Epiblepharon is characterized by a fold of skin that stretches horizontally across the upper or lower eyelid, usually associated with the inversion of eyelashes.\textsuperscript{1–3} The mean best-corrected visual acuity is significantly poorer before surgery compared with after surgery, without significant changes of astigmatism in patients with this disorder.\textsuperscript{4}

There have been many studies describing the clinical characteristics and management of congenital epiblepharon, and there are many types of surgical methods for the correction of upper eyelid epiblepharon. The buried suture technique is one of the surgical methods used for upper blepharoplasty in Asian countries.\textsuperscript{5–9}

Buried suture techniques are commonly used to correct upper eyelid epiblepharon for cases involving minimal fat under the skin of the upper eyelid or in cases where a double eyelid can be easily made by...
an eyelid creaser. With the buried suture techniques, there are no incision scars, but the loss of a double eyelid occurs more frequently than with incisional blepharoplasty. There have been numerous reports describing the incidence of recurrence in upper eyelid epiblepharon after surgery,\(^5,6,9-11\) with recurrence rates of 1.3–16.8%. Recurrence occurred in 30% of cases during the first year and 88% after 5 years.\(^5\)

When considering both therapeutic and aesthetic effects, we developed a newly modified surgical procedure involving blepharoplasty with a buried double twisted suture (BDTS). This novel technique was characterized by rare complications and minimal recurrence rates, and acceptable aesthetic results. In this study, we evaluated the clinical efficacy of blepharoplasty with a BDTS for correction of upper eyelid epiblepharon.

**MATERIALS AND METHODS**

**Study Design**
This retrospective study was conducted from October 2013 to July 2015 at the Oculoplastic Clinic, Bundang CHA Medical Center, CHA University, Seongnam, Korea. A total of 122 eyes from 61 patients with upper eyelid epiblepharon were enrolled. Only patients who satisfied the minimum follow-up time of at least 1 month after surgery were included. Blepharoplasty with a BDTS was performed on all eyes, followed by an evaluation of the surgical results and complications. After surgery, success was defined as the persistence of a double eyelid and by slit lamp examination of the eyelashes showing the upper eyelid not touching the cornea.

**Fig. 1.** Schematic diagram of blepharoplasty with the BDTS technique. The numbers within the circle are the order through which the threads are passed.
Upper Eyelid Measurement
Under general anesthesia, the upper eyelid thickness was measured with Vernier calipers at the level of the upper tarsal border at 3 points, involving the axis of the medial limbus, lateral limbus, and the center of the corneal pupil. The measurements were performed 3 times and averaged.

Surgical Technique
All surgeries were performed by 1 surgeon (L.H.). After determination of a desirable height of sutures for the upper eyelid, lidocaine was injected into medial, middle, and lateral points. Three skin stab incisions and removal of some orbicularis oculi muscle were made medially, centrally, and laterally. A 6-0 nylon suture was passed through the lateral incision point, passing through the palpebral conjunctiva under the lateral incision point and then passed again through the palpebral conjunctiva under the middle point to the middle skin incision. Using the same method, 6-0 nylon, which passed through the medial point, passed through the palpebral conjunctiva under the medial skin incision and then passed again through the palpebral conjunctiva under the middle point to the middle skin incision. After twisting by tying 2 strands of 6-0 nylon at the middle incision, the lateral suture strand passed through the middle skin incision to the lateral skin incision, and the medial suture strand passed through the middle skin incision to the medial skin incision. At the lateral and medial stab incisions, the sutures were passed under the subcutaneous tissue and the two 6-0 nylon sutures were tied to each other. After cutting the sutures just above the knots, the knots were buried under the skin using 2 forceps (Fig. 1).

Outcome Measures
A complete comparison of preoperative and postoperative results was conducted. A paired sample t test was used to calculate the differences between the preoperative and postoperative values of the margin reflex distance (MRD). Statistical analyses were performed using SPSS for Windows software (ver. 21.0; SPSS Inc., Chicago, Ill). A value of $P \leq 0.05$ was considered statistically significant.

