Observational Study

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Serial changes in anxiety levels related to corticosteroid use

A single-center prospective study

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Abstract

Patients with autoimmune diseases treated with corticosteroids sometimes display feelings of anxiety regarding corticosteroid use. In this single-center prospective study, we aimed to evaluate the serial changes in anxiety levels related to corticosteroid use in 18 patients with autoimmune diseases. The degree of anxiety toward corticosteroid use was assessed using the visual analogue scale. Comprehension of drug characteristics and use was assessed using the Likert scale. To assess the patients' levels of depression and anxiety we used the State-Trait Anxiety Inventory. These surveys were conducted immediately before the initiation of corticosteroid therapy and just before discharge from the hospital. We observed a decrease in anxiety levels related to corticosteroid use and State-Trait Anxiety Inventory scores before discharge. However, we did not detect a correlation between these score changes. Additionally, we found that patients who had a poor understanding of the drugs showed little or no changes in their anxiety levels related to corticosteroid use at discharge. These results suggest that some aspects of anxiety related to corticosteroids might be groundless and substantiated by assumptions without a complete understanding of corticosteroid functioning. Patient education regarding corticosteroid use may lead to reductions in anxiety levels and improvement in quality of life of the patients.

Abbreviations: S-Anxiety = State Anxiety Scale, SLE = systemic lupus erythematosus, STAI = State-Trait Anxiety Inventory, T-Anxiety = Trait Anxiety Scale.

Keywords: anxiety, corticosteroid, patient education, State-Trait Anxiety Inventory

1. Introduction

Corticosteroids are one of the essential drugs used for the treatment of autoimmune diseases, such as systemic lupus erythematosus (SLE) and systemic vasculitis.[1,2] However, many side effects of corticosteroids, such as immune deficiency, impaired glucose tolerance, osteoporosis, and loss of muscle mass, have been observed.[3,4] Some patients treated with corticosteroids tend to feel anxious about the use of these drugs. This may cause them to discontinue treatment on their own. Thus, reduction of the anxiety levels related to corticosteroid use is important during corticosteroid therapy. However, the reasons behind this anxiety remain unclear. Therefore, in this study, we aimed to investigate the serial changes in anxiety levels related to corticosteroid use, from the initiation of therapy to discharge from the hospital.

2. Materials and methods

2.1. Patients

A total of 18 patients who were treated with corticosteroids were enrolled in this single-center prospective study. Patients who were hospitalized in the Department of Medicine and Clinical Science of Yamaguchi University Hospital and started corticosteroid therapy (maximum dose of corticosteroid was >20 mg prednisone-equivalent) between August 2020 and April 2022 were included in this study. The doses of corticosteroids were determined based on the type of disease, disease activity, and body weight.[1,2,5–9] Patients who had a history of corticosteroid therapy or had cognitive disorders were excluded. This study was approved by the Ethics Committee of Yamaguchi University Hospital (Control No. 2020-084). Written informed consent was obtained from all patients.

KK and AO contributed equally to this work.

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Informed consent was obtained from all participants.

The authors have no conflicts of interest to disclose.

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

This study was approved by the Ethics Committee of Yamaguchi University Hospital (Control No. 2020-084), and the study protocol was performed in accordance with the ethical standards laid down in the Declaration of Helsinki.

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2.2. Questionnaire surveys

Surveys were conducted immediately before the initiation of corticosteroid therapy and again prior to patient discharge. The surveys included a questionnaire we developed as well as the State-Trait Anxiety Inventory (STAI), which has been used for measuring the depression and anxiety of patients with autoimmune diseases.[10] Both were distributed simultaneously to the patients.

Our questionnaire included questions regarding the degree of anxiety toward corticosteroid therapy, assessed using the visual analogue scale (0–100 points); and self-assessed understanding of the names of drugs they were being administered, assessed using a Likert scale (extremely well: 5 points; very well: 4 points; moderately well: 3 points; slightly well: 2 points; not at all well: 1 point). Patients who reported that they fully understood the names of the drugs scored 5 points, and those who did not understand the names of the drugs at all scored 1 point. As a low Likert scale score represented a poor understanding, the scale could be used as an indicator of the patients' understanding of the drugs they were administered.

