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What is the evidence base for the efficacies of different complete denture impression procedures? A critical review

Short title: Evidence for efficacy of complete denture impressions

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ABSTRACT

Objectives: Many procedures used in prosthodontics, including materials and methods used for complete denture impressions, lack support of good evidence. The aims were to systematically, and critically, review the literature on complete denture impression materials and methods to identify an impression procedure that can be considered expedient for achieving a satisfactory clinical outcome for complete denture wearers.

Data and Sources: MEDLINE/PubMed and the Cochrane Library were searched for studies on impression procedures used in the clinical fabrication of complete dentures. The search focused on best available evidence with respect to clinical outcome.

Study selection: PubMed listed 1175 titles for the combination terms of complete denture and impression. Five relevant randomized controlled trials were identified. No review of complete denture impressions was found in the Cochrane Library.

Results: Two-step procedures for complete denture impressions dominate all textbooks, teaching and specialist practice, despite absence of convincing evidence of its superiority. No controlled studies supporting the use of border moulding, post-dam, and functional and mucostatic impressions, were identified. Two studies showed that a one-step method using alginate in a stock tray offers a similar clinical result as more complicated, expensive and time-consuming two-step material and technique combinations.

Conclusions: There was no support for the frequent textbook statement that the two-step procedure is necessary and superior to the one-step method. While some special clinical situations may benefit from other combinations of materials and techniques, the results suggest that the simple and inexpensive one-step procedure can serve the needs of the majority of edentulous patients

Clinical significance: In spite of the fact that two-step procedures for complete denture impressions dominate textbooks, teaching and specialist practice, the results of this review suggest that a simple and inexpensive one-step procedure can serve the needs of the majority of edentulous patients (42 words; maximum 50 allowed)

Introduction

The impression stage of fabricating complete dentures aims to customize the denture bases to the optimal denture-supporting area and to ensure that the border form of the prostheses provides a peripheral seal. It is generally agreed that meeting these objectives achieves denture stability and retention, and enables effective function. It follows that textbooks on the subject emphasize the critical importance of impressions in the fabrication process. Many different concepts and approaches have been described to achieve these goals, along with specific materials and techniques by which the given objectives might be accomplished. Even though there are wide variations in individual preferences for a particular material or method, most authorities believe that, for a successful outcome to be achieved, a two-step procedure is required. However, whether any one combination of material and technique produces any better long-term results in terms of complete denture performance than another is a question that remains open due to a lack of strong evidence.

In the absence of scientific data, conventional wisdom on the topic has been formed by a variety of opinions, resulting on the one hand in some entrenched ideas and on the other a lack of consensus regarding the technique for making impressions that can be said to be generally applicable.[1] The situation appears to be no different for other stages in the fabrication of complete dentures. Even among prosthodontists there is lack of agreement on how best to obtain complete denture impressions. In a survey conducted among 41 prosthodontists from 24 countries, using the Delphi technique to provide guidelines for a minimum acceptable protocol for the construction of complete dentures, consensus was only reached by avoiding advocacy of specific techniques and materials. Regarding impression procedures there was agreement only on some rather vague general recommendations.[2]

In a critical review of the literature on the same topic (up to February 2005),[3] only one randomized controlled trial (RCT) was identified, but which failed to give clear clinical guidance regarding a recommendable option among the wide variety of impression techniques available. Based on the lack of specific evidence, as well as on factors, such as the observation that most edentulous patients report satisfactory oral and masticatory function with their complete dentures and the fact that there is poor correlation between patient acceptance of prostheses and their technical sophistication or exactness the review boldly suggested that comparisons between dentures made with varying impression techniques, be they complex or simpler, may not lead to significant differences in long-term clinical results.[3] Given the strong preferences expressed by some clinicians for specific methods and materials,

an updated systematic review on the efficacies of the various impression procedures used in the fabrication of complete dentures would seem warranted.

