PSYCHOLOGICAL CHARACTERISTICS OF SURGICAL PATIENTS WITH THYROID DISEASE

Chihiro HASEGAWA1), Toshio KAWAI2), Mika TANAKA3), and Atsushi FUKAO4)

1) Faculty of Human Sciences, Shimane University, Japan
2) Kokoro Research Center, Kyoto University, Japan
3) Kuma Hospital, Japan
4) Ibaraki City Public Health Medical Center, Japan

The present study examined the psychological characteristics of surgical patients with Graves’ diseases (GD) and papillary thyroid cancer (PTC) through the 20-item Toronto Alexithymia Scale (TAS-20) and the Baum test before and after the surgery. In the pre-test [Study 1], the PTC group scored higher on “externally-oriented thinking” of the TAS-20 and drew less structured trees regarding the boundary, consistency, and inner differentiation, compared with the control group. In the post-test [Study 2], the mean score of “externally-oriented thinking” of the TAS-20 was lower, and the mean score of “difficulty identifying feelings” of the TAS-20 was higher than that of the pre-test, respectively. The trees drawn in the post-test were classified into following three clusters; “changed into a more stable structure”, “changed into a more unstable structure”, and “unchanged”. We discussed that the genuine psychotherapy is needed for those who showed more fundamental psychological changes.

Key words: thyroid disease, TAS-20, Baum test

This study is based on the clinical practice of psychotherapy in a specific hospital that specializes in thyroid disease. Since the active introduction of psychotherapy to patients with thyroid diseases remains a new approach, it is currently the important issue to explore what kind of psychotherapeutic approach is effective for them. Here we discuss the psychological characteristics of surgical patients with thyroid diseases in order to contribute to psychological supports for them.

Psychological Aspects of Thyroid Disease

Thyroid diseases are medical conditions that affect the thyroid gland. There are different types of thyroid problems, ranging from abnormal production of thyroid hormones (e.g., hyperthyroidism and hypothyroidism), to goiter and cancer.

Among the thyroid diseases, it is known that Graves’ disease, the most common cause of hyperthyroidism, has some psychosomatic aspects (Alexander, 1950). Many case reports have described psychiatric episodes accompanied by Graves’ disease, since this disease was first reported (Whybrow & Bauer, 2005). While early reports were

Correspondence concerning this article should be addressed to Chihiro Haseawa, Faculty of Human Sciences, Shimane University, 1060 Nishikawatsu-cho, Matsue, Shimane, Japan (e-mail: c-hasegawa@hmn.shimane-u.ac.jp).
somewhat anecdotal, recent epidemiological studies have demonstrated associations
between psychological factors and Graves’ disease. Previous studies have showed that
psychological factors, such as negative experiences, daily hassles, and some personality
traits might be related to the onset, course, or prognosis of Graves’ disease (Winsa et al.,
1991; Sonino et al., 1993; Kung, 1995; Yoshiuchi et al., 1998; Fukao et al., 2003).

On the other hand, there have been very few reports on the relationship between
psychological factors and other thyroid diseases. Thus, further investigations are needed
to confirm such relationships (Fukao, Takamatsu, Miyauchi, & Hanafusa, 2014).

*Psychotherapy and its difficulty in patients with thyroid disease*

Based on these studies, the Japan Thyroid Association (2019) stated that it is
necessary to take note of the patients’ mental condition. In response to this, the thyroid
hospital that the authors were working in set up a counseling center for the mental health
care of the patients.

Yamamori (2002) and Tanaka et al. (2008) reported some cases of patients with
Graves’ disease based on the clinical practice of psychotherapy in the hospital. They
pointed out that, in contrast with neurotic patients, these patients did not always bring
their psychological conflicts into conscious awareness.

In addition to these case reports, previous studies have examined the personality
traits of patients with thyroid diseases using psychological tests. Yamamori (2002)
showed that, in the Baum test, patients with Graves’ disease had some vulnerability of
psychological stability and spatial composition. Hasegawa et al. (2013) also administered
the Baum test to patients with Graves’ disease, Hashimoto’s disease, and nodular goiter,
and found characteristics similar to Yamamori (2002). In addition, among the three types
of thyroid diseases, the characteristics of nodular goiter were more remarkable than those
of Graves’ disease and Hashimoto’s disease. On the other hand, the results from
questionnaires in the previous studies have not provided a consistent point of view. It is
presumed that the discrepancies exist between the results of the self-evaluating approach
and the projective approach (Hasegawa et al., 2013). These studies have described the
psychological characteristics peculiar to the patients with thyroid diseases and suggested
the necessity of appropriate approaches for them.

