AJPMHS GLOBAL RESEARCH NETWORK

AMERICAN Journal of Pediatric Medicine and Health Sciences
Volume 4, Issue 01, 2026 ISSN (E): 2993-2149

Esotropia in Douin Syndrome and Ways to Improve the Results of Surgical Treatment

Boboev Saidavzal Abdurakhmanovich
Ph.D. Associate Professor, Department of Ophthalmology, SamSMU

Khidirov Begzod Ilkhomovich
Ophthalmologist

Abstract: This article presents an extensive study on the clinical features of esotropia in Duane retraction syndrome (DRS) and the optimization of surgical approaches aimed at improving ocular alignment, reducing abnormal head posture, and enhancing binocular function. Duane syndrome, a congenital ocular motility disorder characterized by co-contraction of the medial and lateral rectus muscles, often leads to esotropic deviation due to mechanical and innervational anomalies. The research analyzes various surgical techniques, including medial rectus recession, lateral rectus resection, and transposition procedures, assessing their efficacy, safety, and postoperative outcomes. The study also emphasizes the importance of individualized surgical planning based on the type of DRS, degree of esotropia, limitation of abduction, and presence of globe retraction or up/downshoots. Findings indicate that a tailored, minimally invasive surgical approach, combined with precise preoperative evaluation and long-term follow-up, significantly improves functional and cosmetic outcomes. The research provides an evidence-based framework for enhancing surgical correction in patients with Duane syndrome-associated esotropia. This article provides a comprehensive evaluation of esotropia associated with Duane retraction syndrome (DRS) and explores advanced surgical approaches aimed at improving alignment, reducing abnormal head posture, and restoring binocular function. Duane syndrome is a congenital ocular motility disorder resulting from aberrant innervation of the lateral rectus muscle by branches of the oculomotor nerve, leading to limited abduction, globe retraction, and esotropic deviation in the primary gaze position. The research emphasizes individualized surgical strategies such as graded medial rectus recession, lateral rectus transposition, and Y-splitting procedures to address the unique pathophysiology of the syndrome. Through detailed preoperative assessment and postoperative follow-up, the study demonstrates that tailored, minimally invasive interventions significantly enhance ocular alignment, improve motility, and achieve superior functional and aesthetic outcomes. The findings support a patient-specific, anatomically informed approach as essential for achieving stable and long-lasting results in the management of esotropic Duane syndrome.

Keywords: Duane retraction syndrome, esotropia, medial rectus recession, lateral rectus transposition, ocular motility disorder, abduction limitation, surgical correction, binocular function, head posture, strabismus management.

Introduction:

Duane retraction syndrome (DRS) is a congenital eye movement disorder resulting from anomalous innervation of the lateral rectus muscle by branches of the oculomotor nerve instead

of the abducens nerve. This aberrant innervation leads to co-contraction of the medial and lateral rectus muscles during attempted abduction or adduction, producing characteristic globe retraction and narrowing of the palpebral fissure. Esotropia is the most common manifestation in Type I DRS, where abduction is limited and the affected eye turns inward in the primary position. Patients frequently adopt compensatory head turns toward the affected side to maintain binocular vision and reduce diplopia. The clinical management of esotropic Duane syndrome is complex, as conventional strabismus surgical principles often yield suboptimal results due to the unique mechanical and innervational factors involved. Successful surgical correction requires careful preoperative evaluation of deviation angle, abduction limitation, retraction severity, and anomalous vertical movements (upshoots or downshoots). The main objectives of surgery are to align the eyes in the primary position, reduce co-contraction, minimize head turn, and preserve binocular function. Recent advances in surgical techniques, such as graded medial rectus recession, partial tendon transpositions, and Y-splitting of the lateral rectus, have improved outcomes and reduced complications. This study aims to assess esotropia in Duane syndrome and analyze modern surgical methods for optimizing alignment and functional recovery. Duane retraction syndrome represents a complex congenital eye movement disorder characterized by limitation or absence of abduction, narrowing of the palpebral fissure during adduction, and globe retraction due to paradoxical co-contraction of horizontal rectus muscles. Esotropic deviation is the most frequent presentation, particularly in Type I DRS, where abduction is limited while adduction is preserved or mildly restricted. The resulting misalignment in primary gaze position often leads to compensatory head turns to maintain binocular fusion and prevent diplopia. Conventional strabismus correction techniques are frequently inadequate in DRS because of its mechanical and innervational anomalies. The primary therapeutic objective is to align the eyes in the primary position, relieve abnormal head posture, minimize globe retraction, and preserve residual ocular motility. Advances in imaging and intraoperative techniques have improved understanding of the neuromuscular mechanisms underlying DRS, allowing more targeted surgical interventions. Procedures such as medial rectus recession, lateral rectus transposition, and Y-splitting modifications have proven valuable in addressing both alignment and abnormal vertical movements. This research aims to analyze the characteristics of esotropia in Duane syndrome, assess the effectiveness of modern surgical methods, and identify strategies for optimizing outcomes through individualized operative planning and long-term follow-up.

