Decision-Making in Implantology – A Vignette-Based Study to Determine Clinical Treatment Routines for the Edentulous Atrophic Mandible

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Abstract

Background

The aim of the study was to investigate the influence of possible factors on decision making in the therapy for the severely atrophied edentulous mandible.

Methods

A vignette-based survey among 250 maxillofacial surgeons and oral surgeons on the edentulous narrow atrophic mandible was conducted. Determinants that could influence the therapy decision were patient age, smoking, fear of surgery and radiotherapy in the head and neck area. To achieve a suitable implant site, the options offered to the surgeons were bone split, bone block, augmentation with bone substitute material and bone resection. In addition, there was the option of rejecting any therapy.

Results

The response rate was 46.8%. Resection was preferred by a large majority to all other forms of therapy, regardless of the four determinants. Surgeons tend to refrain from bone block transplants in older patients. Smoking led significantly more often to the rejection of an intervention. Fear of surgery had no influence on the treatment methods, previous radiotherapy treatment only for bone split.

Conclusions

In the narrow atrophic mandible, bone resection is the preferred therapy independent of all determinants. Surgeons tend to refrain from complex and invasive procedures in older patients and generally tend to refrain from interventions in smokers.

Background

An adequate implant bed is the prerequisite for optimal implant positioning. If the resorption of the alveolar ridge is advanced, the conditions for implant surgery become less favorable.¹ In cases with advanced alveolar ridge resorption, augmentation techniques can be used for bone reconstruction to enable successful implant-supported rehabilitation.² This goal can be achieved with various pre-implantological treatment methods. Additive and expansive techniques can be considered. Alternatively, resection of narrow bone crests can lead to a sufficient implant bed.

Additive techniques make it possible to reconstruct the height and width of the bone defect by placing an augmentation material on top. Both, autogenous bone and bone substitute material in granular or block form²⁻⁴ can be used as augmentation material. The frequently used additive techniques include block grafts, augmentation with bone substitute material or augmentation with the aid of a titanium mesh. In expansive techniques, such as bone splitting, a greenstick fracture is provoked by splitting the alveolar ridge into two parts with subsequent stretching.⁵ By this process the alveolar ridge can be stretched to the

desired width. In the case of narrow alveolar ridges with a broad base, the peaked parts of the jawbone can be resected until the bone width is sufficient for an adequate implant site, which allows simultaneous implantation.⁶ However, there is no generally applicable rule that assigns a therapeutic technique to specific clinical situations.

Augmentation and implantation can be accompanied by complications that can affect the surgical procedure and the prognosis. In general, augmentations have a higher risk for complications than the implantological procedure itself.^{7,8} Every additional intervention increases the risk of surgery. In addition to the surgical skills and experience of the surgeon, risk factors and possibly patient interest in implants or fear of surgical interventions might also influence the decision to use a particular surgical technique.

With regard to risk factors, a distinction is made between exogenous, systemic, local and iatrogenic risks. For example, radiotherapy as an exogenous risk factor has a negative influence on the bony blood flow and can lead to radioosteonecrosis.⁹ Irradiation of the jaws, especially the surgical area, therefore has an increased risk of complications. Special measures, such as perioperative antibiotics, might be necessary in such cases. Other local factors are inadequate oral hygiene, periodontitis and smoking.^{10,11} Smoking leads to reduced blood supply to the soft tissues.¹² This can have a negative influence on wound healing¹³ and the incidence of inflammation¹⁴ could be significantly increased.¹⁴

The patient's interest in an implantation, but also the fear of the surgical procedure, might also influence the surgeon in the selection of a suitable therapeutic procedure. The avoidance of very invasive therapeutic procedures is likely to be determined primarily by the patient's age and fear of surgery. In older patients, for example, it can be sensible to avoid more complex treatment methods with higher risks, longer treatment times and increased surgical trauma and to prefer more minimally invasive techniques with less effort and shorter treatment times instead. It is also known that dental fear leads patients to reject implantation.¹⁵ Therefore, a careful medical history should be taken from the patient and taken into account in pre-implantological planning.

