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ARAŞTIRMA / RESEARCH

Efficacy of steroid treatment and identification of prognostic factors in idiopathic peripheral facial nerve palsy in children

Çocuklarda idiyopatik periferik fasiyal sinir paralizisinde steroid tedavisinin etkinliği ve prognostik faktörlerin belirlenmesi

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Abstract

Purpose: The aim of the study is intended to investigate the etiology and clinical features of children with idiopathic peripheral facial palsy (IPFP) and to identify probable prognostic factors. It is also intended to investigate corticosteroid therapy and compare its efficacy.

Materials and Methods: A total of 80 patients with newly diagnosed IPFP were included in the study. Demographic, clinical features and laboratory findings including age, gender, House Brackmann Facial Nerve Grading System (HBGS) grade at admission and follow-up, and the dosage and onset of steroid treatment were reviewed. We assigned our patients to 3 groups: Group 1: Patients given 1 mg/kg oral steroid treatment (1 mg/kg/day oral prednisolone). Group 2: Patients given 2 mg/kg oral steroid treatment (2 mg/kg/day oral prednisolone), and Group 3: Patients who did not receive oral steroid treatment.

Results: A total of 80 children (41 girls and 39 boys) with a median age of 11 years were included in the study. The complete recovery was detected in %78,8(n:63) with IPFP. Of all patients, 78.8% (n=63) showed complete recovery. Admission after more than 24 hours was found to reduce the likelihood of ER by 10 times (1/0.10), while patients with HBGS grade of 5 were found to be 33.3 times (1/0.03) less likely to achieve ER than patients with HBGS grades of 2 to 3. Finally, steroid treatment at 2 mg/kg/d increased the probability of early recovery by 8.38 times.

Conclusion: The prognosis of IPFP in children was very good. The prognostic factors affecting the early recovery were being HBGS grade 2 or 3 on the 21th day and receiving steroid treatment in the first 24 hours and 2 mg/kg/d dose.

Keywords: Idiopathic peripheral facial palsy (IPFP), bell's palsy, children, prognosis

Öz

Amaç: Bu çalışmanın amacı, idiyopatik periferik fasiyal sinir paralizisi (IPFP) çocukların etiyolojisi, klinik özelliklerini araştırmak ve olası prognostik faktörleri belirlemektir. Bununla birlikte kortikosteroid tedavisinin etkinliğini incelemek ve karşılaştırmaktır.

Gereç ve Yöntem: Çalışmaya yeni tanı konmuş IPFP'li toplam 80 hasta dahil edildi. Başvuru ve takipte yaş, cinsiyet, House Brackmann Facial Nerve Grading System (HBGS) derecesi, steroid tedavisinin dozu ve başlangıcı gibi demografik, klinik özellikler ve laboratuvar bulguları gözden geçirildi. Hastalarımızı 3 gruba ayırdık: Grup 1: 1 mg/kg oral steroid tedavisi (1 mg/kg/gün oral prednizolon) verilen hastalar. Grup 2: 2 mg/kg oral steroid tedavisi (2 mg/kg/gün oral prednizolon) verilen hastalar ve Grup 3: Oral steroid tedavisi almayan hastalar.

Bulgular: Çalışma popülasyonu yaş ortalaması 11 olan 80 (41 kız,39 erkek) hastadan oluşmaktadır. IPFP ile %78,8(n:63) oranında tam iyileşme tespit edildi. Tüm hastaların %17.5'i tama yakın iyileşme gösterdi. Buna göre; 24 saat üzeri başvuru erken iyileşmeyi 10 kat (1/0,10) azalttığı, başvuru HBGS grade 5 olanların grade 2-3 olanlara kıyasla 33,3 kat (1/0,03) daha az erken iyileşme olasılığına sahip olduğu ve 2 mg/kg/g streoid tedavi alımının erken iyileşme olasılığını 8,38 kat arttırdığı saptandı.

Sonuç: Çocuklarda IPFP prognozu çok iyiydi. Erken iyileşmeyi etkileyen prognositik faktörler 21. günde HBGS derece 2 veya 3 olması ve ilk 24 saatte ve ve 2 mg/kg/g doz steroid tedavisi almasıydı.

Anahtar kelimeler: İdiyopatik periferik yüz felci (IPFP), Bell felci, çocuklar, prognoz

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INTRODUCTION

Idiopathic peripheral facial nerve palsy is a self-limiting, benign condition of unknown origin also called idiopathic peripheral facial palsy (IPFP) or Bell's palsy, which is common in children. It was first defined by Sir Charles Bell in 1830 as unilateral facial weakness secondary to facial nerve dysfunction[1]. In children the annual incidence of peripheral facial palsy is 20-30/100,000[2]. The etiology is unknown, but it may develop due to inflammation and edema in the facial nerve[3]. Acute peripheral facial palsy may develop as a result of infections (13-36%), congenital disorders (8-14%), systemic disorders, trauma (19-21%), metabolic disorders, iatrogenic diseases, or neoplasms (2-3%). IPFP is responsible for 40-70% of cases of facial paralysis[4,5].

