The influence of video imaging on patients' perceptions and expectations

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The number of patients treated with orthodontics combined with orthognathic surgery to correct moderate to severe dentofacial deformities has been steadily increasing. An estimated 1.2 million people in the United States could benefit from orthodontic/ orthognathic surgical treatment.[1] In university-based programs at the University of North Carolina and the University of Michigan, patients seeking diagnostic services for their dentofacial deformity were shown to be predominantly female (UNC, 2:1; UM, 1.5:1), young adult (UNC, majority aged 15 to 29; UM, average age = 23), and Caucasian (UNC, 92%; UM, 89%).[2,3]

Usually a patient seeks treatment for a complex mixture of esthetic, functional, and dental health reasons. Kiyak et al.[4] reported the most frequently stated motive for seeking orthodontic/ orthognathic surgical treatment was the advice of a professional, most commonly an orthodontist (83% for men and 76% for women). Approximately half of patients indicate esthetic change as a primary motive for treatment.[4,5,6] A desire for functional changes has also been frequently reported as a high motivating factor (41% of males and 29% of females).[4] Barber et al.[3] re-

Abstract

Seventy-four patients, ranging in age from 15 to 50 and presenting with a moderate to severe dentofacial deformity requiring orthognathic surgery, were randomly assigned to a video imaging or a standard case presentation (CP) group. Motives for treatment did not differ significantly between the video image and standard CP groups. Two weeks after the case presentation, 60% of the standard CP group and 74% of the video image group ranked the anticipated change in facial appearance as an important factor in making a treatment decision. Seventy percent of the standard CP group and 83% of the video image group agreed with the statement that surgery would be necessary to correct their problem. In the standard CP group, 47% of the patients ranked dental casts as the most helpful physical record in making a treatment decision, and 46% said the acetate profile tracing was the most helpful tool for understanding what to expect from treatment. In the video imaging group, 42% of the patients said the video imaging presentation was the most helpful tool in making a treatment decision, and 39% of the patients said it was the most helpful tool for understanding treatment expectations. The proportion of patients in the video image case presentation group with elevated self-image expectations following treatment was significantly higher (P=.045) than in the standard case presentation group. The presentation of video images appears to be a valuable information source for conveying treatment options to patients, but caution may be needed to prevent elevated or possibly unrealistic treatment expectations.
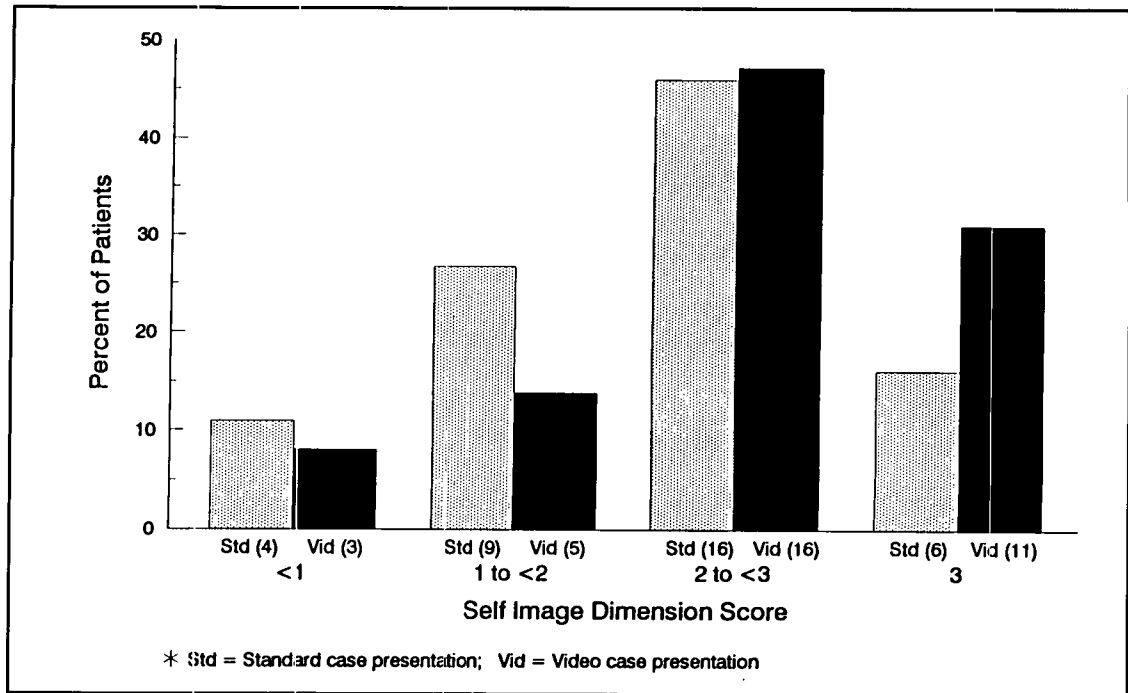
Keywords

