Are Implant Supported Overdentures too Complex to be Included in the Undergraduate Curriculum?

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Abstract - To widen the availability of implant supported mandibular overdentures, their inclusion in the undergraduate clinical training curriculum has been encouraged. The aim was to determine whether implant supported mandibular overdentures provided by undergraduates could achieve similar levels of improvement in patient satisfaction and quality of life as previously demonstrated by experienced prosthodontists. Nineteen patients were treated by Stage 3 undergraduate students at Newcastle University, School of Dental Sciences. Changes between pre-treatment and 3 month post-treatment satisfaction and oral health related quality of life suggest dental undergraduates achieve similar levels of improvement as experienced prosthodontists.

KEYWORDS: Undergraduate, implant support overdenture, quality of life.

INTRODUCTION

When denture bearing anatomy is compromised by ridge resorption the provision of mandibular complete dentures can frequently be challenging¹⁻⁷. More than 50% of edentulous patients may experience problems with stability and retention^{8,9}. This often leads to difficulties during function¹⁰⁻¹³, and the extent of the patient difficulty may not always be apparent to clinicians¹⁴⁻¹⁶. These limitations can affect dietary choices and make patients uncomfortable in social situations¹⁷⁻¹⁹, with some avoiding them altogether²⁰. The longer term consequences can for some, be detrimental on general health^{21,22}.

A significant number of articles including those reporting randomised controls trials have shown the advantages of increased retention and stability with implant supported mandibular overdentures (ISOD's)²²⁻²⁷. Increasingly patient centred instruments for assessing the outcome of ISOD provision have been used to support the more traditional clinician based assessments and after review of the data on the efficacy of ISOD's the McGill Consensus Statement was published in 2002²⁸. In 2009 an updated review of research publications^{29,30} the York consensus commented, 'quality of life with two-implant supported mandibular overdentures is significantly greater than for conventional dentures'³¹.

Population data demonstrates that the UK edentulous population has fallen from 28% in 1978 to 6% and likely to decrease to 1% over the next three decades, however approximately 3% of adults classified as dentate will have an opposing edentulous arch³². An increase in population size coupled with an ageing population means there will still be significant numbers of patients within the population who require complete dentures. These patients are

likely to represent a greater challenge to the profession in terms of satisfactory denture provision as being rendered edentulous later in life is synonymous with more functional problems^{33,34}. This may be due to age related physiological changes, such as decreased motor control and decreased biting force. Long-term edentulous patients may also have poorly formed mandibular ridges which is also a negative indicator for success of conventional treatment³⁵.

Currently ISOD provision is largely limited to private contract in primary care and limited secondary care settings. In order to broaden the availability of this care it has been suggested that 'Acquisition of knowledge and clinical skills regarding implant retained restorations was of fundamental importance in undergraduate education'36. However, inclusion of implant supported overdentures within the undergraduate curriculum is not without its challenges. Despite this, most of the dental schools in the UK and Ireland provide teaching and/or training in implantology but with significant variation in the extent, timing, delivery and undergraduate experience³⁷⁻⁴⁰. This perhaps indicates the recognition of its importance. Few schools however, routinely provide the majority of undergraduate students with the clinical experience of rehabilitating a patient with an ISOD. There are likely to be many reasons for this, including a congested curricula, and resource limitations which may be both in terms of funding and suitably trained clinical teachers. Additionally institutions may have concerns about the feasibility and safety of students providing restorations that are more traditionally viewed as items of specialist care, within the constraints of busy student teaching clinics. Whilst the outcomes of previous studies have clearly demonstrated that ISOD's result in enhanced quality of life and increased patient satisfaction, all of these studies were undertaken by experienced clinicians who in the majority of cases were 'specialist prosthodontists'. What is less clear is whether provision of ISOD's by student practitioners as part of their standard training delivers similar positive outcomes for patients as when treated by prosthodontic specialists.

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AIM

The aim of this clinical evaluation was to determine whether ISOD's provided by dental undergraduates as part of their standard clinical training could achieve similar improvements in patient satisfaction and oral health related quality of life as previously demonstrated by experienced prosthodontists.