*How the Medical Treatment Affects Patients Psychologically?*

In the present study, we focused on the surgical patients with thyroid diseases. For,
in the clinical practice of psychotherapy, those cases after thyroidectomy accounted for
18 percent of all patients visiting the counseling center (Tanaka et al., 2008). This
suggests that thyroidectomy appears to provide the opportunity for the patients’
psychological problems to come up to the surface. But, how does the surgical treatment
affect the patient’s psychological state?

This study was designed to assess the psychological characteristics of surgical
patients with Graves’ disease and papillary thyroid cancer through two types of
psychological tests before and after the surgery.

These two diseases were selected based on the following criteria, after medical
consultation with physicians and surgeons specializing in thyroid disease at the hospital: 1) they often require mental health care in practice, and 2) they are not generally life-threatening and have a good prognosis. Graves’ disease, as described above, is the most common cause of hyperthyroidism. Some patients complain of psychiatric symptoms, such as anxiety and dysphoria, emotional lability, insomnia, and at times, intellectual dysfunction (Whybrow & Bauer, 2005). Thyroidectomy is applied to patients who have complications with a benign tumor, cannot use antithyroid drugs because of side effects or pregnancy, or have drug-intractable hyperthyroidism. On the other hand, papillary thyroid cancer is the most common type of thyroid cancer. One of the symptoms is thyroid tumor, but often there are no clear symptoms. It is usually slow-growing and has a good prognosis. For treatment, thyroidectomy is absolutely essential.

In order to assess the psychological characteristics of the patients, we used the Japanese version of the 20-item Toronto Alexithymia Scale (TAS-20; Komaki et al., 2003) and the Baum test (Koch, 1952). Generating a battery comprised of the questionnaire and the projective test will provide us with a more thorough assessment of the patient’s psychological traits from different aspects.

**Purpose of the Present Study**

The purpose of the present study is to assess the psychological characteristics of surgical patients with Graves’ disease and papillary thyroid cancer through the TAS-20 and the Baum test before and after the surgery. This study was planned as two sessions. Study 1 examined the psychological features of the patients before the surgery, and Study 2 discussed how the surgical treatment affected the patients’ psychological state.

**Ethical Considerations**

Prior to the initiation of the study, the research design was reviewed and approved by the medical ethics review committee of the thyroid hospital.

**Study 1**

In Study 1, we assessed the psychological characteristics of patients with Graves’ disease and papillary thyroid cancer before the surgery through the TAS-20 and the Baum test. These characteristics were compared with the two comparison groups.

**Method**

**Participants**

In Study 1, 29 patients with Graves’ disease (GD: mean age=41.69 years, SD=11.24) and 33 patients with papillary thyroid cancer (PTC: mean age=47.03 years, SD=13.86) participated.

As the comparison group, 35 normal controls (mean age=36.74 years, SD=9.77) and 47 patients with neurosis (NE: mean age = 36.11 years, SD = 11.46) were also enrolled in Study 1. The diagnosis of “neurosis” has not been adopted since DSM-III (American Psychiatric Association, 1980). However, the
perspective of the dimension of personality organization remains effective in the clinical setting. In the current study, the NE group included those who were diagnosed at a psychiatric clinic as having adjustment disorder, anxiety disorder, depressive disorder, dissociative disorder, agoraphobia, and panic disorder based on DSM-IV-TR (American Psychiatric Association, 2000), and were classified as a neurotic level of personality organization by a psychiatrist and four certified clinical psychologists.

Psychological tests

The TAS-20, originally developed by Bagby, Parker, and Taylor (1994) and translated into Japanese by Komaki et al. (2003), is a self-reporting questionnaire for assessing alexithymia. Alexithymia was proposed by Sifneos (1973) as a common personality trait in psychosomatic patients. The TAS-20 is composed of three factors, as follows: Factor 1) “difficulty identifying feelings” with 7 items, Factor 2) “difficulty describing feelings” with 5 items, and Factor 3) “externally-oriented thinking” with 8 items. Each participant evaluated a total of 20 items, according to the five scales.

The Baum test, devised by Koch (1952), is one of the most common and the most-frequently used projective methods in the clinical practice of psychotherapy. It requires each subject to draw “a tree that bears fruits”. It is effective in assessing the dimension of personality organization by analyzing the morphological characteristics of the tree. In Study 1, Index 1 with 62 items was created based on previous studies (Kishimoto, 2002; Sado, Sakamoto, & Ito, 2009), in order to evaluate the tree structure. Whether each tree was applied to each item of Index 1 was assessed independently by three certified clinical psychologists, and the final assessment was determined based on agreement between two of the three assessors.