A method to investigate the influence of the above described risk factors at different levels on the selection of augmentation methods by clinical specialists are case vignettes. Such case vignettes are typified case descriptions and are used in comparative health care research for the experimental investigation of health care decisions.^{16,17} In terms of methodology, they are between theory and real patient cases. A prospective study has shown that case vignettes have comparable informative value in terms of medical practice as a systematic evaluation of medical records and standardized medical patients.¹⁸ With the help of clinical case vignettes, the understanding of care processes can be deepened. They enable the scientific monitoring of innovative clinical developments.¹⁹ Case vignettes provide a valid and comprehensive method that focuses directly on the treatment approach in clinical practice. They are a cost-effective method for measuring the quality of care provided by a group of physicians.^{18,20-22}

The aim of the present study was to investigate with help of case vignettes to what extent the factors "age", "patient's interest in implants" vs. "patient's fear of implantation", "co-morbidity" and "smoking" influence the treatment decision of designated specialists in dental implantation.

Methods

The present study was conducted as a vignette-based survey. For this purpose, a questionnaire was prepared and sent in hardcopy by mail to 250 maxillofacial surgeons and oral surgeons working in private practice who were authorized to conduct specialist training in oral surgery. The existence of an authorization for specialist training ensured that these surgeons were experienced specialists themselves. All specialists to be surveyed were contacted by telephone before the questionnaire was sent out. In the telephone conversation they were informed about the nature and aim of the survey. It was also asked whether there was willingness to participate in the study. Refusals were respected. If, after several attempts, contact was not possible, the interviewee received the questionnaire without special notice.

The study was conducted in accordance to the Declaration of Helsinki and the Professional Code for Physicians of the local Medical Council. The Ethics Committee of the Saarland Medical Council reviewed the study and approved the proposed study (Ref. No.: 133/11).

Structure of the questionnaire

The questionnaire, relevant for this publication, consisted of clinical case vignettes with the request to choose the preferred treatment option. The original questionnaire can be found in the supplemental files (S1). This publication deals with clinical case vignettes of the mandible.

Clinical case vignettes

The questionnaire contained case vignettes relating to the implantological therapy of the edentulous mandible to collect the indication routines of the respondents. The respondents were presented with two patient cases with the corresponding real clinical findings. The case vignettes contained an anamnesis, clinical findings and x-rays (Orthopantomograms and cone beam computed tomography (CBCT) excerpts).

Variable descriptors

Each case vignette had variable descriptors in the anamnesis. The two risk factors "smoking behaviour" as a local risk factor and the comorbidity "radiotherapy" as an external risk factor were chosen as one set of descriptors. Another set of descriptors were "age of the patient" and "anxiety". In the individual vignettes a low or high patient age, smoker or non-smoker, no or existing co-morbidity and no or existing fear of surgery were specified. By using a random generator when creating the vignette sets, these vignette characteristics were distributed independently of each other. By means of such planned variance of individual determinants, decision patterns and causes for favoring a certain therapy can be determined. The aim was to show whether older patients, smokers and comorbid patients result in

different therapeutic decisions than younger patients, non-smokers or patients without comorbidity. The given response treatment options covered the three methods mentioned above (additive, subtractive and resective methods) for creating a wide implant site in a narrow atrophic alveolar ridge.

Five maxillofacial and oral surgeons tested the questionnaire for practicability (comprehensibility, consistency of content of the findings and measures) before sending it out to the intended sample.

Description of the clinical case vignettes

Case vignette 1 ("Lower jaw with residual dentition that cannot be preserved"):

This clinical case vignette was intended to assess the influence of age and smoking habit on the clinical decision.

The presented patient had an insufficient mandibular denture. The wish of the patient was a prosthetic restoration on implants. The pantomographic and CBCT findings (see Figs. 1 and 2) showed a reduced width of the mandible. The referring dentist aimed for a fixed prosthesis in the mandible on four implants. Teeth 33 and 43 were classified as not worth preserving. Thus, edentulism in the lower jaw loomed. The first vignette variance was the patient age (55 or 75 years), the second was the smoking status:

The following variants were therefore incorporated into the vignettes:

Combination 1: *Age of the patient 55 years, patient is non-smoker*

Combination 2: *Age of the patient 55 years, patient is a smoker*

Combination 3: *Age of the patient 75 years, patient is non-smoker*

Combination 4: *Age of the patient 75 years, patient is a smoker*

Case vignette 2 ("toothless lower jaw"):

This clinical case vignette was intended to determine the influence of a previous radiotherapy treatment in the cervical area and the patient's attitude towards the intended treatment. The case involved a 73-year-old female patient who had been edentulous for ten years and could not cope with her complete denture in the lower jaw (repeated decubitus treatments). During the radiotherapy, the jawbone had not been in the radiation field and the salivary flow seemed to be unaffected. X-rays (Orthopantomogram and CBCT, Figs. 3 and 4) in this case showed an atrophic lower and upper jaw with a narrow atrophic mandibular ridge. The referring doctor's preference was a removable denture in the mandible on four implants.