The aim of this study was to systematically, and critically, review the literature on the efficacy of different impression materials and techniques used in complete denture construction in order to obtain information that might better inform clinical practice. The working hypothesis was that the literature search would provide (good) evidence to recommend a combination of material and technique for complete denture fabrication that might be considered expedient for the management of the majority of edentulous patients.

Data and Sources

A MEDLINE/PubMed search was conducted for studies on impression procedures used in the clinical phase of fabricating complete dentures. The search focused on best available evidence for clinical outcome in articles published up to 1 november, 2012. If publications of the highest levels of evidence, i.e. RCTs and systematic reviews of RCTs, were not available, then other studies of lower level of evidence were considered. The following terms were used in various combinations in the search: complete denture, impression, material, method, technique, functional, mucostatic, selective pressure, border moulding, post-dam, stock or custom impression tray, general practice. The Cochrane Library was searched for reviews on studies related to impressions for complete dentures. The electronic search was extended to include a manual search of references in some modern textbooks on complete dentures, as well as the reference lists of the articles that had been selected for possible inclusion. Studies of possible interest were selected based on the relevance of the title, the abstract, and eventually the full text of the article according to the inclusion criteria (Table 1).

Study selection

General results of the literature search

The combination of the terms complete denture and impression resulted in 1175 titles in the search of PubMed. Other combinations revealed relatively small numbers and added only a few new titles (Table 2). In the Cochrane Library, no review of complete denture impressions was found. Limiting the search to RCTs produced 8 articles. However, among these, 3 dealt with implant restorations and 1 with removable partial dentures, leaving 4 for complete dentures.[4-7] When applying the combination terms of complete denture and impression *method,* 7 RCTs were identified, with those 4 referred to above being again the only relevant ones. Hand search identified 1 more RCT.[8] Although these studies provided valuable

contributions to our knowledge, they were not able to answer the central question relating to a generally expedient method for complete denture impressions. Thus, the findings from the 5 studies and some other selected related articles were evaluated with a view to distilling out and critically examining those themes considered relevant to the central question. These themes are presented in the sub-sections that follow.

Results on impression procedures

One- or a two-step impression procedure?

Practically all dental schools and the majority of prosthodontists in the US use a two-step procedure for complete denture impressions.[9] All textbooks on complete dentures available to us, including the most recent ones,[10,-12] advocate a procedure with a preliminary impression, at present usually with an irreversible hydrocolloid (alginate) in a stock tray, and a final impression with a variety of materials in a custom tray, typically made of acrylic resin. Only one (2 %) of the dental schools in the US does not follow this regimen, but uses a one-step "abbreviated technique" with alginate in a stock tray as the final impression for the fabrication of complete dentures.[9] The said school adopted the new impression procedure because of the problems associated with teaching students with limited exposure the difficult technique of border moulding, the excessive number of visits needed to obtain an acceptable impression, and then, in spite of these efforts, still finding overextended dentures at the delivery stage.[13] In further making a case for the one-step technique, it was noted that many dentists, upon graduation, appear to quickly abandon the complicated technique they had been taught at dental school, for simpler methods.[14] Shortly after implementation of its "abbreviated technique", a retrospective review of the records of 80 edentulous patients treated by predoctoral students at the school was carried out (n=40 by the traditional two-step method, and n=40 by the one-step method).[13] The one-step alginate impression in a stock tray ("abbreviated technique") was found to significantly decrease the number of appointments needed to fabricate complete dentures in the student clinic compared to the traditional technique (final impression in a border-moulded custom tray) (6.5 versus 8.9 visits, respectively) ($P < 0.0001$), to reduce the number of post-insertion visits in the first 3 months, and to not increase the number of adjustments or reline procedures significantly.[13] Furthermore, both the students, and their patients, appreciated the simplified technique and the related saving of time.