Several hypotheses have been proposed regarding the pathogenesis of IPFP. According to the viral hypothesis, various features of IPFP are possibly the features of viral infection such as epidemicity and flu-like prodrome[6-8]. However, it does not always respond to antiviral treatments. Another hypothesis is an immunological hypothesis based on a cell-mediated autoimmune mechanism[9-11].

In general, patients with IPFP have good prognosis. It is not life-threatening. Full functional recovery usually occurs within 3 to 4 weeks after the onset of the first symptom. However, recovery may take up to 6 months in some cases. For treatment, conservative anti-aging drugs and synthetic tears together with appropriate exercises intended to strengthen the facial nerves are recommended. In addition, the American Academy of Neurology recommends the use of corticosteroids alone or in combination with antiviral agents such as acyclovir. However, the efficacy and optimal dose of corticosteroid therapy remains uncertain, particularly in the treatment of children[12]. The optimal steroid dose in IPFP cases is not established. In addition, the factors affecting the response to treatment in patients are also controversial. Our aim with this retrospective study is to determine the appropriate steroid dose and the factors affecting the treatment response.

IPFP in children is a source of concern for both the family and physician because of the treatment options and the recovery period. There are a variety of opinions about the incidence, etiology, treatment strategy, recovery time, and prognosis of IPFP in children. This study is intended to investigate clinical features of children with IPFP and to identify probable prognostic factors. It is also intended to investigate corticosteroid therapy retrospectively and compare its efficacy.

Our study reveals prognostic markers in IPFP cases. It can be a guide in determining the initiation time of treatment in IPFP cases. It also contributes to the determination of the effective steroid dose in the treatment of IPFP.

MATERIALS AND METHODS

Design

We evaluated the records of patients aged under 18 years who received treatment for IPFP at our clinic between June 2019 and December 2020 with a minimum follow-up period of 6 months. This study enrolled patients who met the following criteria: (1) having been diagnosed with IPFP, (2) having been followed for at least 6 months, (3) and bearing no evidence of any systemic disease. Exclusion criteria were: (1) peripheral facial palsy due to congenital diseases, trauma, acute otitis media, and causal conditions such as vascular lesions (2) peripheral facial palsy accompanied by another cranial nerve palsy condition and (3) active infections ruled out.

The patient population consists of 80 patients diagnosed with IPFP in Adana city hospital pediatric neurology. Data consists of routine diagnostic tests requested from all patients for the differential diagnosis of IPFP. Laboratory and imaging records were obtained from patient files and the hospital registry system. Patient data were checked by two pediatric neurologists at different times. The institutional review board of the University of Health Sciences Adana City Hospital approved this retrospective study (13/01/2021-74-1249).

Measures

Electronic medical records were reviewed retrospectively. The following variables were noted: age at onset, gender, active infection, time of admission, family history, the time of initiation of treatment peripheral facial palsy severity, laboratory tests (complete blood count, serum biochemistry panel, B12 level, serologic tests for herpes simplex virus-1 [HSV-1], borrelia burgdoferi), results of radiologic tests such as brain magnetic resonance,

and/or computed tomography results. Treatment results of all patients were evaluated.

Peripheral facial palsy with no obvious specific etiology was considered to be IPFP. The House-Brackmann facial nerve grading scale (HBGS) was used to determine the grade of palsy. HBGS grades were calculated at admission, the 3rd week (HBGS grade on the 21st day), and the 6th month (Table 6). The Turkish validity of the IPFP Scoring system has been demonstrated by previous studies[3,10,31].

Vitamin B12 levels and complete blood count values of all patients were determined. The neutrophil-to-lymphocyte ratio (NLR) and mean platelet volume (MPV) of all patients were also examined. The NLR value was obtained by dividing neutrophil count by lymphocyte count. Complete blood counts were performed using an automatic complete blood count device (Mindray BC-6800, Shenzhen, China).

In order to protect the cornea on the affected side, proper eye care was given, artificial tears were administered, and eye patches were applied at night. In addition, patients were asked to do exercises intended to strengthen the facial muscles.

Study population

The optimal dose of corticosteroids is still not clear for children with IPFP. However, the recommended treatment regimen for corticosteroids is 1 to 2 mg/kg/day. We assigned our patients to 3 groups:

Group 1: Patients given 1 mg/kg oral steroid treatment (1 mg/kg/day oral prednisolone),

Group 2: Patients given 2 mg/kg oral steroid treatment (2 mg/kg/day oral prednisolone), and

Group 3: Patients who did not receive oral steroid treatment.

Patients and their parents were given complete information about the course and prognosis of peripheral facial nerve palsy, and the side effects of steroid treatment were explained in advance to those who were concerned about prognosis or rejection of conservative treatment.

