European Archives of Oto-Rhino-Laryngology (2019) 276:1011–1016
https://doi.org/10.1007/s00405-019-05300-3

OTOLOGY

Comparative prognosis in patients with Ramsay-Hunt syndrome and Bell's palsy

Seok Hyun Kim[1] · Junyang Jung[2] · Su Young Jung[3] · Sung Hwa Dong[1] · Jae Yong Byun[1] · Moon Suh Park[1] · Sang Hoon Kim[1] · Seung Geun Yeo[1]

Received: 11 December 2018 / Accepted: 16 January 2019 / Published online: 1 February 2019

Abstract

Purpose Patients with Ramsay-Hunt syndrome have a poorer prognosis than patients with Bell's palsy. Factors of metabolic syndrome affecting prognosis were therefore compared between patients with Ramsay-Hunt syndrome and those with Bell's palsy.

Methods This retrospective study included 106 with Ramsay-Hunt syndrome and 182 with Bell's palsy. Age, sex, body mass index, blood pressure, blood test results, and ENoG results, stratified by House–Brackmann grade, were compared in patients with Ramsay-Hunt syndrome and Bell's palsy. Both groups of patients were treated with steroids and the antiviral agent famciclovir.

Results Age, sex, body mass index, dyslipidemia, triglyceride, diabetes, hypertension, and onset of palsy did not differ in patients with Ramsay-Hunt syndrome and Bell's palsy. Rates of favorable recovery in patients with severe facial palsy and DM were lower in patients with Ramsay-Hunt syndrome than with Bell's palsy and were also lower in low-weight, normal weight, and overweight patients with Ramsay-Hunt syndrome than with Bell's palsy. Rates of favorable recovery in patients with severe facial palsy and normal HDL, as well as in patients with severe facial palsy and < 10% ENoG, were lower in patients with Ramsay-Hunt syndrome than with Bell's palsy.

Conclusions Among patients with severe facial palsy, along with diabetes and < 10% ENoG, unfavorable recovery rates were significantly higher in those with Ramsay-Hunt syndrome than with Bell's palsy.

Keywords Bell's palsy · Ramsay-Hunt syndrome · Metabolic syndrome · Prognosis · Facial palsy

Introduction

Bell's palsy is the most common form of facial nerve paralysis, with an annual incidence of 20–30 per 100,000 persons [1]. Bell's palsy can occur at any age, but is less prevalent among children aged < 10 years and elderly people. Pregnancy and diabetes are risk factors for Bell's palsy [2], and reactivation of latent herpes virus is regarded as the main cause of facial nerve edema [3]. Other causes of facial paralysis can include tumors, trauma, infections, neurological diseases, and immunological diseases. Appropriate treatment can lead to recovery, without sequelae, in 80–90% of patients with Bell's palsy [4].

Ramsay-Hunt syndrome is another disease involving facial nerve paralysis. Patients with Ramsay-Hunt syndrome present with a vesicular rash of the auricle and/or external ear, accompanied by facial nerve paralysis, due to reactivation of latent varicella zoster virus in the geniculate ganglia [5]. The annual incidence of varicella zoster virus infection has been reported to be about 130 per 100,000 persons [6], with 4.5–9.0% of these patients experiencing facial paralysis [7]. The annual incidence of Ramsay-Hunt syndrome in the United States has been reported to be 5 per 100,000 persons, lower than the annual incidence of Bell's palsy [8]. Because

✉ Seung Geun Yeo
yeo2park@gmail.com

[1] Department of Otolaryngology-Head and Neck Surgery, School of Medicine, Kyung Hee University, #1 Hoegi-dong, Dongdaemun-gu, Seoul 130-702, Republic of Korea

[2] Department of Anatomy and Neurobiology, School of Medicine, Kyung Hee University, Seoul, Republic of Korea

[3] Department of Otorhinolaryngology-Head and Neck Surgery, Myongji Hospital, Hanyang University Medical Center, Goyang, Republic of Korea

perineural invasion is more likely with varicella zoster virus than with simple herpes virus, the former can cause sensorineural hearing loss or vertigo by invading the cochlear and vestibular nerves in addition to the facial nerve [9]. Recovery rates are lower in patients with Ramsay-Hunt syndrome than with Bell's palsy. A recent study, however, reported no significant differences in the prognosis of patients with these two conditions [10]. In that study, prognosis was dependent on underlying diseases, including diabetes and hypertension [10], as well as on accompanying symptoms, including hypotonia, decreased taste, hearing loss, and decreased lacrimal function.

