

Defence mechanisms in patients with leukaemia undergoing bone marrow transplantation

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Purpose: To deepen the understanding of defence mechanisms in the adaptation process to bone marrow transplantation.

Procedures: Assessment of presence and intensity of 21 defence mechanisms from 58 patients scheduled to BMT.

Results: Patients were clustered into three groups. Two discriminant functions („immature” and „neurotic” defence) were identified and illustrated by two case reports.

Conclusion: Immature defence may have advantages in the regression-inducing inpatient setting, but passive aggressive behaviour seems to be less adaptive. Especially in combination with higher level defences it may miss the regressive demands of the situation, bearing the risk of provoking unconscious negative feelings and behaviours towards the patient on part of the staff.

Key words: bone marrow transplantation, coping, defence, survival

Introduction

The impact of defence processes on coping with life-threatening diseases has been shown in many studies, especially with regard to cancer [1], chronic haemodialysis [2], myocardial infarction [3], Crohn disease [4], and eating disorders [5]. In general denial seems to be one of the most prominent defence mechanisms of patients facing a chronic, a malignant or other life-threatening disease [6, 7]. However, systematic studies on patients after bone marrow transplantation (BMT) rarely focus on defence mechanisms influencing the adaptation process.

Brown and Kelly [8] described the denial and displacement found in six BMT-patients after being confronted with the anxiety-inducing decision to perform BMT.

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Patenaude and Rapoport [9] report on several defence mechanisms occurring in four patients after BMT, such as minimization, withdrawal, and denial after the death of the patient "in the other bed." These retrospective studies with small groups of patients have discovered defence mechanisms only as a by-product.

In the Ulm project on the aftermath of BMT [10] a retrospective and prospective study were brought to bear on the coping and defence mechanisms in adapting to this new situation. Patients being confronted with the diagnosis of a haematological disease such as leukaemia and with an aggressive medical treatment like BMT [11, 12] must cope with the following unspecific stress situations comparable to other cancers: a sudden confrontation with a life-threatening diagnosis; a short time period between first symptoms, diagnosis and treatment; stressful side effects due to the medical treatment (pain, nausea, vomiting, loss of hair, infections); invasive diagnostic and therapeutic operations; uncertainty for a long time concerning the success of the therapy; and the need for of an adaptive organization of one's whole daily life. Furthermore the patients are confronted with BMT-specific stress situations [13, 14]: germ-free isolation, physical inactivity, a waiting period for taking of the new bone marrow, and the graft versus host disease puts success at risk. For most patients, BMT is the final hope for survival. Not only the leukaemia but the BMT procedure itself is vital threatening. BMT is associated with a mortality rate up to 36%. One-year survival rates vary in dependence of several prognostic factors, e.g. age, general health, stage of disease, and are reported with 70-80% for allogeneic BMT from a related donor and about 50% from an unrelated donor [15].

Because of advances in BMT, the treatment conditions have been changing during the periods (retrospective study 1978-1986; prospective study 1990-1995) we investigated. Nevertheless the focus of distress is still the same. One aim of our research programme is to identify which defence mechanisms are occurring and to explore whether the defence organization changes during the different treatment phases.

We conceptualise defence as a major tool for regulation of relations between the self and the object [16]. By means of defence, the ego masters internal conflicts aroused by external trauma. The stress caused by disease and therapy may well reactivate past unconscious conflicts as well as stir up new dangerous and painful affects, which by themselves initiate defence manoeuvres. The ego must strike a balance between intrapsychic object-related needs and wishes and the external demands of the disease and its treatment consequences. The defence mechanisms can lead to a distorted perception of reality and to the exclusion of conflicting self-aspects. This influences cognitions, emotions, actions, and social relations of the patient, possibly resulting in a less optimal adaptation to the therapeutic situation or even weakening the tolerance for unbearable situations. On the other side, the defence operations may preserve the functioning of the ego, e.g. in a time of overwhelming anxiety due to the life-threatening situation.

Here we report on parts of our research and focus on which defence mechanisms can be observed prior to BMT, immediately after informed consent. We also explore correlations between the defence organization and the Symptom-Check-List SCL-90-R by Derogatis [17]. Thirdly we shall illustrate the impact of the findings for adaptation to the disease in two prototypical cases.