Differences in age, gender, history of infection, degree of facial nerve palsy, and post-treatment prognosis were analyzed for comparisons of the groups. Based on HBGS grades, responses to treatment were classified as complete recovery (grade 1), near-complete recovery (grade 2), and incomplete recovery (grade 3). Recovery times of patients were classified as early recovery and late recovery. Early recovery was defined as <30 days and late recovery as >30 days.

Statistical analysis

Statistical evaluation was performed using STATA software (Stata Corp LLC, College Station, TX, USA). The normal distribution of the data was evaluated with the Shapiro-Wilk test. Normally distributed numerical variables were shown as mean ± standard deviation, while numerical variables not showing normal distribution were shown as median (minimum-maximum). Categorical variables were expressed as numbers and percentages. Chi-square, Yates correction, and Fisher exact tests were used for comparison of categorical data. The Student t-test or Mann-Whitney U test was used to compare numerical variables between two groups according to the distribution of normality. ANOVA (post hoc: Bonferroni test) or Kruskal-Wallis H testing (post hoc: Dunn test) was applied to compare numerical variables between the three groups according to the distribution of normality. Factors predicting early recovery were determined by multivariate logistic regression analysis. Values of $p<0.05$ (*) were considered significant in statistical analysis.

RESULTS

The study population included 41 girls (51.2%) and 39 boys (48.8%) for a total of 80 patients (median age: 11 years, range: 2-17 years). Table 1 shows the distribution of demographic data by groups. A total of 6 subgroups were formed, which included patients with early recovery and those with late recovery in 3 groups. Distributions of demographic and laboratory findings were similar in all subgroups (Table 1).

The percentage of patients given steroid treatment was 80% (n=64) and 20% of the patients (n=16) received 1 mg/kg steroids while 60% (n=48) received 2 mg/kg. Of all patients, 78.8% (n=63) showed complete recovery, 17.5% showed near-complete recovery, and 3.8% (n=3) showed incomplete recovery. Median recovery time was 4 weeks (range: 2-28 weeks).

Table 1. Distribution of demographic data and laboratory findings by groups and recovery time

Variables	Group 1		Group 2		Group 3		p
	Early, n=6	Late, n=9	Early, n=27	Late, n=10	Early, n=10	Late, n=5	
Demographic findings							
Age, years	10.3 (4-15)	11 (2-16)	11 (3-16.1)	10.5 (3-17)	12.5 (3-14)	13 (8-15)	0.858
Gender, n (%)							
Girl	3 (50.0)	4 (44.4)	15 (40.5)	7 (70.0)	7 (70.0)	4 (80.0)	0.285
Boy	3 (50.0)	5 (55.6)	22 (59.5)	3 (30.0)	3 (30.0)	1 (20.0)	
Family history, n (%)	-	1 (11.1)	1 (2.7)	1 (10.0)	-	-	0.522
Laboratory findings							
B12 (pg/ml)	256 (122-495)	215 (125-354)	175 (107-334)	191 (183-209)	164 (97-216)	244.5 (168-321)	0.863
White blood cells (10^3µl)	7 (5.9-12)	11.1 (7.4-19.2)	9.2 (5-20)	10.5 (5.6-16.9)	9.2 (7.9-16.9)	10.3 (5.7-10.6)	0.389
Mean corpuscular volume (fl)	81.8±6.6	79.2±5.9	80.6±4.5	81.9±4.2	80±4.2	78.2±2.9	0.738
Hemoglobin (g/dl)	13.3±0.4	12.8±1.2	13±0.9	13±1.3	13.5±1.2	13.1±0.6	0.844
Mean platelet volume (fl)	8.1±0.7	8±1	8±0.9	8±1.2	8.1±1.1	9.2±1.3	0.506
Neutrophil %	55.8 (0.9-61.4)	47.6 (0-84.8)	56.3 (0.2-88.7)	55.8 (25.2-91.1)	66.5 (33.5-90.6)	58.6 (51.2-83.8)	0.855
Neutrophil # (10^3µl)	4.1 (0.1-6.7)	4.3 (0-15.2)	4.7 (0-12.9)	5.1 (2.7-11.2)	5.7 (2.7-15.3)	5.6 (2.9-8.9)	0.757
Monocyte %	7.8 (7-11.4)	4.6 (2.6-7.2)	7.5 (4.2-15.3)	7.2 (1.3-20.8)	7.3 (1.9-8.5)	7.1 (5.1-8.4)	0.082
Monocyte # (10^3µl)	0.7 (0.5-0.8)	0.5 (0-0.9)	0.6 (0.3-1.3)	0.6 (0.2-3.5)	0.7 (0.2-0.9)	0.7 (0.5-0.9)	0.775
Lymphocyte %	33.3 (29.7-40.4)	21.7 (12.5-68.5)	33.5 (7.1-53.6)	33.9 (7.5-53.5)	25.6 (6.3-55.2)	29.4 (10.5-38.1)	0.953
Lymphocyte # (10^3µl)	2.5 (1.8-4)	2.7 (1.4-7.8)	2.4 (1-5.4)	2.5 (0.5-9)	2.6 (0.9-4.5)	2.5 (1.1-3.7)	0.992
Platelets (10^3µl)	305.5±56.4	384.5±100.9	332±87.9	323±94	331±65.7	346.2±116.4	0.579
C-reactive protein (mg/L)	1.7 (1.1-2.3)	3.6 (1-13)	1.1 (0.1-15.7)	1.6 (0.2-4.2)	1.6 (1-3)	1.8 (0.1-9.8)	0.934
Neutrophil/lymphocyte ratio	1.7 (0-2.1)	1.4 (0-6.6)	1.7 (0-12.4)	2.1 (0.5-12.4)	4.4 (0.6-13.9)	2 (1.3-8.1)	0.754