The following variants were incorporated into the vignettes:

Combination 1: *No systemic diseases, the patient is very interested in a prosthetic restoration on implants*

Combination 2: No systemic diseases, the patient is rather anxious and repeatedly demands an explanation of the procedure

Combination 3: Radiation treatment in the neck area, the patient is very interested in a prosthetic restoration on implants

Combination 4: Radiation treatment in the neck area, the patient is rather anxious and repeatedly demands an explanation of the procedure

The surgeons surveyed were asked to indicate for both vignettes how they would proceed in each case. For this purpose, five uniform possible options were given: Bone split, bone block, augmentation with bone substitute material, resection and general approval of therapy.

For all therapy options it was possible to tick "yes", "not at all" and "possibly". The option "Yes" represented the therapy of the surgeons first choice, "by no means" represented, that this therapy is not recommended to the opinion of the surgeon and "possibly" stood for "I am considering this option, I will decide intraoperatively".

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

Data evaluation

The data from the questionnaires was collected using Microsoft Excel and analyzed using IBM SPSS Statistics 21 (IBM SPSS Statistics, IBM, Armonk, New York, United States) on Windows XP.

The evaluation was performed with complete data sets. Missing data from study participants were excluded on a case-by-case basis. Crosstabs were used as statistical procedures. Binary logistic regressions were used for dependent characteristics. It was examined whether the respondent's specialist designation (maxillofacial vs. oral surgeon) was associated with the preferred care. A probability of error of $p < 0.05$ was interpreted as a statistically significant finding.

Results

Out of the 250 questionnaires, 117 were returned. The response rate was thus 46.8%.

The combinations of characteristics in the returned 117 questionnaires were distributed in a similar way to the sample sent out (about a quarter of 250 each) (Table 1).

Table 1
Distribution of the vignette combinations of the
returned questionnaires (N = 117)

	Case vignette 1	Case vignette 2
	N (%)	N (%)
Combination 1	31 (26.5)	29 (24.8)
Combination 2	35 (29.9)	28 (23.9)
Combination 3	26 (22.2)	35 (29.9)
Combination 4	25 (21.4)	25 (21.4)

Outcome scale for case vignette 1 (edentulous lower jaw)

The statistical analysis showed (Fig. 5) that 81.3% of the respondents generally were in favor of treatment and only 6.3% were ultimately against treatment, 12.5% would "possibly" treat. Almost one in two (48.6%) indicated bone resection as the therapy of choice. 24.8% of all surgeons favored bone replacement materials. Bone block grafts were favored by only 4.1%, but rejected by 63.9% of the respondents. Bone split as the therapy of choice was only indicated by 10.1%, but 43.4% indicated that they would not use this technique in this case.

The binary logistic regression did not reveal any association of the possible therapy modalities with the specialist designation (maxillofacial vs. oral surgeon), here parameterized as a dependent variable (Table 2).

Table 2

Association between the dependent variable "specialist designation" (maxillofacial vs. oral surgeon) and the independent variables "bone split", "bone block", "bone substitute material", "bone resection" and "therapy recommended" for case vignette 1.

	Regression coefficient B	Standard error	Forest	df	Sig.	Exp(B)
Bone split	.189	.249	.575	1	.448	1.208
Bone block	.069	.253	.075	1	.784	1.072
Bone substitute material	-.262	.266	.973	1	.324	.769
Bone resection	.207	.315	.431	1	.511	1.230
Therapy recommended	.263	.302	.758	1	.384	1.301
Constant	-.675	.467	2.090	1	.148	.509
Nagelkerkes R-squared 0.50.						

However, the analysis showed a significant association between patient age (2 groups) and "bone block" and "bone substitute material" as a choice of therapy for edentulous jaws (Table 3). "Bone block" was more likely to be rejected in older patients and "bone substitute material" was more likely to be approved than in younger patients.

