



Features of Vegetative Dysfunction in Patients with Bell's Palsy

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Authors' contributions

This work was carried out in collaboration between both authors. Author SBA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author NAA managed the analyses of the study, the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

Introduction: Bell's palsy is characterised by an acute, unilateral, partial, or complete paralysis of the face. Bell's palsy occurs in a lower motor neurone pattern. The weakness may be partial or complete, and may be associated with mild pain, numbness, increased sensitivity to sound, and altered taste. Bell's palsy is idiopathic, but a proportion of cases may be caused by reactivation of herpes virus at the geniculate ganglion of the facial nerve. Bell's palsy is most common in people aged 15 to 40 years, with a 1 in 60-lifetime risk. We aimed to evaluate vegetative dysfunctions in patients with Bell's palsy, depending on the clinical course and sexual dimorphism.

Methods: The study was carried out over 60 patients divided into three groups for the period 2011-2016. Each group includes 10 patients, according to the severity of lesion of FN, with the control group, consisted of healthy individuals of different age groups.

Results: A detailed analysis of each clinical case suggests that more severe manifestation of BP

and the older patients' age, the higher the sympathetic tone. Cardiac contractions in the Danini-Ashner test did not practically change from the initial value, and on average, it was -2.0 ± 0.27 in males and -3.0 ± 0.3 in females.

Conclusion: Prevalence of sympathetic activity in both patients with VT, in the VMA, and in the directionality of BP, especially among males, with a more severe FN. There is a correlation between severity of vegetative dysfunctions and neurological defect: more severe the lesion of FN, more shifts in the sympathetic orientation of vegetative functions were detected.

Keywords: Bell's palsy; idiopathic neuropathy of the facial nerve; autonomic disorder; sexual dimorphism.

1. INTRODUCTION

Bell's palsy is an idiopathic, unilateral, acute paresis or paralysis of facial movement results of dysfunction of the lower motor neuron. Up to 30% of the population with acute peripheral facial palsy have an alternative cause diagnosed at presentation or during the course of their facial palsy. Alternative causes are higher in children (>50%), warranting specialist evaluation at presentation. Severe pain, vesicles (ear or oral), and hearing loss or imbalance suggest Ramsay Hunt syndrome caused by herpes zoster virus infection, which requires specialist management [1].

The task of assessing the severity of facial nerve (FN) in the acute period of Bell's palsy (BP) is still largely unsolved, since the clinical picture and applied instrumental methods of investigation do not always allow obtaining exhaustive information [2,3].

The vast majority of people with unilateral paresis (partial weakness) make a spontaneous recovery within 3 weeks. Up to 30% of people, typically people with paralysis (complete palsy), have a delayed or incomplete recovery [4].

Common exist problems of diagnosis and treatment of BP from poorly developed questions is the query of nature and course, clinical features of this group of diseases in males and females. Clinic-pathogenetic features of BP in the aspect of sexual dimorphism among the topical problems of facial neuropathy remains unresolved and little studied. The study of the features of the clinical course and the detection of psycho-vegetative dysfunctions of sex dependence in patients with BP will improve the degree of treatment effectiveness [5,6,7].

In the majority of patients with BP, vegetative dysfunctions (VD) are sometimes one of the main complaints requiring special attention and

correction [8]. Nevertheless, in practice, VD is often not given proper attention, and they are considered as a concomitant symptom or phenomenon, indicating the degree and level of lesion of the facial nerve in the fallopian canal. According to clinical experience, the manifestation and dynamics of local VD with BP, such as xerophthalmia, lacrimation, and dry mouth, except for the topical also have a certain prognostic value [9,10]. In connection with this, a detailed study of VD with BP, observation of their dynamics and development of correction methods is of great practical importance [11,12].

Permanent or paroxysmal manifestations of dysfunction of the supreme segmental part of the vegetative nervous system (VNS), first they are caused by psycho-emotional disorders of patients with anxiety, and in case of prolonged course of depression, [13,14,15].

1.1 The Aim of This Study

The aim of this study is to assess vegetative dysfunctions in patients with Bell's palsy, depending on the clinical course and sexual dimorphism.

2. MATERIALS AND METHODS

To identify vegetative dysfunction in BP, we studied the following functions of the supreme segmental portion of the VNS using the following methods:

1. Vegetative tonus (VT), examined on the Guillaume-Vein scale [16].
2. Vegetative response (VR) was examined by using a Danini-Ashner test [17].
3. Vegetative maintenance of activity (VMA) was investigated by carrying out orthostatic tests [18].

A comparative analysis of the above parameters was performed in 30 male and 30 female

patients divided into three groups, who were on inpatient and outpatient treatment at the Bukhara Multidisciplinary Medical Centre, Department of Neurology and Medical Genetics of the Bukhara Medical Institute, for the period 2011-2016. Each group includes 10 patients, according to the severity of lesion of FN, with the control group, consisted of healthy individuals of different age groups, 5 men and women each. Patients were included in the study based on random selection. The criteria for including patients in the study were the following: the presence of an acute and idiopathic form of neuritis of nervus fascialis (NNF). The criteria excluding patients from the study were the oncological and traumatic origin of NNF, neuro leukemia, the presence of severe and decompensated forms of diabetes mellitus, hepatic and renal insufficiency, pregnant women and women during lactation. Vegetative functions were examined during the course of the ERP disease. Group I consisted of patients with mild FN, group II with moderate severity, and group III with patients with severe FN.

