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Pre-and postoperative psychological characteristics in mothers of patients with idiopathic scoliosis

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Abstract The purpose of the present study was to clarify changes in the psychological state of mothers of patients with idiopathic scoliosis, and to clarify relationships between the psychological states of the mothers and patients. The Maudsley personality inventory (MPI) was administered to 30 patients with idiopathic scoliosis who underwent surgery and their mothers preoperatively and at about 1 year postoperatively. We investigated the relationships between preoperative MPI scores and postoperative scores in patients and their mothers, respectively, and the relationships between MPI scores for patients and mothers. The results of the present study revealed that patients became more extroverted following surgery,

while mothers displayed reduced neurotic tendencies. In conclusion, the mothers of patients who undergo corrective treatment for scoliosis may have experienced a substantial psychological burden before surgery, and doctors who treat patients with scoliosis should bear this point in mind.

Keywords Scoliosis · Surgery · Parent–patient · Psychological characteristics

Introduction

Parents of patients with idiopathic scoliosis are nervous about the deformed trunk of the patient on a regular basis, and experience strong anxiety that the patient may lead their life with a deformed trunk in the future [2, 3, 6, 20]. Before the start of scoliosis corrective treatment, parents reportedly have mixed feelings of expectation and anxiety for the treatment, and their psychological state tends to display large changes, which may influence the patient [17]. Very few studies have preoperatively administered personality inventories to patients and their mothers, as with the present investigation, but none have reported the results of personality inventories conducted postoperatively [12, 16]. The present study performed pre- and postoperative personality invento-

ries on patients with idiopathic scoliosis and their mothers, to clarify changes in the psychological state of mothers, and to clarify relationships between the psychological states of the mothers and patients.

Subjects and methods

Subjects comprised 30 patients (6 males; 24 females) with idiopathic scoliosis who underwent surgery in our department between 1999 and 2001, and their mothers. Mean ($\pm$ SD) age of patients was 15.1 ± 4.6 years (range, 10–26 years). Demographic data of the present study was shown in Table 1. Mean age of mothers was 40.4 ± 5.3 years (range, 32–52 years). The major curve of scoliosis was right convexity of the thoracic vertebral

curve in all patients, and mean preoperative Cobb angle was $67.1 \pm 9.7^\circ$ (range, $54\text{--}85^\circ$). Corrective treatment for scoliosis comprised spinal instrumentation using a posterior approach in all patients. Mean Cobb angle at 1 year postoperatively was corrected to $21.0 \pm 6.1^\circ$ (range, $4\text{--}34^\circ$), and mean correction rate of scoliosis was $68.9 \pm 7.2\%$ (range, $53.8\text{--}85.7\%$). We asked patients to evaluate the surgical results according to three grades of “Satisfied,” “Unknown,” and “Unsatisfied” at about 1 year after surgery. Consequently, all of the 30 patients answered “Satisfied,” and at 1 year postoperatively all patients and mothers were satisfied with the results of the surgery. None of the patients had peri-/postoperative severe complications, such as paraplegia and deep wound infection.

The Maudsley personality inventory (MPI) [1, 13, 19] was administered to all patients and their mothers preoperatively and at about 1 year postoperatively. We investigated the relationships between preoperative MPI scores and postoperative scores in patients and their mothers, respectively, and the relationships between MPI scores for patients and mothers. We also investigated the correlation on variation in the scores between pre- and postoperative personality traits, and then the difference between pre- and postoperative *E* and *N* scores (i.e., postoperative score minus preop-

erative score) was calculated in patients and mothers, respectively. We called the four variations in *E* and *N* scores by the name of patients’ *E* variation, patients’ *N* variation, mothers’ *E* variation and mothers’ *N* variation.

The used MPI was a Japanese version of the original inventory published by Jensen [10] in 1958, which has been extensively used as the Eysenck Personality Questionnaire in Europe [4]. The MPI was translated into Japanese by Oyama et al. [18], and the validity has been assessed in a number of studies [9, 14, 21]. This personality inventory uses a simple 80-item questionnaire to judge three scales of introverted/extroverted personality (*E* score), neurotic tendencies (*N* score), and false discovery. In this study, both *E* and *N* scores were evaluated using a maximum score of 48 points, from 24 questions of 2 points each. For *E* score, a lower score shows greater introversion, and a higher score indicates greater extroversion (0–18 points; introversion, 19–29 points; average, 30–48 points; extroversion). For the *N* score, a lower score reveals weaker neurotic tendencies, while a higher score indicates stronger neurotic tendencies (0–18; no neurotic tendency, 19–29 points; slight neurotic tendency, 30–48 points; neurotic tendency).

