ORIGINAL ARTICLE

Inverse correlation between morning plasma cortisol levels and MMPI psychasthenia and depression scale scores in victims of mobbing with adjustment disorders

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Abstract

OBJECTIVES: Evidence in the literature suggests stress-related changes of hypothalamus-pituitary-adrenal (HPA) axis in mobbing. We investigated the association between HPA activity and psychological profiles in mobbing, using a multidisciplinary approach.

DESIGN: Forty-eight victims of mobbing were evaluated by a working group of the Departments of Occupational Medicine, Psychiatry and Internal Medicine. After an informed consent, a detailed occupational history, a psychiatric interview with Minnesota Multiphasic Personality Inventory 2 (MMPI-2) administration and a blood sample (8:00 AM) for the determination of basal adrenocorticotropin (ACTH), cortisol and dehydroepiandrosterone sulphate (DHEAS) plasma levels were collected. Twenty-six patients received an overnight dexamethasone (dex) test.

RESULTS: Mean ACTH, cortisol and DHEAS levels were within normal ranges. The dex-test response was normal, with a significant hormone suppression (ACTH $p<0.001$, cortisol $p<0.001$, DHEAS $p<0.001$). The correlations between basal hormones and the psychometric scales of MMPI-2 revealed that cortisol was significantly and negatively related to Psychasthenia (Pt, $p=0.003$) and Depression (D, $p=0.006$), while DHEAS showed a significant negative correlation to Hysteria (Hy, $p=0.008$). Basal ACTH levels were not significantly related to psychometric scales.

CONCLUSION: A significant inverse correlation between morning plasma cortisol levels and psychometric parameters in victims of mobbing with adjustment disorders was observed. A larger group of patients is necessary to identify and validate a cut-off cortisol level that may become an innovative biological parameter for the diagnosis and follow-up in victims of mobbing.

Abbreviations

ACTH	- adrenocorticotropin
AD	- adjustment disorder
D	- depression
Dex	- dexamethasone
DHEAS	- dehydroepiandrosterone sulphate
HPA axis	- hypothalamus-pituitary-adrenal axis
Hs	- hypochondriasis
Hy	- hysteria
M	- mean
Ma	- hypomania
Mf	- masculinity-femininity
MMPI-2	- Minnesota Multiphasic Personality Inventory 2
Pa	- paranoia
Pd	- psychopathic deviation
Pt	- psychasthenia
Sc	- schizophrenia
SD	- standard deviation
SE	- standard error
Si	- social introversion

INTRODUCTION

Violence in the workplace has harmful consequences for both physical and emotional health conditions of workers, with an estimated 2% fall in productivity. Recent European studies revealed that 8–9% of workers report having been victims of intimidation at their workplace [2]. Mobbing is a psychological distress at work resulting from repeated hostile communication or acts directed in a systematic manner by one or more individuals, toward one subject, who is pushed into a helpless and defenceless position [11].

Evidence in the literature suggests stress-related changes in the hypothalamus-pituitary-adrenal (HPA) axis in victims of mobbing [8–10]. We investigated the association between the HPA activity and the psychological profiles in victims of mobbing, using a multidisciplinary approach. In particular, we evaluated how the stressful load due to mobbing could progressively modify the neuroendocrine system together with the psychometric measures.

MATERIALS AND METHODS

A working group was created, by the collaboration among the Departments of Occupational Medicine, Psychiatry and Internal Medicine. Forty-eight consecutive subjects (22 females and 26 males) were included in the study; all subjects reported offensive behaviour repeatedly received, with difficulties in the defence response, according to a diagnosis of mobbing. After an informed consent, the subjects received the following evaluation:

- an occupational history for the analysis of work organization and hostile behaviours, a chronological description of symptom onset, instrumental examinations in order to define specific health problems;
- a psychiatric examination, including an interview performed by a specialist for the evaluation of psychiatric co-morbidity and the administration of Minnesota Multiphasic Personality Inventory 2 (MMPI-2) [5] for the measurement of the clinical scales: Hypochondriasis (Hs), Depression (D), Hysteria (Hy), Psychopathic Deviation (Pd), Masculinity-Femininity (Mf), Paranoia (Pa), Psychasthenia (Pt), Schizophrenia (Sc), Hypomania (Ma) and Social Introversion (Si). The DSM-IV TR criteria were used for the diagnosis of adjustment disorder (AD) [1];
- an evaluation of intercurrent systemic diseases (with a particular attention to endocrine and other internal diseases), an accurate history for pharmacological therapies potentially interfering with the study (such as corticosteroids and contraceptive pills);
- a blood sample for the determination of basal adrenocorticotropin (ACTH), cortisol and dehydroepiandrosterone sulphate (DHEAS) plasma levels (8:00 A.M.); in fertile females, samples were drawn in the follicular phase of the menstrual cycle (days 2–9).