Because factors associated with metabolic syndrome, including diabetes, hypertension, obesity, and dyslipidemia, have been associated with lower recovery rates in patients with facial palsy, metabolic syndrome itself may be a risk factor for lower recovery rate in these patients [11]. Metabolic syndrome has been defined as the presence of three or more of five criteria: hypertension, triglyceridemia, high fasting blood glucose or diabetes, reduced high-density lipoprotein-cholesterol (HDL-C), and high body mass index (BMI) [12, 13]. This study compared factors that may affect prognosis, including diagnostic criteria for metabolic syndrome, between patients with Ramsay-Hunt syndrome and those with Bell's palsy.

Subjects and methods

This retrospective study included 288 patients at the Department of Otorhinolaryngology-Head and Neck Surgery, Kyung Hee Medical Center, who had been diagnosed with facial paralysis, including 106 patients with Ramsay-Hunt syndrome and 182 with Bell's palsy. Patients with acute facial palsy with otalgia, rash, and skin lesions were diagnosed with Ramsay-Hunt Syndrome, whereas patients with no other known cause of facial palsy were diagnosed with Bell's palsy. Factors evaluated included the occurrence of chronic diseases, including diabetes and hypertension; history of surgery, and accompanying symptoms, such as hearing disturbance, tinnitus, and vertigo, at the time of admission. Other factors included initial and final House–Brackmann grade; and vital signs, including height, weight, BMI and blood pressure. The results of blood tests were recorded, including complete blood count/differential count; liver function tests; and concentrations of triglycerides, HDL-C, and low-density lipoprotein-cholesterol (LDL-C). The results of urine tests and radiographic tests were evaluated. All patients underwent electroneurography (ENoG) 5 days after the onset of facial palsy; if patients were hospitalized > 5 days after onset, ENoG was performed as soon as possible. Electromyography (EMG) was also performed during the second week after facial palsy onset.

Metabolic syndrome was diagnosed in patients who met three of the five diagnostic criteria of the NCEP ATP III: hypertension (blood pressure ≥ 130/85 mmHg measured in the upper left arm in a stable state for more than 30 min; triglyceridemia (serum triglycerides ≥ 150 mg/dl measured after 6 h of fasting); hyperglycemia (fasting plasma glucose ≥ 110/mg/dl, HbA1c ≥ 6.5% or a diagnosis of Type 2 diabetes); dyslipidemia (HDL-C < 40 mg/dl for men and < 50 mg/dl for women after 6 h of fasting) [14]; and obesity (BMI ≥ 25 kg/m^2) [12, 13].

Initial House–Brackmann grades III or IV were classified as moderate facial palsy and grades V or VI as severe facial palsy. Six months after the onset of the disease, the patient was followed up through outpatient clinic. Favorable recovery was defined as final House–Brackmann grades I or II, and unfavorable recovery as final House–Brackmann grades III or higher. All patients whose initial House–Brackmann grades II recovered to final House–Brackmann grades I. Because the initial House–Brackmann grade can affect the prognosis of patients with Ramsay-Hunt syndrome and Bell's palsy, each group was subcategorized by severity of facial palsy prior to comparison.

Both groups of patients were treated with steroids and the antiviral agent famciclovir [15]. Doses of high-dose steroids were 80 mg/day for 4 days, 60 mg/day for 2 days, 40 mg/day for 2 days, 20 mg/day for 2 days, and 10 mg/day for 2 days. All patients were treated with 750 mg/day famciclovir for 7 days [16].

