

Patient expectations of oral implant-retained prostheses in a UK dental hospital

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Statement of problem The loss of the natural dentition leads to severe functional impairment in many edentulous adults. A prosthesis retained and supported by osseointegrated dental implants may provide a satisfactory solution for people who have lost all their natural teeth. However, little information is available as to what patients requesting implants expect of implant-retained prostheses.

Aim The aim of this study was to assess the expectations of a group of edentulous patients requesting implant therapy.

Method The study included two groups: (1) a group of edentulous adults who requested implant therapy ('implant group'); and (2) an edentulous control group, of similar age and gender distribution as the implant group, receiving conventional complete dentures. Following a clinical and radiographic examination of the patients, data were collected using validated questionnaires. Both groups made a subjective assessment of current dentures. The implant group also completed a questionnaire which assessed expectations of implant-retained prostheses.

Results Baseline satisfaction with current dentures was low in both groups, with the implant group being significantly less satisfied with comfort and stability of their mandibular dentures. Perceived ability of the implant group to chew hard foods was less than the control group. The implant group's expectations of an implant-retained prosthesis were significantly greater than for a conventional denture.

Conclusion Careful assessment of patient expectation of implant therapy is essential to determine appropriate treatment need, and to highlight unrealistic expectations.

The most recent decennial study of adult dental health in the UK reported that 21% of the adult population were edentulous.¹ This figure is expected to decrease to around 10% by the year 2008 as adults retain more of their natural teeth throughout life. However, Downer reported that a significant amount of untreated dental disease is still evident in adults, particularly in the north of England, Scotland and Northern Ireland.² He suggested that the maintenance of heavily restored teeth in present cohorts of middle-aged and elderly adults will be a major treatment need in the future. It seems likely that at least some of these adults may, therefore, be rendered edentulous late in life.

The complex dental needs of the ageing dentate and edentulous population present a formidable challenge to the dental profession. Currently, four out of ten edentulous adults in Britain report significant denture wearing difficulties.¹ The problems presented by edentulous patients with conventional dentures are well documented.³ Atrophy of the denture supporting tissues, poor adaptation, poor masticatory efficiency and psychosocial embarrassment are major complaints described by many edentulous adults wearing conventional dentures. Such problems, even with the best possible prosthodontic care, are often insurmountable with conventional denture techniques. Also, as patients age, the complex neuromuscular skills required to overcome the limitations of dentures diminish.⁴ Thus, it is probable that many patients rendered edentulous at an advanced age (eg > 70 years) will never develop satisfactory denture wearing skills.

The development of osseointegrated dental implant therapy offers the possibility of a significant improvement in function and well being for edentulous patients with denture wearing problems.⁵ De Grandmont *et al.*, in a within-subject comparison of mandibular implant-retained prostheses (IRPs), found that patients rated IRPs higher than their conventional prostheses for all functional and psychological factors tested.⁶

As information about implants is now in the public domain, demand for implant therapy from patients with denture-related problems is likely to increase. However, information regarding patient expectation of implant therapy is sparse. Most published studies have only reported patient satisfaction with treatment outcome.⁷⁻⁹ Assessment of patient expectation, in conjunction with a comprehensive clinical and radiological evaluation, is an essential part of the pre-treatment process. Comprehensive clinical assessment alone may not determine appropriate treatment need.¹⁰ The level of patient expectation is likely to influence: whether implant procedures will actually address the patient's complaint; the design of the proposed prosthesis, ie removable or fixed; and the outcome of the procedure. In order to obtain a meaningful assessment of patient expectation of implant therapy, a validated oral-specific measure is required.¹⁰ The aim of this study was, therefore, to assess the level of expectation of patients with denture wearing difficulties prior to receiving implants, using oral specific questionnaires. It was anticipated that the study would yield data essential for the assessment of treatment need in patients seeking dental implants.

Method

Selection of subjects

This study included two groups:

1. Patients requesting implants to retain a complete prosthesis (implant sample group)
2. A control group of edentulous patients, of similar age and gender

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distribution as the implant sample group, requesting replacement of their dentures by conventional means.