The determination criteria for the MPI reveal that both *E* and *N* scores are almost normally distributed

Table 1 Demographic data of the present study

Cases	Age at operation	Mothers’ age	Gender	Pre-op Cobb (°)	Post-op Cobb (°)	Correction rate (%)
1	10	35	Female	65	22	66.2
2	10	32	Female	64	25	60.9
3	11	36	Male	75	24	68.0
4	11	40	Female	56	21	66.1
5	12	42	Female	58	15	74.1
6	12	36	Female	60	17	71.7
7	12	38	Female	75	23	69.3
8	12	42	Female	85	29	65.9
9	12	35	Female	58	15	74.1
10	13	38	Male	63	16	74.6
11	13	39	Female	68	17	75.0
12	13	42	Female	87	26	70.1
13	13	44	Female	65	18	72.3
14	13	35	Female	62	26	58.1
15	13	33	Female	72	18	75.0
16	13	36	Female	84	22	73.8
17	14	37	Male	56	8	85.7
18	14	39	Male	84	34	59.5
19	14	40	Female	65	30	53.8
20	14	44	Female	54	18	66.7
21	15	42	Female	82	34	58.8
22	15	36	Female	62	11	82.3
23	15	38	Female	66	14	78.8
24	18	40	Male	60	18	70.0
25	21	48	Female	66	24	63.6
26	22	50	Female	65	22	66.2
27	22	46	Male	65	18	72.3
28	24	52	Female	56	19	66.1
29	25	46	Female	58	22	62.1
30	26	51	Female	76	25	67.1

[9, 14, 21], but neither scores represent continuous variables, so for statistical analyses, non-parametric methods were used. That is, with regard to differences between *E* and *N* scores before and after surgery, and differences between scores for patients and their mothers, differences were tested for significance using the Wilcoxon method, and values of $P < 0.01$ were considered statistically significant. To examine the significance of correlations between two investigation items, Spearman's rank correlation coefficient was obtained for each item, and a two-tailed value of $P < 0.01$ indicated a significant correlation.

Results

The results of pre- and postoperative administration of the MPI to patients and their mothers are shown in Table 2. With regard to changes in MPI score for patients, mean *E* score was 18.3 ± 10.0 and 26.3 ± 10.0 points preoperatively and postoperatively, respectively. Patients thus became significantly more extroverted after

surgery ($P < 0.001$). Mean *N* score was 17.2 ± 10.3 and 14.9 ± 8.5 points preoperatively and postoperatively, respectively, showing no significant difference. With regard to MPI score for mothers, mean *E* score was 22.8 ± 8.0 and 22.9 ± 7.7 points preoperatively and postoperatively, respectively, indicating no significant difference. Mean *N* score was 19.1 ± 11.2 and 12.6 ± 6.4 points preoperatively and postoperatively, respectively, showing significantly reduced neurotic tendencies after surgery ($P < 0.01$).

In terms of relationships between MPI scores for patients and mothers, no significant correlations in either *E* or *N* scores were noted between before and after surgery. Relationships between MPI scores for mothers and age of patients, preoperative Cobb angle, and postoperative correction rate were examined, but no significant correlations were found between any examined factors.

Regarding the variations in the scores between pre- and postoperative personality traits, the analytical results showed no significant correlations in any combination of two of the four variations (Table 3).

Table 2 Pre- and postoperative scores of Maudsley Personality Inventory in patients and their mothers

Cases	Patients				Mothers			
	Preop E score	Postop E score	Preop N score	Postop N score	Preop E score	Postop E score	Preop N score	Postop N score
1	18	35	22	10	12	22	32	12
2	14	12	10	12	16	24	12	12
3	28	30	8	12	22	12	32	30
4	32	36	34	32	26	20	10	4
5	8	20	36	30	28	26	36	8
6	14	22	20	24	36	30	22	16
7	18	21	10	2	16	18	6	6
8	22	36	6	2	12	20	6	8
9	40	38	8	12	22	26	12	10
10	12	16	10	12	26	22	10	12
11	8	10	14	16	18	16	32	14
12	16	26	18	8	24	30	2	2
13	32	38	20	12	22	28	34	28
14	30	32	2	20	18	20	24	12
15	20	25	36	30	22	22	20	18
16	16	18	2	6	30	32	30	10
17	10	35	28	24	18	20	36	8
18	8	30	32	28	40	42	6	6
19	14	24	10	18	26	26	20	12
20	16	36	12	8	12	18	16	16
21	34	34	14	6	22	20	10	8
22	42	44	32	22	26	20	26	18
23	8	8	6	14	32	30	14	11
24	6	26	8	10	12	10	12	14
25	14	26	18	16	10	10	13	20
26	12	34	10	4	36	32	12	16
27	12	10	4	8	32	38	36	14
28	24	28	32	16	16	22	35	20
29	10	8	20	22	32	12	10	6
30	12	30	14	10	20	18	6	8
Mean	18.3*	26.3*	17.2	14.9	22.8	22.9	19.1**	12.6**

*Patients became significantly more extroverted after surgery ($P < 0.001$)

**Mothers significantly reduced neurotic tendencies after surgery ($P < 0.01$)

Table 3 Variations in the scores between pre- and postoperative personality traits