Method

Defence mechanisms are conceptualised as unconscious processes. Thus, assessments by raters seem to be a more appropriate approach than self-ratings by the patient [18].

Therefore we used the German version of Perry's "Defence Mechanism Rating Scales DMRS" [19, 20]. The defence mechanisms are hierarchically ordered on seven levels (mature, obsessional, neurotic, narcissistic, disavowal, borderline, action). According to the German manual (translated and revised by Tschuschke and colleagues, [21]) the six non-mature levels with 21 defence mechanisms were registered in our study (see also Table 3).

From May 1990 to February 1994 all patients with leukaemia (acute myeloid leukaemia = AML, acute lymphoblastic leukaemia = ALL, and chronic myeloid leukaemia = CML) scheduled for allogeneic BMT at the University Hospital of Ulm, Department of Internal Medicine III, speaking fluidly German, were asked to participate in our study. 58 patients (for characteristics see Table 1) out of 80 patients were interviewed before BMT, just after informed consent. Dropouts: 9 patients refused to take part, 6 patients refused recording of interviews, and 7 patients were lost due to organisational problems (conditioning procedure had already begun). We have no hints that the non-participants differ from participants in socio-demographic and medical variables.

The semi-structured interviews covered all relevant aspects of disease and BMT

Table 1

Patients' characteristics (n = 58)

Age:	mean (range)	36y (16 - 55y)
Gender:	female	19 (33%)
	male	39 (67%)
Education:	high school or above	18 (31%)
	others	32 (55%)
	missing	8 (14%)
Marital status:	married	38 (66%)
	not married	12 (21%)
	missing	8 (14%)
Diagnosis:	ALL	9 (16%)
	AML	24 (41%)
	CML	25 (43%)
Stage of disease:	=1st CP/CR*	41 (71%)
	>1st CP/CR	17 (29%)
HLA-status:	HLA identical sibling donor	45 (78%)
	others	13 (22%)

*CP = chronic phase; CR = complete remission

(e.g. beginning of the disease, diagnosis, changes in health status, personal and social relationships, hopes and fears facing BMT, time in isolation, patient-donor-relationship etc.). All episodes should be addressed by the interviewer leaving it to the patient to what extent he described or commented on the episodes, so length of interview varied. The interviews were conducted in the patient's room at the BMT units and audiotape recorded.

Trained experts (not identical with interviewers) assessed the audiotapes using the DMRS. All occurrences of defence mechanisms were noted. A score for each defence mechanism was computed by dividing its frequency multiplied by 100 by the length of the interview.

According to the manual basis for ratings are 50-minute (psychotherapeutic) sessions. The division by time considers the fact of varying duration of interviews (15 to 95 minutes) that also reflects the intensive care unit setting. A score for a certain level of defence was computed as the arithmetic mean of the corresponding single scores. Interrater-reliability was satisfying (Kappa coefficients ranging from .45 to .97 [21]).

Results

On an average the patients used 8 of the 21 defence mechanisms, with a minimum of 3 and a maximum of 14, above all intellectualization = 96.6%, minimization = 86.2%, rationalization = 81.0%, and isolation = 75.9%. None of them used dissociation, and only two persons = 3.4% splitting and autistic fantasies.

Table 2

Mean scores and frequency for defence mechanisms, mean scores for levels of defence, and total score (n=58)

defence mechanism		mean score	sd	frequency (%)
(20)	intellectualization	20.7	14.4	96.6
(9)	rationalization	8.2	7.4	81.0
(10)	minimization	7.1	5.2	86.2
(2)	passive aggression	5.8	6.1	67.2
(13)	idealization	5.4	5.5	67.2
(19)	isolation of affect	5.1	5.5	75.9
(12)	devaluation	4.7	6.9	51.7
(15)	repression	4.6	5.6	67.2
(7)	denial	4.1	5.6	60.3
(14)	omnipotence	3.7	6.5	39.7
(8)	projection	2.8	3.8	46.6
(18)	displacement	1.4	2.8	29.3
(17)	reaction formation	1.2	3.9	15.5