The simultaneously distributed STAI is a 40-item self-report inventory that enables the measurement of 2 different anxiety types, consisting of the State Anxiety Scale (S-Anxiety) and Trait Anxiety Scale (T-Anxiety).[11] This study used the validated Japanese version of STAI (Form X).[12] STAI contains 20 items to measure S-Anxiety, and another 20 items to measure T-Anxiety. Both S-Anxiety and T-Anxiety subscales were assessed using a self-reported 4-point Likert scale (not at all: 1 point; somewhat: 2 points; moderately so: 3 points; very much so: 4 points). After collecting the answers, the sum scores of T-Anxiety and S-Anxiety were calculated. STAI sum scores ranged between 20 and 80, with a higher sum score indicating higher anxiety and a low sum score indicating little or no anxiety for both S-Anxiety and T-Anxiety.

2.3. Data collection

Data regarding patients' clinical records were collected from each patient's medical chart.

2.4. Statistical analyses

All continuous variables are shown as mean ± standard deviation. Paired comparisons of continuous variables were performed using the Wilcoxon signed-rank test. Correlation coefficients were calculated using Spearman's rank sum test. All statistical analyses in this study were performed using the EZR software. Comparisons were considered statistically significant at $P < .05$.

Table 1

Demographic and clinical characteristics of the patients.

	(n = 18)
Age (yr) (mean ± SD)	57.8 ± 20.9
Women (n [%])	8 (44.4)
Smoking habit (n [%])	6 (33.3)
Drinking habit (n [%])	8 (44.4)
Medical history of depression (n [%])	0 (0)
Duration of hospitalization (d)	37.1 ± 14.3
Treatment during hospitalization	
Corticosteroids (n [%])	18 (100)
Immunosuppressants (n [%])	8 (44.4)
Biologics (n [%])	5 (27.8)
Beta blockers (n [%])	1 (5.6)
Maximum dose of oral corticosteroid (mg daily prednisone-equivalent)	45.8 ± 13.1

Data are presented as means ± SD, N = 18. SD = standard deviation.

3. Results

3.1. Patients' characteristics

Table 1 presents the clinical and demographic characteristics of the 18 patients included in the study. The patients consisted of 8 women (44.4%) and had a mean age of 57.8 ± 20.9 years at hospitalization. Of these patients, 4 had SLE, 3 had microscopic polyangiitis, 2 each had eosinophilic granulomatosis with polyangiitis and Sjögren's syndrome, and one each had granulomatosis with polyangiitis, Takayasu arteritis, giant cell arteritis, IgG4-related disease, cryoglobulinemia vasculitis, focal segmental glomerulosclerosis, and endocapillary proliferative glomerulonephritis. The maximum dose of oral corticosteroid administered was 45.8 ± 13.1 mg daily, which was prednisone-equivalent. All patients received corticosteroids orally after meals every day. However, the number of doses of corticosteroids per day differed for each patient to avoid the side effects of large amounts. The average duration of hospitalization was 37.1 ± 14.3 days. Eight patients (44.4%) received immunosuppressants, and 5 (27.8%) received biologics. One patient (5.6%) received beta blockers.

3.2. Serial changes in the anxiety levels related to corticosteroid use and STAI

Table 2 presents the scores of the questionnaire. The T-Anxiety of 2 patients in the second survey could not be measured because they forgot to complete the questionnaire. Serial changes in the levels of anxiety related to corticosteroid use showed a significant decrease before discharge when compared to the levels before therapy was started ($P < .001$) (Fig. 1A). In addition, both S-Anxiety and T-Anxiety scores decreased significantly (both $P < .05$) (Fig. 1B and C).

3.3. Factors associated with the serial changes in anxiety levels related to corticosteroid use

Anxiety level scores immediately before initiation of corticosteroid therapy were correlated with S-Anxiety and T-Anxiety scores (Fig. 2A and B). However, the serial changes in the levels of anxiety related to corticosteroid use were not correlated to those of S-Anxiety and T-Anxiety scores (Fig. 2C and D). In addition, treatment time and the maximum dose of oral corticosteroids were not correlated with the serial changes in levels of anxiety related to corticosteroid use. However, patients with a low Likert scale score (indicating poor understanding of the drugs) before discharge showed a minimal serial change in the levels of anxiety with respect to corticosteroid use ($P < .05$) (Fig. 2E).

Table 2

Scores of questionnaire surveys.