Procedure

Only after the surgeons gave permission for the both GD and PTC groups to participate in the study based on each medical condition, were the patients asked to participate in the study at the time of hospitalization. After agreement, the first session was set up the day before the surgery. Each of them was engaged in the TAS-20 and the Baum test in a private patient room. The examination period for the GD and PTC groups for Study 1 was from August, X to January, X+1.

The control group, who volunteered to participate in the study, also completed the TAS-20 and the Baum test. Each of the NE patients was asked to participate in the study as a part of a preliminary examination at the psychiatric clinic. After agreement, they engaged in the Baum test alone. We did not administer the TAS-20 to the NE group because of restrictions, as part of their treatment. The examination period for the two comparison groups was from July, X–1 to June, X+2.

Results

TAS-20

Table 1 presents the mean TAS-20 scores and SDs for the three groups (GD/PTC/Control). A one-way analysis of variance (ANOVA) of the groups (GD/PTC/Control) on each of the mean scores for the TAS-20 revealed a significant main effect of groups for Factor 3 ($F(2, 94)=3.818, p<.05$). Tukey’s HSD test confirmed that the PTC group showed a higher mean score on Factor 3 than the controls, and the GD group exhibited a somewhat higher mean score on Factor 3 than the controls.

Baum test

Table 2 presents the frequency and proportion of Index 1 of the Baum test for the four groups (GD/PTC/NE/Control). Fisher’s exact test of the groups (GD/PTC/NE/Control) and applications (Yes/No) on each item for Index 1 showed several significant
Table 1. Means and Standard Deviations of TAS-20 scores

|          | GD (n=29)       | PTC (n=33)    | Control (n=35) |
|----------|-----------------|---------------|----------------|
| Global score | 50.24 (9.49)  | 49.82 (7.27)  | 48.17 (7.65)   |
| Factor 1 | 15.48 (5.85)    | 15.15 (4.27)  | 15.91 (5.00)   |
| Factor 2 | 13.72 (4.03)    | 13.33 (3.97)  | 12.97 (3.39)   |
| Factor 3 | 21.03 (3.65)    | 21.33 (3.05)  | 19.29 (3.20)   |

Table 2. Frequency and Proportion of Index 1 of Baum test

|          | GD (n=29)       | PTC (n=33)    | NE (n=47)      | Control (n=35) |
|----------|-----------------|---------------|----------------|----------------|
| 1 Crown  | Outline of Crown | 24(82.8)     | 23(69.7)       | 44(93.6)       | 32(91.4)       |
| 2 Stem 1 (Stroke) | Single Stroke | 0(0.0)        | 3(9.1)         | 1(2.1)         | 0(0.0)         |
| 3 Stem 2 (Form) | Double Stroke | 29(100.0)     | 28(84.8)       | 45(95.7)       | 34(97.1)       |
| 4 Parallel | 6(20.7)        | 1(3.0)        | 14(29.8)       | 4(11.4)        |
| 5 Divergent Shape | 22(75.9)    | 28(84.8)     | 38(80.9)       | 32(91.4)       |
| 6 Funnel Shape | 5(17.2)      | 13(39.4)     | 6(12.8)        | 7(20.0)        |
| 7 Soldering (upper end) | 0(0.0)     | 0(0.0)       | 0(0.0)         | 0(0.0)         |
| 8 Soldering (bottom end) | 1(3.4)       | 1(3.0)       | 3(6.4)         | 0(0.0)         |
| 9 Branch 1 (Stroke) | Single Stroke | 4(13.8)        | 9(27.3)        | 5(10.6)       | 1(2.9)         |
| 10 Single and Double Stroke | 4(13.8)     | 8(24.2)       | 3(6.4)         | 3(8.6)         |
| 11 Double Stroke | 7(24.1)      | 5(15.2)       | 13(27.7)       | 18(51.4)       |
| 12 Without Branch | 14(48.3)    | 11(33.3)      | 26(55.3)       | 13(37.1)       |
| 13 Branch 2 Branching | 7(24.1)       | 15(45.5)      | 7(14.9)        | 7(20.0)        |
| 14 Root | Single Stroke | 0(0.0)        | 0(0.0)         | 2(4.3)         | 2(5.7)         |
| 15 Single and Double Stroke | 0(0.0)     | 2(6.1)        | 0(0.0)         | 0(0.0)         |
| 16 Double Stroke | 9(31.0)      | 5(15.2)       | 15(31.9)       | 19(54.3)       |
| 17 Without Root | 20(69.0)     | 25(75.8)      | 30(63.8)       | 14(40.0)       |
| 18 Fruit | One Kind | 25(86.2)       | 30(90.9)       | 42(89.4)       | 30(85.7)       |
| 19 Various Kinds | 0(0.0)       | 0(0.0)        | 0(0.0)         | 3(8.6)         |
| 20 Without Fruit | 4(13.8)      | 3(9.1)        | 5(10.6)        | 2(5.7)         |
| 21 Leaf | Leaf | 7(24.1)        | 3(9.1)         | 2(4.3)         | 4(11.4)        |
| 22 Flower | Flower | 0(0.0)        | 0(0.0)         | 0(0.0)         | 1(2.9)         |
| 23 Bark | Shading, String, etc. | 6(20.7)        | 5(15.2)        | 4(8.5)         | 11(31.4)       |
| 24 Wound | Wound | 0(0.0)        | 0(0.0)         | 0(0.0)         | 0(0.0)         |
| 25 Ground Line | Ground Line | 7(24.1)        | 5(15.2)        | 12(25.5)       | 13(37.1)       |
| 26 Accessory | Accessory | 3(10.3)       | 2(6.1)         | 3(6.4)         | 5(14.3)        |
| Line          | Bending | Discontinuity | non-Disruption | Chain | Casting |
|---------------|---------|---------------|----------------|-------|---------|
| Dimension     | Three-Dimension | Perspective | 2(6.9) | 2(6.1) | 0(0.0) | 8(22.9) |
| Spatial Composition | Mismatch | Mismatch | 5(17.2) | 13(39.4) | 7(14.9) | 4(11.4) |
| Apical Termination of Stem | Open Type | Crown Leak Type | 16(55.2) | 23(69.7) | 25(53.2) | 19(54.3) |
| Lower Termination of Stem | Open Type | Apical Leak Type | 20(69.0) | 28(84.8) | 29(61.7) | 22(62.9) |
| Apical Termination of Branch | Closed type | Open type | 3(10.3) | 3(9.1) | 10(21.3) | 13(37.1) |
| Layout        | Protrusion from Paper | Portrait | 2(6.9) | 2(6.1) | 3(6.4) | 5(14.3) |
| Orientation of a Paper | Portrait | Landscape | 28(96.6) | 31(93.9) | 47(100.0) | 34(97.1) |
| Special Type  | Möbius'shes Baum | Funnel Shaped Apical Opening | 1(3.4) | 0(0.0) | 0(0.0) | 0(0.0) |