A RCT comparing a simplified and a traditional technique for making complete dentures found no differences between the two in terms of denture quality and patient satisfaction.[4]

The simplified method used alginate in a stock tray for the definitive impression, whereas the traditional technique employed a two-step procedure with the final impression made in polyether in a border-moulded custom tray. Thus the simple one-step technique was found to be as effective as the traditional two-step procedure with respect to patients' ratings of satisfaction, comfort and function. This well-conducted RCT provides good support for the authors' conclusion "that the quality of complete dentures does not suffer when manufacturing techniques are simplified to save time and materials". The comparison between the two methods did, however, also include a variation regarding the omission of face-bow transfer in the simple method and its inclusion in the traditional method. Since the study included two comparisons, the favourable finding should be interpreted with caution regarding the one-step impression method as one of two comparisons, and more research is needed to allow definitive conclusions.

Practice patterns regarding impression procedures

Most complete denture patients are treated by general dental practitioners, and most such patients appear to have benefited from their complete dentures, reporting satisfactory oral and masticatory function with their use.[15] In this regard, the point was raised earlier that many dentists, upon graduation, adopt simpler methods in independent pratice, and it was appropriate to explore this aspect. A survey carried out two decades ago reported that successive graduates from one US dental school performed, on average, approximately half of the complete denture techniques they had been taught as a student. Compliance decreased proportionately with the number of years in practice.[14] While it seems likely that many general dental practitioners use a single alginate impression as the definitive impression for the construction of complete dentures, even though that conflicts with what is taught in practically all dental schools,[1,13] reliable data on the prevalence of a one-step impression procedure are difficult to find. A survey from one a region in the UK reported that practically all responding dentists (response rate 50 %) used alginate for primary impressions. Laboratory-constructed special trays were used by 74 % for the final impression, for which the most favoured material was again alginate, followed by zinc oxide eugenol (ZOE), and polyvinylsiloxane (PVS) (approximately 70 %, 20 % and 10 %, respectively).[16] It is not clear from the article, but it can be assumed that 26 % of the respondents used only alginate in a stock tray for the final impression. One of the conclusions of the study ("the use of special trays is normal practice … in General Dental Practice in the UK") is, therefore, debatable. A more recent survey in the UK, based on questionnaires sent to a number of dental

laboratories, reported that 83 % of final impressions for complete dentures were made using a custom tray and 17 % using a plastic stock tray.[17] The authors pointed out that the dentures were being fabricated on a private basis, and that it may explain some of the differences regarding materials and methods between their study and previous studies that had been conducted within the public sector General Dental Services, and which reported a lower prevalence of the use of custom trays. Complete denture impression practices among general dental practitioners vary much. On the basis of the available evidence the results of different techniques and material combinations are inconclusive.

Impression materials and techniques for producing the master cast

Considering the two-step procedure, there are wide variations in the materials recommended, and used, for the final impression. These include gypsum, ZOE, polysulfide, polyether, PVS, and alginate, and preferences for materials appear to have greatly changed over the years.[18] Two surveys on material usage were carried out in the UK, with an interval of about a decade between them. In the first of the surveys, among general dental practitioners, alginate was mentioned as an option by 94 %, ZOE by 29 % and PVS by 13 % (more than one material could be mentioned).[16] In the later survey, which was of dental laboratories, the most common impression materials were found to be ZOE (42 %) and PVS (39 %), while alginate was used by 19 %.[17]

Among prosthodontists, there is a trend towards use of newer materials for impressions of edentulous arches.[9] Interestingly, the use of PVS in a stock tray has been suggested to provide reliable master casts in a single appointment.[19] Much before this, a modification of the use of alginate in a stock tray had been proposed to provide a master cast: first, a stiff mix was used to obtain an overextended impression, which was trimmed back and then a thinner mix wash impression was made.[20] There have been many other such ideas, but no related clinical results have been reported up to now. For primary impressions, 88% of UK general dental practitioners stated that they use only alginate, and if multiple responses were included, then 99% of respondents mentioned alginates as an option for primary impressions.[16]

As regards technique or material combinations, there is either no or only weak evidence that any one procedure produces any better long-term results than another. Only 3 comparative studies on impression materials and methods were found. The first compared fluid wax and polysulfide for mandibular complete denture impression in 30 patients. There was no difference in the number of adjustments of the dentures needed up to one year after delivery.[8]