	Mean ± SD
Immediately before the initiation of corticosteroid therapy	
Anxiety about corticosteroids[a]	60.6 ± 28.8
T-STAI[a]	44.6 ± 11.0
S-STAI[a]	45.4 ± 12.3
Score on the Likert scale[b]	3.9 ± 1.1
Immediately before discharge	
Anxiety about corticosteroids[a]	29.4 ± 24.1
T-STAI[b]	39.8 ± 15.8
S-STAI[a]	39.2 ± 14.3
Score on the Likert scale[a]	4.3 ± 1.0

Data are presented as mean ± SD.

[a]N = 18.

[b]N = 16. (Two patients did not take drugs on admission. The T-STAI scores of 2 patients at the second survey could not be fully measured because they forgot to complete the questionnaire.)

SD = standard deviation, S-STAI = State Anxiety Scale, T-STAI = Trait Anxiety Scale.

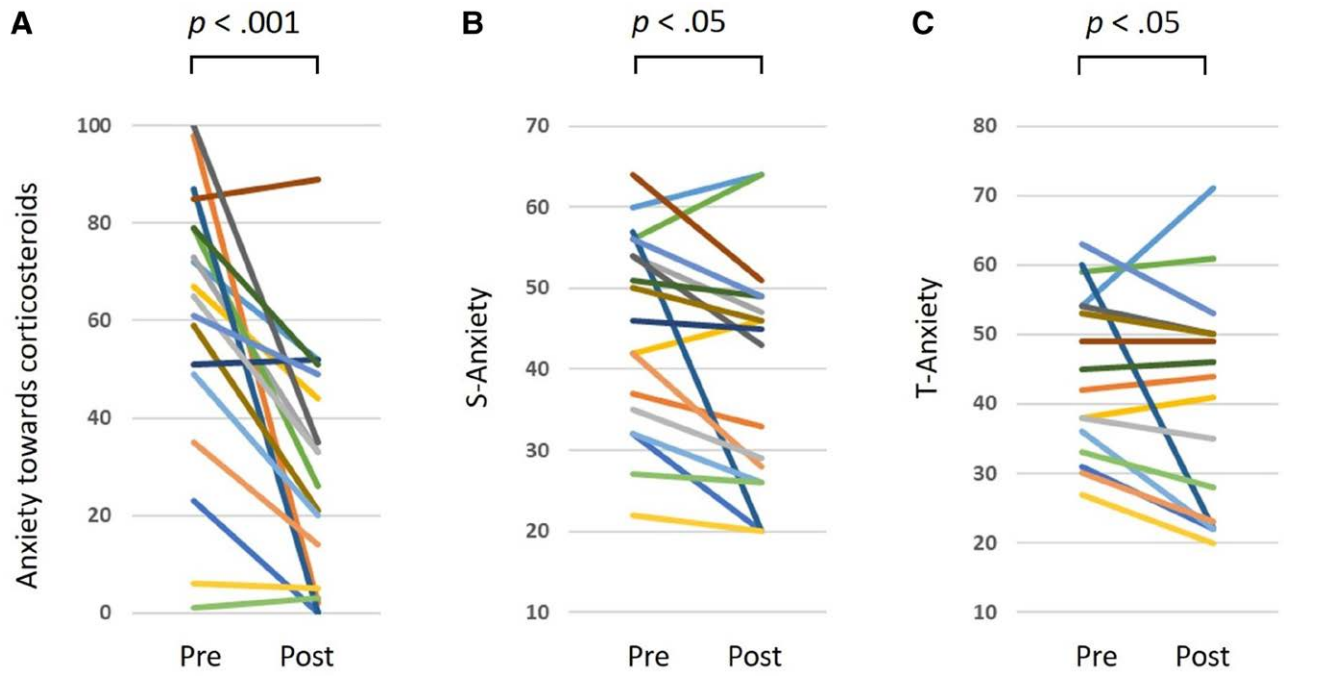

Figure 1. Serial changes in (A) anxiety toward corticosteroids, (B) S-Anxiety, and (C) T-Anxiety. Results immediately before the initiation of corticosteroid therapy (pre) and just before discharge (post) were analyzed and compared using the Wilcoxon signed-rank test. S-Anxiety = State Anxiety Scale, T-Anxiety = Trait Anxiety Scale.