(1)	acting out	1.1	2.2	24.1
(4)	hypochondriasis	.8	2.5	13.8
(21)	undoing	7	1.5	22.4
(3)	turning against self	.7	1.9	17.2
(6)	project. identification	.2	.7	6.9
(5)	splitting	.1	.7	3.4
(11)	autistic fantasies	.1	.4	3.4
(16)	dissociation	.0	.0	.0

level of defence

(VI)	obsessional level	8.8	5.4
(IV)	narcissistic defences	4.6	4.0
(III)	disavowal level	4.5	2.7
(I)	action level	2.1	2.0
(V)	other neurotic level	1.8	2.1
(II)	borderline defences	.2	.5

total score 3.7 1.6

Scores for defence mechanisms, levels of defence, and total score do not correlate with age, stage of disease, and HLA-status (human leucocyte antigene).

Only minor differences were found for gender (female score higher on narcissistic defence; $p=.007$, t-test), education (higher scores for high school or above on reaction formation; $p=.05$, t-test), marital status (married patients showed higher scores on hypochondriasis; $p=.015$, t-test, projective identification; $p=.046$, t-test, and lower scores on minimization; $p=.008$, t-test), and diagnosis (ALL-patients reached highest scores on turning against self and undoing ($p=.039$ respectively $.016$, variance analysis). These results are probably due to chance (7 out of 112 tests reached significance).

The patients showed no signs of psychopathology as measured with the SCL-90-R. The General Symptomatic Index (GSI), expressing overall psychic strain showed an average of 0.50. This value is slightly higher than for "normal healthy persons" (0.33), but substantially lower than for persons undergoing inpatient psychotherapy (1.29) (compared with German norm populations [16]).

A principal component analysis (PCA) of the defence scores was followed by a cluster analysis to identify groups of patients with a similar defence structure. Using factor scores in this cluster analysis avoids assigning excessive weight to inter-correlated variables. To assess the quality of the clustering, a discriminant analysis was conducted with defence scores as discriminating variables*. As our main purpose was to describe

*Our first approach in this step of analysis with 20 variables (variable (16) was excluded due to zero-variance) was only partially successful. Variable (11) autistic fantasies had to be excluded from the analysis because inclusion led not to interpretable results, showing this variable as quite dominating despite the fact that only two persons used this defence mechanism. We repeated the analysis with 19 variables having excluded (16) dissociation and (11) autistic fantasies.

and generate new hypotheses, the solution of choice should be clinically meaningful, show some kind of face validity or be at least of some heuristic value.

PCA led to a four-factor solution explaining 43.8% of the total variance. A three-cluster solution seemed appropriate for cluster analysis (complete linkage with squared Euclidian distances). Mean scores for defence mechanisms and levels of defence for these clusters are shown in Table 3.

Table 3

	cluster 1 (n=49)	cluster 2 (n=5)	cluster 3 (n=4)	total (n=58)
(I) action level	1.8	3.6	4.6	2.1
(1) acting out	0.7	0.7	6.2	1.1
(2) passive aggression	5.2	13.1	3.6	5.8
(3) turning against self	0.5	0.0	4.5	0.7
(4) hypochondriasis	0.6	0.7	4.0	0.8
(II) borderline defences	0.1	0.0	0.9	0.2
(5) splitting	0.0	0.0	1.9	0.1
(6) project. identification	0.2	0.0	0.0	0.2
(III) disavowal level	4.4	5.7	3.4	4.5
(7) denial	3.6	8.6	4.5	4.1
(8) projection	3.2	0.7	1.1	2.8
(9) rationalization	8.1	10.8	5.3	8.2
(10) minimization	7.1	8.4	6.2	7.1
(11) autistic fantasies	0.1	0.0	0.0	0.1
(IV) narcissistic def.	4.6	3.4	5.8	4.6
(12) devaluation	4.5	0.0	12.7	4.7
(13) idealization	6.1	1.7	1.1	5.4
(14) omnipotence	3.2	8.6	3.4	3.7
(V) other neurotic lev.	1.4	6.0	1.0	1.8
(15) repression	3.8	13.6	3.4	4.6
(16) dissociation	0.0	0.0	0.0	0.0
(17) reaction formation	0.4	10.3	0.0	1.2
(18) displacement	1.6	0.0	0.6	1.4