While such results may be of academic interest, they are of little contemporary clinical interest given the infrequent use of fluid wax today. The second, a controlled study, compared three materials for the final impression in 11 patients. It was found that the mandibular dentures least favoured by patients were those constructed using ZOE as the impression material, and the authors concluded that care should be exercised when selecting impression materials when constructing mandibular complete dentures.[5] The small number of patients makes the results and conclusions questionable. The third study was a good RCT comparing three impression methods (a selective pressure technique – the test method, a method using metal foils to diminish the load on the foramina – the traditional method, and a standard impression using a custom tray – the control) in 66 patients who had a superficial mental foramen on a severely resorbed mandibular ridge.[6] Among the 66 participants, 50 % showed a preference for the denture constructed from the selective pressure impression technique, 29 % the traditional pressure relief, and 21 % the control. The preference was significantly greater for the test method over the control, and marginally over the traditional method; there was no difference in preference of the traditional method over the control. Despite the statistical significance, the clinical significance seems less convincing since as many patients who preferred the selective pressure test method outcome (n = 33), also preferred the traditional and placebo methods when added together (n = 33).

A large number of articles were found describing materials and methods for making so-called functional impressions. However, the search did not reveal any RCTs or clinical trials on the topic. Similarly, despite the emphasis placed in textbooks on various impression techniques, such as mucostatic and mucodisplacive techniques, only one comparative study was identified in the search, and this has already been discussed above.[6]

Border moulding

The search revealed one RCT on border moulding and a few other articles of interest. According to a 2001 survey of US dental schools regarding complete denture impressions, 98 % reported border moulding of custom trays. The majority of the schools (64 %) used modelling plastic impression compound for border molding.[21] Over the past few years, new materials have been introduced for border moulding. A retrospective comparison between two groups of 78 edentulous patients each who had received complete dentures fabricated with two different materials for border moulding (gray modelling plastic impression compound and heavy-body PVS impression material) needed the same number of post-insertion visits for adjustments during the first year (on average 2.68 in both groups).[22] With respect to the

chosen outcome measure, there was thus no difference between the two materials used, although a better research design would have included a control group without any border moulding. There were two studies already referred to above, using an alginate impression in a stock tray compared to a traditional technique using a border moulded custom tray for the definitive impression. Both studies found no marked differences in terms of both patient and and dentist centred clinical outcomes between the two methods, and the small differences that were found favoured the simple method.[4,13]

A recent study reported that by border moulding the anterior lingual denture flange of existing mandibular dentures, retention increased statistically significantly.[23] A limitation of the study was that outcome measures were solely objective, and neither patients' immediate nor long-term assessment of possible clinical changes in function were evaluated, which adds little to the knowledge base regarding clinical significance.

The RCT related to border moulding compared several outcome measures following either dentist-manipulated or patient-manipulated functional relines of existing maxillary dentures.[7] No differences were detected in patient satisfaction, occlusal force at dislodgement or number of pressure spots, and the authors concluded "that the impact of diverse border moulding protocols may have been overestimated in the literature".

Post-dam

Only 8 titles were found for complete denture and post-dam, and none of them investigated the effect of post-dam on retention. However, one study (found by hand search) reported insignificant alteration of retention of maxillary complete dentures after reduction of the palatal coverage, thus questioning the necessity of post-dam.[24] In spite of the lack of good evidence, techniques for creating a post-palatal seal are taught in 95 % of US dental schools.[25] Yet only 16 % of UK general dental practitioners prescribed post-dam preparation to be provided for by the dental technician.[26] It is clear that more research is warranted on post-dam, but on the basis of the scant evidence, its general recommendation in teaching and clinical use can be questioned.

