Role of Female Reproductive Hormones in Musicians' Dystonia

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Musicians' dystonia is an occupational focal dystonia affecting men more often than women. **Methods:** We identified all patients presenting with musicians' dystonia and prospectively collected data on reproductive and menstrual history from the women with musician's dystonia and female musicians without dystonia. **Results:** 149 men and 23 women (13.37%) with musician's dystonia where identified. We did not identify any effect of contraceptive hormones, pregnancy, or menstrual phases on dystonia symptoms, but as compared with women without dystonia, those with musician's dystonia reported oligomenorrhea and menometrorrhagia significantly less frequently. **Conclusions:** Our data reinforce the relation between sex hormones variations and musicians' dystonia. This link should be further explored to identify mechanisms and assess whether certain hormonal interventions might protect from the manifestation of dystonia. *Med Probl Perform Art* 2012; 27(3):156–158.

Musicians' dystonia is an occupational focal dystonia characterized by loss of coordination or motor control that affects specific tasks on the instrument. Women are less prone to develop this disorder than men,[1] and there is no evidence that this could be explained by a lower proportion of women playing musical instruments at a high level or by other occupational factors.[2]

Some studies have shown different degrees of influence of estrogen or progesterone on movement disorders, including dystonia, but not referred to specifically as musician's dystonia.[3] We suggest that the unequal gender distribution could be due to the influence of the female hormones on central nervous system cortical excitability. In this study, we examine whether women with musician's dystonia present differences in their menstrual cycle compared to nonaffected women musicians and whether there is a correlation between subjective dystonia symptoms and the menstrual cycle.

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PATIENTS AND METHODS

We prospectively collected data from all patients diagnosed as having musician's dystonia seen in our center from 2005 to date. We focused specifically on women (dystonia group), studied their menstrual and reproductive history, and compared the findings to a control group of 29 matched female musicians consecutively seen in our center for musculoskeletal disorders other than focal dystonia (control group).

All participants gave their consent prior to entering the study, which was approved by the institutional review board of Fundació Ciència i Art. All filled out a questionnaire on (1) reproductive history; (2) menstrual disorders during the 5 years prior to dystonia (dystonia group) or musculoskeletal disorder onset (amenorrhea, no menses during 6 months; irregular cycle intervals. >4 days variability between cycles; oligomenorrhea, >32-day intervals; polymenorrhea, < 26-day intervals; and menometrorrhagia, excessive uterine bleeding); (3) hormone contraceptive history; (4) premenstrual dysphoric disorders, and (5) in the dystonia group, menstrual phase influence on dystonia symptoms (the week before menses, time during menses, and time between menses). Premenstrual dysphoric disorder was evaluated by DSM IV criteria. We also captured presence of hirsutism, acne, acanthosis nigricans or ovary cysts, any chronic illness, and any medications taken for more than 3 months.

Data are presented as the mean ± SD. Various factors (age, years playing instrument, etc.) were compared across groups (men versus women, or individuals with versus individuals without dystonia) using one-factor ANOVAs or chi-squared test. All calculated p values were two-sided, and $p<0.05$ were considered statistically significant.

RESULTS

Twenty-three women (13.37%) and 149 men with musician's dystonia were identified. In one of the 23 women, the onset of symptoms began at the third month of pregnancy. In another, the symptoms began 16 months after hysterectomy and bilateral oopherectomy without hormonal replacement therapy. Mean age of dystonia onset was 30.05 ± 8.16 yrs in women and 31.01 ± 9.13 yrs in men.