Table 3

Association between the dependent variable "patient age" (55 years vs. 75 years) and the independent variables "bone split", "bone block", "bone substitute material", "bone resection" and "therapy recommended" for case vignette 1

	Regression coefficient B	Standard error	Forest	df	Sig.	Exp(B)
Bone split	.137	.257	.284	1	.594	1.146
Bone block	.532	.268	3.951	1	.047	1.702
Bone substitute material	– .556	.280	3.953	1	.047	.574
Bone resection	– .337	.323	1.091	1	.296	.714
Therapy recommended	.217	.316	.473	1	.491	1.243
Constant	.533	.469	1.294	1	.255	1.704
Nagelkerkes R-squared 0.50.						

Smoking was not associated with the different possible choices of therapy, but smoking was significantly associated with a general refusal of treatment. (Table 4).

Table 4

Association between the dependent variable "smoking" (smoker vs. non-smoker) and the independent variables "bone split", "bone block", "bone substitute material", "bone resection" and "therapy recommended" for case vignette 1

	Regression coefficient B	Standard error	Forest	df	Sig.	Exp(B)
Bone split	.323	.265	1.482	1	.223	1.381
Bone block	– .182	.271	.452	1	.501	.833
Bone substitute material	.226	.277	.666	1	.415	1.254
Bone resection	– .369	.333	1.229	1	.268	.691
Therapy recommended	-1.080	.374	8.356	1	.004	.340
Constant	.508	.482	1.111	1	.292	1.662
Nagelkerkes R-squared 0.50.						

Under "other", the most frequent statements were "no fixed prosthesis on four implants" (N = 15, 13.3%) and "more implants for fixed restoration" (N = 5, 4.4%). In addition, combinations such as bone resection together with bone substitute material or autologous bone mixed with bone substitute material were suggested. Plasma Rich Growth Factor (PRGF), shell technique, the use of Astra Profile implants, and smoking ban were also among the free texts.

Outcome scale for case vignette 2 (edentulous lower jaw)

The evaluation showed (Fig. 6) that 81.6% of the respondents supported a therapy in case vignette 2 and only 1.8% refused treatment. More than 2/3 (68.1%) of the surgeons indicated resection as the therapy of choice. Bone block transplants were favored by only 11.7%, but rejected by 75.5% of the respondents. Bone split as the treatment of choice was only proposed by 14.3%, but 61.2% indicated that this technique should not be used in this case.

The specialist designation (maxillofacial vs. oral surgeon) was not associated with any kind of therapy decision in the binary logistic regression analysis (Table 5). Radiation of the neck area was only significantly associated with the bone split technique (Table 6), where the rejection of a bone split was significantly higher. The fear of a surgical intervention had no statistically significant association with the possible therapy (Table 6).

Table 5

Association between the dependent variable "specialist designation" (maxillofacial vs. oral surgeon) and the independent variables "bone split", "bone block", "bone substitute material", "bone resection" and "therapy recommended" for case vignette 2.

	Regression coefficient B	Standard error	Forest	df	Sig.	Exp(B)
Bone split	.175	.268	.424	1	.515	1.191
Bone block	– .438	.380	1.332	1	.248	.645
Bone substitute material	– .303	.257	1.396	1	.237	.738
Bone resection	.777	.416	3.495	1	.062	2.175
Therapy recommended	.175	.282	.387	1	.534	1.191
Constant	– .987	.574	2.960	1	.085	.373
Nagelkerkes R-squared 0.50.						

Table 6

Association between the dependent variable "previous radiotherapy" (yes vs. no) and the independent variables "bone split", "bone block", "bone substitute material", "bone resection" and "therapy recommended" for case vignette 2.

	Regression coefficient B	Standard error	Forest	df	Sig.	Exp(B)
Bone split	.607	.276	4.829	1	.028	1.835
Bone block	.611	.354	2.989	1	.084	1.843
Bone substitute material	– .423	.262	2.610	1	.106	.655
Bone resection	.135	.384	.124	1	.724	1.145
Therapy recommended	– .330	.296	1.246	1	.264	.719
Constant	– .075	.546	.019	1	.890	.927

Table 7

Association between the dependent variable "readiness to involvement" (anxiousness vs. interest in implant therapy) and the independent variables "bone split", "bone block", "bone substitute material", "bone resection" and "therapy recommended" for case vignette 2.