Video image • Clinical trial • Patient perception • Patient expectation

Figure 1
A comparison of the self-image dimension from the long-term expectancies questionnaire for the standard and video image case presentation groups.

Figure 1

ported that of 505 patients, 52% had esthetic/dental complaints, 17% had masticatory problems, and 14% had esthetic/facial motives for seeking treatment.

Several techniques can be used at the case presentation appointment to illustrate the anticipated surgical result and the effect on esthetics. A patient's lateral photograph can be cut with portions moved to predict the surgical result. Disadvantages of this technique are "gaps" created by the photograph alteration and the inability to alter soft tissue contours. A more common method is the use of acetate tracings or computer plots of predicted postsurgical profiles from digitized tracings. Treatment options presented in this way are clear to the dental specialist but may be difficult for patients to understand. Patients who are unable to adequately comprehend the treatment options presented or who misinterpret the possible effects of treatment may develop inappropriate presurgical expectations or heightened presurgical anxiety, which have been shown to contribute to postsurgical dissatisfaction.[7,8]

With the development of new computer capabilities in the late 1980s, alterations to a video image of the patient can now be included in orthognathic surgical workups.[9,10,11,12] Simultaneous hard and soft tissue changes can be made through the use of algorithms relating soft to hard tissue. Some practitioners believe that this new technology should be used with caution due to the lack of knowledge in predicting soft tis-

sue change.[12,13] Another concern relates to the possibility that a patient may interpret the video image presentation as an implied guarantee of postsurgical results.[9,12,13] Unfortunately, the systems currently marketed for orthognathic surgery only effect soft tissue changes on the video-captured profile image. Transverse changes on frontal images are possible but these cannot at present be related to profile cephalometric changes and are purely subjective predictions made by the clinician.

A retrospective patient survey[9] and comments of clinicians[14] suggest that this technology may give patients a better understanding of the surgical options and help them make informed treatment decisions. However, no systematic research project has been undertaken to examine the effect of video imaging on patient's perceptions and expectations of the treatment process. In this study, patients with moderate to severe anteroposterior and/or vertical dentofacial developmental deformities presenting at UNC for diagnosis and treatment planning were randomly assigned to a video image case presentation or a traditional case presentation format. The purpose of this project was to assess patients' impressions of video imaging as an information source and to evaluate whether the incorporation of video imaging into the case presentation affected their expectations.

Table 1
Percentage of patients who rated each motive as "very much a reason (4)" for seeking treatment

| | Presentation group | |
	Standard %	Video %
Self-image		
Improve appearance of teeth	68	70
Improve facial appearance	49	62
Feel better about myself	41	54
Oral function		
Improve fit of upper and lower teeth	70	70
Improve chewing ability	27	35
Prevent pain or damage to jaw joint	35	41
Future dental health		
Prevent periodontal disease	24	19
Prevent tooth loss in the future	30	24
General well-being		
Increase my confidence	24	35
Improve speaking ability	16	14
Improve my social life	14	16
Improve general health	11	16
Improve work or school performance	11	3
Please my family	3	5

Table 2
Percentage of patients who rated each item as "will be much better (+3)" after treatment

| | Presentation group | |
	Standard %	Video %
Self-image		
Appearance of teeth	68	75
Appearance of face	46	69
General appearance	30	47
Feelings about self	30	44
Oral function		
Fitting front teeth together	84	69
Fitting back teeth together	49	56
Biting into foods	30	39
Chewing	27	33
General well-being		
Socializing	19	25
Being out in public	16	14
General health	8	6
Performance in work or school	5	11
Speech	5	6
General health		
Popping and clicking of the jaw	16	3
Pain and soreness in front of ear	5	9
Headaches	8	17
Sleeping	5	11
Appetite	0	3

Materials and methods

Caucasians between 15 and 50 years of age who had developmental anteroposterior and/or vertical problems for which orthognathic surgery was a viable treatment option and who were seen between November 1990 and February 1994 for a pretreatment consultation in the Dentofacial Deformities Program at the University of North Carolina were eligible to participate in this project. Patients with asymmetry were excluded because transverse surgical predictions are not available using the current video image techniques. In addition, patients with craniofacial anomalies, deformities due to acute trauma, multiple missing teeth, or a primary complaint of temporomandibular joint problems were excluded from participation because their presenting problems result from different etiologies and generally follow a different treatment history. Of the 90 eligible patients, 89 agreed to participate in this project and signed informed consent forms. Fifteen of the 89 patients did not complete the data collection phase and were not included in the analyses. A surgical treatment plan was recommended for all patients.