RESULTS
Blepharoplasty with a BDTS technique was performed in a total of 122 eyes from 61 patients with

| Table 1. Eyelid Characteristics of Epiblepharon Patients from the Present and Past Studies |
|---------------------------------------------|
| Medial Eyelid Thickness (mm) | Central Eyelid Thickness (mm) | Lateral Eyelid Thickness (mm) | Height of the Tarsal Plate (mm) | Surgical Amount (mm) |
| Present study | 3.85±0.82 | 4.23±0.60 | 4.10±0.83 | 7.63±1.31 | 5.85±0.52 |
| Lew et al11 | 3.78±0.92 | 3.84±0.78 | 3.67±0.62 | 7.47±1.37 | 5.87±1.18 |

Fig. 2. Comparison between preoperative and postoperative morphological results.
upper eyelid epiblepharon. The patients were composed of 29 females and 32 males. The average age of the patients was 9.0 ± 7.7 years, and the average follow-up period was 7.3 ± 5.2 months. A lower eyelid epiblepharon procedure for the lower eyelid was performed in 44 patients, and epicanthoplasty was performed in 22 patients at the same time as blepharoplasty using a BDTS technique. Blepharoplasty with a BDTS alone was performed in 12 patients.

Morphological changes between preoperative and postoperative results are shown in Figure 2.

The upper eyelid thicknesses measured at the medial, central, and lateral points of three fixation points, and the height of the tarsal plate and the amount of surgery were similar (Table 1). Regarding the clinical characteristics of the epiblepharon patients, depending on the surgical procedures, the amount of surgery between the blepharoplasty with a BDTS group with lower eyelid epiblepharon correction and the BDTS group with lower eyelid epiblepharon correction and epicanthoplasty was significantly different ($P < 0.05$; Table 2). There was no recurrent case among the patients with a medial upper eyelid thickness $\leq 3.00$ mm or a central upper eyelid thickness $\leq 3.70$ mm. However, one recurrent case had thick medial and central upper eyelids, but the result was statistically insignificant. Patients with a lateral upper eyelid thickness $\leq 3.25$ mm showed successful results. One recurrent patient had thick lateral upper eyelids compared with patients with successful surgery, but the result was statistically insignificant. There was no correlation between the height of the tarsal plate and recurrence (Table 3).

The preoperative MRD1 value was $2.0 \pm 1.0$ mm, and the postoperative MRD1 value was $3.2 \pm 0.9$ mm. The MRD1 values increased significantly after surgery ($P < 0.05$) (Fig. 3).

The success rate determined by slit lamp examination, and the persistence of double eyelids was 98.1%. There was recurrence in 1 patient (1.9%), who was treated after 2 months. Postoperative complications occurred in 2 patients (3.8%), and all complications involved knot exposures (Fig. 4). Knot adjustment was performed in these cases after an average of 8 months. The knots were buried in the deep layer under local anesthesia. Overall, all cases showed good results without complications.

### Table 2. Clinical Characteristics of Epiblepharon Patients According to the Surgical Procedures

|                  | Medial Eyelid Thickness (mm) | Central Eyelid Thickness (mm) | Lateral Eyelid Thickness (mm) | Height of Tarsal Plate (mm) | Surgical Amount (mm) |
|------------------|-----------------------------|-------------------------------|-------------------------------|-----------------------------|----------------------|
| Upper eyelid     |                             |                               |                               |                             |                      |
| BDTS             | 3.75 ±0.20                  | 4.19 ±0.38                    | 4.38 ±0.43                    | 8.13 ±0.14                  | 5.88 ±0.43           |
| BDTS + epicanthoplasty | 4.10 ±0.71                  | 3.77 ±0.61                    | 4.07 ±0.12                    | 8.23 ±0.61                  | 5.23 ±0.61           |
| Subtotal         | 3.90 ±0.31                  | 4.01 ±0.38                    | 4.24 ±0.35                    | 8.17 ±0.19                  | 5.60 ±0.48           |
| Lower eyelid     |                             |                               |                               |                             |                      |
| BDTS + lower eyelid epiblepharon correction | 4.13 ±0.43                  | 4.35 ±0.39                    | 4.44 ±0.37                    | 8.10 ±0.74                  | 6.17 ±0.51           |
| BDTS + lower eyelid epiblepharon correction + epicanthoplasty | 3.55 ±1.04                  | 4.11 ±0.79                    | 3.73 ±1.04                    | 7.02 ±1.62                  | 5.65 ±0.34           |
| Subtotal         | 3.82 ±0.86                  | 4.22 ±0.64                    | 4.06 ±0.87                    | 7.52 ±1.38                  | 5.93 ±0.51           |
| Total            | 3.85 ±0.82                  | 4.25 ±0.60                    | 4.10 ±0.83                    | 7.63 ±1.31                  | 5.85 ±0.52           |

*P < 0.05.