3. RESULTS

In the study of the vegetative tone in patients with severe hypothyroidism, the sympathetic tone prevails, in comparison with the control group ($p < 0.01-0.001$) and with a group of patients with an average degree of BP prosoparesis ($p < 0.01$). The exception was female patients with mild degrees of severity of prosoparesis, when compared with the control group, whereas when compared with group III, the reliability was $p < 0.05$.

A detailed analysis of each clinical case suggests that the more severe the manifestation of BP and the older the patient's age, the higher the sympathetic tone. This was especially true for cases with severe lesion of FN, when in 4 (13.3%) men and 3 (10%) women we observed sympathoadrenal reactions during the OD of the disease. At an average severity of lesion of FN in OP, sympathoadrenal reactions were observed in only 2 (6%) men and 1 woman (3%). Thus, the heavier the lesion of FN, the stronger the sympathetic tone prevails, among both females and males.

The study of the VMA revealed significant differences in the pulse and blood pressure indices, both at rest and during the orthostatic test, between the compared groups and the control group. The obtained results showed the presence of significant differences between the

group of patients with severe lesion FN (III group), in comparison with the control group and with the group of patients with mild lesion FN (group I) ($p < 0.01$). This difference was more pronounced in males: gender differences were more pronounced when the pulse was compared in patients with severe FN (i.e., between men and women in group III) (Table 2).

At the same time, according to the parameters of the pulse parameter of the VMA, between the first group of males and females and the control group, the difference was not reliable.

In the study of mean systolic blood pressure (SBP), both at rest and during the orthostatic test, the following results were obtained: thus, in patients in the I group of male and female, there were no significant differences between them and the control group.

Significant differences were found when comparing SBP at rest, between Groups I and III both male and female indicating a sympathetic orientation of the VMA. When carrying out the orthostatic test, in both I and in III groups of the male and in I and in III female groups there was a significant difference ($p < 0.01$). This circumstance probably has several reasons: 1 - the use of steroid drugs with a decongestant, according to a fractional scheme with a short course; 2 - activation of the sympathetic nervous system due to psycho-emotional reactions to events. Thus, the differences were revealed when comparing the pulse and blood pressure parameters between groups with severe and mild severity of injuries of FN (both at rest and during the orthostatic test) indicate the sympathetic orientation of the VMA in severe manifestations of injuries of FN.

The results of a comparative analysis of BP in patients with damage of FN (Table 3) also confirm the predominance of sympathetic activity in response to external influences, more pronounced in Group III patients, both male and female, and in Group II patients, compared with group control. At the same time, the initial sympathetic activity is extremely expressed in the group of patients with the severe course, especially among men. In the same patients, the number of cardiac contractions in the Danini-Ashner test did not practically change from the initial value, and on average, it was -2.0 ± 0.27 in males and -3.0 ± 0.3 in females. Whereas in group I male and female patients' values did not differ significantly from the control group.

Table 1. Features of vegetative tonus in Bell's palsy in male and female patients

Indicators of VT	Mild		Moderate severity		Severe		Control group n=10
	m (n=10)	f (n=10)	m (n=10)	f (n=10)	m (n=10)	f (n=10)	
Sympaticus	57,6±1,2	56,1±0,6	60,6±0,9	59,1±0,9	65,6±0,8*b	60,4±0,72*a	55,1±0,75
P<, to control			0,01	0,01	0,001	0,01	
Parasympaticus	42,4±0,8	43,9±0,6	49,5±0,58*	40,9±0,6*a	34,4±0,4**bb	30,6±0,52**ba	44,9±0,5
P<, to control			0,01	0,05	0,01	0,01	

* - reliability to indicators of an easy degree (* - $P < 0,05-0,01$); ^ - reliability to indicators of an easy degree (* - $P < 0,05-0,01$); b - the reliability of the data to the indicators of an average degree (b - $P < 0,05-0,01$); a - reliability of data between indicators by sex (a - $P < 0,05$)

Table 2. Features of vegetative maintenance of activity in patients with Bell's palsy

Indicators of VMA	Mild		Moderate severity		Severe		Control group n=10	
	m (n=10)	f (n=10)	m (n=10)	f (n=10)	m (n=10)	f (n=10)		
Heartrate	At rest	77,4±0,5	73,2±0,8a	80,1±0,67*	74,4±0,ba	86,2±0,6**b	79,0±1,0*ba	75,0±0,7
	P<, to control			0,001		0,001	0,01	
	Ortostat	88,0±1,1	85,0±1,1a	95,0±0,9*	94,0±0,9*	112,0±2,1**bb	109,0±1,3**ba	87,0±0,7
SAD	P<, to control			0,01	0,01	0,001	0,01	
	Rest	90,0±1,6	87,0±1,4a	93,0±1,8	95,0±1,4**	95,0±1,8*	92,0±0,86*ba	91,0±1,5
	P<, to control							
	Orthostat	102,0±2,3	99,0±1,7a	105,0±2,2	102,0±1,8*a	108,0±2,3*	109,0±1,9*b	106,0±1,5
P<, to control		0,05						