During the initial records appointment, a profile video image was taken and patients were asked to complete a modified Motives for Treatment[15] questionnaire (Table 1). Three social motives were added to the original 13: to improve my social life, to please my family (significant other), and to increase my confidence. The patients rated each motive using a four-point scale from "not at all a reason (1)" to "very much a reason (4)." Factor analysis identified four dimensions: self-image, oral function, future dental health, and general well-being. Cronbach's alpha for these four dimensions ranged from 0.67 to 0.81.

Patients who agreed to participate were allocated to a standard case presentation or a standard plus video image prediction presentation

Table 3
Percentage of patients who rated each item on the patient reactions questionnaire as important[1] in making their treatment decision

	Standard group %	Video group %
Change in facial appearance	60	74
Recommendation	51	46
Improved chewing ability	49	29
Cost of treatment	38	49
Physical discomfort	35	23
Length of treatment	38	29
Seeing the video image prediction	NA	27
Seeing the profile tracings	3	11
Personality of surgeon	3	0
Personality of orthodontist	3	6

[1]Ranked 1st, 2nd, or 3rd in importance.

Table 4
Percentage of patients who rated each physical record as most helpful in making a treatment decision and as most helpful in understanding what to expect from treatment

	Treatment decision Standard %	Video %	Expect from treatment Standard %	Video %
Dental models	47	31	44	14
Video imaging	NA	42	NA	39
Acetate profile tracings	17	6	46	29
Facial photographs	31	20	11	24

group in alternating order based on the patients' initial appointment sequence. Surgical predictions were produced for patients in the video image group using the Prescription Planner/ Portrait system. The video image surgical predictions were prepared by one of two investigators (BJH and CC) before each patient's case presentation appointment.

Before the case presentation appointment, patients viewed a videodisc on orthognathic surgery produced by Videodiscovery, Inc (Videodiscovery Inc, Seattle, Wash, © 1987). This program provides information, using a menudriven format, about each type of surgery, diet, anesthesia, pain and swelling, and potential post-

operative problems. The inclusion of the videodisc as a routine part of patient preparation helped to insure that all patients could make treatment decisions with a common knowledge base. A checklist was also used to standardize the case presentations. Skeletal/dental problems and treatment alternatives were explained to the standard case presentation patients using pretreatment photographs, dental models, and radiographs with the planned surgical treatment options completed on acetate paper. The video image group had an identical case presentation format but had, in addition, a video imaging session. At this session, one individualized video image surgical prediction, planned and approved by the attending orthodontist and/or surgeon, was shown to the patient by BJH or CC, second year orthodontic residents. A checklist was used to insure that the information communicated to the two groups of patients about the effect of surgery was as similar as possible, except for the visual effect of seeing the video image surgical prediction.

One week after the case presentation, questionnaires to assess long-term expectancies of treatment[16] and patient reactions to the case presentation format were sent, with self-addressed stamped envelopes, to all patients. Long-term expectancy items (Table 2) were rated using a seven-point scale ranging from "will be much worse after treatment (-3)" to "will be much better (+3)." Factor analysis identified four dimensions: self-image, oral function, general well-being, and general health. Cronbach's alpha for these four dimensions ranged from 0.71 to 0.91. The patient reaction questionnaire asked patients to rank a list of items from the most important (#1) to the least important (#9/10) consideration in making their treatment decision (Table 3) and to rank the physical records [facial photographs, dental models, acetate profile tracings, and video image (video group only)] used in the case presentation from the most helpful (#1) to the least helpful (#3/4) in making their treatment decision and in understanding what to expect from treatment (Table 4). In addition, patients were asked to respond on a 1 (strongly agree) to 5 (strongly disagree) scale to the following statement: "At this time, I feel that surgery will be necessary to correct my problem." Patients were paid $10 if they returned their questionnaires within 3 weeks.