Ethical considerations

This study protocol was approved by the Institutional Review Board of Kyung Hee Medical Center (2017-11-058-002).

Statistical analysis

Final House–Brackmann grades in patients with Ramsay-Hunt syndrome and Bell's palsy were categorized by the presence of diabetes and hypertension, by concentrations of serum triglycerides and HDL-C, and by BMI and ENoG, and compared. Continuous variables were compared using Mann–Whitney *U* tests and categorical variables by Fisher's exact tests. All statistical analyses were performed using SPSS (version 20.0, SPSS Inc, Chicago, IL, USA) software, with p values < 0.05 considered statistically significant.

Results

Comparisons of patients with Ramsay-Hunt syndrome and Bell's palsy showed no statistically significant between-group differences in age, sex, BMI, HDL-C and triglyceride concentrations, rates of diabetes, and onset of

paralysis. The ratio of patients with hypertension showed significantly approached differences (Table 1). Moreover, the grade of initial facial palsy did not differ significantly in the two groups ($p > 0.05$, Table 2). Groups of patients with Ramsay-Hunt syndrome and Bell's palsy and moderate facial palsy, showed no difference in recovery rates and no significant difference in the rates of metabolic syndrome, hypertension, hyperglycemia, obesity, dyslipidemia, and triglyceridemia ($p > 0.05$, Table 3). The rate of favorable recovery in patients with severe facial palsy and hyperglycemia was significantly lower in those with Ramsay-Hunt syndrome than with Bell's palsy (25% [2/8] vs. 82% [9/11], $p = 0.013$, Table 4). However, the rate of favorable recovery in patients with severe facial palsy but without hyperglycemia did not differ significantly in patients with Ramsay-Hunt syndrome and Bell's palsy ($p > 0.05$). Of patients with severe facial palsy with non-obesity, 19 of 36 (52.8%) with Ramsay-Hunt syndrome and 33 of 43 (76.7%) with Bell's palsy showed favorable recovery ($p = 0.025$). However, the rate of favorable recovery did not differ significantly in obese patients with severe facial palsy who had Ramsay-Hunt syndrome and those who had Bell's palsy ($p > 0.05$). The rate of normal recovery in patients with non-dyslipidemia and severe facial palsy was significantly lower in patients with Ramsay-Hunt syndrome than with Bell's palsy (53.5% [23/43] vs. 80% [40/50] (80%), $p = 0.003$). In contrast, favorable recovery rates did not differ in patients with dyslipidemia ($p > 0.05$). A comparison of final House–Brackmann grade in Ramsay-Hunt syndrome and Bell's palsy patients with severe facial palsy and without metabolic syndrome showed that the rate of favorable recovery was significantly lower in the former group (55% [22/40] vs. 78.6% [44/56], $p = 0.014$). However, favorable recovery rates did not differ significantly in patients with metabolic syndrome ($p > 0.05$).

A comparison of final House–Brackmann grade in patients with severe facial palsy and ENoG < 10% showed that favorable recovery rates were significantly lower in patients with Ramsay-Hunt syndrome than with Bell's palsy (12.5% [1/8] vs. 66.7% [4/6], $p = 0.036$, Table 5). However, rates of favorable recovery did not differ significantly between patients with moderate facial palsy and those with ENoG > 10% ($p > 0.05$).