	Regression coefficient B	Standard error	Forest	df	Sig.	Exp(B)
Bone split	– .231	.257	.805	1	.369	.794
Bone block	.386	.334	1.337	1	.248	1.472
Bone substitute material	– .307	.247	1.544	1	.214	.735
Bone resection	.153	.371	.171	1	.679	1.166
Therapy recommended	– .117	.279	.176	1	.675	.890
Constant	.393	.534	.540	1	.462	1.481
Nagelkerkes R-squared 0.50.						

Under "other", the most frequent response was the use of diameter-reduced implants (N = 6, 5.2%) and only two instead of four implants (N = 3, 2.6%). Vestibuloplasty, PRGF, certain shell techniques, and the combination of bone resection with bone substitute material were also mentioned.

Discussion

The present study dealt with the implantological decision-making process in the edentulous mandible. The objective was to determine the influence of various factors such as "age", "readiness to involvement",

"co-morbidity" and "smoking" on the treatment decision in the narrow atrophied edentulous mandible by using case vignettes. The response rate of almost 47% achieved can be classified as high, especially against the background that no incentives were provided in the study. Mehlkop and Becker²³ stated in their study that a response rate of approximately 28% was to be expected if the respondents did not receive any reward and of approx. 52% if an incentive was provided.

Every physician develops clinical routines in the course of his or her professional life, which he or she uses in his or her practice to provide good and reliable care.²⁴ These routines concern diagnostics and decision-making as well as the performance of the actual medical procedure. In the decision-making process, the physician has the duty to identify technically responsible ways to solve the clinical problem that exists on the patient's side. Often there are several options for achieving this goal. Clinical case vignettes offer a practicable option for determining the decision making of a large number of physicians. Here case vignettes have a comparable validity as a systematic medical record evaluation or an evaluation with standardized patients^{18,20-22}

In the present study, both case vignettes included the therapy options of bone split, bone block, the use of bone substitute material and bone resection. In addition, there was the option to generally approve or reject therapy in the given case. Bone block and bone split are the more complex therapy forms of the four options. In addition, block transplantation with autologous bone always requires a donor region, which leads to additional trauma with chances of increased postoperative symptoms and increased surgical risk.²⁵ While bone resection usually can be done with simultaneous placement of implants, bone block transplantation often requires a second operation a few months later.^{6,26,27}

With case vignette 1 it could be shown that more than 80% of the surgeons approved of a therapy for the narrow atrophic edentulous mandible. Altogether, bone resection was preferred by a large majority over any other treatment option. In all four combinations of this case vignette, bone resection was the "therapy of my choice". The use of bone substitute material followed at a considerable distance. This seems to be reasonable, since both techniques usually allow simultaneous placement of implants and the surgical risk seems to be acceptable. Bone block transplants and bone split, on the other hand, were rejected with high percentages and had only few supporters. This could be explained by the reasons mentioned above.

Case vignette 2 showed a similar, but even more pronounced pattern. A therapy was somewhat more clearly advocated and bone resection was even more popular. Bone substitute material followed at a substantial distance. Bone block transplants and bone split were rejected even more strongly.

However, patient age was significantly associated with bone block and bone substitute material in vignette 1. With regard to bone block transplants, it can be assumed that patients of higher age are more likely to suffer from postoperative discomfort and should be spared a longer treatment period. Smoking also led to a significantly higher refusal of treatment. This is comprehensible, as tobacco consumption leads to higher infection rates and in the long term tends to promote periimplantitis.^{28,29} The comparison of the determinants "age" and "smoking" showed that age had a lower influence on the decision to

recommend a therapy than smoking. The participants therefore decided not to do "age-rationing", but to take into account the oral health status, which experience has shown to be associated with smoking. Reasons for this could be that placing implants in the lower jaw is successful in the long term even at an advanced age³⁰ and moreover higher patient satisfaction can be achieved.³¹

Case vignette 2 showed that the patients' anxiety had no correlation with the treatment methods chosen. An already performed radiotherapy treatment in the neck area was only significantly correlated with bone split. This option was only rarely chosen, while bone resection was the therapy of choice for most of the specialists. As mentioned above, bone resection offers the possibility of simultaneous placing implants and avoids augmentation procedures. Therefore, bone resection is particularly suitable for anxious patients and avoids a complex procedure in post-radiation conditions. Both determinants did not, however, lead to the general exclusion of surgical treatment.