	Patients' <i>E</i> variation	Patients' <i>N</i> variation	Mothers' <i>E</i> variation	Mothers' <i>N</i> variation
1	17	-12	10	-20
2	-2	2	8	0
3	2	4	-10	-2
4	4	-2	-6	-6
5	12	-6	-2	-28
6	8	4	-6	-6
7	3	-8	2	0
8	14	-4	8	2
9	-2	4	4	-2
10	4	2	-4	2
11	2	2	-2	-18
12	10	-10	6	0
13	6	-8	6	-6
14	2	18	2	-12
15	5	-6	0	-2
16	2	4	2	-20
17	25	4	2	-28
18	22	-4	2	0
19	10	8	0	-8
20	20	-4	6	0
21	0	-8	-2	-2
22	2	-10	-6	-8
23	0	8	-2	-3
24	20	2	-2	2
25	12	-2	0	7
26	22	-6	-4	4
27	-2	4	6	-24
28	4	-16	6	-15
29	-2	2	-20	-4
30	18	-4	-2	2
Mean	7.9	-2.3	0	-4.6

Discussion

In the treatment of spinal disease, patients with strong involvement of psychogenic factors tend to be resistant to conservative or surgical treatment. For such patients, personality inventories are thus administered preoperatively to identify such patients and objectively evaluate psychological status and predict postoperative results [5, 11, 15, 22]. It is a very intriguing issue whether personality traits and change in personality traits can predict the treatment outcome. Unfortunately, however, we could not mention any relationship between MPI results and surgical results, as all of the 30 patients tested had no peri-/postoperative significant complications and were satisfied with the surgical results.

As a personality inventory, the Minnesota multi-phasic personality inventory (MMPI) has been utilized extensively, and many papers have reported the utility of this inventory for patient selection [7, 23, 25]. However, the MMPI has several limitations, in that it takes longer to administer, at 45–75 min, contains numerous questions that can be difficult to answer, and the methods of judgment are very complicated [8], and correction

between MMPI and surgical outcome is poor [24]. The MPI offers advantages in that patients can complete the questionnaire within about 10 min, and the results can be easily determined in a short amount of time. However, the MPI is not well known all over the world, and thus somewhat disadvantageous for the comparison of data between institutions.

The reason for postoperative changes in the personality test score in patients with scoliosis is probably because of successful surgery, which relieved of anxiety and gained self-confidence in the body image risen from improved cosmetic deformity, which resulted in emotional stability enabling to actively participate in school and social activities. Bridwell et al. [2] investigated the preference and concerns of patients and parents regarding scoliosis surgery, and reported that the greatest concern for both groups was the possibility of neuromyolysis. In addition, parents display very strong anxiety that the patient might have to lead their life with a deformed trunk in the future, and parents are more anxious and have higher expectations for the surgery than patients. Rinella et al. [20] administered the SRS-24, a questionnaire to evaluate postoperative quality of Life in patients with scoliosis, to both patients and parents. For self-image, satisfaction and total score, parents displayed significantly higher scores than patients. This may suggest that the parents of patients with scoliosis are more anxious before surgery and experience more satisfaction after surgery than the patients themselves. The present results also showed that *N* score of mothers was high preoperatively and low postoperatively, which may reflect a strong sense of anxiety before surgery and a sense of relief or satisfaction after surgery. The fact that no significant correlation was noted between results of the MPI for mothers and scoliosis correction rate, suggests that if scoliosis correction is obtained to some extent without major complications, postoperative *N* score of mothers may be reduced and psychological state is improved after surgery.

Meyer et al. [17] reported that in brace treatment for scoliosis, patient attitudes toward the brace were much the same as those of mothers. Kahanovitz et al. [12] mentioned that psychological state of the patient with scoliosis is influenced by the attitude of the mother. However, the present results did not identify any significant correlation between MPI scores for mothers and patients, and thus do not lend any support to the hypothesis that psychological state of mothers influences patients in any tangible sense.

The present study shows some limitations, in that the number of patients was small, no personality inventories other than the MPI were performed, and the MPI was only conducted twice, once before surgery, and once at 1 year after surgery. Thus, MPI was administered to all 30 patients enrolled in this study and their mothers in July 2005 (mean postoperative time, 5 years and

1 month; range, 3 years and 8 months–6 years and 2 months), with response from 22 patients and their mothers (response rate, 73.3%). The results showed that the MPI scores for the patients and mothers in the postoperative time of approximately 5 years were little changed, compared with those in the time of 1 year; the *E* and *N* scores in the postoperative time of approximately 5 years were within four points of difference from those in the time of 1 year. These data indicate that the psychological characteristics in the postoperative time of 1 year would not largely change after 4 years. In future, we would like to increase the number of patients, and administer personality inventories other than the MPI.

The results of the present study revealed that patients with scoliosis became more extroverted following surgery, while mothers displayed reduced neurotic tendencies. It should be stressed for spinal surgeons to take enough time to explain to patients and mothers with kindness and politeness to obtain the informed consent before surgery, because not only patients but mothers also feel substantial psychological burden before the surgery. In addition, we doctors should contact not only patients but also mothers to always relieve them, in particular, to provide relief from great uncertainty for mothers even after surgery.

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