(VI) obsessional lev.	9.1	9.4	5.6	8.8
(19) isolation of affect	4.6	10.3	4.5	5.0
(20) intellectualization	21.8	17.9	10.7	20.7
(21) undoing	0.7	0.0	1.6	0.7
total score	3.6	5.0	3.6	3.7

Stepwise discriminant analysis with the 19 defence scores as discriminating variables led to two significant discriminant functions. 6 out of the 19 variables were sufficient and entered into the model in this order: (17), (5), (1), (3), (2) and (4). This classification process predicted cluster membership of all 58 cases correctly (100% hit rate). For standardized discriminant function coefficients see Table 4.

Table 4

**Standardized canonical discriminant function coefficients
(results performing stepwise selection of variables)**

variable	immature defence (f1)	neurotic defence (f2)
(1) acting out	.59	.22
(2) passive aggression	-.15	.78
(3) turning against self	.78	.10
(4) hypochondriasis	.59	-.17
(5) splitting	1.08	.22
(17) reaction formation	-.14	1.05

Figure 1 shows the discriminant scores of all cases separated by cluster membership for function 1 (immature defence) against function 2 (neurotic defence), and Figure 2 compares scores for levels of defence for all three clusters using z-scores.

Discussion

Contrary to results of elder studies, denial as single defence mechanism belongs not to the most prominent mechanisms in our prospective study. Surprisingly, we found intellectualization, rationalization, and minimization to be the defence mechanisms with the highest scores and being used most frequently.

The decision to undergo BMT demands a lot of cognitive involvement. The patients diagnosed with leukaemia often do not feel themselves physically very uncomfortable and affected. But they are forced to make a decision concerning an aggressive and demanding procedure with no guarantee for success. Intellectualisation, rationalization, and minimization seem to be useful defences shown before BMT.

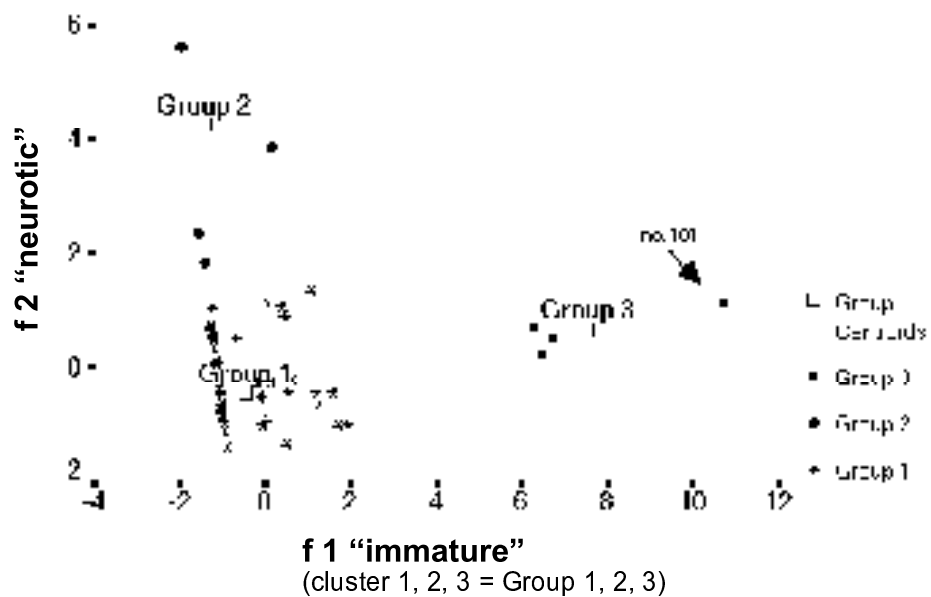


Figure 1 Discriminant Scores on Function1 (immature defence) and Function 2 (neurotic defence) for the Cases of Clusters (= Groups) 1, 2, and 3, and Centroids for these Clusters