4. Discussion

A major finding of this study was that anxiety levels related to corticosteroid use could not be decreased with the improvement of mental status alone. This is corroborated by the fact that STAI scores showed a serial decrease, which suggested that the mental status of the patients was improved. Despite this, the serial changes in the levels of anxiety related to corticosteroid use were not correlated to serial changes in STAI scores. It has been reported that anxiety can be categorized into 2 subtypes: S-Anxiety, which indicates the degree of anxiety experienced in a specific situation; and T-Anxiety, which indicates personality tendencies to be anxious.[13,14] S-Anxiety can easily change over time, while T-Anxiety reflects relatively stable aspects of anxiety proneness.[14] Thus, T-Anxiety tends to remain unchanged in the short term. In addition, T-Anxiety has been reported to correlate positively with S-Anxiety in situations of interpersonal threat, but not in those of physical threat.[14] However, in our study, both S-Anxiety and T-Anxiety significantly decreased. T-Anxiety has been associated with specific situations such as physical danger threat, social anxiety, ambiguous threat, and threat in innocuous situations or daily routines.[14,15] In this study, the use of corticosteroids and the diagnosis and treatment of the disease may be a major stressor for patients. Resolution of these stressors could contribute to a decrease in this type of anxiety.

Contrastingly, serial changes in anxiety levels with respect to corticosteroid use did not show correlation with those in STAI scores (S-Anxiety and T-Anxiety), which suggests the possibility that a decrease in anxiety toward corticosteroid use and serial changes in S-Anxiety and T-Anxiety were caused by different factors. Interestingly, a better understanding of the drugs seemed to be an important factor associated with serial changes in levels of anxiety toward corticosteroids. These results suggest that some aspects of anxiety related to corticosteroids might be groundless, substantiated by assumptions without a complete understanding of corticosteroid functioning. Thus, the patients may have felt vaguely anxious about corticosteroid use due to unreliable information before starting their treatment. Under such circumstances, some patients experienced side effects, including increased susceptibility to infection. On the other hand, the disease conditions and physical symptoms of all patients in our study improved after treatment with corticosteroids, demonstrating the beneficial effects. Experiencing the benefits might decrease patients' anxiety levels related to corticosteroids following discharge from the hospital.

Conversely, some patients who had a poor understanding of the drugs they were taking (including corticosteroids) may have continued having higher levels of anxiety than patients who had a good understanding. A strong correlation between noncompliance with medication and increased rates of autoimmune disease relapse has been reported.[16,17] Poor compliance with medication is caused by lack of knowledge, negative attitudes, and a poor relationship between patient and therapist.[18,19] Thus, it is important for physicians and pharmacists to provide detailed education and guidance on corticosteroid use to patients. In addition, it is also important for nurses to check patients' understanding of the treatments and listen to their concerns. Such interactions may lead to reduced anxiety levels toward corticosteroids, which can improve the patients' quality of life, namely by increasing their compliance with the treatment.

Socio-economic factors might interfere with the measurement of anxiety levels.[20] However, the Japanese government promotes financial support for patients with intractable diseases.[21] Fourteen patients (77.8%) in our study received financial support through this system. Thus, we believe that socio-economic factors did not show a significant effect in our study.

On the other hand, this study had some limitations. First, the study had a small sample size; therefore, a multivariate analysis was difficult to perform. Validation studies in larger patient cohorts and institutions are needed to verify our results. Second, the participants presented with various diseases, which showed different clinical features, affecting the dose of corticosteroids and the timing of administration. The heterogeneity among the participants made it difficult to assess the anxiety-related characteristics of each disease. However, we believe that our results contribute to promoting a better understanding of patient anxiety toward corticosteroid use. This, in turn, may lead to improving patient's quality of life.

