Esthetics and Psyche—Part 1: Assessment of the Influence of Patients' Perceptions of Body Image and Body Experience on Selection of Existing Natural Tooth Color

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Purpose: The aim of this research was to test the hypothesis that patients' attitudes toward their body affect their capacity to accurately select their existing natural tooth color. ***Materials and Methods:*** Standard validated psychologic assessments were used to determine a person's perception of body image and experience. Oral images were compared with the patients' perceptions of their natural tooth color, which were then compared with the actual tooth color judged by a dental professional. ***Results:*** For the vital body dynamic and disliking body experience subscales, women exhibited a significantly more negative attitude toward their bodies than men ($P = .000$). Patients with a negative attitude toward their body tended to choose a lighter tooth color. The correlation between patients' and the testing physician's choices of color was $r = 0.540$ for women and $r = 0.746$ for men. ***Conclusions:*** Unhappiness with body image and experience results in poor perception of a patient's own oral image, which in turn results in a patient perceiving that his or her natural tooth color is lighter than that judged by a dental professional. This has clinical implications when trying to achieve patient satisfaction with dental prostheses. *Int J Prosthodont 2012;25:36–43.*

Impairments of perception and experience of the body play a crucial role in both somatic and psychic diseases.[1–3] The term *body image* describes the degree of happiness with one's body or parts of the body, the conscious experience and evaluation of the body as a whole, and the experience of the limits of the body.[4] Body image impairments are central to various psychosomatic diseases and are considered identity disorders with unfavorable prognoses.[5]

Body image is dependent on a variety of biologic, psychologic, and social factors. Studies show that in cases of absence of organic and psychic disorders, sex is the strongest determinant of body image perception. In the Western hemisphere, women have a slightly more negative body image than men. Women generally are more critical of their bodies, dedicate more attention to them, and are more sensitive to health problems.[6]

No studies on body image as it relates to dentistry have been performed, although psychosomatic diseases such as psychogenic intolerance of dentures[7] and burning mouth syndrome (synonymous with glossopyrosis and mucosal pyrosis)[8] have been investigated. The appearance of one's body and particularly that of one's face plays a prominent social and psychologic role in daily life, influencing, for example, a job search or choice of partner.[3,9,10] Moreover, the mouth, being situated in the center of the face, draws attention and strongly influences first impressions.[11] Accordingly, the mouth and teeth are of great importance to an individual's overall appearance and personality.[12,13] When performing a self-evaluation using a questionnaire, most patients with posttraumatic yellow staining of one or more anterior teeth report themselves as unhappy.[14] Most patients feel that dark staining of individual teeth or lacunar anterior teeth are disfiguring.[15] Numerous investigations emphatically show that the choice of tooth color plays a significant role in patient satisfaction with prostheses. According to Sagars,[16] almost half of renewed dentures in the anterior portion of the mouth are

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Table 1 Standard Values for EOB Questionnaire Regarding Self-Evaluation of One's Body

	Scale 1: Unease/ discomfort	Scale 2: Attractiveness/ self-confidence	Scale 3: Accentuation of one's body/sensitivity
Mean	5.32	8.91	11.1
Standard deviation	4.03	2.91	3.77
No. of questions	19	13	20
Negativity	10 (very negative)	< 5 (very negative)	< 7 and > 15 (negative)
Range of values	0 to 19	0 to 13	0 to 20

performed as a result of poor color matching. Thus, matching of tooth color is an important characteristic of perceived quality and can lead to a patient's refusal of a denture for esthetic reasons.

This study tested the hypothesis that patient attitude toward his or her body (a psychic parameter) influences the determination of existing tooth color.

Materials and Methods

One hundred twenty patients were selected at random, considering a balanced share of sex and age, from a total of 2,300 patients at Zahnklinik 2, Department of Prosthodontics, University Hospital Erlangen, Erlangen, Germany, and were divided into groups based on age and sex. The existence of natural teeth or fixed partial dentures, homogenous tooth color in the maxilla, and natural maxillary central incisors free of fillings or caries were defined as inclusion criteria. One hundred twenty patients (60 women, 60 men) formed the test group including 15 women and 15 men in each of four age groups: 31 to 40 years, 41 to 50 years, 51 to 60 years, and 61 to 80 years. Sixty randomly selected dental students of the University Hospital Erlangen formed the control group.

The study was approved by the ethics committee of Erlangen-Nuremberg University FAU, and patients provided written consent to participate.