Table 1 Demographic and clinical characteristics of patients with Ramsay-Hunt syndrome and Bell's palsy

	Ramsay-Hunt syndrome ($n = 106$)	Bell's palsy ($n = 182$)	p value
Age (year)	44.98 ± 16.37	42.59 ± 19.46	0.288
Gender			
Male (n, %)	40 (37.7)	79 (43.4)	0.346
Female (n, %)	66 (62.3)	103 (56.6)	0.346
Electroneurography (%)	49.71 ± 26.47	52.26 ± 27.41	0.452
BMI (kg/m^2)	23.70 ± 3.99	23.52 ± 4.14	0.726
Triglyceride (mg/dl)	137.89 ± 95.08	148.02 ± 111.86	0.452
HDL-C (mg/dl)	49.38 ± 14.16	52.25 ± 16.03	0.338
Diabetes	16 (15.1%)	26 (14.3%)	0.851
Hypertension	12 (11.3%)	37 (20.3%)	0.052
Side			
Right (n, %)	57 (53.8%)	82 (45.1%)	0.137
Left (n, %)	49 (46.2%)	100 (54.9%)	0.137

Table 2 Distribution of initial and final House–Brackmann grades in patients with Ramsay-Hunt syndrome and Bell's palsy

House–Brackmann grade	Initial		p value	Final		p value
	RHS ($n = 106$)	BP ($n = 182$)		RHS ($n = 106$)	BP ($n = 182$)	
I	0 (0%)	0 (0%)	–	51 (48.6%)	86 (47.3%)	0.888
II	7 (6.3%)	13 (7.1%)	0.437	30 (28.6%)	66 (36.3%)	0.167
III	22 (20.8%)	37 (20.4%)	0.776	14 (13.3%)	24 (13.2%)	0.996
IV	31 (29.2%)	66 (36.3%)	0.415	5 (4.8%)	5 (2.7%)	0.379
V	40 (37.7%)	59 (32.4%)	0.268	5 (4.8%)	1 (0.5%)	0.017*
VI	6 (5.7%)	7 (3.8%)	0.474	0 (0%)	0 (0%)	–

*$p < 0.05$

Table 3 Associations between favorable recovery rates and criteria of the metabolic syndrome in Ramsay-Hunt syndrome and Bell's palsy patients with moderate facial palsy

	Ramsay-Hunt syndrome ($n=53$)	Bell's palsy ($n=103$)	p value
Total	48/53 (90.6%)	90/103 (87.4%)	0.555
Metabolic syndrome			
(+)	5/6 (83.3%)	15/18 (83.3%)	1.000
(−)	43/47 (91.5%)	75/84 (89.3%)	0.686
Hypertension			
(+)	4/5 (80%)	23/26 (88.5%)	0.605
(−)	44/48 (91.7%)	67/77 (87.0%)	0.422
Hyperglycemia			
(+)	6/7 (85.7%)	12/14 (85.7%)	1.000
(−)	42/44 (91.3%)	78/89 (87.6%)	0.521
Obesity			
(+)	18/20 (90%)	29/33 (87.9%)	0.819
(−)	30/33 (90.9%)	61/69 (88.4%)	0.703
Dyslipidemia			
(+)	8/9 (88.9%)	17/18 (94.4%)	0.603
(−)	40/44 (90.9%)	73/85 (85.9%)	0.412
Triglyceridemia			
(+)	13/15 (86.7%)	30/33 (90.9%)	0.656
(−)	35/38 (92.1%)	60/70 (85.7%)	0.330

Table 4 Associations between favorable recovery rates and criteria of the metabolic syndrome in Ramsay-Hunt syndrome and Bell's palsy patients with severe facial palsy

	Ramsay-Hunt syndrome ($n=46$)	Bell's palsy ($n=66$)	p value
Total	26/46 (56.5%)	49/66 (74.2%)	0.051
Metabolic syndrome			
(+)	3/5 (60%)	5/10 (50%)	0.714
(−)	22/40 (55%)	44/56 (78.6%)	0.014*
Hypertension			
(+)	1/7 (14.3%)	5/8 (32.5%)	0.057
(−)	25/39 (64.1%)	44/58 (75%)	0.210
Hyperglycemia			
(+)	2/8 (25%)	9/11 (81.8%)	0.013*
(−)	24/38 (63.2%)	40/55 (72.7%)	0.327
Obesity			
(+)	6/9 (66.7%)	16/23 (69.6%)	0.874
(−)	19/36 (52.8%)	33/43 (76.7%)	0.025*
Dyslipidemia			
(+)	3/3 (100%)	9/16 (56.2%)	0.149
(−)	23/43 (53.5%)	40/50 (80%)	0.006*
Triglyceridemia			
(+)	8/15 (53.3%)	14/20 (70%)	0.313
(−)	18/31 (58.1%)	35/46 (76.1%)	0.094