*: $p<0.05$ shows statistical significance.

The rate of patients whose HBGS grades were 3 at the time of admission was higher in Group 2 than in Group 1 or Group 3 ($p<0.05$). The highest early recovery rate was found in Group 2 ($p<0.05$). When early and late recovery were compared between patients, the rates of admission within 24 hours (62.3% vs. 12.5%, $p<0.001$), HBGS grade of 2 at admission (18.9% vs. 0%, $p<0.001$), HBGS grade of 3 at admission (64.2% vs. 37.5%, $p<0.001$), HBGS grade of 1 on the 21st day (88.7% vs. 0%, $p<0.001$), HBGS grade of 1 after 6 months (92.5% vs. 58.3%, $p=0.001$), and percentage of those who received steroid treatment at 2 mg (69.8% vs. 41.7%, $p=0.013$) were found to be higher (Table 5). Distribution of findings upon follow-up with recovery in the groups according to HBGS grades at admission is shown in Figure 1. Other features at the time of admission and findings upon follow-up with recovery did not differ between the groups (Table 2). Distribution of features at admission and the follow-up recovery findings of the groups are detailed in Table 4 and their relationships with recovery time are provided in Table 5.

A multivariate regression model that included parameters such as monocyte %, time of admission, HBGS grade at admission, steroid therapy, and HBGS grade on the 21st day was established in order to determine the factors that predicted early recovery. Accordingly, admission after more than 24 hours was found to reduce the likelihood of early recovery by 10

times (1/0.10), while patients with HBGS grade of 5 were found to be 33.3 times (1/0.03) less likely to achieve early recovery than patients with HBGS grades of 2 to 3. Finally, steroid treatment at 2 mg/kg/d increased the probability of early recovery by 8.38 times (Table 3).

Table 2. Distribution of admission characteristics and follow-up recovery findings by recovery time in groups

Variables	Group 1		Group 2		Group 3		p
	Early, n=6	Late, n=9	Early, n=37	Late, n=10	Early, n=10	Late, n=5	
Season, n (%)							
1	**6 (100.0)**	3 (33.3)	8 (21.6)	2 (20.0)	1 (10.0)	**3 (60.0)**	0.010*
2	-	3 (33.3)	2 (5.4)	2 (20.0)	2 (20.0)	1 (20.0)	
3	-	1 (11.1)	9 (24.3)	3 (30.0)	**4 (40.0)**	1 (20.0)	
4	-	2 (22.2)	**18 (48.6)**	3 (30.0)	3 (30.0)	-	
Admission time, n (%)							
24 h	**4 (66.7)**	1 (11.1)	22 (59.5)	1 (10.0)	7 (70.0)	1 (20.0)	0.001*
24-72 h	2 (33.3)	**5 (55.6)**	15 (40.5)	**6 (60.0)**	2 (20.0)	2 (40.0)	
>72 h	-	3 (33.3)	-	3 (30.0)	**1 (10.0)**	2 (40.0)	
Side of palsy, n (%)							
Right	3 (50.0)	5 (55.6)	17 (45.9)	5 (50.0)	5 (50.0)	3 (60.0)	0.993
Left	3 (50.0)	4 (44.4)	20 (54.1)	5 (50.0)	5 (50.0)	2 (40.0)	
Status, n (%)							
First	5 (83.3)	9 (100.0)	35 (94.6)	10 (100.0)	9 (90.0)	5 (100.0)	0.617
Recurrence	1 (16.7)	-	2 (5.4)	-	1 (10.0)	-	
Trigger, n (%)							
URI	0 (0.0)	1 (11.1)	3 (8.1)	1 (10.0)	1 (10.0)	2 (40.0)	0.196
Exposure to cold	1 (16.7)	1 (11.1)	16 (43.2)	3 (30.0)	1 (10.0)	-	
Unknown	5 (83.3)	7 (77.8)	18 (48.6)	6 (60.0)	8 (80.0)	3 (60.0)	
HBGS grade at admission, n (%)							
2	-	-	1 (2.7)	-	9 (90.0)	-	<0.001*
3	5 (83.3)	2 (22.2)	28 (75.7)	4 (40.0)	1 (10.0)	3 (60.0)	
4	1 (16.7)	5 (55.6)	6 (16.2)	4 (40.0)	-	1 (20.0)	
5	-	2 (22.2)	2 (5.4)	2 (20.0)	-	1 (20.0)	
Exercise, n (%)	6 (100.0)	9 (100.0)	36 (97.3)	10 (100.0)	10 (100.0)	5 (100.0)	0.999
Recovery duration, weeks	4 (3-4)	14 (5-28)	4 (2-4.3)	19 (5-28)	4 (3-4)	14 (10.5-28)	<0.001*
HBGS grade on the 21st day, n (%)							
1	**5 (83.3)**	-	**32 (86.5)**	-	**10 (100.0)**	-	<0.001*
2	1 (16.7)	**7 (77.8)**	4 (10.8)	**8 (80.0)**	-	**4 (80.0)**	
3	-	2 (22.2)	**1 (2.7)**	2 (20.0)	-	1 (20.0)	
HBGS grade in the 6th month, n (%)							
1	**5 (83.3)**	5 (55.6)	**34 (91.9)**	6 (60.0)	**10 (100.0)**	3 (60.0)	0.008*
2	1 (16.7)	4 (44.4)	**3 (8.1)**	4 (40.0)	**-**	2 (40.0)	