The Mantel Haenszel row mean score statistic[17] was used to compare the distribution of the dimension scores from the motives for treatment, and long-term expectancies question-

Table 5
Demographic and clinical characteristics of patients assigned to the
standard and video image presentation format

Characteristic	Standard (n = 37)				Video image (n = 37)			
	Mean	Std	Min	Max	Mean	Std	Min	Max
Age	24.1	7.9	14.6	42.9	25.0	8.7	15.1	47.5
SNA	81.6	4.8	69.3	91.3	80.8	3.0	73.6	86.0
SNB	79.4	6.2	62.1	92.8	78.5	5.3	69.8	90.1
ANB	5.0	2.7	0.4	10.9	5.1	2.3	0.0	9.9
AFH	127.8	8.7	110.1	143.7	125.2	9.9	108.8	151.0
Md Plane Angle	36.0	9.2	12.2	65.4	36.8	7.6	18.5	51.1
OJ	3.6	5.2	-5.5	16.5	4.3	4.8	-6.6	11.1
OB	1.7	5.7	-16.3	15.5	2.8	3.3	-1.7	10.3

naires and the responses for the necessity of surgery of the standard and video image case presentation groups. Level of significance was set at 0.05.

Results

Demographic and clinical characteristics of the 74 patients who completed the project are given in Table 5. The average age was 24.5 years and there was a 2:1 female-to-male ratio. The demographic composition of the two groups was similar as was the percentage of skeletal/dental Class I, II, and III patients.

The distribution of all four dimension scores for motives of treatment was similar (P>0.10) for the two case presentation groups (Table 6). Seventy-six percent of the standard case presentation group had an average score of 3 or greater on the self-image dimension and 51% on the oral function dimension. In the video image group, 81% of the patients had an average score of 3 or more on the self image dimension and 68% on the oral function dimension. Forty-seven percent of the patients had an average score of 3 on both the self-image and oral function subscales. Thirty-one percent of the patients had a high (≥3) score only on the self-image dimension while 12% had a high score only on the oral function dimension. The frequency of patients in each group who chose "very much a reason (4)" for each item on the questionnaire is given in Table 1. Overall, the motives cited most frequently as "very much a reason" for treatment were the

desire to improve the fit of upper and lower teeth (70%), improve the appearance of the teeth (69%), and improve the facial profile (55%).

Patients completed the long-term expectancies questionnaire approximately 2 weeks following the case presentation. The distribution of dimension scores was similar (P>0.13) for the two groups for the oral function, general well-being, and general health dimensions (Table 6). Sixty-two percent of the patients in each group had an average score of two or greater on the oral function dimension, approximately 10% scored 2 or greater on the general well being dimension, and only 3% of the control and 11% of the video image group patients had an average score of 2 or more on the general health dimension. The frequency of patients in each group who chose "will be much better (+3)" after treatment for each item is given in Table 2.

The distribution of self-image expectation dimension scores was significantly different (P=.045) between the standard and video image case presentation groups. Sixty-two percent of the standard case presentation group had an average of 2 or greater on the self-image dimension while 78% of the video image presentation group scored 2 or higher. Only 16% of the standard group had an average dimension score of 3, that is, rated each item in the dimension as "will be much better" after treatment, while 31% of the video image case presentation group rated each item in the self-image dimension as a 3 (Figure 1).

Table 6
Descriptive statistics for the dimension[1] scores derived from the patient perception questionnaires

| | Standard | | | | Video Image | | | | |
	Mean	SD	Min	Max	Mean	SD	Min	Max	P Value
Motives for treatment									
Self image	3.25	0.7	1.67	4.00	3.43	0.7	1.33	4.00	0.10
Oral function	2.88	0.9	1.00	4.00	3.00	0.8	1.33	4.00	0.69
Future dental health	2.37	1.2	1.00	4.00	2.20	1.1	1.00	4.00	0.65
General well-being	1.82	0.8	1.00	3.67	1.91	0.7	1.00	3.67	0.47
Long-term expectations									
Self-image	2.04	0.7	0.50	3.00	2.32	0.8	-0.25	3.00	0.045
Oral function	2.05	0.7	0.25	3.00	2.08	0.8	0.00	3.00	0.75
General well-being	0.79	0.8	0.00	3.00	0.86	0.8	-0.20	3.00	0.54
General health	0.44	0.6	-0.40	2.40	0.65	0.7	-0.20	2.40	0.13