Twenty-six patients (26/48) received an overnight dexamethasone (dex) test (1 mg dex 11:00 P.M.) (7) for the evaluation of ACTH, cortisol and DHEAS plasma levels in the subsequent day (8:00 A.M.).

Patients with endocrine disorders or on steroid or contraceptive drugs were excluded from the study.

Hormonal determinations

The hormonal determinations were carried out by chemiluminescence with Immunelite 2000 Medical Systems and DPC reagents (Los Angeles, USA). ACTH was analyzed by sequential immunometric method with two sites in solid phase (CV intra- and inter-assay of 7.7% and 8.5%, respectively), cortisol and DHEAS by competitive immunoenzymatic method in solid phase (CV intra- and inter-assay of 6% and 7.8% and 7.1% and 9.8%, respectively). The hormonal normal ranges in this laboratory were: ACTH=0–46 pg/ml, cortisol=138–690 nM/l, DHEAS=80–560 μg/dl (for males) and 35–430 μg/dl (for fertile females).

Statistical analysis

Values in the text were expressed as mean (m), standard deviation (SD) and standard error (SE). Differences in ACTH, cortisol and DHEAS plasma levels before and after the dex-test were evaluated by the paired Student's t-test (N=26).

Associations between psychological and hormonal variables were investigated by Spearman's rank test and linear regression analysis. The correlations between the psychometric scales were evaluated by Spearman's rank test. Regression analysis were controlled for gender and sex. $p<0.05$ was assumed as significant.

RESULTS

Victims of mobbing frequently referred stress-related symptoms, such as fatigue, anxiety, fear, sleep disorders, modification of the feeding behaviour, alcohol and

Table 1. Spearman's correlation (σ) between cortisol (C) levels and psychometric scales in victims of mobbing (N=48, p value<0.05 as significant).

		C	Hs	D	Hy	Pd	Mf	Pa	Pt	Sc	Ma	Si
Cortisol (C)	σ	1.00										
	p											
Hypochondriasis (Hs)	σ	−0.332	1.00									
	p	0.021										
Depression (D)	σ	−0.394	0.647	1.00								
	p	0.006	0.000									
Hysteria (Hy)	σ	−0.307	0.801	0.674	1.00							
	p	0.034	0.000	0.000								
Psychopathic (Pd) Deviation	σ	−0.217	0.457	0.652	0.559	1.00						
	p	0.138	0.001	0.000	0.000							
Masculinity- (Mf) Femininity	σ	−0.117	0.047	0.081	0.173	0.127	1.00					
	p	0.430	0.753	0.585	0.241	0.389						
Paranoia (Pa)	σ	−0.275	0.609	0.488	0.628	0.498	−0.054	1.00				
	p	0.058	0.000	0.000	0.000	0.000	0.717					
Psychasthenia (Pt)	σ	−0.413	0.588	0.744	0.545	0.711	−0.013	0.518	1.00			
	p	0.003	0.000	0.000	0.000	0.000	0.930	0.000				
Schizophrenia (Sc)	σ	−0.371	0.568	0.729	0.582	0.692	0.038	0.636	0.839	1.00		
	p	0.009	0.000	0.000	0.000	0.000	0.797	0.000	0.000			
Hypomania (Ma)	σ	−0.130	0.387	0.214	0.414	0.239	0.137	0.469	0.314	0.471	1.00	
	p	0.377	0.007	0.145	0.003	0.101	0.352	0.001	0.030	0.001		
Social (Si) Introversion	σ	−0.267	0.107	0.551	0.046	0.330	0.080	0.177	0.529	0.520	−0.005	1.00
	p	0.067	0.471	0.000	0.758	0.022	0.589	0.229	0.000	0.000	0.971	