*: p<0.05 shows statistical significance. URI: Upper respiratory tract infection; HBGS: House-Brackmann facial nerve grading system

Table 3. Predictive factors for early recovery

Variables	Univariable			Multivariable		
	OR	95% CI	p	OR	95% CI	p
Monocyte %	1.12	1.01-1.40	0.050*	-	-	-
Admission time, n (%)						
24 h	Ref			Ref		
>24 h	0.09	0.02-0.33	<0.001*	0.1	0.02-0.65	0.016*
HBGS grade at admission, n (%)						
2-3	Ref			Ref		
4	0.14	0.04-0.48	0.006*	0.2	0.03-1.34	0.097
5	0.08	0.01-0.46	0.002*	0.03	0.01-0.52	0.015*
Steroid treatment, n (%)						
No	Ref			Ref		
1 mg	1.33	0.17-14.80	0.148	1.22	0.13-11.44	0.864
2 mg	1.85	1.15-36.6	0.034*	8.38	1.11-63.55	0.040*
HBGS grade on the 21st day, n (%)						
1	Ref					
2-3	0.07	0.01-0.67	0.020*	-	-	-
				Nagelkerke R^2 = 0.530, p<0.001		

*: p<0.05 shows statistical significance. OR: Odds ratio; CI: Confidence interval; HBGS: House-Brackmann facial nerve grading system

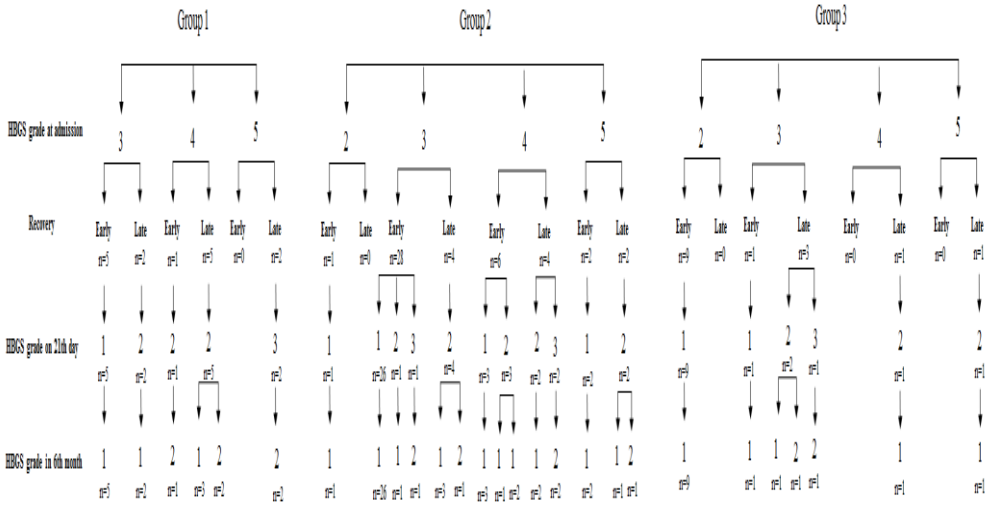

Figure 1. Grade distributions in the recovery processes of the patients by groups.

Recovery duration, weeks (early, late). HBGS: House-Brackmann facial nerve grading system

Table 4 Distribution of admission characteristics and follow-up improvement by groups.