Subjects for the 'implant group' were recruited from patients who attended the multidisciplinary implant assessment clinic at the Newcastle Dental Hospital, UK. These patients had a history of denture wearing problems and were referred to the clinic from other departments within the Dental Hospital or by GDPs practising in the north-east of England. Patients seeking implants were assessed by specialists in prosthodontics and oral and maxillofacial surgery. The range of treatment options available were explained to the patients, and information about implant therapy was provided verbally and in many cases also with the aid of a video and explanatory literature. While the explanation of treatment options to patients was provided in a consistent manner, it was an unavoidable source of variability. The majority of patients (65%) were accepted for implant therapy. Reasons for rejection included: unwillingness to undergo surgery; patient medically unfit for surgery; significant improvement was thought possible using conventional prosthodontic methods; and, financial reasons. Patients deemed unsuitable for implant therapy were offered conventional treatment by a prosthodontist at the Dental Hospital.

All edentulous patients attending the implant clinic were invited to participate in the study. Recruitment of patients into the study took place at the assessment stage prior to the acceptance/rejection of implant therapy. Information about the study was provided by means of an information leaflet and by discussion with one of the research team. Patients were advised that their treatment would be unaffected by their decision regarding participation in the study. In addition, to reduce the possibility of response bias, patients were assured that the research was being undertaken by workers unconnected with the provision of their dental treatment. Details of the patients' age, gender, social background and denture wearing history were collated. Jaw bone status was assessed from plain film radiographs *ad modum* Lekholm and Zarb.¹¹

In the control group, subjects were recruited randomly from patients attending the undergraduate student prosthodontic clinic at the Newcastle Dental School for the provision of conventional complete replacement dentures. These patients did not have major problems with conventional dentures and were satisfied with the plan to provide treatment by conventional means. They neither requested, nor were they offered, the option of implant therapy.

The study received approval from the Newcastle and North Tyne-side local ethics committee. Recruitment of subjects for the study took place over a 2-year period, from January 1996 to January 1998.

Questionnaire design

After informed consent was obtained, subjects in the implant sample group were asked to complete a validated questionnaire. This questionnaire had been used previously in other implant-related studies.⁶ The questionnaire consisted of two scales: (a) a subjective appraisal of the patient's existing conventional dentures, and (b) their expectations of an implant-retained prosthesis. Responses to statements were given on the Likert response scale, eg 1 = totally satisfied; 2 = very satisfied; 3 = reasonably satisfied; 4 = not very satisfied; and, 5 = not at all satisfied. The questionnaire was completed unaided by the subject. All queries were dealt with by the research worker.

Variables assessed for existing maxillary and mandibular prostheses were: (1) general satisfaction, (2) satisfaction compared with natural teeth, (3) retention, (4) stability, (5) comfort, (6) appearance, (7) the ability to speak, (8) occlusion, and (9) the ability to chew and swallow sliced bread, cheese, carrots, bacon, lettuce, apples and nuts.

The 'expectations of implants' questionnaire (b) assessed the variables detailed above (numbers 1–9) by asking respondents questions such as 'do you think that you will be satisfied with the

comfort of your mandibular (bottom) denture retained by implants?' Subjects were asked to respond to statements pertaining to the jaw where implant therapy was planned. Again, responses were graded on the Likert scale.

Subjects in the control group were asked to complete scale (a) only as described above, ie the subjective appraisal of existing conventional dentures.

Data analysis

Data were entered onto a PC and analysed using Minitab. Non-parametric methods were used for statistical analysis, as the data were not normally distributed. The Mann-Whitney *U* test was used to test for differences between the sample and control group responses to questionnaire (a). The one sample Wilcoxon Signed Rank test was used to test for statistical differences between satisfaction with existing dentures (questionnaire a) and expectation of implant-retained prostheses (questionnaire b) in the implant sample group. A 5% level of significance was used.

Results

All subjects invited to participate in the study agreed to do so, giving a 100% response rate in both groups. Twenty-seven subjects (19 females and 8 males) were recruited in the implant group. The age range of the patients was 40–83 years, with a median age of 57 years. Thirty-four subjects (26 females and 8 males) were recruited in the conventional denture control group. These subjects ranged in age from 47 to 75 years, with a median age of 64 years. The median time subjects in the implant group were edentulous was 25 years, and the median number of dentures worn was 4.5. The corresponding median values for the control subjects were 25 years and 2.5 dentures respectively. The social background of both groups was similar, subjects being either retired (non-professional) or having a manual occupation. Among implant group subjects, implant therapy was requested for a single jaw in 17 cases, and in both jaws in the remaining 10 subjects. The responses to the questionnaires, along with demographic data for these sub-groups of implant subjects were compared. There were no statistically significant differences between the subjects requesting implants in a single jaw and those requesting implants in both jaws. Therefore, for the purposes of comparison with the control group, all implant subjects were pooled as a single experimental group.