Psychologic Assessments

Three questionnaires were used to assess parameters relevant to dental medicine and psychology: a patient history form addressing personal data and including questions related to dental rehabilitation in the maxillary anterior area, a standard validated psychologic questionnaire regarding self-evaluation of one's body (EOB),[4] and a standard validated psychologic questionnaire relating to body image (QBI-20).[5]

The EOB is one of the most widespread questionnaires applied in Germany for assessing subjective views of an individual's own body. The questionnaire addresses the following topics: perceived significance of defects involving individual body features; attention, awareness, and attitude toward one's body; identification with one's body; and significance of attractiveness and body care. The EOB comprises three subscales: *(1)* tentativeness/insensibility (19 items), *(2)* attractiveness/self-confidence (13 items), and *(3)* analysis of one's body/sensitivity (20 items).

Questions were formulated in the first person and could be answered by using marks for the possible answers "correct" or "incorrect." Individual scale values were determined by counting the number of marks. The mean value for each subscale was calculated and compared to established reference mean values (Table 1). A minimum of 15 minutes was required to complete the questionnaire.

The QBI-20 questionnaire is very similar to the English Multidimensional Body-Self Relations Questionnaire (MBSRQ) by Cash and Deagle.[1] Compared to the questionnaires by Thompson et al,[17] which have been used in the Anglo-American world, the MBSRQ is especially suited to assess body image. The MBSRQ is well validated (quality factor is matched) and includes affective, cognitive, and behavioral aspects of body image. Structural concurrence of the scale dimensions between the German QBI-20 and the English MBSRQ is evident. The QBI-20 is a short questionnaire assessing impairments of body image and self-evaluation of subjective aspects of experiencing one's body. It was validated in randomized studies in adults and is therefore only appropriate for this population. The QBI-20 comprises two subscales: *(1)* disliking body experience (DBE), which evaluates the exterior and well-being of ones body, and *(2)* vital body dynamic (VBD), which registers power, fitness, and physical health. Each subscale (DBE and VBD) includes 10 items. For the DBE, to prevent test subjects from constantly marking "not applicable" or "applicable" without reading the questions, a lie criterion was included for the answers to items 5 and 19. Assessment was performed using an evaluation form and adding the individual item values.

Table 2 Analysis of the QBI-20 Questionnaire Scores Using the Disliking Body Experience (DBE) Subscale

	Student scores*		Patient scores*	
Percentile	Women	Men	Women	Men
1	11	10	13	12
5	13	12	16	15
10	14	12	17	17
15	15	13	18	18
20	15	14	19	19
30	16	15	21	20
40	17	16	23	23
50	18	17	26	25
60	20	19	27	27
70	22	20	30	29
80	26	21	34	32
85	29	22	37	34
90	30	23	41	37
95	37	26	46	40
99	42	34	48	48

*Scores above the horizontal line indicate approval of one's body image, whereas those below indicate disapproval.

Table 3 Analysis of the QBI-20 Questionnaire Scores Using the Vital Body Dynamic (VBD) Subscale

	Student scores*		Patient scores*	
Percentile	Women	Men	Women	Men
1	19	27	12	10
5	25	32	15	14
10	28	33	17	17
15	31	34	19	20
20	32	35	21	21
30	35	36	23	23
40	36	37	25	25
50	37	38	27	27
60	38	40	30	29
70	40	41	31	31
80	42	42	33	34
85	42	42	35	35
90	42	44	37	38
95	45	45	39	40
99	48	47	43	43

*Scores above the horizontal line indicate an "inactive" experience of one's body (ie, negative body image), whereas those below indicate a positive body image.

The results (mean values) were compared to sample tables. Sample scores differ according to sex, owing to the high significance of sex with regard to body image. A high score on the VBD corresponds to a very "active" experience of one's body, that is, to a positive body image. A high score on the DBE corresponds to strong disapproval of one's body, and thus to a negative body image (Tables 2 and 3). A minimum of 10 minutes was required to complete the QBI-20.

Determination of Tooth Color

Existing tooth color had to be determined by the patients at the present maxillary central incisors independent of a necessity for an oral/prosthodontic rehabilitation in the maxilla. The VITAPAN classic color ring (VITA Zahnfabrik) was used to determine tooth color. The VITAPAN classic color ring consists of 16 colors, with color intensity and lightness coded.[18] Hassel et al[19] demonstrated that the determination of color intensity and shades is significantly simplified using a systematic procedure, as is required using the VITAPAN color ring. The determination of tooth color was done under standardized conditions at the natural maxillary left or right central incisor, which had to be free of fillings or caries lesions. If the color of the maxillary central incisors greatly differed from the remaining teeth, another representative tooth was chosen. Makeup, such as lipstick, was removed, and the clothes of the patients were covered with a light gray neutral cover.

