

Correlation between Dermatology Life Quality Index and Minor Test and Differences in Their Levels over Time in Patients with Axillary Hyperhidrosis Treated with Botulinum Toxin Type A

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SUMMARY Hyperhidrosis is an idiopathic condition of exaggerated sweat production resulting in dramatic impairments of daily activities, social interactions and occupational activities. The aim of the present study was to evaluate correlation between a subjective (Dermatology Life Quality Index) and an objective (Minor test) criterion and to assess difference in their levels over time in patients affected by axillary hyperhidrosis treated with botulinum toxin type A. Nineteen patients received injections of 50 U of botulinum toxin type A *per* axilla. Patients were observed for 9 months after treatment. All patients showed great improvement of hyperhidrosis by Minor test and Dermatology Life Quality Index following treatment with botulinum toxin type A, with the effect persisting for 6-9 months. All patients demonstrated direct relationship between objective improvement documented by Minor test and quality of life improvement documented by Dermatology Life Quality Index after treatment with botulinum toxin type A.

KEY WORDS: axillary hyperhidrosis, botulinum toxin type A, Minor test, Dermatology Life Quality Index

INTRODUCTION

Hyperhidrosis is defined as an excess of sweating beyond the amount needed to cool down elevated body temperature (1). It is a quantitative disturbance of sweat function, most often involving the axilla, sole, palm and face (2,3). It usually manifests in the second or third decade of life with a positive family history in 30%-50% of cases (4). A recent paper reports the prevalence of hyperhidrosis in the United States to be 2.8% (7.8 million individuals), with 50.8%

of this population (4.0 million individuals) reporting they have axillary hyperhidrosis (1.4% of the US population) (2). This condition affects both men and women equally (5).

It is a disabling condition in both private and professional life (6). Clothing is soiled and each day multiple changes are necessary. Anxiety further increases the production and excretion of sweat, and the problem is therefore self-maintained (2). This condition may be

idiopathic or secondary to other diseases, metabolic disorders, febrile illnesses, or medication use.

The pathophysiology of idiopathic focal hyperhidrosis remains unknown, however, a dysfunction of the central sympathetic nervous system is suspected (7,8). Treatment options for focal hyperhidrosis include topical application of aluminum chloride, administration of anticholinergic agents and beta-blockers, tap water iontophoresis (palmar hyperhidrosis), excision and suction curettage of sweat glands, or transthoracic endoscopic sympathectomy (9-11). These therapeutic strategies are, however, frequently ineffective, time consuming, or associated with some serious side effects (12,13).

Botulinum toxin type A (BTX-A) has emerged as a treatment for hyperhidrosis in the past 5-6 years with studies showing good results (14,15). The eccrine sweat gland is innervated by the sympathetic nervous system, but its principal periglandular neurotransmitter is acetylcholine. BTX-A inhibits the release of acetylcholine from the presynaptic membrane of cholinergic neurons (16,17). BTX-A is today the most effective therapy for hyperhidrosis (18-20).

Numerous studies have been reported in the literature on the patient quality of life improvement (subjective criterion) as evaluated with the Dermatology Life Quality Index (DLQI) and Minor test (objective criterion) after treatment with BTX-A (21,22). The aim of this study was to assess (a) correlation between DLQI and Minor test; and (b) whether differences in their levels over time existed in patients with axillary hyperhidrosis treated with BTX-A.

PATIENTS AND METHODS

We selected 19 (7 female and 12 male) patients affected by axillary primary hyperhidrosis treated with BTX-A and followed-up at our Department for at least 9 months. All patients underwent physical examination with neurologic consultation, electrocardiogram and laboratory test (routine blood tests, urine analysis, thyroid hormones, and thyroid antibodies) to exclude other diseases and to classify their hyperhidrosis (primary or secondary, focal or generalized).

An informed consent was obtained from all patients following full written and oral explanation.

The DLQI, a valid and reliable hyperhidrosis questionnaire, was completed by patients at all scheduled visits (treatment, and then at 1 week, 1 month, 3-4 months, 5 months, 6 months and 9 months). A test was carried out to visualize the location and involvement of the hyperhidrotic area. In this test, iodine solution is applied over the skin area to be tested and when it had dried, starch powder is applied. Sweat causes the mixture to turn dark brown. The identified

hyperhidrotic area was then marked with a pen as an elliptical area. In order to evaluate the level of Minor test positivity, each axilla was subdivided into four areas (Fig. 1), which were scored 0 to 3 *per area*, giving the possible total score of 0-12 (Fig. 2) (23).