Variables	**Group 1**	**Group 2**	**Group 3**	p
	n=16	n=48	n=16	
Admission season, n (%)				
Winter	9 (56.3)	10 (20.8)	4 (25.0)	0.020*
Spring	3 (18.8)	4 (8.3)	4 (25.0)	
Summer	1 (6.3)	12 (25.0)	5 (31.3)	
Autumn	3 (18.8)	22 (45.8)	3 (18.8)	
Admission time, n (%)				
0-24 hours	5 (31.3)	23 (47.9)	8 (50.0)	0.204
24-72 hours	7 (43.7)	21 (43.8)	4 (25.0)	
>72 hours	4 (25.0)	4 (8.3)	4 (25.0)	
Side of palsy, n (%)				
Right	8 (50.0)	23 (47.9)	9 (56.3)	0.950
Left	8 (50.0)	25 (52.1)	7 (43.8)	
Status, n (%)				
First	15 (93.8)	46 (95.8)	14 (87.5)	0.557
Recurrence	1 (6.3)	2 (4.2)	2 (12.5)	
Trigger, n (%)				
URI	1 (6.3)	4 (8.3)	3 (18.8)	0.075
Exposure to cold	2 (12.5)	19 (39.6)	2 (12.5)	
Unknown	13 (81.3)	25 (52.1)	11 (68.8)	
HBGS grade at admission, n (%)				
2	-	1 (2.1)	9 (56.3)	<0.001*
3	7 (43.7)	32 (66.7)	4 (25.0)	
4	6 (37.5)	11 (22.9)	1 (6.3)	
5	3 (18.8)	4 (8.3)	2 (12.5)	
Prednisolone duration, days	10 (10-12)	12 (10-15)	-	0.326
Receiving antiviral treatment, n (%)	6 (37.5)	4 (8.5)	7 (43.8)	0.002*
Exercise, n (%)	16 (100.0)	47 (97.9)	16 (100.0)	0.999
Recovery in follow-up, n (%)				
Complete	10 (62.5)	40 (83.3)	13 (81.3)	0.292
Near-complete	5 (31.3)	7 (14.6)	2 (12.5)	
Incomplete	1 (6.3)	1 (2.1)	1 (6.3)	
Recovery duration, weeks	7.8 (3-21)	4 (2-28)	4 (3-28)	0.020*
Early, n (%)	6 (37.5)	37 (77.1)	10 (62.5)	0.013*
Late, n (%)	10 (62.5)	11 (22.9)	6 (37.5)	
HBGS grade on the 21st day, n (%)				
1	5 (31.3)	32 (66.7)	10 (62.5)	0.134
2	8 (50.0)	12 (25.0)	4 (25.0)	
3	3 (18.8)	4 (8.3)	2 (12.5)	
HBGS grade in the 6th month, n (%)				
1	10 (62.5)	40 (83.3)	13 (81.3)	0.293
2	5 (31.3)	7 (14.6)	2 (12.5)	
3	1 (6.3)	1 (2.1)	1 (6.3)	

Categorical variables are shown as numbers (%)
*: $p<0.05$ shows statistical significance
URI: Upper respiratory tract infection; HBGS: House-Brackmann facial nerve grading system

Table 5. Relationship of admission characteristics and findings on follow-up improvement with recovery time

Variables	Recovery		p
	Early, n=53	Late, n=24	
Season, n (%)			
1	15 (28.3)	8 (33.3)	0.136
2	4 (7.5)	6 (25.0)	
3	13 (24.5)	5 (20.8)	
4	21 (39.6)	5 (20.8)	
Admission time, n (%)			
24 h	33 (62.3)	3 (12.5)	<0.001*
24-72 h	19 (35.8)	13 (54.2)	
>72 h	1 (1.9)	8 (33.3)	
Side of palsy, n (%)			
Right	25 (47.2)	13 (54.2)	0.628
Left	28 (52.8)	11 (45.8)	
Status, n (%)			
First	49 (92.5)	24 (100.0)	0.408
Recurrence	4 (7.5)	-	
Trigger, n (%)			
URI	4 (7.5)	4 (16.7)	0.209
Exposure to cold	18 (34.0)	4 (16.7)	
Unknown	31 (58.5)	16 (66.7)	
HBGS grade at admission, n (%)			
2	10 (18.9)	-	<0.001*
3	34 (64.2)	9 (37.5)	
4	7 (13.2)	10 (41.7)	
5	2 (3.8)	5 (20.8)	
Prednisolone duration, days	12 (10-15)	10 (10-15)	0.643
Steroid treatment, n (%)			
1 mg	6 (11.3)	9 (37.5)	0.023*
2 mg	37 (69.8)	10 (41.7)	
None	10 (18.9)	5 (20.8)	
Receiving antiviral treatment, n (%)	6 (11.3)	9 (39.1)	0.013*
Exercise, n (%)	52 (98.1)	24 (100.0)	0.999
Recovery duration, weeks	4 (2-4.3)	14 (5-28)	<0.001*
HBGS grade on the 21st day, n (%)			
1	47 (88.7)	-	<0.001*
2	5 (9.4)	19 (79.2)	
3	1 (1.9)	5 (20.8)	
HBGS grade in the 6th month, n (%)			
1	49 (92.5)	14 (58.3)	0.001*
2	4 (7.5)	10 (41.7)	