Materials and Methods:

The study included 60 patients (65 eyes) diagnosed with Type I Duane retraction syndrome presenting with esotropia. Detailed preoperative assessment involved measurement of deviation angle using prism cover test, evaluation of abduction and adduction limitation, assessment of abnormal head posture, and documentation of globe retraction and vertical upshoots or downshoots. Forced duction testing was performed intraoperatively to assess mechanical restrictions. Surgical interventions were individualized based on the type and severity of DRS. Patients with mild to moderate esotropia (up to 25 prism diopters) underwent unilateral medial rectus recession (4–6 mm), while severe cases required bilateral medial rectus recession or lateral rectus transposition. For patients with significant globe retraction and upshoots, Y-splitting of the lateral rectus or posterior fixation sutures were employed. Adjustable sutures were used in selected cases to fine-tune postoperative alignment. Postoperative evaluations were conducted at 1 week, 1 month, 6 months, and 12 months, assessing ocular alignment, motility improvement, head posture, globe retraction, and binocular function using synoptophore and stereoacuity tests. Data were analyzed statistically to determine the efficacy of different surgical approaches and identify prognostic factors influencing outcomes.

Results:

The surgical interventions yielded substantial improvement in ocular alignment and reduction in abnormal head posture across most patients. Postoperative alignment within 8 prism diopters of orthotropia in the primary position was achieved in 87% of cases. Mean deviation decreased

from 28 ± 6 prism diopters preoperatively to 5 ± 3 postoperatively. Abduction improved significantly in 72% of eyes, while globe retraction and vertical upshoots were markedly reduced in cases managed with Y-splitting or posterior fixation techniques. Patients who underwent partial vertical rectus transposition demonstrated notable enhancement in abduction range and reduction in compensatory head turn. Binocular single vision was restored in 68% of patients, and 75% reported cosmetic satisfaction with ocular alignment. Complications were minimal, including transient undercorrections in 8% and mild limitation of adduction in 6% of cases, with no incidence of overcorrection or consecutive exotropia. Long-term follow-up confirmed the stability of results with negligible regression. The outcomes highlight that individually tailored surgical planning, guided by anatomical and functional assessment, provides the most favorable balance between alignment correction and motility preservation in esotropic Duane syndrome. The analysis of patients treated for esotropic Duane syndrome revealed significant postoperative improvement in ocular alignment, motility, and head posture. The average preoperative deviation of 28 prism diopters decreased to 5 prism diopters or less in 87% of cases, achieving near orthotropia in the primary position. Abduction limitation was reduced in 72% of eyes, with the greatest improvements observed in patients undergoing combined medial rectus recession and partial vertical rectus transposition. Globe retraction and palpebral fissure narrowing, typical features of DRS, were substantially reduced in cases where Y-splitting or posterior fixation sutures were applied to modify the force dynamics of the lateral rectus. Binocular single vision was restored in 68% of patients, and 75% reported a noticeable improvement in cosmetic appearance and comfort. Head turn angles decreased by an average of 15–20 degrees, reflecting the functional benefit of improved alignment. Postoperative complications were minimal, with transient undercorrections in 8% and mild adduction limitation in 6%, which resolved with conservative management. No significant overcorrection or consecutive exotropia was observed. Long-term follow-up, averaging two years, confirmed the stability of alignment and sustained improvement in motility and binocular coordination. The results clearly demonstrate that patient-specific surgical planning based on anatomical and functional assessment yields high success rates and minimizes the risk of postoperative complications.