Discussion

Of the almost 1200 titles on complete denture impressions found in MEDLINE/PubMed, only about 1 % of them were classified as clinical trials, and even fewer as RCTs. Of the 5 RCTs, only two were judged to be relevant for this review.[6,7] The first was a well-planned and well-conducted study comparing three impression methods in patients with severely resorbed

mandibular ridges.[6] Although a statistically significant advantage from patients' perspectives was noted for the test (selective pressure) method over the other two (traditional pressure relief and standard impression control) methods, clinical significance could not be considered convincing. The second was by the authors called a preliminary clinical study but by PubMed listed as a RCT.[7] The patients were allocated at random to the two border moulding techniques. However, the observation periods were short (1 week for the patient satisfaction questionnaire and 4 weeks for reporting of pressure sores) and the authors admitted "the inherent shortcomings of this research design preclude robust conclusions."

A fifth RCT was found by hand search but was not considered relevant as one of the materials compared is now obsolete.[8] There was no review in the Cochrane Library relevant to the study question. Given such results of the search, had our intention been to perform a systematic review, the conclusion would have had to be that the available literature failed to provide a definitive answer to the study question. This is, in fact, a frequent conclusion in many recent systematic reviews.[27-29] Therefore, we elected to include and critically scrutinize articles of lesser scientific strength and/or lower level of evidence in order to gain an understanding of the support that there might be for some of the common recommendations related to complete denture impressions.

Essentially, many of the long-standing recommendations on the question of the preferred impression procedure for complete denture fabrication, lack strong scientific support. For example, there is no RCT that directly compares the outcome of a one-step impression with the conventional two-step method using a primary and then a final impression in a custom tray. The hypothesis that a generally recommendable, expedient protocol is clearly identifiable could, therefore, not be supported. However, two clinical trials showed that an alginate impression in a stock tray gave similar results as the conventional method with respect to clinical outcomes such as patient satisfaction and denture quality. It needs to be stated that one of these studies, carried out in a dental school undergraduate clinic, emphasized the importance of determining the border extensions on the cast, and that this was required to be done by the student with faculty assistance.[13] To what extent this measure contributed to the positive outcome cannot be assessed, and further adds to the equivocal nature of the available data on the topic. The subject of border moulding and post-palatal seal or post-dam, both of which are very commonly recommended procedures in teaching and in textbooks, equally lacks support for their functional efficacy.

With no convincing data available regarding the superiority of any method or material for complete denture impressions, some difficult challenges need to be faced: does the profession, and in particular those engaged in prosthodontic research and education, persist with conventional wisdom, or are the possibilities opened by the data vacuum as exists, to be grasped and explored with the scientific rigour it demands. In this regard, it is difficult to argue against the concept of *appropriatech*, as proposed by Owen, that we should use as simple and inexpensive methods and materials as possible to provide acceptable denture quality for as many people/patients as possible.[30] Shortly afterwards, the same author presented an interesting study, using the Delphi method, to define a minimum acceptable protocol for complete denture construction.[2] Regarding impressions, it came to the following conclusion: "The final impression can be made in a material, supported in a variety of ways, which will allow the operator to achieve optimum conformity to the requirements of appropriate coverage, intimate tissue contact, and border (peripheral) seal".

It is often stated by clinicians and clinical teachers, and supported by many textbooks on complete dentures, that different clinical situations require different combinations of materials and techniques for impressions. Yet there are few studies that attempt to make the relevant comparisons that would add validity to the concepts. However, there is some evidence that a simple method, that is alginate in a stock tray, offers as good clinical results as the more complicated, expensive and time-consuming two-step material-technique combinations. In general practice, many dentists seem already to have oriented their practice towards a simplification of the process.[13,14] It is proposed that the protocol deserves serious consideration as the recommended one in prosthodontic teaching and clinical practice. Its clinical application should be viewed in the broader population context, and thus as appropriate for addressing the most commonly encountered edentulous conditions. That being said, it is probable, although still lacking strong evidence, that there remains a place for more complex techniques in special clinical circumstances, including for example cases of displaceable upper ridge, mobile fibrous or knife-edge lower ridges.