All questionnaires were completed satisfactorily by the subjects. Table 1 shows the results of the Mann-Whitney *U* test of differences, by variable, between the medians of the two groups. The median scores for variables relating to the mandibular denture were high in both groups (4 = not very satisfied; 5 = not at all satisfied). A statistically significant difference between the groups emerged for the comfort ($P < 0.001$) and stability ($P < 0.01$) of the mandibular denture, with the implant group more dissatisfied with their existing denture. Table 2 shows differences in the median perceived chewing and swallowing ability between groups. The rating of chewing ability in both groups ranged from 1 ('no difficulty') to 4 ('quite a lot of difficulty'). The median score for swallowing ability in both groups for all foods was 2 ('reasonably broken down'). There was a statistically significant difference between the groups in perceived ability to chew apple, bacon, and to chew and swallow bread and nuts. The implant group found these tasks more difficult.

Table 3 shows the results of the comparison of baseline denture satisfaction of the implant group with their expectations of the proposed implant-retained prosthesis (questionnaire (b)). Median values of the implant sample group responses to questionnaires (a) and (b) are shown, as are the differences in median responses to questionnaires (a) and (b). Twenty-six subjects responded to statements in questionnaire (b) pertaining to mandibular implant-retained prostheses, 11 responded to statements related to

Table 1 Comparison of self-reported satisfaction with current conventional dentures, by variable (Mann-Whitney U test)

Variable	Implant group (n = 27) Median	Control group (n = 34) Median	P
General satisfaction with maxillary denture	3.0	3.0	0.99
General satisfaction with mandibular denture	5.0	4.0	0.07
Compared with natural teeth, maxillary denture	3.0	3.0	1.00
Compared with natural teeth, mandibular denture	5.0	4.0	0.05*
Retention of maxillary denture	3.0	2.0	0.28
Retention of mandibular denture	5.0	4.0	0.07
Stability of maxillary denture	3.0	3.0	0.63
Stability of mandibular denture	5.0	4.0	< 0.01*
Comfort of maxillary denture	3.0	2.0	0.06
Comfort of mandibular denture	3.0	2.0	< 0.001*
Ability to speak†	2.0	2.0	0.09
Appearance of maxillary denture	3.0	3.0	0.83
Appearance of mandibular denture†	3.0	3.0	0.11
Occlusion	3.0	4.0	0.75

*Statistically significant ($P \leq 0.05$)

†Same medians, implant subjects greater dissatisfaction than controls

maxillary implant-retained prostheses. The differences between baseline satisfaction and expectation of mandibular implant-retained prostheses were significant for all variables. Statistically significant differences emerged between satisfaction with retention and stability of maxillary prostheses, and expectation of maxillary implant-retained prostheses. These differences were not as strong as equivalent mandibular variables. Subject's expectations of how their teeth would occlude were significant, as were their expectations of speech with their new implant-retained prosthesis.

Discussion

In a study using questionnaires to collect pre-operative data, the potential response bias should be considered. A number of measures were used in this study to minimise response bias. In addition to advising participants that research workers were not involved in making decisions regarding their treatment, data collection was undertaken away from the clinical environment. The control group subjects neither requested nor were offered information on implant therapy, and are therefore unlikely to have used their responses to influence regarding their treatment options. All control group subjects were selected randomly from the hospital waiting list pool at the Newcastle Dental Hospital, thus reducing the possibility of selection bias. Selection bias in the implant group was avoided by inviting all edentulous subjects requesting implants during the course of the study to participate.