*$p<0.05$

Table 5 Associations of favorable recovery rates with ENoG and initial House–Brackmann grade in patients with Ramsay-Hunt syndrome and Bell's palsy

Initial palsy	Ramsay-Hunt syndrome	Bell's palsy	p value
Moderate facial palsy			
ENoG < 10	3/3 (100%)	3/5 (60%)	0.206
ENoG ≥ 10	45/50 (90%)	87/98 (88.8%)	0.821
Severe facial palsy			
ENoG < 10	1/8 (12.5%)	4/6 (66.7%)	0.036*
ENoG ≥ 10	25/38 (65.8%)	45/60 (71.4%)	0.411

*$p<0.05$

Discussion

Other common symptoms include tinnitus, hearing loss, nausea, vomiting, dizziness, and nystagmus. Although Ramsay-Hunt syndrome was described in the early 1960s as a more florid form of Bell's palsy [17], facial paralysis is considered more severe in patients with Ramsay-Hunt syndrome than with Bell's palsy. Bell's palsy is thought to be caused by reactivation of latent herpes simplex virus. In contrast, Ramsay-Hunt syndrome is thought to be caused by reactivation of the varicella zoster virus, which was latent in the geniculate ganglia, with this virus more likely due to perineural invasion than herpes simplex virus [18]. In addition, Ramsay-Hunt syndrome often involves the cochlear and vestibular nerves, which can lead to hearing loss and dizziness [19].

Previous studies comparing prognosis in patients with Ramsay-Hunt syndrome and Bell's palsy have suggested that facial paralysis is more severe in patients with Ramsay-Hunt syndrome. Because the poorer prognosis of patients with Ramsay-Hunt syndrome may be due to differences in initial House–Brackmann grade, this study compared patients with the same initial House–Brackmann grade. Another study evaluating factors showed that age, initial paralysis grade, electrophysiologic results, stapedial reflex, lacrimal function, and time required for spontaneous improvement were prognostic. Moreover, neurophysiologic test results and House–Brackmann grade IV after 1 month were reported to be highly prognostic in patients aged > 50 years, whereas initial House–Brackmann grades V and VI were prognostic in patients with moderate facial paralysis, and varicella zoster virus-induced paralysis and stapedial reflex loss were low-risk factors [20]. This study found no difference in prognosis between Ramsay-Hunt syndrome and Bell's palsy patients with both severe and moderate facial palsy and metabolic syndrome.

Age, diabetes and hypertension were found to affect the prognosis of patients with Ramsay-Hunt syndrome, but not those with Bell's palsy, with no significant difference

in final House–Brackmann grade between patients with Ramsay-Hunt syndrome and Bell's palsy [10]. Metabolic disorders have been associated with neuropathies, including nitric oxide inhibition, vascular dysregulation, and oxidative injury. In addition, microangiopathy due to vascular insufficiency causes compensatory ischemia in nerves [11]. Therefore, metabolic syndrome, including hypertension, diabetes, obesity, and dyslipidemia, may affect recovery from facial palsy.

There was no significant difference in the prognosis of Ramsay-Hunt syndrome and Bell's palsy patients with hypertension and severe facial palsy. However, the favorable recovery rate tended to be lower in patients with Ramsay-Hunt syndrome. Although hypertension may affect the prognosis of patients with facial paralysis [21], to our knowledge no previous study has compared prognosis in these two groups of patients with hypertension.