The first color determination was done in the treatment chair under daylight conditions using a daylight lamp (OSRAM LUMILUX DELUX daylight 12-950, Osram). The second determination was done at a north-facing window of the dental clinic between 10 and 11 AM or 2 and 3 PM under moderately cloudy conditions. Both color determinations took place under a 45-degree exposure to light on the labial surface of the tooth and had to be identical before they were reported as the patient's choice. The same procedure was used for color determination by the same investigator for all test subjects. The independent investigator was an experienced dentist in prosthodontics and dental esthetics. He was not included in the planning or organization of the study.

Statistical Analyses

All data were entered into the statistical program SPSS for Windows version 10.0 (SPSS) and evaluated using Microsoft Excel for Windows version 8.0. In addition to generating descriptive statistics, the following tests were applied: the Mann-Whitney *U* test

was used to compare scale scores between groups, the Fisher exact test was used to compare group differences, and the Kruskal-Wallis test was used to compare independent samples of more than two groups. The coefficient of correlation (r_S) was determined using the Spearman rank correlation and ranged between –1 and +1. A value close to 1 indicates a strong correlation and a value close to 0 indicates a weak correlation. *P* values less than .05 were considered significant.

Results

EOB Questionnaire

The mean EOB scores for the patients were almost equivalent to the reference values. The patients scored a mean of 4.38 (reference value: 5.32) for the EOB subscale tentativeness/insensibility, 8.88 (reference value: 8.91) for the subscale attractiveness/self-confidence, and 10.72 (reference value: 11.1) for the subscale analysis of one's body/sensitivity. Body-related tentativeness became stronger with increasing age. The experience of one's body was more negative in elderly individuals. However, it was striking that women paid more attention to their outer appearance than men. Patient age did not affect this measure.

QBI-20 Questionnaire

Using the QBI-20, two dimensions were evaluated (DBE and VBD). Most patients had a positive attitude toward their bodies for the DBE subscale. There was a significant difference (*P* = .000) between the sexes: Only women (8 women) had a negative attitude toward their bodies (DBE). Patient age did not affect the DBE score. Only 6.7% of patients considered themselves weak and physically ill. Unlike the DBE, a significant difference concerning sex was not found for the VBD. Patient age did not affect the VBD score.

Exactly half of all patients who had a negative result on the DBE (a negative attitude toward their bodies) also had a negative result on the VBD. However, no male patients had a negative result on the VBD. Thus, it was only women's scores that deviated from the reference scores for these two scales, indicating a negative body image.

Correspondence Between Questionnaires

Statistical analysis of the QBI-20 and EOB scores showed that there was a significant difference between answers for the DBE subscale and the three EOB subscales. Patients with a negative body image (compared to reference scores) according to the DBE also had statistically significantly different scores compared to patients with a positive body image on all three subscales of the EOB (tentativeness: *P* = .000, self-confidence: *P* = .000, analysis of one's body: *P* = .014; Figs 1a to 1c). The same relationship was found between VBD and EOB scores (Figs 2a and 2b), with the exception of scale 3 (analysis of one's body: *P* = .105). Patients who had negative VBD values compared to reference values scored significantly different for the EOB subscales "tentativeness" (*P* = .001) and "self-confidence" (*P* = .007) than patients with positive VBD values.