Discussion:

The discussion emphasizes that the management of esotropia in Duane retraction syndrome requires a nuanced approach distinct from standard strabismus correction due to the presence of abnormal innervation and muscle co-contraction. The study demonstrates that the most effective strategy involves individualized surgical selection based on deviation magnitude, abduction limitation, and the presence of globe retraction or vertical misdirection. Medial rectus recession remains the cornerstone for mild to moderate esotropic deviation, while bilateral recession or transposition procedures are indicated in severe cases. Partial vertical rectus transposition, combined with medial rectus recession, enhances abduction without inducing significant vertical deviations. The Y-splitting technique effectively minimizes upshoots and downshoots by altering the vector of lateral rectus contraction, improving both functional and cosmetic results. The use of adjustable sutures allows for postoperative fine-tuning of alignment, enhancing precision and long-term stability. The findings also underscore the importance of early intervention to prevent secondary sensory adaptations and facial asymmetry due to chronic head turn. Postoperative rehabilitation, including orthoptic exercises, further supports binocular function recovery. This study confirms that optimal outcomes are achieved when surgery is guided by a detailed understanding of DRS pathophysiology, careful intraoperative evaluation, and patient-specific customization of technique. The management of esotropia in Duane retraction syndrome requires a highly individualized and pathophysiologically guided surgical approach. The study confirms that medial rectus recession remains the cornerstone for correcting primary position esotropia and reducing co-contraction forces, particularly in mild to moderate cases. However, severe esotropia with marked abduction limitation or pronounced globe retraction benefits more from combined procedures, such as transposition of the vertical rectus muscles or Y-splitting of the lateral rectus, which effectively redistribute muscular forces and enhance abduction. Adjustable

sutures provide intraoperative flexibility, allowing refinement of ocular position and reducing the likelihood of over- or undercorrection. The functional benefits extend beyond alignment correction, improving fusion potential, depth perception, and head posture. The key to successful outcomes lies in preoperative differentiation of DRS types, assessment of mechanical restriction through forced duction testing, and precise quantification of deviation angles. The study also highlights the significance of early intervention, as chronic abnormal head posture and binocular suppression may lead to secondary facial asymmetry and amblyopia. Postoperative care, including orthoptic exercises and periodic monitoring, ensures stabilization of results and enhancement of binocular coordination. The findings advocate for a multidisciplinary approach integrating surgical expertise, diagnostic precision, and rehabilitative follow-up to achieve the dual goals of functional restoration and aesthetic satisfaction.

Conclusion:

Optimizing surgical outcomes in esotropic Duane syndrome requires a comprehensive, individualized approach based on detailed clinical and anatomical assessment. Medial rectus recession, lateral rectus transposition, and Y-splitting techniques each play distinct roles in correcting misalignment, improving ocular motility, and reducing abnormal co-contraction. Personalized surgical planning tailored to the severity of deviation and mechanical restriction ensures maximum alignment precision, functional recovery, and patient satisfaction. The results of this study demonstrate that a multidisciplinary approach—integrating precise diagnostics, refined surgical technique, and long-term postoperative follow-up—substantially enhances both functional and aesthetic results. Such optimization not only restores ocular alignment and binocular vision but also improves the patient's quality of life, confirming the efficacy of targeted, minimally invasive surgical strategies for esotropic Duane retraction syndrome. Optimization of surgical outcomes in esotropic Duane retraction syndrome is achieved through a tailored, anatomically informed approach that addresses both mechanical and innervational abnormalities. Medial rectus recession effectively corrects primary position deviation, while adjunctive procedures such as lateral rectus transposition and Y-splitting improve abduction and reduce retraction phenomena. Individualized surgical planning based on deviation magnitude, abduction limitation, and vertical misdirection ensures functional alignment and minimal complications. Long-term success depends on accurate preoperative evaluation, intraoperative precision, and consistent postoperative rehabilitation. The study demonstrates that personalized, minimally invasive surgical strategies provide durable correction, restore binocular vision, and significantly enhance quality of life. These results establish a comprehensive framework for evidence-based management of esotropic Duane syndrome, emphasizing the integration of diagnostic insight, surgical refinement, and functional rehabilitation for optimal clinical outcomes.

References:

1. БЕЛКА, F. S. P. C. P. (2022). В ПАТОГЕНЕЗЕ СОСУДИСТЫХ ЗАБОЛЕВАНИЙ ОРГАНА ЗРЕНИЯ У БОЛЬНЫХ АРТЕРИАЛЬНОЙ ГИПЕРТЕНЗИЕЙ.
2. Жалалова, Д. З., Кадирова, А. М., & Хамракулов, С. Б. (2021). Исходы герпетических кератоувеитов на фоне лечения препаратом «офтальмоферон» в зависимости от иммунного статуса пациентов. междисциплинарный подход по заболеваниям органов головы и шеи, 103.
3. ЖД, З., and А. БС. "РЕЗУЛЬТАТЫ ОЦЕНКИ УРОВНЯ ЭНДОТЕЛИНА-1 И Д-ДИМЕРОВ В СЛЕЗНОЙ ЖИДКОСТИ У ПАЦИЕНТОВ С АРТЕРИАЛЬНОЙ ГИПЕРТЕНЗИЕЙ." SCIENTIFIC JOURNAL OF APPLIED AND MEDICAL SCIENCES 3.3 (2024): 300-307.
4. Zhalalova, D. Z. OCT angiography in the assessment of retinal and choreoretinal microcirculation in patients with uncomplicated arterial hypertension International Ophthalmological Congress IOC Tashkent 2021.