The PTC group showed a higher proportion of “Stem 2: Funnel Shape”, “Branch 1: Single Stroke”, “Branch 2: Branching”, “Continuity among Parts: Mismatch”, and
“Spatial Composition: Mismatch”. Furthermore, it showed a lower proportion of “Crown: Outline of Crown”, “Stem 2: Parallel”, “Branch 1: Double Stroke”, “Root: Double Stroke”, “Line: non-Disruption”, “Lower termination of Stem: Closed Type”, and “Lower termination of Stem: Closed Type: Root Type”. The NE group showed a higher proportion of “Stem 2: Parallel”, and a lower proportion of “Dimension: Three-Dimension” and “Continuity among Parts: Mismatch”. The control group showed a higher proportion of “Branch 1: Double Stroke”, “Root: Double Stroke”, “Fruit: Various Kinds”, “Line: non-Disruption”, “Dimension: Three-Dimension”, “Dimension: Perspective”, “Lower Termination of Stem: Closed Type: Root Type”, and “Apical Termination of Branch: Closed Type”, and a lower proportion of “Branch 1: Single Stroke” and “Root: Without Root”. On the other hand, the GD group showed no significant differences.

**DISCUSSION**

**TAS-20**

The PTC group showed a higher mean score for “externally-oriented thinking” and the GD group showed a marginally higher mean score for “externally-oriented thinking”, respectively, compared with the control group. Factor 3 indicates a practical way of thinking and acting, instead of understanding, analyzing, or examining things psychologically. The results suggested that patients with thyroid disease are likely to focus on the outer reality rather than the inner reality. This corresponds to the clinical findings by Sifneos (1973). Such a utilitarian way of thinking can help them to adapt themselves well to their social lives. However, on the other hand, it has the potential risk to make their inner lives superficial. If they are biased too strongly toward “externally oriented thinking”, their feelings, fantasies and conflicts would be left beneath the consciousness, without developing psychologically. As Sifneos (1973) pointed out, such tendency can make a form of psychodynamic psychotherapy difficult.