Although 71% of patients with Bell's palsy recovered normal facial function, complete recovery was observed in only 21% of patients with Ramsay-Hunt syndrome, with 25% and 26% of the latter group experiencing residual mild sequelae and moderate sequelae, respectively. In agreement with previous results [22], prognosis was also poorer in patients with diabetes and Ramsay-Hunt syndrome than in patients with diabetes and Bell's palsy, with the poorer prognosis in the former group. This may be related to vascular insufficiency and diabetic polyneuropathy [22].

A comparison of obese patients with severe Ramsay-Hunt syndrome and Bell's palsy showed that final House–Brackmann grade was similar in the two groups, although prognosis tended to be poorer in patients with Ramsay-Hunt syndrome. In non-obese patients, however, those with Ramsay-Hunt syndrome had a significantly poorer prognosis than those with Bell's palsy. Obesity is thought to be associated with chronic low-grade inflammation. Determination of the association of obesity with the prognosis of patients with both types of facial paralysis requires further study.

A comparison of patients with non-dyslipidemia found that the recovery rate was lower in those with Ramsay-Hunt syndrome than with Bell's palsy. HDL-C concentration may impair the recovery of patients with Ramsay-Hunt syndrome more than those with Bell's palsy by a mechanism similar to that observed in patients with diabetes and obesity. However, studies are needed to determine the mechanism by which HDL-C affects recovery from facial paralysis.

Although ENoG results have been reported to predict the prognosis of patients with facial palsy, ENoG does not provide accurate information about prognosis or recovery rates in patients with Bell's palsy and Ramsay-Hunt syndrome [23]. However, ENoG cut-off values may be highly predictive of recovery rates [24]. In this study, the ENoG cutoff was set at $< 10\%$, a level associated with axonotmesis (damage to the myelin sheath and axons). Patients with ENoG $< 10\%$ were significantly more likely to recover completely than those with ENoG $\geq 10\%$, a level associated with neurotmesis (damage to the myelin sheath, axons, and endoneurium) [25]. Because the recovery rates at the same ENoG levels differed in patients with Ramsay-Hunt syndrome and Bell's palsy patients, nerve degeneration caused by varicella zoster virus was likely to cause neurotmesis-induced nerve damage in the former.

Comparisons of patients with Ramsay-Hunt syndrome and Bell's palsy with severe facial palsy found that diabetes, obesity, and dyslipidemia were associated with the prognosis. In contrast, final House–Brackmann grades did not differ significantly in patients with Ramsay-Hunt syndrome and Bell's palsy with moderate facial palsy, indicating that moderate facial palsy did not affect recovery rate. However, in patients with severe facial palsy, the presence of underlying diseases had a significant negative effect on prognosis, especially in patients with Ramsay-Hunt syndrome.

Conclusion

Assessments of patients with severe facial paralysis showed that the prognosis of patients with Ramsay-Hunt syndrome, accompanied by diabetes, non-obesity, non-dyslipidemia, or ENoG $< 10\%$, was significantly poorer than in similar groups of patients with Bell's palsy and the same initial House–Brackmann grade.

Funding The authors have no funding or financial relationships to disclose.

Compliance with ethical standards

Conflict of interest The authors have no conflicts of interest to report.

References

1. Holland NJ, Weiner GM (2004) Recent developments in Bell's palsy. BMJ 329:553–557
2. Adour KK, Wingerd J, Doty HE (1975) Prevalence of concurrent diabetes mellitus and idiopathic facial paralysis (Bell's palsy). Diabetes 24:449–451
3. Sullivan FM, Swan IR, Donnan PT, Morrison JM, Smith BH, McKinstry B, Davenport RJ, Vale LD, Clarkson JE, Hammersley V (2007) Early treatment with prednisolone or acyclovir in Bell's palsy. N Engl J Med 357:1598–1607
4. Flint PW, Haughey BH, Robbins KT, Thomas JR, Niparko JK, Lund VJ, Lesperance MM (2014) Cummings Otolaryngology-Head and Neck Surgery 6th edn. Saunders
5. Hunt JR (1968) On herpetic inflammations of the geniculate ganglion. A new syndrome and its complications. Arch Neurol Chic 18:584–589