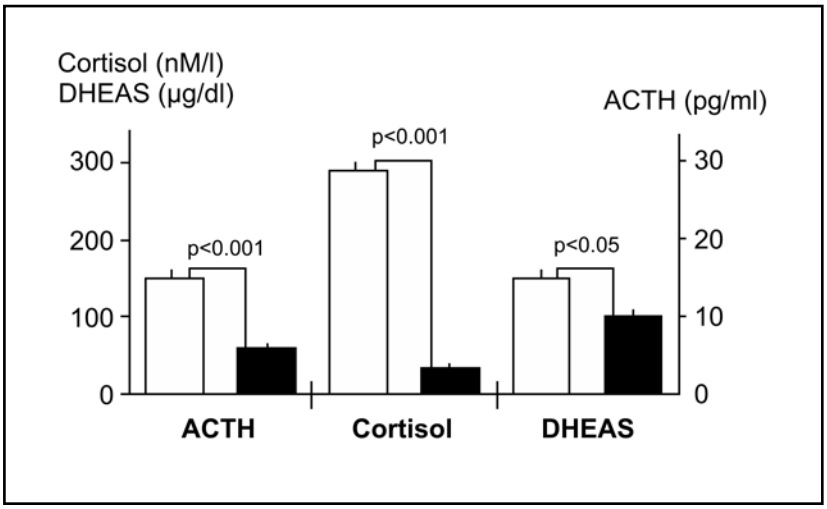

Figure 1. Basal (□) (N=48) and post-dex test (■) (N=26) ACTH, cortisol and DHEAS plasma levels in victims of mobbing (mean+standard error, m±SE).

tobacco abuse, headache, dizziness, skin eruptions, palpitations, chest discomfort, blood pressure increase and gastrointestinal alterations.

The psychiatric interview revealed ADD (adjustment disorder with depression) in six cases, ADA (adjustment disorder with anxiety) in eight cases and ADD-ADA (adjustment disorder with mixed depression and anxiety) in the majority of the subjects (N=34). Twenty-two out of forty-eight (45.8%) subjects were on treatment with psychoactive drugs (mainly benzodiazepines and antidepressant agents).

Mean basal ACTH, cortisol and DHEAS plasma levels (m±SE, 14.98±1.05 pg/ml, 288.67±14.70 nM/l, 149.41±11.01 μg/dl, respectively) were within the normal ranges of reference of this laboratory. Hormone values in treated (psychoactive drugs) and untreated patients were not significantly different (data not shown). The dex-suppression test induced a statistically significant hormone inhibition (5.77±0.49 pg/ml, $p<0.001$ for ACTH, 30.06±0.92 nM/l, $p<0.001$ for cortisol, 101.2±9.00 μg/dl, $p<0.001$ for DHEAS, respectively) (Figure 1), as observed in normal subjects (post-dex cortisol levels less than 1.8 μg/dl or 50 nM/l) and in not depressed subjects (post-dex cortisol levels less than 5 μg/dl) [4, 12].

The correlations between hormones and the psychometric scales of MMPI-2 revealed that basal morning plasma cortisol levels were significantly and negatively related to Pt ($r=-0.413$, $p=0.003$), D ($r=-0.394$, $p=0.006$), Hs ($r=-0.332$, $p=0.021$), Hy ($r=-0.307$, $p=0.034$) and Sc ($r=-0.371$ $p= 0.009$) scales (Table 1). Furthermore, basal morning plasma DHEAS levels showed a significant negative correlation to Hy scale ($r=-0.381$, $p=0.008$); basal morning plasma ACTH levels were not significantly related to the psychometric scales (data not shown).

DISCUSSION

A recent study in victims of bullying at work pointed out that bullied respondents reported more symptoms of depression, anxiety, somatization and worsening of mental health, and presented lower morning salivary cortisol concentrations compared with non-bullied respondents. Neither negative affectivity nor social support affected this association [8].

Other preliminary data showed a trend towards a flattened cortisol cycle at the work day in victims of mobbing, where the majority of subjects were females [10]. Both these studies suggested the presence of stress-related HPA axis modifications in mobbing.

Our data confirmed the association of psychological and biological changes in victims of mobbing with adjustment disorders [6]. Furthermore, higher psychasthenia scores and depression (as well as hypochondriasis, hysteria and schizophrenia) were related to lower cortisol levels in identified victims of mobbing (data controlled for age and gender).

This negative correlation is in contrast with that commonly observed in endogenous depression where persisting high post-dex cortisol levels and a positive correlation between D score of MMPI and cortisol levels has been reported [3]. In our study, victims of mobbing did not present endogenous depression comorbidity or lack of cortisol supression after dex-test.

On the other hand, fatigue and depression are common symptoms in patients with hypocortisolism [7], and lower concentration of cortisol has been observed in other models of stress-related disorders, as the post-traumatic stress disorders (PTSD) and the chronic fatigue syndrome (CFS), partly in line with mobbing [9]. The significantly low post-dex cortisol levels in victims of mobbing suggest a hypersuppression as commonly observed in victims of trauma; such results need to be confirmed by a control group, and a prospective study may be useful to establish a causal relationship among mobbing, biological stress response and health outcomes.

In conclusion, we observed a significant inverse correlation between morning plasma cortisol levels and psychometric parameters in victims of mobbing. Further evaluations are necessary in order to identify and validate a cut-off cortisol level that may become a innovative biological parameter for the diagnosis and follow-up of the victims of mobbing.

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