### Table 3. Upper Eyelid Thickness and the Recurrence of Upper Eyelid Epiblepharon After Correction with Blepharoplasty with the BDTS Technique

| Eyelid Thickness | Success | Recurrence | $P$  |
|------------------|---------|------------|------|
| Medial           |         |            |      |
| ≤3.00 mm (n = 24)| 24      | 0          | 0.619|
| >3.00 mm (n = 98)| 97      | 1          |      |
| Central          |         |            |      |
| ≤3.70 mm (n = 8)| 8       | 0          | 0.790|
| >3.70 mm (n = 114)| 113   | 1          |      |
| Lateral          |         |            |      |
| ≤3.25 mm (n = 20)| 20      | 0          | 0.657|
| >3.25 mm (n = 102)| 101    | 1          |      |

Fig. 3. Comparison of preoperative and postoperative MRD.
DISCUSSION

Upper eyelid epiblepharon is less frequent than lower eyelid epiblepharon in Koreans (9.2% versus 80.3%, respectively).\(^{10}\) Attachment between the upper eyelid skin and aponeurosis of the levator can produce upper eyelid creases. In Asians, the attachment is usually weak due to well-developed subcutaneous fat and pretarsal fat in the upper eyelid. The incisional method and the buried suture technique are 2 common types of surgeries used to correct upper eyelid epiblepharon. Incisional surgery has a relatively low rate of eyelid crease disappearance. However, the incisional method requires a long recovery time and produces a scar at the incision site. The buried suture technique is a fast and convenient way of creating the double fold, and there is usually minimum postoperative swelling with a fast recovery time, but recurrence is a major problem. Since the first description by Mikamo, there have been several modifications to this method.\(^{12-20}\) For the continuous buried suture technique, a lower rate of double fold loss and fewer complications in the continuous buried suture method were reported than with the interrupted buried suture method for double fold formation in Koreans.\(^{21}\) However, the complication rate was still 8.6%, even when using the continuous buried suture method in this study.

A previous study reported that the lateral upper eyelid thickness and the height of the tarsal plate were essential morphological characteristics of the upper eyelid determining the results of epiblepharon correction by the buried suture technique. Furthermore, when the thickness of the lateral upper eyelid was >3.25 mm, the chance of recurrence of epiblepharon was high (13.2% recurrence).\(^{11}\)

The percentage of recurrence after blepharoplasty with the BDTS technique was 1.9% in this study, which was a low incidence of recurrence when compared with previous results. Knot exposure was a postoperative complication in 2 patients (3.8%), but we treated the complication under local anesthesia by simply burying the knots in the deep layer. Furthermore, severe complications such as irritation by eyelashes or corneal erosion did not occur in the recurrent cases. In our case of recurrence, the patient had an epicanthal fold at the medial canthus. A previous study reported that epiblepharon repair with epicanthoplasty, especially root Z-epicanthoplasty, was effective in relieving cilia-cornea touch in children with upper eyelid epiblepharon and significant epicanthal folds.\(^{19,20}\) To prevent recurrence, epicanthoplasty can be added to blepharoplasty with BDTS technique for patients with prominent epicanthal fold.

In summary, we developed blepharoplasty with a BDTS to correct upper eyelid epiblepharon. It is a relatively simple and effective method to correct epiblepharon with a low rate of complications. Based on excellent cosmetic outcomes, this technique can be applied to double eyelid surgery to produce both functional and aesthetic improvements.

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PATIENT CONSENT
Patients or parents or guardians of the patients provided written consent for the use of the patients’ image.

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