**Baum test**

The PTC group showed contrasting results with the control group on Index 1. The trees structure drawn by the PTC group can be consolidated into the following four main points: 1) the blurred boundary, 2) mismatch among parts, 3) single-stroke branch or root, and 4) branching. Fig. 1 shows an example drawn by a patient with papillary thyroid cancer. The tree shows the open-type stem without a crown and less integrated composition. The open-type apical termination, especially without crown, and single-stroke line indicate the blurred boundary in that the inner space of the tree leaks to the outer space. These characteristics have been often observed in psychotics (Inadomi, Tanaka, & Ohta, 2003; Kaneda et al., 2010) and suggest more severe problems of the “ego boundary” (Yamanaka, 1976) or the “psychological boundary” (Kishimoto, 2002) than the neurotic level of personality organization. The important function of the psychological boundary is to establish a single self with interiority through distinguishing
between self and non-self or inner and outer reality. And, the less integrated composition, such as mismatch between parts or subspaces, indicates that the viewpoints are separated in all directions. It implies difficulty in having a certain fixed point of self. Then, branching represents generally the inner differentiation of self. However, ramifying single-stroke branches which are not rooted in the stem implies that the inner differentiation is not completely successful, though it is attempted. These four characteristics suggest that some patients with papillary thyroid cancer might have difficulty in differentiating, identifying, and developing their inner sense of self.

Fig. 2 shows an example drawn by a patient with Graves’ disease. The proportions on each item for the GD group exhibited intermediate values, except for some items, between those of the PTC and control groups. On the other hand, in the GD group, it was noticeable that “Special Types” - “Möbius’ses Baum” and “Funnel Shaped Apical Opening”, whose inner space and outer space are in confusion appeared. According to Yamanaka (1976), these types have been often observed among schizophrenic patients and rarely observed in neurosis, and therefore, this suggests a more severe level of personality organization than the neurotic level. Compared with the PTC group, it is considered that the GD group is successful to some extent in making the framework and the fixed point of self, however, some of them present the particular vulnerability of psychological boundary, more severely than neurotic patients.

Psychological Characteristics with Patients with Thyroid Diseases

The results from both the TAS-20 and the Baum test suggest that the patients have some difficulties in establishing and differentiating the inner sense of self. Among the

Fig. 1. A tree drawn by a PTC patient. It shows the open-type stem without a crown and the mismatch between parts.

Fig. 2. A tree drawn by a GD patient. It shows the open-type stem with a crown.
thyroid diseases, the patients with papillary thyroid cancer exhibited these psychological characteristics more strongly, especially in the Baum test. On the other hand, the psychological state in patients with Graves’ disease could be considered as being closer to the neurotic level, while it is presumed that they have vulnerabilities similar to patients with papillary thyroid cancer in some aspects. The present result corresponds with a previous study that compared Graves’ disease and nodular goiter (Hasegawa et al., 2013). In clinical practice, we must take notice of the fact that some patients with thyroid diseases, especially papillary thyroid cancer, exhibit more severe psychological vulnerabilities than neurotic patients.

**STUDY 2**

In Study 2, we administered the same two psychological tests to patients with Graves’ disease and papillary thyroid cancer about six months after the surgery, and discussed how the surgical treatment affected the patient’s psychological state.

**METHOD**

*Participants*

Of the 29 patients with Graves’ disease and the 33 patients with papillary thyroid cancer who participated in Study 1, 22 patients with Graves’ disease (mean age=41.18 years, SD=11.78) and 22 patients with papillary thyroid cancer (mean age=44.55 years, SD=14.83) took part in Study 2.

*Psychological tests*

The same psychological tests as first session, the TAS-20 and the Baum test, were used. In the Baum test, a new Index 2, with 13 items, was created to evaluate the changes of the structure of each tree, based on the following four categories: 1) the boundary, 2) consistency, 3) differentiation, and 4) stroke. Each of the items of Index 2 was assessed in a similar manner as Study 1.

*Procedure*

The second session was conducted when each participant visited the hospital for a medical examination, about six months after the surgery, after the patients were generally able to live their daily lives without significant problems. The timing of the sessions was decided based on the recommendations of the surgeons. Of the 22 GD patients and the 22 PTC patients, 21 GD patients and 21 PTC patients were engaged in the both TAS-20 and the Baum test, while a GD patient and a PTC patient participated in the Baum test alone because of time restrictions. The examination period for Study 2 was from February, X+1 to October, X+1.

**RESULTS**

*TAS-20*

Table 3 presents the mean TAS-20 scores and SDs for the four conditions. A two-way ANOVA of the groups (GD/PTC) and examination periods (pre-test/post-test) on each mean score of the TAS-20 was conducted, and revealed a significant main effect of
the examination period for Factor 1 \( (F(1, 40) = 4.483, p < .05) \); with the groups showing a higher mean score on Factor 1 in the post-test than in the pre-test. It also revealed a significant main effect of the examination period for Factor 3 \( (F(1, 40) = 4.454, p < .05) \), with the groups showing a lower mean score on Factor 3 in the post-test than in the pre-test.