* - reliability to indicators of an easy degree (* - $P < 0,05-0,01$); ^ - reliability to indicators of an easy degree (* - $P < 0,05-0,01$); b - the reliability of the data to the indicators of an average degree (b - $P < 0,05-0,01$); a - reliability of data between indicators by sex (a - $P < 0,05$)

Table 3. Features of the vegetative response in Bell's palsy in male and female patients

Indicators of VR	Mild		Moderate severity		Severe		Control group n=10
	m (n=10)	f (n=10)	m (n=10)	f (n=10)	m (n=10)	f (n=10)	
Heart rate at rest	78,4±0,7	72,2±0,5a	80,1±0,8*	74,4±0,7a	86,2±0,61**b	80,0±0,5*a	75,1±0,7
P<, to control	0,01	0,05	0,01		0,001	0,01	
Sample with reactivity	-6,5±0,28	-5,4±0,3a	-4,0±0,35**	-4,0±0,4*	-2,0±0,27***b	-3,0±0,3**ba	-6,0±0,2
P<, to control		0,05	0,01	0,01	0,001	0,001	

* - reliability to indicators of an easy degree (* - $P < 0,05-0,01$); ^ - reliability to indicators of an easy degree (* - $P < 0,05-0,01$); b - the reliability of the data to the indicators of an average degree (b - $P < 0,05-0,01$); a - reliability of data between indicators by sex (a - $P < 0,05$)

4. DISCUSSION

The prognosis is largely favourable. Even without therapy, complete recovery will occur in 70% of cases, and near-complete recovery in 85% [6]. Nevertheless, 15% will remain with a long-lasting sequence that can result in significant psychological distress. Aberrant neural regeneration can cause regenerating motor neurons innervate inappropriate muscles, resulting in abnormal movements or facial synkinesis. Autonomic dysfunction can be found when fibers intended for salivary glands instead feedback with lacrimal ducts, causing lacrimation while eating – the phenomenon nicknamed “crocodile tears” [7,9].

Researchers consider that Bell's palsy is associated with vegetative dysfunction that can be proved by clinical features of Bell's palsy [19]. According to the clinical guidelines, Bell's palsy comes with these traits [20]:

- Weakness or paralysis of the upper and lower facial muscles of the affected side
- The difficulty with eating due to ipsilateral muscle weakness causing food to be trapped on the affected side of the mouth
- Pain in or behind the ear
- Drooping of ipsilateral eyelids
- Drooping of the corner of the mouth
- Inability to close the eye completely
- Dribbling of saliva
- Ipsilateral impaired/loss of taste sensation
- Dry eye due to inability to close eyes completely
- The altered sensation on the affected side of the face
- Excessive tearing of the eye (epiphora)
- Increased sensitivity to sound (hyperacusis) on affected side if stapedius muscle is involved.

Any somatic and neurological diseases are accompanied by certain psychoemotional experiences of the patient and associated vegetative dysfunctions [21]. Nevertheless, changes in facial expressions are accompanied by stronger psychoemotional disorders than lesions of any other peripheral nerves, for example, peroneal, ulnar nerves, etc [22]. This circumstance is due to the fact that the concept of the inner self, of one's own and other person's perception (the concept of "person-person"), is initially formed in close conjunction with the subject's facial expressions [23]. Naturally, a qualitative or quantitative change in the external

appearance leads to a pronounced inner psychoemotional experience and conflict. As a result, in the behavioural attitude, at the beginning of the disease, anxiety disorders are observed, related to the expectation of improvement, followed by depressive phenomena and the associated vegetative shifts [24]. In this respect, NNF should be considered as a model of the psycho-vegetative syndrome, which requires detailed study. In most patients with NNF, local vegetative dysfunctions (VD), such as tear and saliva discharge disorders are sometimes one of the main complaints, but in practice, this is often overlooked [25], and they are seen as a concomitant symptom or phenomenon that indicates the degree and the level of lesion of the facial nerve in the fallopian canal [26]. Whereas genitalized permanent and / or paroxysmal manifestations of dysfunction of the nassegmental department of the ANS are caused by anxious and depressive psychoemotional disorders of patients [27].

5. CONCLUSION

Thus, the study of autonomic functions in the group of patients with BP showed a prevalence of sympathetic activity in both patients with VT, in the VMA, and in the directionality of BP, especially among males, with a more severe FN. There is a correlation between the severity of vegetative dysfunctions and the severity of the neurological defect: the more severe the lesion of FN, the more shifts in the sympathetic orientation of vegetative functions [16]. The presence of obvious tendencies to certain generalized vegetative shifts in patients with BP indicates the need for correction of vegetative dysfunctions.

CONSENT

As per international standard or university standard written patient consent has been collected and preserved by the authors.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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