Numerical variables are shown as mean ± standard deviation or median (min-max); categorical variables are shown as numbers (%)
*: $p<0.05$ shows statistical significance URI: Upper respiratory tract infection; HBGS: House-Brackmann facial nerve grading system

Table 6. The House-Brackmann facial nerve grading system

Grade	Appearance	Forehead	Eye	Mouth
1	Normal	Normal	Normal	Normal
2	Mild weakness, normal resting tone	Medium-good movement	Full closure with minimum effort	Slightly asymmetrical
3	Non-deforming weakness, normal resting tone	Weak-medium movement	Full closure with maximum effort	Mild weakness with maximum effort
4	Deforming weakness, normal resting tone	N/A	Incomplete closure	Asymmetrical with maximum effort
5	Minimum movement, asymmetric resting tone	N/A	Incomplete closure	Slight movement
6	Asymmetric	N/A	N/A	N/A

DISCUSSION

IPFP is the most common cause of acute peripheral facial paralysis in children. For diagnosis, other causes of acute peripheral nerve palsy should be excluded. There are many points to clarify regarding etiopathogenesis and treatment, which still arouse curiosity. In this study, we evaluated the clinical features of children with IPFP, the possible prognostic factors, and the dose and efficacy of corticosteroid therapy.

Chen and Wong showed that the mean age of onset of IPFP in children was 6 years and 7 months, 52% of patients were male, and 44.4% of patients had right-sided IPFP[13]. Another study conducted by Arican et al. reported that the mean age of onset of IPFP was 11 years, while 59% of patients were female and 47% of patients had right-sided IPFP[14]. Our findings on IPFP onset age, gender, and affected area of the face were similar to the findings of these studies in the literature.

Recurrent facial palsy is rare in children and studies reported recurrent peripheral facial paralysis incidence in children at rates of 3-15%[15]. On the other hand, one study reported the recurrence rate of IPFP in children to be less than 10%, similar to the rate in adults, and noted that the disorder could recur on the same or the opposite side of the face months or years after its first appearance[16]. Our findings were consistent with the literature. The results of central imaging of these patients were normal. We found no different causes associated with recurrence.

In a study evaluating the relationship between IPFP and climate, Peitersen et al[4]. did not show seasonal variation, while many other researchers reported higher IPFP incidences in winter[17-19]. Our findings likewise revealed that IPFP most commonly develops in autumn and winter months and 28.7% of the cases were triggered by exposure to cold. This may be due to frequent or prolonged exposure to cold leading to vasomotor changes in the facial area and consequently to reflex ischemia and edematous neuritis. However, it may also be caused by reactivation of HSV-1 when it is in the latent state in ganglion cells[18,19].

A number of blood components such as white blood cells and neutrophils in particular are considered to be classic inflammatory markers. There are many studies suggesting that high NLR values are associated with poor prognosis. These studies suggest NLR is an inflammatory marker that can predict the prognosis of facial palsy in children even at an early stage[20,21]. We did not find such a relationship in our study. However, only 57 of our 80 patients had baseline complete blood count data available. This restrictive situation is likely to have affected the results.

IPFP cases generally resolve spontaneously. IPFP treatment in children is focused on improving facial nerve functions and reducing neuronal damage. Management is intended to minimize the possibility of incomplete resolution and to reduce the risk of morbid sequelae as well as moderate to severe facial weakness, synkinesis, autonomic dysfunction, and facial tissue contractures[22].

Most studies have focused on the prognosis of IPFP and have found most cases to improve with minimum dysfunction. Dhiravibulya reported the complete recovery rate to be 61.7% (HBGS stage 1) and the near-complete recovery rate to be 38.2% (HBGS stage 2) after 7 months of follow-up among 39 patients who received oral steroid treatment[23]. That study also reported that all children had recovered within 7 months and that the mean recovery time was 6.61 weeks (from 9 days to 28

weeks). Another study conducted by Chen and Wong reported that all cases had completely recovered except for one patient (3.1%) with MRI evidence of parotitis on the contralateral side, and that the rate of complete recovery in the first 3 weeks was 68.8%[13]. In our study, 78.8% of patients (n=63) completely recovered, while 17.5% achieved near-complete recovery at the end of a 6-month follow-up, similar to the results of previous studies. Fifty-three of the patients recovered early, while 24 recovered late. Of the patients with early recovery, 88.7% were completely recovered on the 21st day.

Only 3.8% (n=3) of patients had recovered incompletely after 6 months of follow-up. These high recovery rates emphasize the importance of appropriate treatment when the psychological aspects of IPFP sequelae for children and their parents are considered, although they are not life-threatening.

Karatoprak et al. found that steroid treatment in the first 24 hours was among the factors predicting early recovery[24]. Our findings likewise showed that admission after more than 24 hours reduced the likelihood of early recovery by 10 times. Before their admissions to our outpatient clinic, all of our patients were examined by an emergency physician or a pediatrician, and they were then referred to us without receiving treatment. In this regard, we think it is necessary to increase the awareness of family physicians, emergency physicians, and pediatricians, who are generally the first contacts of patients, about this important disease.

