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ORIGINAL ARTICLE

Distribution of Ocular Deviation among the Different Types of Duane Retraction Syndrome

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Abstract

Purpose: To evaluate the distribution of the ocular deviation among different types of Duane Retraction Syndrome (DRS).

Method: This historical cohort study was performed on 321 hospital records of different types of DRS patients in Baghdad, Iraq from 2012 to 2022. Patient data collected included sex, age, laterality of DRS (unilateral or bilateral), presence of abnormal head posture (AHP), source of DRS (congenital, acquired), corrected distance visual acuity (CDVA), refractive error, deviation at primary gaze in far and near, overaction or underaction of extraocular movement.

Result: The mean age of DRS patients 321 patients was 16.05 ± 12.6 (range, 1 to 73) years. The patient's records included 191 (59.5%) females and 130 (40.5%) males ($P < 0.001$). Esotropic, exotropic, and orthotropic DRS were observed in 197 (61.4%), 105 (32.7%), and 19 (5.9%) patients, respectively. The frequency of unilateral and bilateral DRS was noticed in 309 (96.3%) and 12 (3.7%) patients, respectively ($P < .001$). Unilateral DRS was observed in 197 patients (esotropic and exotropic types), of whom the left eye was affected in 233 (72.6%) patients and the right eye in 76 (23.7%) patients ($P < .001$).

Conclusion: The most common type of ocular deviation was esotropia in type I of DRS patients followed by exotropia and orthotropia, respectively.

Keywords: DRS, Esotropic, Exotropic, Baghdad and Refractive error

1. Introduction

Strabismus (eye misalignment) is one of the earliest recorded genetic disorders, more than 2400 years ago. Occurs in 2–4% of individuals. The low-resolution label “strabismus” covers a range of heterogeneous defects. Strabismus can cause visual problems during development, including loss of binocular vision, amblyopia (‘lazy eye’), and abnormal retinal correspondence (shifting of the fixation point relative to the macula in one eye). Strabismus disrupts stereopsis, which impacts the performance of numerous practical tasks requiring the precise judgment of distance or depth, in addition to reduced

visual function. There are two types of strabismus: (comitant strabismus) nonsyndromic strabismus is characterized by non-restrictive, non-paralytic ocular misalignment with the same magnitude in all directions of gaze, (concomitant) Incomitant strabismus is paralytic in origin and the angle of deviation varies in different directions [1, 2]. In our study, we search for Duane retraction syndrome (DRS), as non-syndromic strabismus occurs at elevated rates in affected families, and describe model organism studies related to genetic forms of strabismus. DRS is a congenital eye movement disorder characterized by abduction and/or adduction restriction, palpebral fissure narrowing, and adduction retraction of the

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globe [3]. Patients with DRS display an anomalous head position to obtain single binocular vision and may have an upshoot/downshoot when the affected eye is adducted [4–6]. DRS, also known as Stilling-Turk-Duane Syndrome, was initially identified by Alexander Duane (which bears his name) in 1905 [7]. It is a congenital non-progressive minimal horizontal eye movement followed by retraction of the globe that results in the palpebral fissure being narrowed [8, 9]. The Huber classification scheme, which is based on the more prominent duction deficiency, has classically classified DRS into three types; Type I, II, and III [10]. However, Some researchers simplified DRS types into three subtypes, including esotropic, exotropic, and orthotropic, based on the deviation in the primary position³ and type IV or synergistic divergence type in which total limitation of adduction is associated with simultaneous abduction of the DRS eye on attempted adduction [11]. Type I: marked limitation or complete absence of abduction, normal or slightly defective adduction with esotropia of the affected eye, narrowing of the palpebral fissure, and retraction of the globe on attempted adduction [11]. Type II: limitation or absence of adduction with exotropia of the affected eye, normal or slightly limited abduction, narrowing of the palpebral fissure, and retraction of the globe on attempted adduction [12]. Type III: the combination of limitation or absence of both abduction and adduction, retraction of the globe, and narrowing of palpebral fissure on attempted adduction [13]. Alphabet patterns of DRS were also noted in DRS due to synergistic innervation of the vertical rectus. Sometimes, an X pattern may be present due to both upshoot and downshoot in the patient. V pattern strabismus was more common than A pattern. Whenever there is an A pattern, bilateral DRS has to be suspected [14]. Esotropic DRS is the most common presentation in both unilateral and bilateral DRS, followed by Types III and II, respectively. It has been documented that some bilateral cases have Esotropic DRS in one eye and Exotropic DRS in the other [15]. In bilateral DRS cases, primary position deviation is found to be variable depending on the form of presentation in each eye [16].

The purpose of this study is to determine the distribution of ocular deviation among different types of DRS patients.