Clinical Evaluation Setting

The evaluation was undertaken on undergraduate prosthodontic clinics within Newcastle University, School of Dental Sciences. Students are allocated ISOD cases for restoration as part of their removable prosthodontics training in the 3rd year of the dental course. Patients had already had 2 implants placed in the anterior mandible and these were restored using two Straumann LOCATOR[®] abutments. As there is no contemporary data on the Locator system in terms of patient satisfaction and/or quality of life when used to retain a two-implant overdenture, the outcome of specialist rehabilitation of 19 patients using a ball attachment and gold cap mechanism was used as an alternative standard against which to evaluate the student outcomes⁴¹.

Evaluation Standard

Two patient centred outcome measures were included within the evaluation standard; general patient satisfaction as measured by the McGill patient satisfaction questionnaire, and Oral health related quality of life as measured by the OHIP-20 instrument. The McGill patient satisfaction questionnaire has additional domains for patient satisfaction and these are included within the results for interest but where not considered as part of the clinical evaluation which was confined to 'general satisfaction'. The evaluation standard was determined as an increase of 75 points on the patient 'general satisfaction' scale (maximum 100), and a decrease in OHIP-20 score of 48 points⁴¹.

METHODOLOGY

A full clinical history and examination undertaken by a Consultant in Restorative Dentistry had determined that the prognosis for a successful outcome with conventional denture provision was poor, and accepted the patient for implant provision. In the academic year 2010-11, 19 of these patients who had previously worn a conventional complete mandibular denture opposed by a complete maxillary denture were allocated for treatment on undergraduate clinics. Prior to implant placement the patients satisfaction with their current dentures had been measured using the McGill satisfaction questionnaire utilising a 100mm visual analogue scale⁴². Patient quality of life was evaluated by the OHIP-20 questionnaire which captures the impact of oral health problems on functional, physical and psychological outcomes43. Following informed written consent two Strauman dental implant fixtures were placed in the anterior region of the mandible at tissue level for transmucosal healing by consultant or consultant supervised specialist trainee. Three months post surgery patients were offered appointments on undergraduate student clinics in their first year of their clinical prosthodontic training (Year 3). The patient was either the first or second edentulous patient to be managed by the students. The undergraduate students undertook all clinical stages of ISOD provision including the connection of appropriate Locator attachments and fabrication of a new conventional maxillary denture. Undergraduates worked in routine student clinics where the teaching ratio was unaltered from the normal 1 clinical teacher to 5 student treatment cases.

Preceding this clinical attachment, undergraduates completed a short didactic teaching program including a technical training session which provided them with experience of the appropriate restorative phases of implant provision.

Following treatment completion and a favourable review appointment, a further 3 months follow-up appointment was arranged with a member of staff, Post-treatment satisfaction and OHIP-20 questionnaires were completed on this occasion.

Data Management and Statistical Analysis

Items of the OHIP-20 were recorded on five-point Likert scales (never, hardly ever, occasionally, fairly often, very often, always), which were transferred into numerical values between zero (never) and five (always). Higher scores indicate a worse oral health related quality of life condition. The sum of patient responses to the 20 items gave the overall OHIP score with a possible range of between 0 and 100.

The 100mm visual analogue scales used to record patients' denture satisfaction were anchored by the phrases such as "Not at all satisfied" to "Extremely satisfied".

All questionnaires were measured and scored by one clinician (GC) who was blinded to whether the questionnaires represented baseline or 3 month post-treatment data.

Data were transcribed onto a spreadsheet and checked for errors. Pre and post-treatment mean and standard deviation from the mean were calculated for each domain of the satisfaction questionnaire and the overall OHIP-20 score. The baseline data, 3/12 review and differences between baseline and review were compared between student cases and the reference standard data using a 2-sample t-test to compare means and standard deviations of the two cohorts. Non-parametric analysis, Mann-Whitney test was additionally carried out.

RESULTS

This sample comprised 19 patients with a mean age of 68 years, of which 14 (74%) were female.

