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Acute Acquired Comitant Esotropia and Digital Device Overuse in Children: a Three-Case Report

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Abstract

Acute acquired comitant esotropia (AACE) is an uncommon strabismus involving sudden-onset inward eye deviation and diplopia. Recent trends suggest a rising incidence among youth, potentially linked to excessive digital device use.

This study reviews three children (ages 8–12) who developed AACE and diplopia following prolonged daily screen time (≥4 hours). Clinical evaluations revealed full ocular motility and no neurological deficits, with deviations ranging from 24 to 50 prism diopters.

Management transitioned from conservative monitoring to surgery once deviations stabilized. Interventions included bilateral medial rectus recession or unilateral recession-resection.

Postoperatively, all patients achieved orthotropia, resolved diplopia, and restored normal stereopsis. While a temporal association exists between heavy digital use and AACE, causality remains unproven. However, surgical intervention remains highly effective for restoring binocular function. Further research is necessary to clarify the mechanisms behind this "digital-age" presentation of strabismus.

Key Words: Acute Acquired Comitant Esotropia (AACE); Digital Device Overuse; Pediatrics; Diplopia; Strabismus Surgery.

INTRODUCTION

Acute acquired comitant esotropia (AACE) is an uncommon form of esotropia that typically presents in older children with sudden-onset esodeviation and diplopia. It is not primarily associated with accommodative effort and is characterized by comitant deviation with preserved ocular motility. The prevalence of AACE has increased worldwide in recent years [1]. It accounts

for approximately 0.3% of strabismus cases in children, and spontaneous recovery is considered rare [2].

Historically, Burian and Miller classified AACE into three types based on clinical features and presumed etiology [3]. Type I (Swan type) is associated with disruption of fusion, often due to monocular occlusion or vision loss. Type II (Burian–Franceschetti type) is typically linked to physical or psychological stress and presents with large-angle esotropia, minimal refractive error, and little or no accommodative component. Type III (Bielschowsky type) is commonly associated with moderate myopia [3]. However, more recent studies have shown that a significant proportion of cases reported in the past decade do not conform to these traditional classifications [1].

Buch and Vinding further expanded the classification by analyzing 48 pediatric cases and identifying seven etiological subtypes of AACE, including hyperopic, decompensated monofixation syndrome or esophoria, idiopathic, intracranial, secondary, cyclic, and occlusion-related forms [4].

In recent years, the incidence of AACE has shown an increasing trend, particularly among children and adolescents [5]. This rise coincides with the widespread adoption of mobile technologies and digital devices. Smartphones, in particular, have become one of the most rapidly integrated technologies worldwide, requiring sustained near visual attention [6].

The increasing use of smartphones has also been associated with various health concerns, including behavioral dependence and excessive screen exposure. With the growing prevalence of digital device use, the number of reported AACE cases appears to be rising [6,7]. In 2016, Lee et al. described 12 patients with AACE associated with excessive smartphone use, with improvement of esotropia observed in 9 cases following restriction of device usage [6]. These findings suggest a possible association between prolonged near work and the development of AACE.

Nevertheless, despite increasing clinical observations and growing interest in this condition, the etiology, classification, and optimal management of AACE remain incompletely understood and continue to be a subject of debate [8,9].

CASE

We present a case series of three pediatric patients who were referred to our clinic with acute-onset comitant esotropia. Detailed medical histories were obtained in all cases, including the time of onset, potential precipitating factors, and associated symptoms such as diplopia.

All patients underwent comprehensive ophthalmological examination. The angle of deviation was measured using the prism cover/uncover test and was further evaluated with a synoptophore

and the Hirschberg test. Ocular motility was assessed in all directions of gaze to exclude extraocular muscle paresis or the presence of nystagmus. Best-corrected visual acuity and binocular function, including fusion potential, were also evaluated in all patients.

Cycloplegic refraction was performed 30 minutes after the administration of 1% cyclopentolate eye drops. Two drops were instilled in each eye at a 5-minute interval prior to measurement.

All patients additionally underwent neurological evaluation to exclude underlying neurological pathology.

We present three pediatric patients (aged 8, 10, and 12 years) with acute-onset comitant esotropia and diplopia. All cases were temporally associated with prolonged daily use of digital devices.

Case 1

An 8-year-old boy presented with sudden-onset strabismus and diplopia (Fig. 1 A). According to the mother, the child had been using electronic devices for more than 4–5 hours daily.

Figure 1

An 8-year old boy with acute acquired comitant esotropia before (A) and after (B) surgery

Ocular motility was full in all directions. Best-corrected visual acuity (BCVA) was 20/20 in both eyes. The angle of deviation measured 35 prism diopters (PD) by Krimsky test, approximately 15° by Hirschberg test, and +18° on synoptophore.