2. Method

This historical cohort study was performed on different hospital records of all patients with different types of DRS in Baghdad, Iraq, from 2012 to 2022. In this study, the records of 321 patients were evaluated, 191 (59.5%) females and 130 (40.5%) males ($P < 0.001$).

with a mean age of 16.05 ± 12.6 (range, 1.00 to 73) years.

Patient data collected included sex, age, past medical history, laterality of DRS (unilateral or bilateral), corrected distance visual acuity (CDVA) in log-MAR, refractive error, and horizontal and vertical deviation at primary gaze in far and near.

Visual acuity was measured at a 6meter distance and recorded in log-MAR, refractive error was measured by Topcon KR-800 auto-refractometer (Tokyo, Japan), and the result was confirmed by Heine Beta-200 streak retinoscope (Heine Optotechnik, Herrsching, Germany). Anisometropia was considered when a refractive difference of 1.00 D or more (either sphere or cylinder) existed between the two eyes. Amblyopia was defined based on Pediatric Eye Disease Investigator Group (PEDIG) studies.

The angle of deviation was measured by using an alternate prism cover test for far and near. Ocular ductions and versions were assessed in the nine diagnostics of gazes.

Diagnosis of different type of different types of DRS was done by checking the presence of limitation in adduction or/and abduction, globe retraction, upshoot, or downshoot as follows; 1-Esotropic type: marked limitation or complete absence of abduction, normal or slight defective adduction with esotropia in the affected eye, narrowing of the palpebral fissure and retraction of the globe on adduction; 2-Exotropia type: limitation or absence of adduction with exotropia in the affected eye, normal or slightly limited abduction, narrowing of the palpebral fissure and retraction of the globe on attempted adduction; 3- Orthotropic type: a combination of limitation or absence of both abduction and adduction, retraction of globe and narrowing of palpebral fissure on adduction.

The collected variables will be analyzed using SPSS-version 24 software (IBM, Armonk, NY, USA). To describe quantitative data, statistical indices such as mean, standard deviation, and qualitative representations of ratios and statistical tables were used. To examine the relationship between variables Spearman correlation was performed. A one-way ANOVA test was performed to compare variables in different DRS types. *P*-values less than 0.05 will be considered significant.

3. Result

This historical cohort study was performed on 321 DRS patients with a mean age of 16.05 ± 12.6 years. The patient's records included 191 (59.5%) females and 130 (40.5%) males with a mean age of 16.05 ± 12.6 (range, 1.00 to 73) years, ($P < 0.001$). In this study, the frequency of unilateral and bilateral DRS was noticed

Table 1. Distribution of ocular deviation in different types of Duane retraction syndrome.

Ocular deviation*	Type I N (197)	Type II N (104)	Type III N(20)
Orthotropia	2 (0.6%)	0 (0.0%)	19 (5.9%)
Esotropia	193 (60.1%)	0 (0.0%)	0 (0.0%)
Exotropia	2 (0.6%)	104 (32.4%)	1 (0.3%)
Total	197 (61.3%)	104 (32.4%)	20 (6.2%)

* Percentages of the ocular deviation of total (321) and of the total of each type (I, II, and III).

in 309 (96.3%) and 12 (3.7%) patients, respectively ($P < .001$). Unilateral DRS was observed in 197 patients (esotropic and exotropic types), of whom the left eye was affected in 233 (72.6%) patients and the right eye in 76 (23.7%) patients ($P < .001$). The mean angle of deviation at primary gaze in far and near was 5.48 ± 20.64 PD and 2.62 ± 21.36 PD, respectively.

4. Discussion

In this study, the majority of patients 309 (96.3%) had unilateral DRS; there was a vast predominance of female patients and left eye involvement. The mean amount of near primary position deviation in esotropic, exotropic, and orthotropic types was 18.2 PD esodeviation, 20.2 exodeviation, and 17.2 PD exodeviation, respectively. In addition, the mean amount of far primary position deviation esotropic, exotropic, and orthotropic was 20.8 PD esodeviation, 16.3 PD exodeviation, and 14.7 PD exodeviation, respectively. Like other studies esotropia occurred more frequently in both unilateral and bilateral DRS [17]. According to several studies DRS type I is more common than types II and III [18, 19]. In the current study, the most common type of strabismus was esotropia observed in 61.4%. This prevalence was similar to the study by Raab *et al.*, [18] they reported esotropia was the most common type of strabismus in 73% of cases. In contrast, a study by Shrestha *et al.*, [20] observed orthotropia 41.5% and exotropia 34.1% more commonly than esotropia 24.4%.

5. Conclusion

The most common type of ocular deviation was esotropia in type I of DRS patients followed by exotropia and orthotropia, respectively.

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