[1]Dimension score is the average of the values given for the items belonging to that dimension.
P values from the Mantel Haenszel row mean score test

The most important factors influencing the treatment decision for the patients overall were "anticipated change in my facial appearance" (67%), "recommendation from an orthodontist or oral surgeon" (49%), "cost of treatment" (44%), and "anticipated improvement in my ability to chew food" (39%). Seventy-four percent in the video image group and 60% in the standard presentation group ranked the anticipated change in facial appearance as an important factor in making a treatment decision. Twenty-seven percent of the video image group chose the video image predictions as one of the three most important factors in making a treatment decision (Table 3).

In the standard presentation group, the dental casts were most frequently ranked as the most helpful physical record in making a treatment decision (47% of the patients) and the acetate profile tracing (46%) as the most helpful in understanding what to expect from treatment (Table 4). In the video image group, the video imaging presentation was most frequently ranked as the most helpful physical record (treatment decision, 42%; treatment expectations, 39%) (Table 4). Two weeks following their case presentation, 85% of the video image group and 70% of the standard presentation group agreed with the statement that surgery would be necessary to correct their problem (P= 0.38).

Discussion

The patients randomly assigned to the two case presentation groups had similar demographic and clinical characteristics and overall similar motives for treatment. With an average age of 24.5 years and a female-to-male ratio of 2:1, the sample of patients in this study is similar to larger samples of orthognathic surgical patients.[2,3] The percentage of patients who reported an esthetic motivation for treatment was higher than in other studies[3,4,5,6] with 69% of the patients desiring improved appearance of the teeth and 55% desiring improved facial esthetics. Almost half of the patients had strong dual motivations (self-image and oral function) for treatment. Of those who appeared to have primarily either a self-image or oral function motivation, almost three times as many patients presented with stronger self-image motives.

When compared to other, more traditional factors that patients consider when making treatment decisions (i.e. esthetic changes, functional changes, cost, etc.), video imaging was not an overwhelmingly important consideration, but 27% of the video image group chose it as one of the top three choices. However, the video imaged surgical prediction was ranked as the most helpful of the physical records with regard to treatment decision and understanding what to expect from treatment. Though video imaging was not an overriding factor in deciding whether or not to proceed with treatment, it appears that the information provided by the video image

was valued more highly than the information provided by other physical records traditionally used by orthodontists and oral surgeons at the case presentation appointment.

Interestingly, patients in the standard case presentation group thought that the dental casts were the most important physical record in deciding on treatment, which is consistent with the importance of dental esthetics and function as motives for treatment. The casts and the acetate profile tracings were ranked as the physical records providing the most information about what to expect from treatment. The acetate tracings were expected to be the most important, since the profile tracing was the only physical record shown to the standard CP groups which could illustrate the projected facial changes and should better illustrate projected tooth movements than the dental casts. It may be that patients do not value or cannot fully understand the impact of the line drawings.

A higher percentage of patients in the video image presentation group than in the standard case presentation group believed, approximately 1 month after the CP, that surgery would be necessary to correct their problem (85% and 70%, respectively), although this difference was not statistically different. The video imaged predictions did seem to help patients understand the severity of their skeletal malocclusion and the importance of the surgical treatment.

Long-term expectancy of improvement in self-image was elevated in the video image group. It may be that these expectations are, in fact, realistic and that the visual display provided the patients with a more appropriate appreciation for the extent of the appearance changes that will result from orthognathic surgery. The possible danger, however, is that a video image presentation may be interpreted as the immediate final result following surgery. If after surgery, the response from the social environment is limited and/or the result does not match the patient's expected facial alteration, the likelihood of post-surgical depression and dissatisfaction increases.[16,18] Patients who have seen a video image presentation at a pretreatment consultation visit and who indicate a very high posttreatment self-image expectation, particularly if expectations regarding improvement in social life, socializing, or performance in work or school are also high, should be carefully counselled about the postsurgical experience including the possibility of neutral or negative social interactions.

Conclusions

The data suggest the following trends:

1. Video image predictions do not directly affect patients' treatment decisions but may indirectly affect them by strengthening the patients' self-image motivation and expectations and by confirming the necessity of surgery as the treatment option.

2. Video imaging was ranked as the best information source compared to the other physical records presented in the video image presentation group.

3. Video imaging influences patients by heightening their expectations of improvement in self-image following treatment

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