The most serious complication of radiotherapy is radiation necrosis of the bone.³² This is an irreversible, progressive devitalization of the irradiated bone. The clinical manifestation may be pain, orofacial fistulas, exposed necrotic bone, pathological fractures and putrid infections.³³ For these reasons, radiotherapy is actually considered a risk factor.³⁴ The fact that many surgeons were nevertheless in favor of surgery may be due to the fact that the mandible was not in the direct radiation field.

Conclusion

The present vignette-based study showed that in the narrow atrophic mandible, bone resection is by far the preferred therapy by maxillofacial and oral surgeons for patients of all ages, smoking behaviour, previous radiotherapy treatment and fear of surgery. Bone resection can avoid augmentation and thus allows simultaneous placing of implants without the need for a second surgical intervention.

The specialist designation had no influence on the choice of therapy. In older patients, surgeons tended to refrain from complex procedures and avoid bone donor regions. Tobacco consumption by patients, on the other hand, tends to lead to therapy avoidance. The fear of surgery has no significant influence on the therapy decision and radiotherapy in the neck area only leads to lesser use of bone split.

The results showed that the survey participants take the above-mentioned patient characteristics into account when making therapy decisions. Comparative studies should be carried out on the superiority of individual treatment methods over others.

Abbreviations

BSM = bone substitute material

CBCT = cone beam computed tomography

df = number *of* degrees *of* freedom

Exp(B) = Effect coefficient (B)

mm = millimeters

N = number

PRGF = Plasma Rich Growth Factor

S1 = supplemental files

p-value = probabilitas

% = percent

R-squared = Coefficient of determination

Sig. = significance

Therapie rec. = therapy recommended

vs. = versus

Declarations

- Ethics approval and consent to participate: The Ethics Committee of the Saarland Medical Council reviewed the study and approved the proposed study (Ref. No.: 133/11). The participants were informed about the study by telephone and that participation in it is voluntary. In addition, information was provided about the positive ethical vote on this survey. The declaration of consent was obtained orally and was confirmed by returning the questionnaire. Participants who did not want to take part in the study orally refused the declaration of consent or did not return the questionnaire. The ethics committee did not ask for a written confirmation of participation.
- Consent for publication: The authors agree to the publication under the guidelines of BMC.
- Availability of data and materials: We provide the data as supplementary files
- Competing interests: The authors declare no conflict of interests.
- Funding: The study was not funded.
- Authors' contributions:

Statement listing the contributions made by each of the authors

- *KM*: Design, statistics, data analysis/interpretation, drafting article, approval of the submitted version.
- *WW*: Design, statistics, drafting article, approval of the submitted version.
- *BR*: Design, statistics, approval of the submitted version.

- *AS*: Data collection, data analysis/interpretation, approval of the submitted version.
- *MH*: Drafting article, data analysis/interpretation and approval of the submitted version.

AB: Drafting article, data analysis/interpretation approval of the submitted version.

All authors have read and approved the manuscript

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Figures

Figure 1

Panoramic tomography of the first case vignette. In the lower jaw the remaining teeth 33 and 43 are present. Tooth 33 shows apical periodontitis. There is a bony height deficit in the premolar and molar area of the lower jaw.

Figure 2

Sagittal plane from the CBCT of region 32-34 and 42-44 of case vignette 1. The alveolar ridge is substantially atrophied in the crestal region. The widths of the alveolar ridge (mm = millimeters) are provided in the respective cut-outs. The alveolar ridge height is sufficient.

Figure 3

Panoramic radiograph of case vignette 2: The alveolar ridge is atrophied in both the upper jaw. In the premolar and molar region of the mandible the bone height is insufficient. There is sufficient bone height interforaminarily.

Figure 4

Sagittal planes from CBCT of regions 32, 34, 42 and 44 of case vignette 2. The alveolar ridge is substantially atrophied in the crestal region. The widths of the alveolar ridge (mm = millimeters) are provided in the respective cut-outs. The alveolar ridge height is sufficient.

Figure 5

Preferred therapy decisions of the surgeons surveyed for the restoration of the edentulous severely atrophied mandible according to the four different combinations of "patient age" and "smoking". Case vignette 1.

Figure 6

Preferred therapy decisions of the surgeons surveyed for the restoration of the edentulous severely atrophied mandible according to the four different combinations of "radiotherapy" and "anxiety". Case vignette 2.

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