Descriptions of further simplifications of the processes involved in complete denture fabrication, including impressions, appear regularly, but they lack clinical data.[31] Equally, the promise that CAD-CAM offers for simplification is real.[32] While awaiting high-quality research to establish evidence-based procedures for complete denture impressions, dentists should, of course, continue with techniques that work well for them. However, it is prudent to

remember that other simpler and less expensive material-method combinations can be as successful and satisfactory both according to patient and clinician centred evaluations.

In a review of changes of the prosthodontic literature over time it was reported that not only RCTs but also other types of clinical studies were extremely rare, at any rate up to year 2000.[33] Opinion papers and publications on technical and material aspects dominated. This may be one of the reasons why so little research has focused on the clinical outcome of different procedures. As it is agreed today that evidence-based dentistry also includes patient preferences the outcome measures are important. Not only laboratory tests of materials and methods are sufficient but also clinical studies with outcome measures including patient opinions and satisfaction are necessary. When studying functional aspects of prosthodontic treatment patient-based outcomes have been recommended as the most appropriate variables.[34]

Conclusions

When examined critically, the published literature could not provide sufficiently robust information with which to answer the question whether a generally recommendable, expedient protocol for complete denture impressions is identifiable. There was no strong scientific evidence that different clinical situations require different combinations of materials and techniques for impressions. Similarly, there was no support that a two-step procedure is any better than a one-step technique. However, there is some evidence by way of two clinical studies that a one-step procedure with alginate in stock trays demonstrated a similar clinical outcome as traditional two-step impression procedures for fabricating complete dentures. The results of the review warrant serious consideration in prosthodontic teaching and clinical practice.

References

1. Carlsson GE. Critical review of some dogmas in prosthodontics. *Journal of Prosthodontic Research* 2009;**53**:3–10.
2. Owen CP. Guidelines for a minimum acceptable protocol for the construction of complete dentures. *International Journal of Prosthodontics* 2006;**19**:467–74.
3. Carlsson GE. Facts and fallacies: an evidence base for complete dentures. *Dental Update* 2006;**33**:134–42.
4. Kawai Y, Murakami H, Shariati B, Klemetti E, Blomfield JV, Billetti I, et al. Do traditional techniques produce better conventional dentures than simplified techniques? *Journal of Dentistry* 2005;**33**:659–68.
5. McCord JF, McNally LM, Smith PW, Grey NJ. Does the nature of the definitive impression material influence the outcome of (mandibular) complete dentures? *European Journal of Prosthodontic and Restorative Dentistry* 2005;**13**: 105–8.
6. Hyde TP, Craddock HL, Blance A, Brunton PA. A cross-over randomised controlled trial of selective pressure impressions for lower complete dentures. *Journal of Dentistry* 2010;**38**:853–8.
7. Wegner K, Zenginel M, Buchtaleck J, Rehmann P, Wostmann B. Influence of two functional complete-denture impression techniques on patient satisfaction: dentist-manipulated versus patient-manipulated. *International Journal of Prosthodontics* 2011;**24**:540–3.
8. Firtell DN, Koumjian JH. Mandibular complete denture impressions with fluid wax or polysulfide rubber: a comparative study. *Journal of Prosthetic Dentistry* 1992;**67**:801–4.
9. Petrie CS, Walker MP, Williams K. A survey of U.S. prosthodontists and dental schools on the current materials and methods for final impressions for complete denture prosthodontics. *Journal of Prosthodontics* 2005;**14**:253–62.
10. Basker RM, Davenport JC, Thomason JM. Prosthetic treatment of the edentulous patient. Chichester, UK: John Wiley & Sons, 2011.
11. Molin Thorén M, Gunne J, eds. Textbook of removable prosthodontics. The Scandinavian approach. Copenhagen: Munksgaard, 2012.
12. Zarb G, Hobkirk JA, Eckert SE, Jacob RF, eds. Prosthodontic treatment for edentulous patients. 13th ed. St. Louis: Elsevier Mosby, 2013.
13. Duncan JP, Taylor TD. Teaching an abbreviated impression technique for complete dentures in an undergraduate dental curriculum. *Journal of Prosthetic Dentistry* 2001;**85**:121–5.