**Baum test**

In order to classify the trees with similar morphological changes, a cluster analysis was performed with Ward’s method, based on 13 items of Index 2. Fig. 3 shows the resultant dendrogram by IBM SPSS statistics. The trees were divided into three clusters (CL 1/CL 2/CL 3).

Table 4 presents the frequency of each patient group for three clusters. Fisher’s exact test of clusters (CL 1/CL 2/CL 3) and groups (GD/PTC) revealed a marginally significant difference for CL 2. CL 2 showed a somewhat higher proportion in the GD group and a lower proportion in the PTC group.

Table 5 presents the frequency and proportions of Index 2 for the three clusters. Fisher’s exact test of clusters (CL 1/CL 2/CL 3) and applications (Yes/No) on each item for Index 2 showed several significant differences. CL 1 showed a higher proportion on “Boundary: Unchanged”, “Consistency: Unchanged”, “Differentiation: Unchanged” and “Stroke: Unchanged”, and lower proportion on “Boundary: Changed into a more closed form”, “Consistency: Changed into a greater mismatch”, “Differentiation: Changed into a more complicated form”, “Differentiation: Changed into a more simple form”, and “Stroke: Changed into double stroke”. CL 2 showed a higher proportion on “Boundary: Changed into a more open form”, “Consistency: Changed into a greater mismatch”, and “Differentiation: Changed into a more complicated form”, and a lower proportion on “Boundary: Changed into a more closed form”, “Consistency: Unchanged”, and “Differentiation: Unchanged”. CL 3 showed higher proportion on “Boundary: Changed into a more closed form”, “Consistency: Changed into a greater match”, “Differentiation: Changed into a more simple form” and “Stroke: Changed into double stroke”, and showed lower proportion on “Boundary: Unchanged”, “Consistency: Changed into a greater mismatch”, “Differentiation: Unchanged”, and “Stroke: Unchanged”.

### Table 3. Means and Standard Deviations of TAS-20 scores for the pre-test and the post-test

|                | Pre-test               | Post-test               |
|----------------|------------------------|-------------------------|
|                | GD (n=21)              | PTC (n=21)              | GD (n=21)              | PTC (n=21)              |
| Global score   | 51.43 (9.28)           | 50.19 (8.32)            | 52.05 (11.20)          | 51.43 (8.21)            |
| Factor 1       | 15.48 (5.47)           | 15.38 (4.67)            | 17.05 (6.74)           | 16.10 (5.04)            |
| Factor 2       | 14.38 (3.83)           | 13.43 (4.19)            | 14.29 (4.38)           | 14.81 (3.71)            |
| Factor 3       | 21.57 (3.53)           | 21.38 (3.06)            | 20.71 (3.21)           | 20.52 (3.09)            |
Fig. 3. Dendrogram
DISCUSSION

TAS-20

The post-test showed a higher mean score on “difficulty identifying feelings” than the pre-test and a lower mean score on “externally-oriented thinking” than the pre-test. This result suggested that, after the surgery, the tendency of “difficulty identifying
feelings” became stronger, and that of “externally-oriented thinking” became weaker. When they focused on the inner reality from the outer reality, they recognized the difficulty in identifying the sensation within them at the same time. To become aware of “difficulty identifying feelings” is the first step in identifying and developing their own psychological theme. The surgery can give the patients the opportunities to deal with their essential psychological themes.

 Baum test
We assessed how the structure of the trees changed based on Index 2. The cluster analysis grouped the trees into three types by higher similarity of the morphological changes.

 CL 1 is composed of 7 patients with Graves’ disease and 10 patients with papillary thyroid cancer. The feature of CL 1 is that the structure of the trees has changed little. The result reflects that the personality organization has not essentially changed. Viewed from another perspective, the psychological vulnerabilities, which they had originally, remain unchanged.

 CL 2 is composed of 9 patients with Graves’ disease and 2 patients with papillary thyroid cancer. The distinctive feature of CL 2 is that the structure of the trees has become more unstable. Figures 4a and 4b show examples drawn by a patient with Graves’ disease. The results suggest that the psychological structure becomes less integrated after the surgery. That is, the difficulty in establishing the boundary and the fixed point of self become apparent. Indeed, some patients started to undergo mental treatment during the 6 months, post-surgery, and have continued it after the surgery has been a success. Through the surgery, they faced their own psychological theme from a latent state and began to struggle with them without avoiding the problems. It implies that their psychological structure might be changing essentially, while their mental condition seems getting worth. They are now in the process of psychological transformation. In CL 2, the proportion of the GD group is marginally higher, and that of the PTC group is marginally lower. The patients with papillary thyroid cancer are less likely to become unstable psychologically with the physical change, while the patients with Graves’ disease are more likely to become unstable.