The subjects who participated in this study experienced the full range of problems associated with edentulousness. It was anticipated that the implant group would be far less satisfied with their conventional dentures than the control group. However, the mean satisfaction of both groups with existing conventional dentures was low. Differences between the groups were only apparent for comfort and stability of the mandibular denture. A likely explanation for this is that the control group requested new dentures because of deficiencies in existing dentures, and, therefore, their satisfaction scores were low. Greater differences between the implant and control groups may have emerged if the control group consisted of edentulous subjects with new, satisfactory dentures. The reasons for dissatisfaction are likely to differ between the groups. In the case of the control group, subjects requested dentures to replace those which had recently become problematic. Although dissatisfied with these dentures, it was thought likely that new, conventional dentures would address the patient's complaints. The reasons for the implant subjects' dissatisfaction are probably more than just functional limitation, which may explain why subjects in the implant group had received more sets of dentures than the control group in a similar period of time. The questionnaire appeared to capture the nature of functional complaints, but not psycho-social problems with denture wearing. It may well be that further differences between the groups would emerge if psycho-social statements were added to the questionnaire. This issue will be examined in a follow-up study.

Regarding chewing and swallowing ability, the assumption was made that if subjects responded 'no', this was because of inability to eat that food. However, a further reason for not eating a food may simply have been food preference, a factor not accounted for in the wording of the questionnaire. We considered this further by analysing the data of subjects who ate three or more test foods (ie excluding those who ate less than three), and found a very similar pattern of results. Whether all subjects or only subjects responding positively to eating three or more test foods were included in the analysis, differences emerged between the groups in terms of ability to chew and swallow harder foods such as nuts. This suggests that food choice was more limited in the implant group.

Table 2 Comparison of the implant group with the conventional denture group by perceived ability to chew and swallow food (Mann-Whitney U test)

Test food	Implant group (n = 27) Median	Control group (n = 34) Median	P
Chew bread	2.0	1.0	< 0.01*
Swallow bread†	2.0	2.0	< 0.01*
Chew cheese	2.0	2.0	0.20
Swallow cheese	2.0	2.0	0.20
Chew carrot	4.0	3.0	0.14
Swallow carrot	3.0	2.0	0.23
Chew bacon	3.0	1.5	0.01*
Swallow bacon	2.5	2.0	0.11
Chew lettuce†	2.0	2.0	0.07
Swallow lettuce	2.0	2.0	0.18
Chew apple†	3.0	3.0	0.03*
Swallow apple	2.0	2.0	0.31
Chew nuts	4.0	2.0	< 0.001*
Swallow nuts	3.0	2.0	0.03*

*Statistically significant ($P \leq 0.05$)

†Same medians, perceived chewing and swallowing ability of implant subjects was less than control subjects

Table 3 Comparison of implant group satisfaction with current conventional dentures and expectation of implant-retained prostheses (IRP), by variable (Wilcoxon Signed Rank test)

Variable	<i>n</i>	Median (a) [†]	Median (b) [‡]	Median (a) – (b) [§]	<i>P</i>
Satisfaction with maxillary IRP	11	3.0	2.5	0.5	0.141
Satisfaction with mandibular IRP	26	5.0	2.0	3.0	< 0.0001*
Compared with natural teeth-maxillary IRP	11	3.0	2.0	1.0	0.059
Compared with natural teeth-mandibular IRP	26	5.0	2.0	3.0	< 0.0001*
Retention of maxillary IRP	11	3.0	2.0	1.0	0.004*
Retention of mandibular IRP	26	5.0	2.0	3.0	< 0.0001*
Stability of maxillary IRP	11	3.0	2.0	1.0	0.043*
Stability of mandibular IRP	26	5.0	2.0	3.0	< 0.0001*
Comfort of maxillary IRP	11	3.0	2.0	1.0	0.108
Comfort of mandibular IRP	26	5.0	2.0	3.0	< 0.0001*
Ability to speak	26	3.0	1.0	2.0	< 0.0001*
Appearance of maxillary IRP	11	3.0	2.0	1.0	0.108
Appearance of mandibular IRP	26	4.0	2.5	1.5	< 0.0001*
Occlusion	26	3.0	2.0	1.0	< 0.0001*

*Statistically significant ($P \leq 0.05$), Wilcoxon Signed Rank test

[†]Median responses, Questionnaire (a)

[‡]Median responses, Questionnaire (b)

[§]Differences between median scores of satisfaction with dentures (Questionnaire (a)) and expectations of implant retained prostheses (Questionnaire (b))

The results shown in Tables 1 and 2 highlight the significant functional limitation experienced by edentulous adults wearing conventional dentures. Subjects in both groups, were dissatisfied with most aspects of their mandibular dentures and, experienced problems chewing and swallowing certain foods. These findings are not unexpected as differing resorption patterns in the jaws led to greater problems in the mandible.¹²