Undergraduate patient pre-treatment satisfaction scores are shown alongside patients pre-treatment satisfaction scores from the reference standards (Table 1). The student patients' mean general satisfaction score was slightly higher than those in the reference standard (18.6 v 6.2), and this difference was statistically significant (p = 0.001). However, examination of the remaining McGill patient satisfaction questionnaire domains showed that the student patients had similar levels of satisfaction in the domains of ease of cleaning, speech, comfort, appearance, stability, ability to chew, function and oral condition (Table 1). The three month post-treatment satisfaction scores are shown in Table 2, where it can be seen that the final satisfaction scores of the undergraduate sample were similar to the reference standard across all domains of the satisfaction questionnaire.

Mean pre-treatment OHIP-20 scores for the undergraduate sample patients were 58.8 ± 25.83 whereas pre-treatment reference standard cohort scores were 64.9 ± 22.4 . Mean post-treatment OHIP-20 scores for the undergraduate sample patients were 13.8 ± 7.9 and for the reference standard patients 16.2 ± 18.3. Thus OHIP- 20 scores reduced by 44.9 \pm 17.9 in student patients and 48.7 \pm 25.4 in reference patients. The magnitude of the improvement of undergraduate patients' satisfaction and oral health related quality of life is compared against the reference standard in Table 3. No significant difference was seen between the two samples. Non-parametric testing showed no significant difference between the standard and sample parameters suggesting the patient cohorts were directly comparable, nevertheless, we have presented the 2-sample t-test results as they are perhaps a little easier to interpret.

Of the 19 undergraduate patients, 63.2% achieved a greater increase in patient general satisfaction than the reference standard, while 47.3% of undergraduate patients saw a decrease in OHIP-20 scores equal to or more than the reference standard.

DISCUSSION

The aim of this clinical evaluation was to determine whether undergraduate students providing implant supported overdentures could achieve similar improvements in patient satisfaction and oral health related quality of life as experienced prosthodontists using a similar rehabilitation technique. The results of this clinical evaluation demonstrate there is no significant difference between the magnitude of improvement in patients' satisfaction and quality of life whether treatment is delivered by undergraduates or experienced prosthodontists.

 Table 1. Baseline satisfaction scores for sample (undergraduate) patients and standard (specialist) patients

	Baseline			
_	Sample Mean (±sd)	Standard Mean (± sd)	Baseline differences between sample and standard	
General satisfaction	18.6 ± 10.6	6.2 ± 9.8	12.4, (p=0.001)	
Ease of cleaning	89.1 ± 17.8	76.1 ± 34.0	13.0, (p=0.148)	
Ability to speak	52.6 ± 38.6	47.8 ± 34.9	4.8, (p= 0.690)	
Comfort	22.9 ± 31.9	10.8 ± 13.0	12.1, (p= 0.134)	
Appearance	57.1 ± 40.5	38.2 ± 36.0	18.9, (p= 0.137)	
Stability	14.7 ± 28.6	10.9 ± 23.2	3.8, (p= 0.656)	
Ability to chew	23.4 ± 33.6	18.3 ± 25.9	5.1, (p= 0.603)	
Function	39.3 ± 30.8	28.8 ± 31.3	10.5, (P= 0.304)	
Oral condition	40.5 ± 35.4	31.8 ± 32.0	8.7, (p = 0.432)	

Table 2. Three month post-treatment satisfaction questionnaire scores for sample (undergraduate) patients and standard (specialist) patients

	Three month review			
	Sample Mean (±sd)	Standard Mean (<u>±</u> sd)	Post treatment differences between sample and standard	
General satisfaction	88.6 ± 17.8	81.3 ± 31.9	7.3, (p = 0.434)	
Ease of cleaning	96.2 ± 3.4	92.4 ± 17.1	3.8, (p = 0.404)	
Ability to speak	97.3 ± 3.6	94.1 ± 12.0	3.2, (p = 0.273)	
Comfort	72.4 ± 36.9	80.6 ± 32.1	-8.2, (p = 0.470)	
Appearance	87.6 ± 29.6	91.3 ± 23.6	-3.7, (p = 0.673)	
Stability	81.9 ± 23.8	81.2 ± 32.8	0.7, (p = 0.940)	
Ability to chew	88.4 ± 24.8	87.6 ± 25.0	0.8, (p = 0.922)	
Function	95.4 ± 4.4	88.6 ± 16.0	6.8, (p = 0.082)	
Oral condition	90.8 ± 15.6	88.2 ± 18.0	1.8, (p = 0.637)	