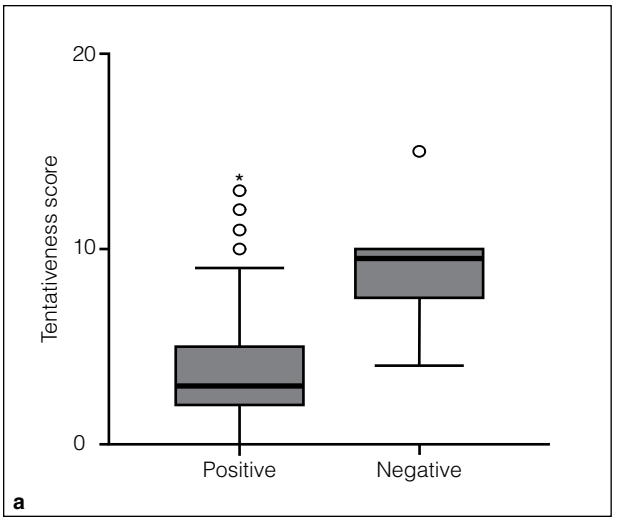
Determination of Tooth Color

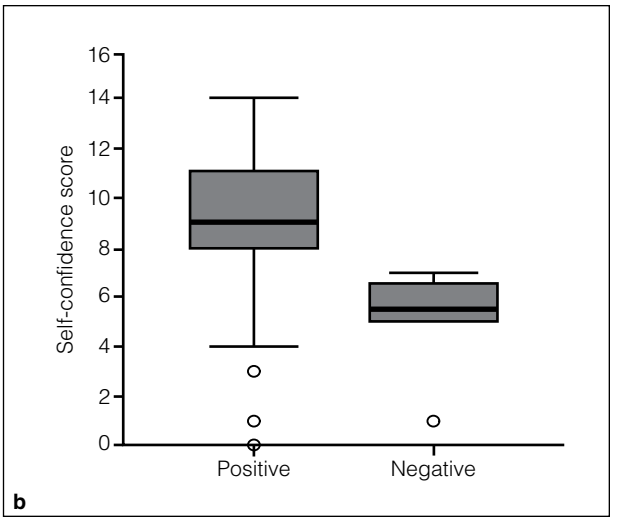
Only 42.5% of patients but 86.7% of the controls chose the same color for their anterior teeth as the testing physician. The coefficient of correlation (r_S) was 0.537 for patients. Within the patient group, there was a significant difference according to sex. The coefficient of correlation was 0.540 for women and 0.746 for men, indicating that women more often chose a different color for their teeth than the testing physician. There was no difference between age groups. The Mann-Whitney test was used for the comparison of patients who did or did not choose their correct tooth color concerning the EOB subscales. A significant difference was noticeable between a correctly or incorrectly selected tooth color and answers for subscale 2 (self-confidence), respectively (*P* = .034).

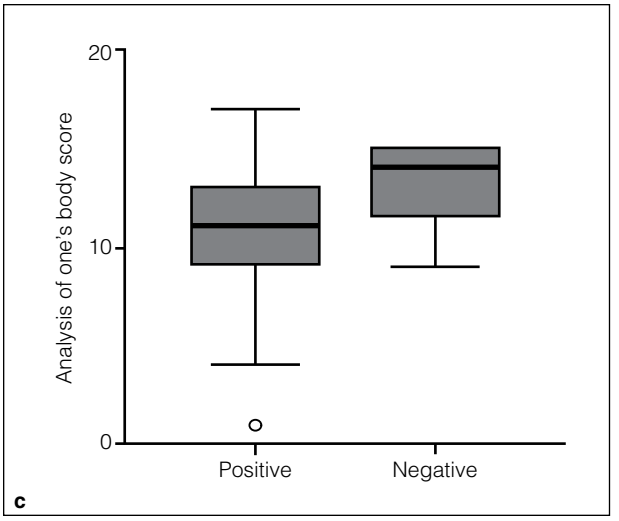
Using the Fisher exact test, no difference was found between selected tooth color (correct or incorrect) and the answers for DBE or VBD subscales of the QBI-20 (two-sided exact significance or one-sided exact significance). Patients who had a negative body image according to the QBI-20 questionnaire and abnormal scores on the EOB scale choose a tooth color two or more shades too light than their natural tooth color. However, seven of the eight patients who disapproved of their body could not definitely determine tooth color, and none of the eight patients who had a negative body image according to the VBD was able to correctly determine the shade of their teeth.

Discussion

No study has assessed the direct correlation between determination of tooth color and self-analysis of the body. Application of standardized psychologic questionnaires helped to assess the correlation between determination of tooth color and body image and body experience.