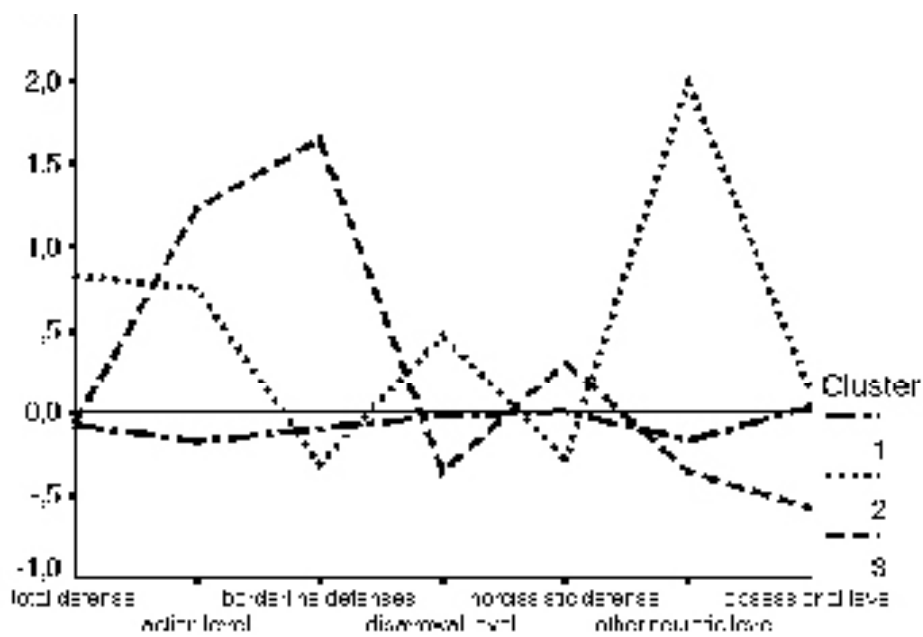


Figure 2 Mean z-Scores of Defence Levels for Cluster 1, 2, and 3

Denial is often used to minimize aversive memories, therefore former findings may be a result of the retrospective method.

Our approach to the discriminant functions led to interesting results:

The first discriminant function f1 can easily be identified as “immature defence” with low scores on passive aggression as exception. Three standardized coefficients for immature defences contribute substantially to function f1 with positive signs (see Table 4). The canonical correlation coefficients (not reported here) support this interpretation: immature and lower level defences are positively correlated, and higher level defences, especially all three obsessional level defences carry a negative sign.

Function f2 is dominated by reaction formation and passive aggression as indicated by the function coefficients (see Table 4). Considering the patients being confronted with BMT, the main themes of the defence mechanisms associated with function f2 seem to be a way of denying threat (denial, repression) and replacing negative feelings and thoughts with positive ones (reaction formation, idealization). Passive aggression in this context allows a person to express negative impulses, normally behind a mask of friendliness and cooperation. In summary: Patients show no resignation, and they seem to be quite confident, friendly, and compliant, but inside they are full of doubts. For function f2 we suggest the label “neurotic defence” despite passive aggression which seems to play a special role.

Looking at the number of cases in each cluster we can state that most of the patients are not remarkable on both functions f1 and f2. Only few patients have either high scores on f1 (immature defence) or f2 (neurotic defence; see also Table 3). As expected, the great majority of our BMT patients show no remarkable (negative or pathological) defensive structure. This findings are in agreement with clinical experience, that the most patients undergoing BMT are quite “normal”.

Two prototypical cases

We will report on two cases which characterize the most extreme positions on immature defence (Cluster 3; patient A) and on neurotic defence (Cluster 2; patient B), respectively. They are labelled in Figure 1. Levels of defence z-scores for both cases are shown in Figure 3. The description of the two cases is not restricted to defence mechanisms. We also include data on social behaviour, coping strategies, and assessments of the staff, using registered scores. Listening to the audiotapes also contributed to our clinical understanding.

Both patients were female and were diagnosed CML approximately two years before transplantation. At BMT patient A is 45 years old, but is now no longer working as a correspondent. She is married and mother of two children aged 20 and 14. Patient B is 29 years old, married, without children and working full time in a white collar job.