Patients were injected with a dose of 100 U BTX-A (Botox[®]), 50 U *per axilla*. BTX-A was diluted in 5 mL of sterile 0.9% saline using 27 G x 1/6 0.40 x 4 mm needles. Each injection covered an area of about 2.25 cm², the volume inoculated was 0.1 mL *per site* corresponding to 2 U of BTX-A. This procedure did not prove painful and was well tolerated by all patients without local anesthesia.

The evaluation of the results was performed by patient subjective reports (DLQI) and by objective comparison (Minor test) before treatment, and then at 1 week, 1 month, 3-4 months, 5 months, 6 months and 9 months.

Statistical Analysis

We calculated means (standard deviations) of quantitative variables (Minor and DLQI levels). Since

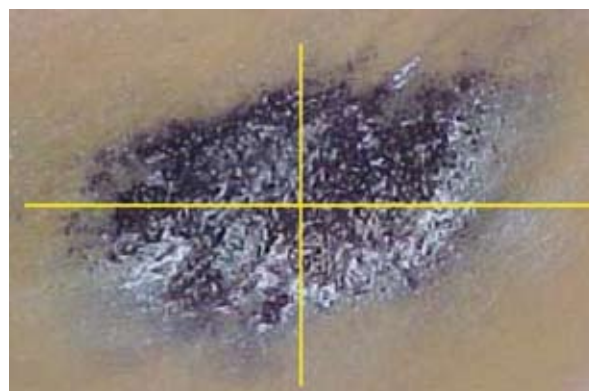


Figure 1. Minor test: each axilla divided into 4 areas.

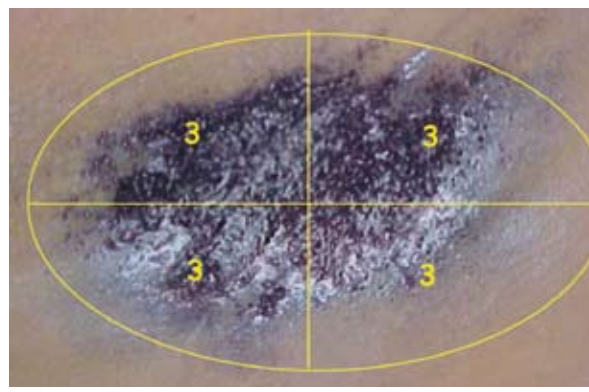


Figure 2. Minor test: axillary global score 12.

the values of Minor and DLQI were not normally distributed, differences between two periods were estimated by the nonparametric test for paired data (Wilcoxon test). Analysis of variance (ANOVA) with repeated measurements (F test) was used to verify differences if Minor and DLQI levels changed over time. Spearman correlation coefficient (rho) was used to assess the correlation between Minor and DLQI levels at each time point. The level of significance was set at $P < 0.05$. Statistical analysis was performed using SPSS, release 12.0 for Windows.

RESULTS

All of the enrolled patients finished the study. The beginning of BTX-A action was noticed by patients 48-72 hours after the injection. The treatment success was documented by DLQI and Minor test and by pre- and post treatment photography. All patients showed reduction of sweat from the first week of treatment. This reduction was evaluated by the objective criterion. The Minor test score at the end of treatment (Minor = 7.29 ± 2.76) was lower than the score obtained before therapy (Minor = 9.63 ± 1.74) (Fig. 3). ANOVA for repeat measurement revealed a significant difference of Minor levels over time (F test = 47.007; $P < 0.0001$). In this case, the observed differences over time were not influenced by sex ($P = 0.871$) and age ($P = 0.263$). Comparison of Minor levels before treatment and those recorded at each follow up period yielded a statistically significant difference (P from Wilcoxon tests < 0.05). According to Minor test, anhidrosis lasted for 12 months in three patients, 9 months in

Table 1. Spearman correlation coefficients between Dermatology Life Quality Index and Minor test over time in patients with axillary hyperhidrosis

Time	Spearman rho	P
Before	0.437	0.062
7 days	0.829	<0.0001
1 month	0.708	0.001
3-4 months	0.634	0.004
5 months	0.572	0.013
6 months	0.712	0.001
9 months	0.578	0.030

eight patients, 6 months in one patient, 5 months in five patients, and 4 months in two patients. The median duration of treatment effect was 7 months. The reduction of hyperhidrotic area was associated with a lower quality of life impact for patients, as demonstrated by DLQI scores obtained before and after treatment. ANOVA for repeat measurement revealed a significant difference in DLQI levels over time (F test = 12.705; $P = 0.001$). Again, the observed differences over time were not influenced by sex ($P = 0.512$) and age ($P = 0.577$). More specifically, the average score at the end (DLQI = 9.00 ± 4.77) of therapy was lower than before therapy (DLQI = 13.32 ± 3.32) (Fig. 4). Comparison of DLQI levels before treatment against each follow up period also yielded a statistically significant difference (P from Wilcoxon tests < 0.001).