Cycloplegic refraction revealed:

- OD: +0.50 sph –0.25 cyl ×180
- OS: –0.25 sph –0.25 cyl ×170

Fundus examination was unremarkable. Neurological and pediatric evaluations revealed no abnormalities. The patient underwent vision therapy during the initial management period.

After 6 months of conservative treatment, bilateral medial rectus recession was performed. Postoperatively, ocular alignment was orthotropic, diplopia resolved completely, and stereopsis was fully restored (fig. 2 B)

Case 2

A 10-year-old boy presented with acute-onset esotropia and diplopia (Fig. 2 A), reportedly developing after prolonged use of electronic devices for at least 8 hours per day.

Figure 2

A 10-year old boy with acute acquired comitant esotropia before (A) and after (B) surgery

Visual acuity was 20/20 in both eyes. Ocular motility was full. The angle of deviation was 24 PD by Krimsky test, approximately 20° by Hirschberg test, and +25° on synoptophore.

Cycloplegic refraction demonstrated mild accommodative spasm:

- OD: –0.25 sph +0.50 cyl ×89
- OS: –0.50 sph –0.25 cyl ×90

Binocular vision was assessed using Worth 4-dot test, synoptophore, and Titmus stereotest. Fundus examination and neurological evaluation were normal. The patient underwent vision therapy.

After 6 months, surgical treatment was performed with unilateral medial rectus recession combined with lateral rectus resection in the right eye. Diplopia resolved on the first postoperative day. The patient achieved orthotropia with restoration of binocular single vision at both near and distance. Stereopsis was normal, and results remained stable at 6-month follow-up (Fig. 2 B)

Case 3

A 12-year-old boy presented with acute-onset esotropia and diplopia (Fig. 3 A). The patient had a history of prolonged electronic device use exceeding 7 hours daily.

Figure 3 A 12-year old boy with acute acquired comitant esotropia before (A) and after (B) surgery

Ocular motility was full in all directions. Visual acuity was 20/20 in the right eye, with diplopia reported. The angle of deviation measured 50 PD by Krimsky test, approximately 25° by Hirschberg test, and +25° on synoptophore.

Cycloplegic refraction revealed:

- OD: +1.25 sph +0.25 cyl ×89
- OS: +1.25 sph +0.50 cyl ×90

Binocular function was evaluated using Worth 4-dot test, synoptophore, and Titmus test. Fundus and neurological examinations were unremarkable.

After 6 months of observation, bilateral medial rectus recession was performed. Postoperatively, ocular alignment was symmetrical, diplopia resolved, and stereopsis was restored (Fig. 3 B).

The main clinical characteristics and outcomes are summarized in Table 1.

Parameter	*Case 1*	*Case 2*	*Case 3*
Age (years)	8	10	12
Sex	Male	Male	Male
Daily smartphone use	4–5 hours	≥8 hours	≥7 hours
Onset	Acute	Acute	Acute
Diplopia	Present	Present	Present
Visual acuity (BCVA)	20/20 OU	20/20 OU	20/20 OU
Ocular motility	Full	Full	Full
Angle of deviation (PD)	35 PD	24 PD	50 PD
Hirschberg (approx.)	~15°	~20°	~25°
Synoptophore	+18°	+25°	+25°
Refraction (OD)	+0.50 –0.25 ×180	–0.25 +0.50 ×89	+1.25 +0.25 ×89
Refraction (OS)	–0.25 –0.25 ×170	–0.50 –0.25 ×90	+1.25 +0.50 ×90
Neurological evaluation	Normal	Normal	Normal
Fundus examination	Normal	Normal	Normal
Conservative treatment	Vision therapy	Vision therapy	Observation
Surgical procedure	Bilateral MR recession	MR recession + LR resection (RE)	Bilateral MR recession
Time to surgery	6 months	6 months	6 months
Postoperative alignment	Orthotropia	Orthotropia	Orthotropia
Diplopia (post-op)	Resolved	Resolved	Resolved
Stereopsis	Restored	Normal	Restored

Table 1.

Clinical Characteristics and Outcomes of Patients with AACE

DISCUSSION

Acute acquired comitant esotropia (AACE) represents a distinct subtype of esotropia characterized by sudden-onset comitant esodeviation accompanied by diplopia, with full ocular motility and no evidence of extraocular muscle paresis. It is more commonly observed in older children and adolescents, although its exact pathophysiology remains incompletely understood [2-4,8].

In recent years, increasing attention has been given to the possible association between AACE and prolonged near work, particularly excessive smartphone use [1,5,6,8]. Sustained viewing of near objects may increase convergence demand and disrupt the balance between accommodation and vergence mechanisms. It has been suggested that prolonged near fixation may lead to increased tonic activity of the medial rectus muscles, potentially contributing to the development of esodeviation. Additionally, accommodative dysfunction or fatigue may further exacerbate this imbalance [6,8].

In the present case series, all three patients had a history of prolonged daily use of electronic devices prior to the onset of symptoms, suggesting a temporal association between excessive near work and the development of AACE. However, given the small number of cases and the observational nature of this study, a causal relationship cannot be established.