12 out of the 21 defence mechanisms could be observed with *patient A*. Compar-

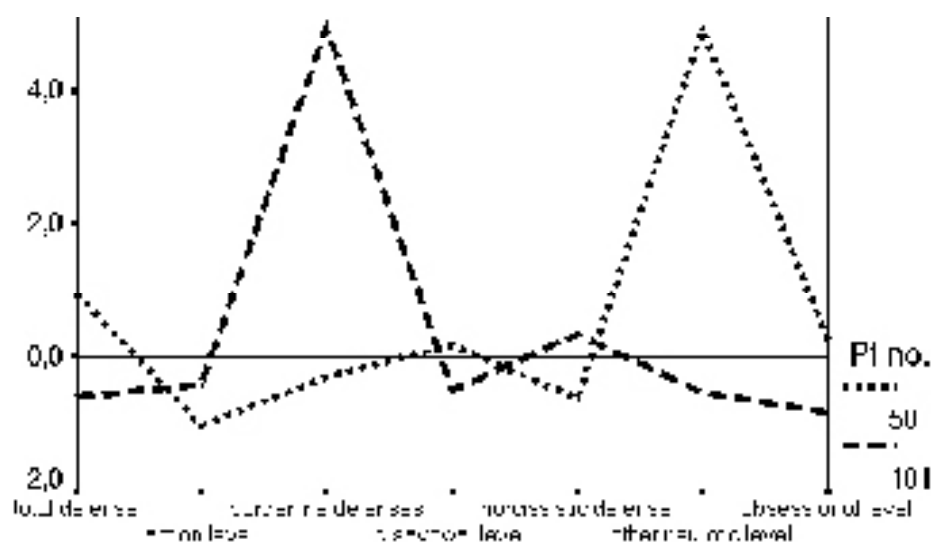


Figure 3 Case study: z-scores of Defence Levels for Patient A and Patient B

ing her to the average, she shows high devaluation, denial and splitting, and her total score is below average. SCL-GSI-score is 1.25, which almost corresponds to the average score of psychotherapy inpatients with neurotic disorders (1.29). She scores high on SCL factors “obsessive-compulsive”, “depression”, and “anxiety”. Resignation, passive receptivity, and diversion from the disease are coping strategies that she uses more than average. She was transplanted during the first chronic phase, her physician assessed her chance getting cured as good, however, her psychic resistance as not as good; similar ratings were given by the nursing staff.

Listening to the recorded interview modifies somewhat these impression deduced from the scores. Patient A reports on how she was shocked when her diagnosis was confirmed. Leukaemia to her was tantamount to a death sentence at the beginning. Her brother was not a possible donor, so an unrelated donor had to be found. Nobody could help her with the decision in favour of BMT. This is something that she had to decide on her own. She hates nothing more than being told what to do. The patient looked for help outside of conventional medicine. “Choosing the best from what doctors and others had to offer” was her strategy. A non-medical practitioner suggested a special form of diet to her. “My quality of life improved 100 percent”, she reports. He told her about her horoscope and met her secret expectations. If she would manage the next 5 or 6 years, all will be fine. For a long time, she says, she could not decide to undergo BMT. She believed that the time of her death was predetermined. Thus, she could not go wrong in deciding in favour of BMT. She also had psychotherapeutic help. A female friend told her to meet a female psychologist. She was sceptical at first, and guessed that “in the worst case I have wasted my time”. Looking back she assessed these therapeutic contacts as very helpful. She talked about topics that she could not discuss with her husband or with anybody else. All in all, “I had a lot of luck in my life”.

Listening to her one gets the impression of a somewhat childlike person, construing her own reality. So, her position on *f1* seems to be plausible. Perhaps, *f1* reflects

a kind of regression from maturity to earlier stages of development and in this sense to immature behaviour.