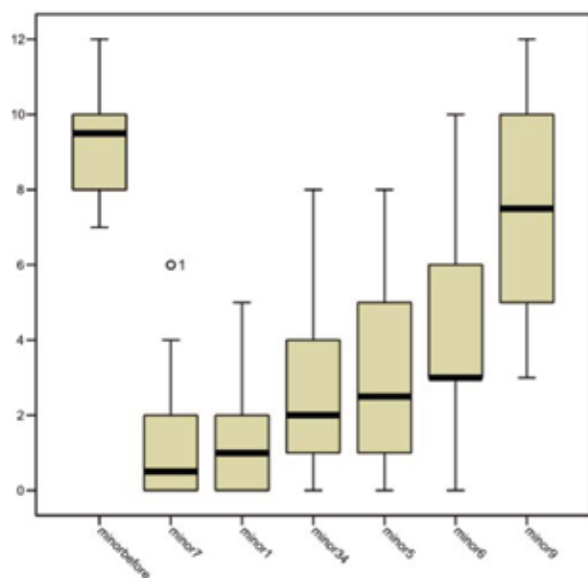


Figure 3. Minor test score.

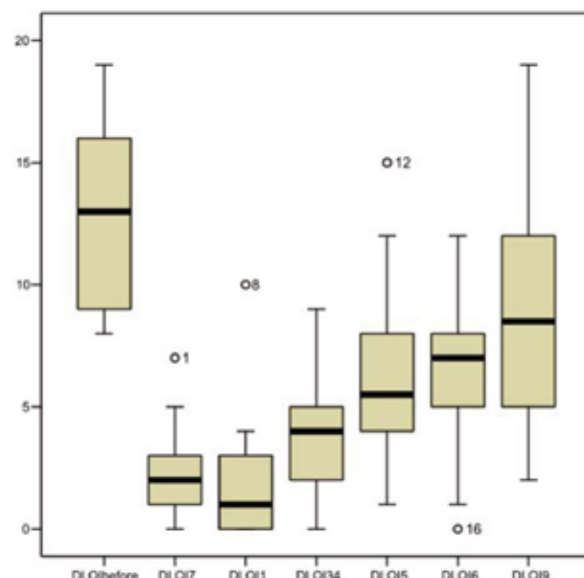


Figure 4. Dermatology Life Quality Index score.

The higher improvement evaluated by objective and subjective reports was achieved in one month after treatment and was stable until the month 6-7. From month 6-7, a clinically progressive relapse developed but the intensity of sweating reported by patients was lower than before treatment, although it would increase with time in the next months. Spearman correlation coefficients between DLQI and Minor over time are shown in Table 1. It is evident that, after treatment, there was always a strong correlation between these two variables, with strongest correlation after 7 days ($P < 0.0001$).

DISCUSSION

Axillary hyperhidrosis is the most prevalent form; in 50% of cases, it is associated with other forms of localized sweating, has a familial predisposition, onset after puberty, and is more common in women. Axillary hyperhidrosis is a socially and emotionally disturbing condition causing wetness, staining, and decaying of clothes.

Botulinum toxin type A is a simple, quick and safe treatment for axillary hyperhidrosis, and adverse effects are rare and mild, with only one patient reporting mild and temporary compensatory sweating on his back. This treatment eliminates daily medications and the potential complications of medical and surgical management (24,25). The patients reported greater satisfaction with social life, at work, as well at leisure time when answering the questionnaire (DLQI) after 7-9 months. Evaluation of the hyperhidrosis area with Minor test showed marked reduction of sweating until 7-9 months. The treatment is effective and the reduction in sweat production is dramatic and lasts for at least 9 months, which was the duration of the study. In three subjects, the benefits lasted beyond 9 months.

CONCLUSION

Our results demonstrated important correlation between the subjective criterion (DLQI) and objective criterion (Minor test). In fact, comparison of the average trend for the two independent parameters, Minor and DLQI, suggested significant association between the progressive reduction of Minor related to clinical improvement, and reduction of DLQI values related to the quality of life improvement.

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