The treatment of IPFP in children is still a controversial issue. There is still a considerable lack of evidence and no definitive guidelines for the management of IPFP in children are available because most studies have been conducted with adults or mixed populations (i.e., both adults and children)[1]. Steroids are likely to reduce inflammation, neural edema, and nerve compression in the facial canal[25]. Corticosteroid therapy has been revealed to have significant benefits for adult patients, especially when used early in the course of the disease[26,27]. Unuvar et al. conducted a study with 42 children with IPFP who were treated with methylprednisolone and compared them to an untreated group[28]. Both groups had completely recovered after 12 months and there were no significant differences between the groups in terms of recovery. Another prospective study from Germany showed a 97% recovery rate without steroid administration in children under 15 years of age[1]. Contrary to that previous study, the guidelines of the American Academy of Neurology recommend early treatment with oral glucocorticoid therapy for all children with IPFP, considering the benefits of glucocorticoid therapy for adults with IPFP[29]. According to this recommendation, treatment should preferably be started within 3 days of symptom onset. The recommended regimen is 2 mg/kg prednisone per day for a period of 5 days (up to 60 to 80 mg), which is followed by a dose reduction for a period of 5 days. At least two studies reported that oral corticosteroids, even 1 mg/kg/day oral prednisolone, are highly effective in the treatment of children with IPFP[14,24]. In addition, our study showed that 2 mg/kg/day steroid treatment increased the probability of early recovery by 8.38 times. Considering that this situation is very worrying for families and children, we recommend steroid treatment at 2 mg/kg/day. Although steroid-related side effects can be used as an argument against steroid use, no side effects were observed in any of the patients in our study due to steroids used at therapeutic doses.

The rate of patients admitted within 24 hours was higher among Group 3 early recovery patients compared to the other groups, followed by Group 1 early recovery patients and Group 2 early recovery patients (p=0.001). The percentage of patients with HBGS grade 2 at admission was highest among Group 3 early recovery patients. This shows us that exercise and conservative treatment without steroids is preferred for patients admitted early with lower HBGS grades. The numbers of patients admitted late and those with higher HBGS grades at the time of admission were higher in Group 1 and Group 2, and this might be the cause of the higher recovery rates in group 3.

Electroneuronography and electromyography are important tools in predicting the prognosis of IPFP, but since they are difficult to perform for children, the search for easy-to-perform prognostic procedures continues. The HBGS provides both a clinical indication of the severity of IPFP and an objective record of the prognosis. The prognosis of IPFP is good if some improvement is observed within the first 21 days after symptom onset[30]. Karatoprak et al. found that HBGS grade 2 or 3 on the 10th day was an important predictive factor for early recovery. In our study, we observed that patients with HBGS grades of 2 and 3 on the 21st day

were more common among those who recovered late (Table 5). Our findings contain important results. As a predictor of prognosis, we recommend evaluating patients' HBGS grades on the 10th and 21st days. However, prospective studies are needed.

Limitations of our study; First of all, it is retrospective, the response to the treatment has not been monitored more frequently, and the education level of the families has not been determined. IPFP remains a serious problem commonly faced in clinical practice. However, there still is no consensus on its treatment or prognosis. To clarify these points, there is a need for multicenter, prospective studies enrolling larger numbers of cases.

IPFP may affect the social life of the child, and a prolonged recovery process may particularly become a source of concern for the child and his or her parents. Identifying the prognostic factors enables more satisfactory results to be achieved in treatment. This may allow for early intervention before the problems hinder these children's formal education or behavioral adaptation. Our results reveal that it is of great importance to admit patients and start their treatment within the first 24 hours. In addition, determining HBGS grades on the 21st day is an easy and practicable method that can be used for prognosis. Raising awareness in this regard is extremely important. We additionally recommend steroid administration of 2 mg/kg/day to increase the probability of early recovery.

In conclusion, IPFP remains a serious problem commonly faced in clinical practice. However, there still is no consensus on its treatment or prognosis. Our results reveal that it is of great importance to admit patients and start their treatment within the first 24 hours. In addition, determining HBGS grades on the 21st day is an easy and practicable method that can be used for prognosis. We additionally recommend steroid administration of 2 mg/kg/day to increase the probability of early recovery. In order to determine the appropriate steroid dose in IPFP patients and to evaluate the factors affecting the treatment. There is a need for randomized prospective controlled multicenter studies in which findings at the time of diagnosis and different steroid doses are planned

Yazar Katkıları: Çalışma konsepti/Tasarımı: HKU; Veri toplama: HKU; Veri analizi ve yorumlama: HKU; Yazı taslağı: HKU; İçeriğin eleştirel incelenmesi: HKU, ES; Son onay ve sorumluluk: HKU, ES; Teknik ve malzeme desteği: ES; Süpervizyon: ES; Fon sağlama (mevcut ise): yok.

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