Our second case, *patient B* showed 7 defence mechanisms. Her scores are extremely high on repression, reaction formation, denial, and isolation. The total score is above the average. The patient describes herself as above average symptom-free on all SCL scales. Her GSI = 0.10 is evidently lower than for “normal healthy women” (0.39). Her highest score is 0.30 on “obsessive-compulsive” (average = 0.51). Her use of coping strategies of resignation was below average and that of diversion from disease as a strategy above average. The nursing staff reported the same. Her physician assessed her psychic resistance as quite good, but her chances of being cured as only average, although having an HLA-identical related donor and being transplanted in 1st chronic phase.

On the audiotape patient B is heard laughing when reporting on her diagnosis. Her shock, she says, diminished when the doctor mentioned BMT. She gained hope and it was clear to her that she should undergo BMT. Medication was tolerated well by her. She had no urge to talk with somebody about her disease. She managed it and acted as though nothing had happened. She was convinced that the doctors would do their best and she was in good hands. So, she did not think a lot about it. “There will always be a risk, and you have to face it.” Looking toward the time in isolation she expected no problems. Since she likes to be alone, she anticipated that she would have something to read and handicrafts to work with. So, she told her husband that he should not stay with her for the days of radiation and chemotherapy. “At the moment I can’t imagine that it would get worse, I am not very sensible to pain. I don’t fear isolation”, she says. “It will be a success, I’ve come here and I think, I will leave cured.”

The patient talks clearly and distinctly. There is no resignation in her voice. She is reserved and shows nearly no affect during the interview. This case illustrates function f2 quite well. The negative aspects of the disease and procedure are blocked away. A calculated optimism is shown, but optimistic feelings were missed by the listener.

Patient B died 38 days after BMT. Patient A is still alive*.

A preliminary attempt of evaluating the meaning of the two functions

The following considerations focus on the potential meaning of the two discriminant functions (The term validation seems not to be adequate given the low number of cases). What relations exist between psychic symptoms and scores on immature defence (f1) and neurotic defence (f2)? High scorers on f1 would be expected to show some psychic symptoms, namely more than another, scoring low on immature defence. Patients with high scores on neurotic defences show less immature defence mechanisms than high scorers on f1 and people who have low scores on f1 and f2. For measure of symptoms we would therefore expect the following relationship (higher score means

* All 4 patients of cluster 3 are still alive (in cluster 1: 22 out of 49, and in cluster 2: 3 out of 5 patients survived to date). It seems to be a trend for better survival for cluster 3 patients but due to the small number, no significance testing was performed.

more symptoms) for our three clusters (see Figure 1): group 3 > group 1 > group 2.

SCL scores are a measure of impairment of psychic symptoms. Highest scores on GSI and on all of the 8 subscales of the SCL were found in Cluster 3. With the exception of factor "anger-hostility", in which Cluster 1 scored lowest, Cluster 2 had the lowest average scores.

Due to the small number of cases in cluster 2 and 3, significance testing of differences was not performed. However, the pattern 2<1<3 in 8 out of 9 cases is more than would be expected by chance.

We can only speculate how defences should be evaluated in respect to managing a severe disease. At first glance one would expect high scorers on f1 to be less successful than low scorers on f1 or high scorers on f2. The two cases described are contrary to this hypothesis. The answer to this question must be established empirically. In the case of BMT, using immature defence mechanisms may be adaptive behaviour:

The clinical setting demands regressive behaviour of the patient. He has to follow routines and procedures, physicians' and nursing staff's orders, and is expected to comply with medication. This situation is not unlike that of a child who has to obey his parents. And if the patient is a good one, he will get positive attention, emotional support and other kinds of reinforcement.

Probably high scorers on f2 (which show more passive aggression) do not fit the regressive demands of the situation and therefore may arouse negative feelings, emotions, and/or attitudes towards them on the part of the staff, a process of which both parties are likely to be unaware of.

Our further research will also focus on the relationship between coping strategies and defence mechanisms. We think both of these constructs are relevant to the understanding of managing severe diseases. Understanding the defensive structure of patients may help in caring for them. But it seems to soon to give empirically derived directions for psychotherapeutic interventions. If BMT patients profit from a psychosocial intervention programme is under scrutiny in an ongoing study (Grulke et al 2000).

For further research it would be interesting to investigate if defence mechanisms change over time from diagnosis to treatment until recovery or death.

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