 CL 3 is composed of 6 patients with Graves’ disease and 10 patients with papillary thyroid cancer. It is characterized by a change into a more stable structure. Fig. 5a and 5b show examples drawn by a patient with papillary thyroid cancer. The basic tree structure has been reinforced, while the inner space has been preserved vacant. It is considered that the psychological stability has improved with the physical treatment and physical changes, without dealing with psychological problems directly. Committing and entrusting themselves to the treatment in itself seems to be significant for the psychological stability. However, psychological conflicts with the inner differentiation may be avoiding without being conscious. In one case, a patient with papillary thyroid cancer managed to draw double-stroke branches ramified from the stem. However, after trial and error, she gave up on completing the task. She finally rubbed out the double-stroke branches, and only empty crown remained. This case suggests that it is a difficult
Fig. 4a. A tree drawn by a GD patient before the surgery.

Fig. 4b. A tree drawn by the GD patient after the surgery. The boundary become a more open form, and the differentiation is in confusion.

Fig. 5a (same as Fig. 1). A tree drawn by a PTC patient before the surgery.

Fig. 5b. A tree drawn by the PTC patient after the surgery. The boundary and the consistency become improved, while the branches disappear.
task that causes conflict in accomplishing inner differentiation.

As the results from the Baum test, 61.4 % (the CL 2 and the CL 3) of all patients showed some changes of the basic tree structure. It reflects more fundamental change in the psychological characteristics. The surgical treatment seems to have a strong impact on the patients psychologically.

Psychological Change after the Surgery

The results from the TAS-20 showed that the patients have focused on the inner, and recognized the difficulty in identifying the sensation inside themselves. The fact that some patients recovering from operation visit the counseling center seems to reflect this change of attitude. However, according to Tanaka et al. (2008), many of these cases often finished for a short-term by the somatic troubles settling down. The attitude focusing on the inner seems to be not always acquired consistently. On the other hand, those who became more unstable in the Baum test after the surgery indicated more profound psychological themes. Especially for these patients, not merely temporal medical care but genuine psychotherapy is needed. Only through the process of struggling with psychological problems inside themselves, it is possible to accomplish the real psychological transformation.

In the Baum test, of the 22 patients with Graves’ disease, 9 patients with Graves’ disease showed more unstable psychological state in the post-test than in the pre-test, while 2 of the 22 patients with papillary thyroid cancer showed more unstable psychological state in the post-test than in the pre-test. In the patients with Graves’ disease, the essential psychological problems are more likely to become apparent with the physical treatment than in the patients with papillary thyroid cancer. However, it does not always mean that the patients with papillary thyroid cancer have no problems psychologically. Therefore, when the latent psychological problems come up to the surface, it is necessary for them to introduce the appropriate psychological supports.

REFERENCES

Alexander, F. 1950. Psychosomatic medicine: Its principles and applications. New York, NY: W.W. Norton & Company.
American Psychiatric Association. 1980. Diagnostic and Statistical Manual of Mental Disorders, Third Edition. Washington DC: American Psychiatric Association.
American Psychiatric Association. 2000. Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision. Arlington, VA: American Psychiatric Publishing.
Bagby, R. M., Parker, J. D. A., & Taylor, G. J. 1994. The twenty-item Toronto Alexithymia scale-I. Item selection and cross-validation of the factor structure. Journal of Psychosomatic Research, 38(1), 23–32.
Fukao, A., Takamatsu, J., Murakami, Y., Sakane, S., Miyauchi, A., Kuma, K., … Hanafusa, T. 2003. The relationship of psychological factors to the prognosis of hyperthyroidism in antithyroid drug-treated patients with Graves’ disease. Clinical Endocrinology, 58, 550–555.
Fukao, A., Takamatsu, J., Miyauchi, A., & Hanafusa, T. 2014. Stress and thyroid disease. In iConcept Press (Ed.), Endocrine diseases. Retrieved from https://www.iconceptpress.com/book/endocrine-diseases/
Hasegawa, C., Umemura, K., Kaji, M., Nishigaki, N., Kawai, T., Tanaka, M., . . . Miyauchi, A. 2013. Psychological characteristics of NEO-FFI and the Tree Drawing Test in patients with thyroid disease. *Psychologia*, **56**(2), 138–153.