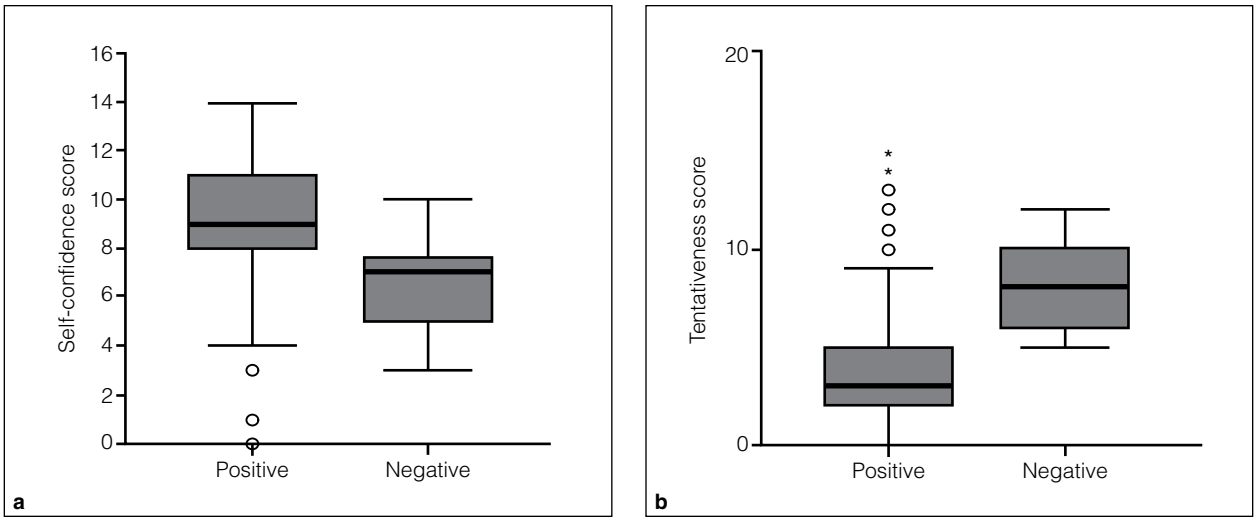




Figs 1a to 1c Relationship between answers to the DBE subscale (positive [n = 112] or negative [n = 8]) and EOB subscales **(a)** tentativeness, **(b)** self-confidence, and **(c)** analysis of one's body. Circles = mild outliers, asterisks = extreme outliers.

Some patients (6.7%) had a negative attitude toward their bodies. Patient evaluations on the DBE, which is primarily focused on physical appearance and coherence and well-being with one's body, were very negative. There was a significant difference between the sexes, since all patients with a negative body experience were women. Women were also over-represented in investigations by Marxkors and Müller-Fahlbusch[20] on patients suffering from psychosomatic disease and intolerance of dentures. This could indicate that women analyze their bodies more intensively and critically than men. This is supported by investigations by Noles et al,[6] where in the Western hemisphere, women were found to have a more negative body image than men. Women generally evaluate their bodies more critically, pay more attention to their bodies, and are more sensitive to health problems.[6] Feingold and Mazzella also confirmed a gender difference regarding body image in which women were more critical of their bodies.[21] In the present study, men and women did not differ with regard to perceived strength or health, but 6.7% of patients felt that they were weak and unhealthy.

Women tended to have higher scores for the EOB subscale attractiveness/self-confidence. It seems that they dedicate more attention to physical appearance and intensively work at concerns regarding health and vigor. All eight female patients who had a negative body image according to the DBE also had nonstandard scores on all three subscales of the EOB. Sex also had a significant impact on all EOB subscales. Women experienced more tentativeness, malaise, and bad feelings regarding their bodies and placed a higher value on their appearance and physical image than men, but they



Figs 2a and 2b Relationship between answers on the VBD subscale (positive [n = 112] or negative [n = 8]) and EOB subscales **(a)** self-confidence and **(b)** tentativeness. Circles = mild outliers, asterisks = extreme outliers.

were also unhappier with their bodies. Comparable findings were also reported for numerous other studies using this questionnaire.[4,22,23] In summary, these results yield the recommendation that dentists should pay attention to female patients regarding esthetics, especially if they are unhappy with their body image.

Patients in the study were between 31 and 80 years of age. The results regarding age suggest that body-related insecurities and concerns increase with age, whereas perceived attractiveness and accentuation of physical appearance decrease accordingly. Body experience becomes more negative with increasing age, obviously reflecting changes in the body that are associated with reduced vigor and increased risk of illness.[24] The effects of age are particularly pronounced for items and scales that indicate increased insecurity and concern regarding the body's functioning. Therefore, dentists can help older patients to stabilize or enhance their confidence by choosing an adequate and satisfying tooth color.

More than half of the patients in this study were unhappy with their tooth color. Tooth color is subject to age-dependent changes resulting from a shift in the refractive index between the enamel and saliva. Oral hygiene, old fillings, and daily life practices such as smoking and drinking red wine or coffee can substantially change tooth color.[25–28] Over time, tooth color becomes increasingly dark. Since white, healthy teeth are associated with youth and purity, unhappiness with tooth color naturally increases with age.

