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Effect of upgaze on lower eyelid position in Korean patients with congenital ptosis☆

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Summary *Purpose:* The purpose of this study was to demonstrate accompanying clinical features besides lid droop in congenital ptosis and to determine the effect of upgaze on lower eyelid position in patients with congenital ptosis.
Methods: Pediatric patients with congenital ptosis who visited our clinic over a 1-month period in 2014 were recruited for this study. Clinical photographs and measurements were taken prospectively in primary gaze and upgaze. Measurements taken from photographs and clinical records include inferior scleral show (ISS), vertical lower lid height (LL), and canthal tilt angle (CTA).
Results: There were 35 patients with congenital ptosis. There was more ISS in unilateral ptosis eyes than in the normal side in both primary gaze ($p < 0.05$) and upgaze ($p < 0.01$), with corresponding increase in ISS in upgaze ($p < 0.05$). There was also more ISS in unilateral ptosis eyes than in bilateral ptosis eyes in primary gaze ($p < 0.05$) and upgaze ($p < 0.01$), with accompanying increase in ISS in upgaze ($p < 0.01$). There was less elevation of the lower lid in unilateral ptosis eyes (0.5 ± 0.7 mm) than in the contralateral normal eyes (0.8 ± 0.7 mm) in upgaze, but this was not statistically significant ($p = 0.07$). CTA was lower in ptosis eyes than in normal eyes in primary gaze and upgaze ($p < 0.01$ and $p < 0.05$, respectively).
Conclusion: ISS was larger in ptosis eyes and upgaze appears to increase ISS. Canthal tilt is lower in congenital ptosis eyes than in normal eyes in primary gaze and upgaze.

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Introduction

In our clinical practice, besides complaining of a droopy eyelid, children with congenital ptosis and their guardians often complain of an asymmetrical or unusual appearance of the eyelids. This includes noticing an increased inferior scleral show (ISS) and a lower positioned lateral canthus. However, these accompanying changes are rarely reported in the literature. It has been reported that lower eyelid position could change according to the status of the upper eyelid in patients with ptosis.[1,2] In addition, we have demonstrated that ISS was found in patients with congenital ptosis and diminished after ptosis surgery.[3]

The aim of our study was to quantify these accompanying changes, especially in the lower eyelid position with upgaze in patients with congenital ptosis. We also seek to clarify and postulate the possible causes of these observations. This would enable to better understand the interplay of the vectors of forces during eyelid movement. Measurements obtained from this study might help us to understand why there is an improvement of ISS after ptosis surgery.[3]

Materials and methods

This study was approved by the Institutional Review Board (IRB)/Ethics Committee. The study adhered to the tenets of the Declaration of Helsinki, and written informed consent was obtained from all the participants (parents or legal guardians).

This is a prospective comparative observational study. All children under the age of 12 years who were diagnosed in the clinic with unilateral or bilateral simple myogenic congenital ptosis were recruited. Patients with the following conditions were excluded from the study: blepharophimosis, Marcus Gunn Jaw winking, neuromuscular diseases, strabismus, and previous eyelid surgery.

Clinical photographs of all patients were taken in primary gaze (Figure 1a) and upgaze (Figure 1b). For the photograph in upgaze, the patient was asked to focus on a fixation target, and this target was elevated to 40 degrees of elevation. This upgaze is maintained and the photograph is taken at that angle of fixation. An 8-mm circular disc was placed on the child's forehead as a measuring guide.

The measurements taken from the photographs and clinical records include marginal reflex distance 1 (MRD1) and 2 (MRD2), palpebral aperture (PA), levator function (LF), ISS, vertical lower lid height (LL), and canthal tilt angle (CTA). ISS is defined as the vertical distance measured from the inferior corneal limbus to the lower lid margin (Figure 2a). LL is defined as the vertical distance between a horizontal line drawn through the medial canthal angle and the lowest margin of the lower lid (Figure 2b). CTA is defined as the angle subtended by a line drawn through the medial and lateral canthal angle and a horizontal line drawn through the medial canthal angle (Figure 2c).

ISS, LL, and CTA were statistically compared using the paired or independent *t*-test (where appropriate). The measurements for controls were obtained by measuring the non-ptosis side of the patients with unilateral ptosis. These measurements were used as a pooled control for both unilateral and bilateral ptosis cases. Statistical test was two-sided with the significance level set at 0.05, and was performed using IBM® SPSS® Statistics version 20 software.

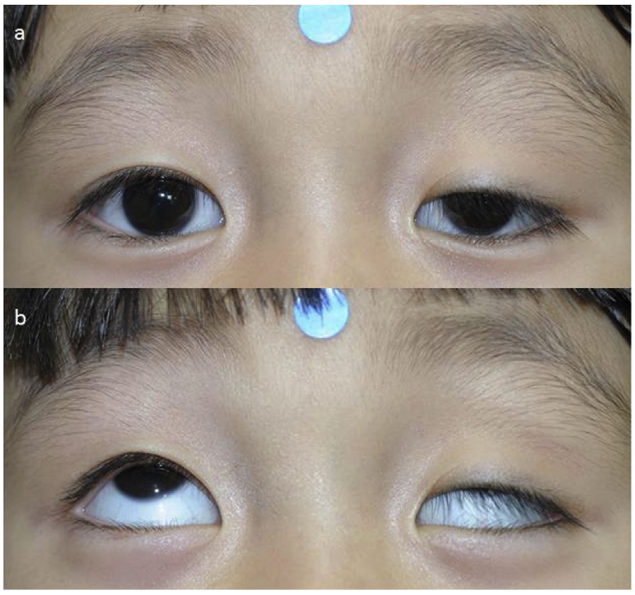

Figure 1 Clinical photographs in primary gaze (a) and upgaze (b) with measuring circular disc.

Results

There were 35 patients with congenital ptosis. Twenty-two patients (62.9%) were male patients. The mean age of the patients was 4.4 years (range, 6 months to 9 years). Sixty-three percent of the patients (n = 22) had unilateral ptosis and 37% (n = 13) had bilateral ptosis. Of the 22 patients in the unilateral ptosis group, 11 patients (50%) were male patients. The mean age in this group was 3.9 years (range 6 months—8 years). Of the 13 patients in the bilateral ptosis group, 11 patients (85%) were male patients. The mean age in this group was 5.2 years (range 2—9 years).

There was more ISS in unilateral ptosis eyes than in the normal eyes in both primary gaze ($p < 0.05$) and upgaze ($p < 0.01$). This change in ISS from primary gaze to upgaze was also statistically significant in both ptosis eyes and the normal eyes ($p < 0.05$, Table 1).

There was also more ISS in unilateral ptosis eyes than bilateral ptosis eyes in primary gaze ($p < 0.05$) and upgaze ($p < 0.01$). This change in ISS from primary gaze to upgaze was also statistically significant in both the groups ($p < 0.01$, Table 2).

In normal eyes, there was elevation of the lower lid position in upgaze ($p = 0.41$), demonstrated by a decrease in LL from primary gaze to upgaze. In ptosis eyes, there was less elevation of the lower lid in upgaze, demonstrated by a decrease in LL from primary gaze to upgaze ($p = 0.53$), but the change was not statistically significant ($p = 0.07$, Table 3).

CTA was lower in ptosis eyes than in normal eyes in primary gaze ($p < 0.01$) and upgaze ($p < 0.05$, Table 4). The representative cases are presented in Figure 3.

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