Inadomi, H., Tanaka, G., & Ohta, Y. 2003. Characteristics of trees drawn by patients with paranoid schizophrenia. *Psychiatry and Clinical Neurosciences*, **57**, 347–351.

Japan Thyroid Association (Eds). 2019. *Basedoubyou chiryou gaidorain* [Guideline for the treatment of Graves’ disease in Japan]. Tokyo, Japan: Nankodo.

Kaneda, A., Yasui-Furukori, N., Santo, M., Sugawara, N., Nakagami, T., Furukori, H., & Kaneko, S. 2010. Characteristics of the tree-drawing test in chronic schizophrenia. *Psychiatry and Clinical Neurosciences*, **64**, 141–148.

Kishimoto, H. 2002. Baum no miki-sentan-shori to kyoukai-zeijaku shoukougun [Apical termination in Baumtest and “blurred outline syndrome”]. *Journal of Japanese Clinical Psychology*, **20**(1), 1–11.

Koch, C. 1952. *Der Baumtest 3 Auflage: der Baumzeichensversuch als psychodiagnostisches Hilfsmittel* [The tree test, 3rd edition: The tree drawing test as an aid in psychodiagnosis]. Bern, Germany: Verlag Hans Huber.

Komaki, G., Maeda, M., Arimura, T., Nakata, A., Shinoda, H., Ogata, I., . . . Kubo, C. 2003. Nihongo-ban The 20-item Toronto Alexithymia Scale (TAS-20) no shinraisei, inshiteki datousei no kentou [The reliability and factorial validity of the Japanese version of the 20-Item Toronto Alexithymia Scale (TAS-20).] *Japanese Journal of Psychosomatic Medicine*, **43**, 839–846.

Kung, A. W. C. 1995. Life events, daily stresses and coping in patients with Graves’ disease. *Clinical Endocrinology*, **42**, 303–308.

Sado, T., Sakamoto, K., & Ito, M. 2009. Baum test no miki-sentan-shori ni kansuru kiso kenkyu: daigakusei no baum-ga yori [A basic study on apical termination in the Baum test: With Baum-drawings by college students]. *Journal of Japanese Clinical Psychology*, **27**(1), 95–100.

Sifneos, P. E. 1973. The prevalence of ‘alexithymic’ characteristics in psychosomatic patients. *Psychotherapy and Psychosomatics*, **22**, 255–262.

Sonino, N., Girelli, M. E., Boscaro, M., Fallo, F., Busnardo, B., & Fava, G. A. 1993. Life events in the pathogenesis of Graves’ disease. A controlled study. *Acta Endocrinologica*, **128**, 293–296.

Tanaka, M., Kanayama, Y., Kawai, T., Kuwabara, H., Yamamori, M., Kubota, S., . . . Miyauchi, A. 2008. Koujousen senmon byouin ni okeru shinri-rinshou: Shintai-i kara irai saru-ke katu no kentou [Psychotherapy in thyroid hospital: Classification and characteristics of cases referred by medical doctors]. *Psychosomatic Medicine*, **12**(5), 430–435.

Whybrow, P. C., & Bauer, M. 2005. Behavioral and psychiatric aspects of thyrotoxicosis. In L. E. Braverman & R. D. Utiger (Eds.), *Werner and Ingbar’s the thyroid* (9th ed., pp. 664–650). Philadelphia, PA: Lippincott Williams & Wilkins.

Winsa, B., Adami, H., Bergström, R., Gamstedt, A., Dahlberg, P. A., Adamson, U., . . . Karlsson, A. 1991. Stressful life events and Graves’ disease. *Lancet*, **338**, 1475–1479.

Yamamori, M. 2002. Baum test to shinri-mensetsu kara mita Basedoubyou kanja: Atopi-sei hifuen kanja tomo hikaku [Baum test and psychotherapy process of patients with Graves’ disease: Psychological features derived from a comparison with atopic dermatitis]. *Archives of Sandplay Therapy*, **15**(1), 31–42.

Yamanaka, Y. 1976. Seishin-bunretsutsu-byou ni okeru baum test no kenkyu [A study of Baum test in schizophrenia]. *Journal of Psychometry*, **12**, 18–23.

Yoshiuchi, K., Kumano, H., Nomura, S., Yoshimura, H., Ito, K., Kanaji, Y., . . . Suematsu, H. 1998. Stressful life events and smoking were associated with Graves’ disease in women, but not in men. *Psychosomatic Medicine*, **60**, 182–185.

(Manuscript received 31 August, 2018; Revision accepted 31 December, 2018; Released online in J-STAGE as advance publication 9 September, 2019)