Determination of tooth color is difficult.[29,30] In most cases, it took several minutes to explain the color ring to the patient. Many participants were unable to decide on a tooth color. Only a small minority of patients indicated that they had previously held a color ring. To reduce artificial influences on the difficult determination of the tooth color, determination was carried out under rigorous standardized conditions. The inhomogeneity in the level of prosthodontic rehabilitation in the different age groups was eliminated as much as possible by including only patients with natural central incisors and only fixed partial dentures in the maxilla. Therewith, all patients had to determine the tooth color at an existing natural tooth. This procedure avoids color determinations that represent a patient's wish for tooth color, such as that for a full or partial denture.

Investigations by Anusavice et al[29] and McMaugh[30] show that experience plays a large role in determining tooth color. There have been controversial reports in the literature regarding the influence of sex and age. Anusavice et al[29] and Donahue et al[31] confirmed that women are better suited to determine tooth color. However, this was not confirmed in the present study since there was no gender difference among patients; women performed worse than men, independent of age. To reduce exterior influences in the detection of tooth color in the present study, color detection was based on standardized conditions concerning the daylight and weather conditions as well as the color of clothes and use of makeup.

Based on the evaluation of the two psychologic tests, the authors conclude that they provide concrete information regarding psychologically problematic patients. Moreover, there seems to be a correlation between determination of tooth color and

"mentally problematic" patients for whom teeth play an important role. All "psychically problematic" patients choose a tooth color lighter than their natural one. The eight female patients who had a negative body image according to the QBI-20 questionnaire and abnormal scores on the EOB scale chose a tooth color much lighter than their natural color (two or more shades too light). The results of the study can be interpreted to conclude that "psychically problematic" patients seem not to be able to distinguish between the tooth color they would like to have and the tooth color they think they have.

These results, concerning the correct determination of tooth color, correlated with the EOB scale, and there was only a trend toward correlation with the QBI-20 questionnaire. Since this "extreme appraisal" was only true of eight female patients, further investigations with a larger number of patients are needed to confirm this result.

Conclusion

A correlation between negative attitude toward one's body and determination of tooth color was demonstrated. All patients with a negative body image were unable to correctly determine their tooth color, choosing colors that were too light. Owing to the small number of patients identified as mentally problematic, the findings can only be considered suggestive of the usefulness of the esthetics questionnaire for identifying patients who may present a difficulty during the determination of dental restorative color. However, the EOB and QBI-20 questionnaires seem to be well suited to the identification of patients who project their negative attitude toward their body onto dental characteristics such as tooth color. In a dental office, these psychologic tools are too extensive, time-consuming, and far away from questions that are typical for a general dental/medical history. Based on these findings, the authors feel that further studies involving a larger number of patients and developing an esthetic questionnaire are worthwhile. A simple esthetic questionnaire could be recommended as a clear and practicable indicator in daily dental practice to detect patients with possible mental problems in determining tooth color, shape, and size.

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Literature Abstract

Incidence, risk factors, and outcomes of osteonecrosis of the jaw: Integrated analysis from three blinded active-controlled phase III trials in cancer patients with bone metastases

The aim of this study was to identify the incidence of osteonecrosis of the jaw (ONJ) as well as risk factors and outcomes in patients with metastatic bone disease receiving bisphosphonates. Patients (n = 5,723) were randomly assigned to receive subcutaneous denosumab (120 mg) or zoledronic acid intravenously. Review examinations were carried out every 6 months. This study lasted from 36 to 41 months. Independent adjudicators were responsible for reviewing oral lesions suspicious for ONJ identified by investigators. The Cochran-Armitage test was used to investigate the significant differences in ONJ incidence between treatment groups. Eighty-nine (1.6%) patients were diagnosed with ONJ (52 from the denosumab group, 37 from the zoledronic acid group). The incidence rate between the two groups was not significantly different (P = .13). The following oral events were reported for patients with ONJ: tooth extraction (61.8%), oral infection (48.3%), and jaw pain (82.0%). Patients receiving corticosteroids and antiangiogenic agents were reported to have higher ONJ incidence. Treatments carried out for patients with ONJ include conservative treatment (54%), limited surgery (41%), and resection of the affected bone (< 5%). Among these 89 patients, ONJ had resolved in 32 patients at primary data analysis during this study (October 2010). The authors concluded that ONJ was an infrequent event that should be managed conservatively among patients with metastatic bone disease receiving antiresorptive drugs. They further suggested that the low incidence rate of ONJ in this study could be a result of well-trained investigators in preventive measurement and recognition of early signs of ONJ.

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