th></th>
<th>Tear trough (%)</th>
<th>Cheek hollow (%)</th>
<th>Nasolabial fold (%)</th>
<th>Marionette line (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haematoma</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Infection</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pain</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nerve injury</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ecchymosis</td>
<td>1 (8.3%)</td>
<td>1 (8.3%)</td>
<td>1 (8.3%)</td>
<td>2 (16.7%)</td>
</tr>
<tr>
<td>Asymmetry</td>
<td>1 (8.3%)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Palpability</td>
<td>1 (8.3%)</td>
<td>0</td>
<td>1</td>
<td>1 (8.3%)</td>
</tr>
</tbody>
</table>
lifting or V lifting. PDO threads, which were used as absorbable sutures, are now safely used in face lifting. Although face lifting using non-absorbable threads is an effective cosmetic procedure, it did not become popular due to the difficult nature of the procedure. In contrast, procedures using absorbable threads are simple and easy to learn, and many practitioners can perform the procedure at a low risk. These procedures, initially performed in Asia, are now widely used internationally.

In the epidermis, corneocytes (terminally differentiated keratinocytes) accumulate, giving the skin a rough and dull appearance. In the dermis, the collagen content decreases and collagen and elastin fibers become disorganised and fragmented. This weakens the structure of the underlying elastic, leading to wrinkles. Subcutaneous fat redistribution also occurs, in which the periorbital, frontal, temporal, mandibular, mental, perioral, and glabellar areas are reduced, whereas the submental, lateral nasolabial folds, labiomental crease, jowls, infraorbital, and malar areas are increased. Therefore, rejuvenation starts by lifting, then moving upwards and tightening, followed by volume re-positioning. Rejuvenation tools comprise mechanical lifting through surgery and/or threads, skin tightening lasers, botulinum toxin, mesotherapy and microneedle therapy system followed by volume reposition using autologous fat transplantation and fillers. Originally, PDO threads were used in sutures, cardiac surgery, and tissue engineering. PDO threads become hydrated, and are excreted as urine. Thread residues are completely excreted through the gastrointestinal tract, and by respiration in the form of carbon dioxide. PDO is a colourless crystal, and an absorbable synthetic polymer.

PDO breaks down fat deposits, to a certain extent, within tissues. It is more effective in breaking down fat in the body than in the face as fibrosis occurs in the face, and the location of the SMAS layer that partially contains fat, varies. PDO also promotes collagen regeneration. It induces a degree of inflammation to produce new collagen. Ultimately, PDO restores skin elasticity and whitens the skin. PDO also promotes angiogenesis in the dermis and subcutaneous fat and increases dermal thickness.

Once the cavern thread is inserted into the body, it maintains its cavern form for a long period of time. During this time, the threads are dissolved and the cavern is filled with tissue which maintains the treatment effect. By maintaining the cavern form for a long period of time, a space is secured and filled by substances that promote healing such as...
collagen, and better outcomes than those of existing products can be expected. In the case of screw-type products, their screw shape could become distorted following insertion if not rotated with the same speed and force during the procedure, making it difficult to achieve satisfactory outcome. On the other hand, cavern screws can be inserted immediately without any rotation, and therefore, can drastically reduce surgery time and do not require special skills or experience. While existing products tend to move along with wrinkles, as the wrinkles move significantly reducing the anti-wrinkle effect of the procedure, cavern screws are securely fixed on the skin and can bring about satisfactory treatment outcomes.

Fillers, which are commonly used to add volume, are difficult to use in patients with loose skin as the weight of the filler may exacerbate the sagging. Volume maintenance is easier with cavern threads, which have no weight at all.

The procedure is simple, can be repeated, uses relatively inexpensive ingredients, and has no side effects based on long-term clinical experience. If well-performed, it can restore the skin's youthfulness to a satisfactory level.

**Conflict of interest**

No potential conflict of interest relevant to this article was reported.

**Acknowledgement**

Patients provided written consent for the use of their images.

**References**