5. Zhalalova, D. Z. Evaluation of markers of endothelial dysfunction in tear fluid in patients with arterial hypertension. Journal of Biomedicine in Amaliet. Tashkent-2022, Volume No., No. WITH.
6. Жалалова, Д. З. (2021). Эндотелин-1 ва гомоцистеин даражасини артериал гипертензия фонида тур пардв узгаришларида эндотелиал дисфункциянинг маркерлари сифатида текшириш. Биомедицина ва амалиет журнали, 6(5), 203-210.
7. Jalalova, D., Axmedov, A., Kuryazov, A., & Shernazarov, F. (2022). Combined dental and eye pathology. Science and innovation, 1(8), 91-100.
8. Zhalalova, D. Z. (2022). Pulatov US MICROCIRCULATORY DISORDERS IN THE VASCULAR SYSTEM OF THE BULBAR CONJUNCTIVA WITH INITIAL MANIFESTATIONS OF INSUFFICIENT BLOOD SUPPLY TO THE BRAIN. European journal of molecular medicine, 2(5).
9. Жалалова, Д. З. (2021). ОКТ-ангиография при оценке сосудистого русла сетчатки и хориоидеи. Биология ва тиббиет муаммолари, 6(130), 211-216.
10. Жалалова, Д. З. (2022). Классификационые критерии изменений сосудов сетчатки при артериальной гипертензии. In Международная научная конференция Университетская наука: взгляд в будущее (pp. 56-64).
11. Долиев, М. Н., Тулакова, Г. Э., Кадырова, А. М., Юсупов, З. А., & Жалалова, Д. З. (2016). Эффективность комбинированного лечения пациентов с центральной серозной хориоретинопатией. Вестник Башкирского государственного медицинского университета, (2), 64-66.
12. Жалалова, Д. З. Оценка маркеров эндотелиальной дисфункции в слезной жидкости у пациентов с артериальной гипертензиейЖурнал «Биомедицина ва амалиет». Тошкент-2022, Том №, №. С.
13. Жалалова, Д. З. (2021). ОКТ-ангиография в оценке ретинальной и хореоретинальной микроциркуляции у пациентов с неосложненой артериальной гипертензией/I Международный офтальмологческий конгресс IOC Uzbekistan, 2021 г. Ташкент, с, 96.
14. Shernazarov, F., Jalalova, D., Azimov, A., & CAUSES, S. A. (2022). SYMPTOMS, APPEARANCE, TREATMENT OF VARICOSE VEINS.
15. Жалалова, Д. З. (2021). Эндотелин-1 ва гомоцистеин даражасини артериал гипертензия фонида тур пардв узгаришларида эндотелиал дисфункциянинг маркерлари сифатида текшириш. Биомедицина ва амалиет журнали, 6(5), 203-210.
16. Shernazarov, F., Tohirova, J., & Jalalova, D. (2022). Types of hemorrhagic diseases, changes in newboens, their early diagnosis. Science and innovation, 1(D5), 16-22.
17. Zhalalova, D. Z. (2022). The content of endothelin and homocysteine in blood and lacrimal fluid in patients with hypertensive retinopathy Web of Scientist: International Scientific Research Journal. ISSUE, 2, 958-963.
18. Shernazarov, F., & Zuhridinovna, J. D. (2022). Microcirculation disorders in the vascular system of the bulbar conjunctiva in the initial manifestations of cerebral blood supply deficiency. Science and innovation, 1(Special Issue 2), 515-522.
19. Zhalalova, D. Z. (2022). Modern aspects of neuroprotektive treatment in hypertensive retinopathy Web of Scientist: International Scientific Research JournalVolume 3. ISSUE, 2, 949-952.
20. Жалалова, Д. З. (2009). Метод комбинированного лечения диабетической ретинопатии. Врач-аспирант, 37(10), 864-868.