Another important consideration in patients presenting with AACE is the exclusion of underlying neurological pathology. Although most cases are benign, AACE may rarely be associated with intracranial disease [2,7,9]. Therefore, thorough ophthalmological and neurological evaluation is essential. Neuroimaging, particularly magnetic resonance imaging (MRI), is often recommended to rule out central causes; however, the optimal indications and timing for imaging remain controversial, as no single clinical feature reliably predicts intracranial pathology [7,9].

The management of AACE remains individualized. While some patients may benefit from conservative measures such as reduction of near work, refractive correction, or orthoptic therapy, stable deviations often require surgical intervention [2,7,8]. In our series, all patients underwent surgery after a period of observation, achieving excellent motor and sensory outcomes, including orthotropia, resolution of diplopia, and restoration of binocular function.

This study has several limitations. The small sample size, absence of a control group, and reliance on patient-reported screen time limit the ability to draw definitive conclusions. Furthermore, the observational design precludes establishing a causal relationship between smartphone use and AACE. Future studies with larger cohorts and controlled designs are needed to better elucidate the underlying mechanisms and risk factors.

CONCLUSION

Excessive smartphone use may be temporally associated with the development of acute acquired comitant esotropia (AACE), although a causal relationship cannot be established based on the present findings. The increasing incidence of AACE in recent years underscores the need for further studies to better understand its underlying mechanisms and risk factors.

Surgical management of AACE provides excellent motor and sensory outcomes, with restoration of ocular alignment, resolution of diplopia, and recovery of binocular function. In cases with stable deviation, surgical intervention should be considered after an appropriate period of observation.

NOTES ON PATIENT CONSENT

The study adhered to the principles of the Declaration of Helsinki. Written informed consent for publication of clinical data and images was obtained from the parents/legal guardians of all patients included in this case series. All identifying personal information was omitted to ensure patient anonymity and confidentiality.

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მწვავე შეძენილი შეუღლებული ეზოტროპია და ციფრული მოწყობილობების ჭარბი მოხმარება ბავშვებში: სამი კლინიკური შემთხვევის აღწერა

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მწვავე შეძენილი შეუღლებული ეზოტროპია სიელმის იშვიათი ფორმაა, რომელიც ხასიათდება თვალის უეცარი გადახრით და დიპლოპიით (მხედველობის გაორებით). ბოლო წლებში აღინიშნება ამ მდგომარეობის სიხშირის ზრდა ბავშვებსა და მოზარდებში, რაც სავარაუდოდ, დაკავშირებულია ციფრული მოწყობილობების ხანგრძლივ და ინტენსიურ გამოყენებასთან.

წინამდებარე ნაშრომში წარმოდგენილია 8–12 წლის ასაკის სამი პაციენტის კლინიკური შემთხვევა, რომელთაც მწვავე შეძენილი შეუღლებული ეზოტროპია და დიპლოპია განუვითარდათ ელექტრონული მოწყობილებების გადაჭარბებული გამოყენების შემდეგ (≥4 საათი). კლინიკურმა გამოკვლევამ ყველა შემთხვევაში გამოავლინა თვალების შეუზღუდავი მოძრაობა და ნევროლოგიური პათოლოგიის არარსებობა, ხოლო გადახრის კუთხე მერყეობდა 30 დან 55 პრიზმულ დიოპტრიამდე.

პაციენტებს თავდაპირველად უტარდებოდათ დინამიკური დაკვირვება, ხოლო გადახრის მაჩვენებლების სტაბილიზაციის შემდეგ ჩატარდა ქირურგიული მკურნალობა. ოპერაციული ჩარევა მოიცავდა მედიალური სწორი კუნთების ორმხრივ რეცესიას ან ცალმხრივ რეცესია-რეზექციას.

ოპერაციის შემდგომ ყველა პაციენტთან მიღწეულ იქნა ორთოფორია, სრულად აღმოიფხვრა დიპლოპია და აღდგა სტერეოსკოპიული მხედველობა. მიუხედავად იმისა, რომ ციფრული მოწყობილობების ჭარბ გამოყენებასა და მწვავე შეძენილი შეუღლებული ეზოტროპიის განვითარებას შორის შეინიშნება დროებითი კავშირი, მათი მიზეზ-შედეგობრივი ურთიერთობა ჯერ კიდევ საჭიროებს დამატებით შესწავლას. ამასთან, ქირურგიული მკურნალობა ეფექტურ მეთოდად რჩება თვალების სწორი მდებარეობისა და ბინოკულარული ფუნქციის აღსადგენად.

საკვანძო სიტყვები: მწვავე შეძენილი შეუღლებული ეზოტროპია, ციფრული მოწყობილობები, დიპლოპია, პედიატრიული ოფთალმოლოგია, სიელმის ქირურგია, სტერეომხედველობა.