In the dental literature, there is a growing interest in the impact of oral conditions on the quality of life.^{10,13} Using the WHO classification,¹⁴ edentulous adults suffer impairment (lack of ability to perform the tasks of daily living, eg chewing food), disability (eg unable to enjoy certain foods), and handicap (eg having to decline social invitations). The results of this study show that both groups experienced impairment and disability. It seems likely that patients seeking implants expect to have an improved quality of life following implant therapy. The level of expectation of potential implant patients prior to implant therapy is likely to be a major influence on treatment outcome. However, the nature of the impact of implant-retained prostheses on the quality of life is as yet unclear. The results shown in Table 3 indicate that expectations are very high. It is clear that the subjects in the implant group expected a major improvement in oral function following implant therapy. The level of expectation did not appear to be influenced by the proposed prosthesis design discussed with the subject at the assessment stage. This finding should, however, be interpreted with caution. A larger sample may show that the proposed prosthesis design has a bigger influence on patient expectation than is shown in this study. Many subjects expect to be either totally or very satisfied with their implant-retained prosthesis when com-

pared with natural teeth. As yet, it is unclear whether implants restore a level of oral function experienced by dentate adults, and such expectation may be unrealistic. The results in Table 3 indicate that subjects expect dramatic improvement in stability, retention and comfort of their implant-retained prosthesis. Subjects expect their 'bite' to be significantly better. It is unclear whether this signifies a better occlusion or whether subjects expect to have less limitation of chewing function. A surprising result was the expectation of better appearance of the mandibular implant-retained prosthesis. To facilitate denture stability, the occlusal plane of mandibular complete dentures are often placed below the level of the lower lip and tongue. This may give rise to a complaint of lower teeth not being visible, and may explain the high expectation of appearance. In terms of ability to speak with current dentures, the median satisfaction score of the implant sample group was 3.0 (reasonably satisfied). However, the difference between this score and expectation of implant-retained prostheses was highly significant. This may be a reflection of the high expectation of stability and retention of implant-retained prostheses, subjects believing that a more stable and retentive prosthesis would facilitate speech. Overall, differences between satisfaction with current dentures and expectation of implant-retained prostheses were more significant for mandibular prostheses. As the number of subjects having a maxillary implant-retained prosthesis was small, however, the results should be interpreted with caution. A further explanation may be that the satisfaction scores for maxillary dentures were much higher than mandibular dentures, and therefore greater improvement was expected of a mandibular implant-retained prosthesis.

It is not clear whether the manner in which implant therapy was explained had an influence on expectations. In this study, we did not attempt to standardise the provision of information regarding implant procedures. This may have introduced bias, but also reflects a 'real world' situation. An assessment of the level of expectation prior to implant therapy is extremely important. If expectations are unrealistic, then the possibility of dissatisfaction with treatment outcome may arise. Potential problems with implants such as possible failure of fixtures and the burden of maintenance requirements should be highlighted. As is standard practice in some centres, introducing prospective implant patients to patients who have had implant-retained prostheses placed may help moderate expectations. Patient expectation may also influence prosthesis design. Many patients will simply request a prosthesis which 'doesn't move around', and may well be satisfied with a simple design such as a hybrid overdenture. Others will wish to have a prosthesis which feels part of themselves, and a fixed bridge may be indicated. It may be appropriate to use questionnaires such as that described in this study to screen for patients with unrealistic expectations of implant therapy. Data derived from subjective measures such as this are likely to complement objective, clinical assessment when planning prosthesis design. Patients who make the oral cavity the focus of all their problems may be highlighted by their responses. Such patients can then receive further counselling and, if appropriate, psychiatric evaluation prior to commencing implant therapy.

Conclusion

The responses given by all the subjects in this study indicate the degree of functional limitation and discomfort experienced by many adults wearing complete dentures. Compared with the edentulous control group, subjects requesting implant-retained prostheses tended to be less satisfied with their conventional dentures, particularly their lower denture. These subjects had high expecta-

tions of their planned implant-retained prostheses. In the absence of evidence confirming that implants restore oral function and comfort to the level of a dentate individual, it is questionable whether such expectations are realistic.

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