Women played on average 3.90 ± 1.70 hrs/day and started playing their instrument at 9.14 ± 2.61 yrs old. There were no statistical differences on any of these parameters between groups. None referred family history of movement disorders. Mean age of menarchy was 11.71 ± 1.45 yrs for the dystonia group and 12.62 ± 1.84 yrs for the control group ($p = 0.067$). There were no statistical differences between groups regard-

TABLE 1. Incidence of Oligomenorrhea in the Two Groups

	Dystonia Group	Control Group	Total
Oligomenorrhea	2 (9,5%)	12 (41,4%)	20
No oligomenorrhea	19 (90,5%)	17 (58,6%)	30
Total	21	29	50

Percentages express proportions in each group. $p = 0.013$

TABLE 2. Incidence of Menometrorrhagia in the Two Groups

	Dystonia Group	Control Group	Total
Menometrorrhagia	3 (14,3%)	17 (58,6%)	20
No menometrorrhagia	18 (85,7%)	12 (41,4%)	30
Total	21	29	50

Percentages express proportions in each group. $p = 0.002$.

ing musical instrument played, professionalism, their medical history, reproductive history, or the duration of menstrual cycle and menstruation.

Seven women with dystonia took contraceptive hormones, but they did not manifest any effect of the treatment on dystonia symptoms. Only two of these women were taking contraceptive hormones just prior or during the onset of dystonia. Two women became pregnant, and this did not change their dystonia symptoms.

There were no statistical differences between the two groups regarding the presence of amenorrhea, cycle irregularities, polymenorrhea, hirsutism, ovarian cysts, endometriosis, breast fibroids, breast discharge, or premenstrual dysphoric disorder. Tables 1 and 2 show the incidence of oligomenorrhea and menometrorrhagia in both groups. Two women with musician's dystonia described premenstrual worsening of symptoms and one described a worsening during menstruation. None noted that the menstrual characteristics had changed during the last 5 years or were different pre- or post-onset of dystonia symptoms.

DISCUSSION

One of the motivating goals for this study was to try to identify possible causes for the relative low incidence of focal task-specific dystonia in women as compared to men. One might think that hormonal fluctuation could protect from the development or manifestations of dystonia. Our data do not seem to strongly support this assumption, as dystonia symptoms do not change depending on menstrual phase and women with menses irregularities do not seem to be more prone to musician's dystonia. However, the lower incidence of musician's dystonia in women with oligomenorrhea and menometrorrhagia does suggest a link between sex hormones and a possible protection from dystonia.

There are many possible factors linking hormonal status and musician's dystonia. Although a strong genetic role is not documented in musician's dystonia, there is some evidence that this neurological disorder might have some inherited component.[4] So, we can speculate about a common or related genetic predisposition. In our patients, we found no family history of movement disorders. Nonetheless, a genetic component cannot be completely ruled out, but the impact of behavioral factors seems more important.[5]

A second feasible origin could be common psychophysiological factors that may affect menstrual cycles and promote dystonia separately. Musicians with dystonia are supposed to have a change in behavior and different psychological stressors prior to the onset of the disorder.[6] We also know that psychosocial stressors are associated with menstrual cycle disturbances.[7] So if stress contributes to the manifestation of both of these disorders, it might provide the link to otherwise unrelated entities. We do not have any independent measures of stress in our patients. Future studies should incorporate baseline and serial assessments of psychological stressors to further clarify this possible link between dystonia and menstrual abnormalities.

Another possibility could be the existence of metabolic links between hormonal levels and neurobiological substrates of dystonia. Some surveys have shown how brain excitability and plasticity can change depending on female hormones levels.[8,9] Estrogen appears to have an impact on the dopaminergic system, but progesterone and testosterone levels have also been implicated in movement disorders.[10] Although the etiology of oligomenorrhea and menometrorrhagia is not always clear, and many factors can produce them, in the absence of any illness, the most plausible origin is hormonal imbalance.[11] Therefore, it is possible that hormonal changes that lead to menstrual differences also alter cortical excitation/inhibition balance, change specific neurotransmitter levels, affect plasticity, and alter brain networks. Such neurophysiologic effects may promote dystonia in highly trained female musicians.

Obviously, this small epidemiologic study cannot address the mechanistic causal links. Future studies to address the link between sex hormones and musician's dystonia should include hormonal level determinations in both men and women. Neurophysiologic assessment of brain excitability in this context would be desirable—for example, using techniques such as transcranial magnetic stimulation.

In conclusion, we present new data reinforcing the relation between sex hormones variations and musician's dystonia. We believe that the link should be explored further since certain hormonal interventions might protect from the manifestation of dystonia.

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