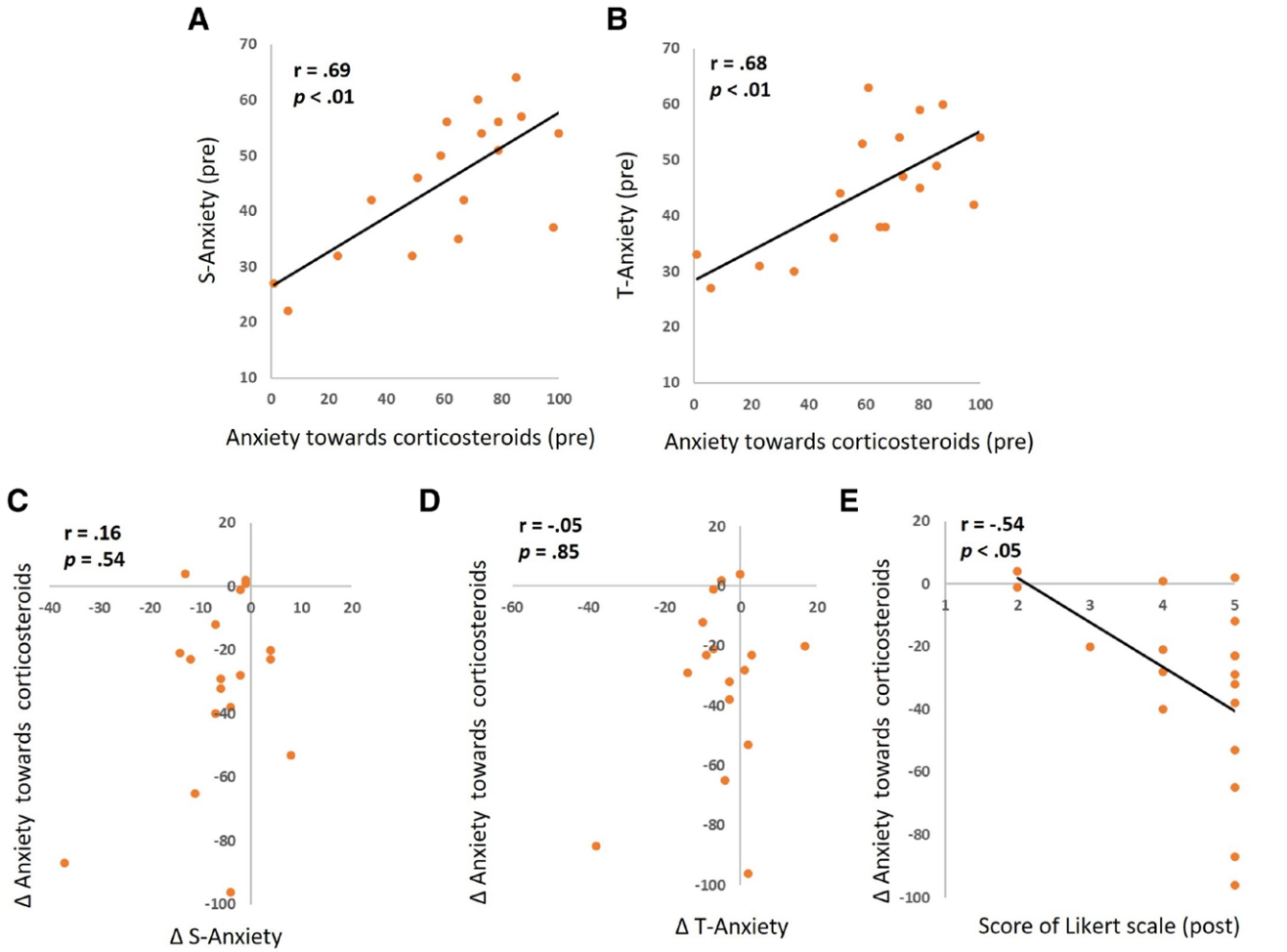

Figure 2. Factors associated with changes in anxiety related to corticosteroid use. (A, B) Correlation diagrams between anxiety toward corticosteroids, S-Anxiety, and T-Anxiety immediately before the initiation of corticosteroid therapy (pre). (C, E) Correlation diagrams between serial changes of anxiety toward corticosteroids (Δ anxiety toward corticosteroids), ΔT-Anxiety, ΔS-Anxiety, and score of comprehension about drugs assessed using a Likert scale just before discharge (post). The correlation coefficient (*r*) was calculated using Spearman rank sum test. S-Anxiety = State Anxiety Scale, T-Anxiety = Trait Anxiety Scale.

5. Conclusions

Our study suggests that some aspects of anxiety toward corticosteroids might be groundless and substantiated by assumptions without a clear understanding of corticosteroid functioning. Patient education concerning corticosteroids might lead to a reduction in their anxiety and an improvement in their quality of life.

Author contributions

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Investigation: Ayaka Ohgami, Takashi Nawata, Kana Sato.
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