6. Ragozzino M, Kurland L, Chu C, Perry H (1988) Population-based study of herpes zoster and its sequelae. Medicine 61:310–316
7. Devriese P, Moesker W (1988) The natural history of facial paralysis in herpes zoster. Clin Otolaryngol 13:289–298
8. Adour KK (1994) Otological complications of herpes zoster. Ann neurol 35:62–64
9. Byl FM, Adour KK (1977) Auditory symptoms associated with herpes zoster or idiopathic facial paralysis. Laryngoscope 87:372–379
10. Yeo SW, Lee DH, Jun BC, Chang KH, Park YS (2007) Analysis of prognostic factors in Bell's palsy and Ramsay Hunt syndrome. Auris Nasus Larynx 34:159–164
11. Jung SY, Jung J, Byun JY, Park MS, Kim SH, Yeo SG (2018) The effect of metabolic syndrome on Bell's palsy recovery rate. Acta Oto Laryngol 138:670–674
12. Zimmet P, Alberti KGM, Kaufman F, Tajima N, Silink M, Arslanian S, Wong G, Bennett P, Shaw J, Caprio S (2007) The metabolic syndrome in children and adolescents—an IDF consensus report. Pediatr Diabetes 8:299–306
13. Grundy SM, Cleeman JI, Daniels SR, Donato KA, Eckel RH, Franklin BA, Gordon DJ, Krauss RM, Savage PJ, Smith SC (2005) Diagnosis and management of the metabolic syndrome: an American Heart Association/National Heart, Lung, and Blood Institute scientific statement. Circulation 112:2735–2752
14. Ford ES, Giles WH, Dietz WH (2002) Prevalence of the metabolic syndrome among US adults: findings from the third National Health and Nutrition Examination Survey. JAMA 287:356–359
15. Kang H, Jung S, Byun J, Park M, Yeo S (2015) Steroid plus antiviral treatment for Bell's palsy. J Intern Med 277:532–539
16. Lee HY, Byun JY, Park MS, Yeo SG (2013) Steroid-antiviral treatment improves the recovery rate in patients with severe Bell's palsy. Am J Med 12:336–341
17. Dalton G (1960) Bell's palsy: Some problems of prognosis and treatment. BMJ 1:1765–1770
18. Meier JL, Straus SE (1992) Comparative biology of latent varicella-zoster virus and herpes simplex virus infections. J Infect Dis 166:13–23
19. Sweeney C, Gilden D (2001) Ramsay hunt syndrome. J Neurol Neurosurg Psychiatry 71:149–154
20. Ikeda M, Abiko Y, Kukimoto N, Omori H, Nakazato H, Ikeda K (2005) Clinical factors that influence the prognosis of facial nerve paralysis and the magnitudes of influence. Laryngoscope 115:855–860
21. Katusic SK, Beard CM, Wiederholt W, Bergstralh EJ, Kurland LT (1986) Incidence, clinical features, and prognosis in Bell's palsy, Rochester, Minnesota, 1968–1982. Ann Neurol 20:622–627
22. Peitersen E (2002) Bell's palsy: the spontaneous course of 2,500 peripheral facial nerve palsies of different etiologies. Acta Oto Laryngol 122:4–30
23. Lee DH, Chae SY, Park YS, Yeo SW (2006) Prognostic value of electroneurography in Bell's palsy and Ramsay–Hunt's syndrome. Clin Otolaryngol 31:144–148
24. Byun H, Cho YS, Jang JY, Chung KW, Hwang S, Chung WH, Hong SH (2013) Value of electroneurography as a prognostic indicator for recovery in acute severe inflammatory facial paralysis: a prospective study of Bell's palsy and Ramsay-Hunt syndrome. Laryngoscope 123:2526–2532
25. Lee DH (2016) Clinical efficacy of electroneurography in acute facial paralysis. J Audiol Otol 20:8–12