Table 3. Magnitude of change of patient satisfaction and Oral health related quality of life (baseline to post-treatment) for sample and standard results

	Sample	Standard	Significance of difference between
	(Mean <u>+s.d)</u>	(Mean <u>+s.d)</u>	sample and standard
General satisfaction	70.0 ± 14.2	75.1 ± 35.8	p = 0.569
OHIP-20	44.9 ± 17.9	48.7 ± 25.4	p = 0.598

Although the undergraduate cohort of patients demonstrated a higher baseline satisfaction, this can perhaps be explained by the patients' route of entry into the undergraduate implant program. These patients were not actively seeking implant provision but instead had been referred to secondary care as challenging cases for conventional denture construction. As such, it could be argued that undergraduate clinicians faced a greater challenge to deliver the similar magnitude of improvement recorded by experienced prosthodontists whose patient cohort was inherently more dissatisfied at the outset of treatment and were enrolled actively seeking this alternative to conventional dentures.

Nonetheless the post-treatment scores were similar in both groups, and we can therefore be reassured that engaging undergraduate students in this sort of training activity is unlikely to compromise the standard of care patients receive.

The clinical outputs of undergraduate delivered treatment, whilst critically important, however, aren't the only aspects that educational providers need to consider when embarking on an innovative programme development such as this. Resource implications, staff training, and managing unplanned events need also be considered. In this service evaluation only one of the patients required a second master pick up impression due to a tear within the Impregum® impression material and a second patient required adjustment of the locator position at chair side in the finished denture. This is an inherent complication of the locator system, as depending on the underlying implants parallelism compensation of the Locator angulation can be unforgiving, irrespective of operator experience. In terms of resources, whilst there are undoubtedly initial set up costs associated with a programme such as this, allowing students to develop skills in contemporary prosthetics and subsequent maintenance can provide in itself a valuable resource that can enhance and increase patient access capacity within educational institutions. Moreover, developing a generation of graduates that have experience in fabrication of ISOD's and an insight into their maintenance provides a potential resource within primary care to benefit a wider edentulous population. The issues of funding for such a service are out with the remit of this work, but the authors recognize that they currently present a significant barrier to this extending to NHS provision.

The GDC's document Preparing for Practice - Dental Team Learning Outcomes for Registration⁴⁴, mentions implants only once. It states that upon registration with the GDC the registrant should be able to; '*Recognise and explain to patients the range of implant treatment options, their impact, outcomes, limitations and risks*'. Further commenting, '*When appropriate act as an advocate for patient needs*.' It is likely that registrants will be more capable of undertaking this role if they have insight into more advanced procedures such as ISODs.

However, it could be argued that providing training in the provision of ISOD's goes above and beyond what the GDC regards as required for registration. Nevertheless, 13 of the 15 schools in the UK and Ireland recognize the importance of implant treatment as an important learning outcome and provide various teaching and/or training³⁶⁻³⁹. Therefore delivering this in an undergraduate setting, education providers can be confident that teaching is delivered without bias

from commercial influence. By actively involving students in implant rehabilitations we are more able to equip them with the abilities to engage with patients in meaningful discussions of the impact, outcomes, limitations and risks of implants and contemporary prosthodontics.

CONCLUSION

This clinical evaluation reiterates, ISOD's have a positive impact on patient's quality of life and their general satisfaction with a removable prosthesis. Moreover, relatively inexperienced clinicians can reproduce improvements seen by specialist colleagues in quality of life and general satisfaction. As such undergraduates demonstrated a competent level of ability when using implant components in this contemporary teaching environment.

MANUFACTURERS DETAILS

- (Locator, Zest Anchors Inc. USA)
- (Gold Cap, Nobel Biocare UK Limited)
- (Impregum, 3M ESPE UK & Ireland)

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