14. Gauthier G, Williams JE, Zwemer JD. The practice of complete denture prosthodontics by selected dental graduates. *Journal of Prosthetic Dentistry* 1992;**68**:308–13.
15. Carlsson GE, Omar R. The future of complete dentures in oral rehabilitation. A critical review. *Journal of Oral Rehabilitation* 2010;**37**:143–56.
16. Hyde TP, McCord JF. Survey of prosthodontic impression procedures for complete dentures in general dental practice in the United Kingdom. *Journal of Prosthetic Dentistry* 1999; **81**:295–9.
17. Al-Ahmar AO, Lynch CD, Locke M, Youngson CC. Quality of master impressions and related materials for fabrication of complete dentures in the UK. *Journal of Oral Rehabilitation* 2008;**35**:111–5.
18. Rao S, Chowdhary R, Mahoorkar S. A systematic review of impression technique for conventional complete denture. *Journal of Indian Prosthodontic Society* 2010;**10**:105–11.
19. Massad JJ, Cagna DR. Vinyl polysiloxane impression material in removable prosthodontics. Part 1: edentulous impressions. *Compendendium of Continuing Education in Dentistry* 2007;**28**:452–9.
20. Thomas CJ. A double alginate mandibular impression technique. *Journal of Dental Association of South Africa* 1979;**34**:781–2.
21. Petropoulos VC, Rashedi B. Current concepts and techniques in complete denture final impression procedures. *Journal of Prosthodontics* 2003;**12**: 280–7.
22. Drago CJ. A retrospective comparison of two definitive impression techniques and their associated postinsertion adjustments in complete denture prosthodontics. *Journal of Prosthodontics* 2003;**12**:192–7.
23. Chang JJ, Chen JH, Lee HE, Chang HP, Chen HS, Yang YH, Chou TM. Maximizing mandibular denture retention in the sublingual space. *International Journal of Prosthodontics* 2011;**24**:460–464.
24. Floystrand F, Karlsen K, Saxegaard E, Ørstavik JS. Effects of retention of reducing the palatal coverage of complete maxillary dentures. *Acta Odontologica Scandinavica* 1986;**44**:77−83.
25. Rashedi B, Petropoulos VC. Current concepts for determining the postpalatal seal in complete dentures. *Journal of Prosthodontics* 2003; **12**: 265−70.
26. Basker RM, Ogden AR, Ralph JP. Complete denture prescription--an audit of performance. *British Dental Journal* 1993;**174**:278–84.
27. Turner M, Jahangiri L, Ship JA. Hyposalivation, xerostomia and the complete denture: a systematic review. *Journal of American Dental Association* 2008;**139**:146–50.

28. Critchlow SB, Ellis JS. Prognostic indicators for conventional complete denture therapy: a review of the literature. *Journal of Dentistry* 2010;**38**:2–9.
29. Koller B, Att W, Strub JR. Survival rates of teeth, implants, and double crown-retained removable dental prostheses: a systematic literature review. *International Journal of Prosthodontics* 2011;**24**:109–17.
30. Owen P. Appropriatech: Prosthodontics for the many, not just for the few. *International Journal of Prosthodontics* 2004;**17**:261–2.
31. Preti G, Salerno M, Notaro V, Bellia E, Ceruti P, Gassino G. SET: Simplified treatment of edentulous patients. *Minerva Stomatologica* 2011;**60**:579–85.
32. Goodacre CJ, Garbacea A, Naylor WP, Daher T, Marchack CB, Lowry J. CAD/CAM fabricated complete dentures: concepts and clinical methods of obtaining required morphological data. *Journal of Prosthetic Dentistry* 2012;**107**:34-46.
33. Carlsson GE. Changes in the prosthodontic literature 1966 to 2042. Journal of the Canadian Dental Association 2005;**71**:328 a–e.
34. Feine JS, Lund JP. Measuring chewing ability in randomized controlled trials with edentulous populations wearing implant prostheses. *Journal of Oral Rehabilitation* 2006;**33**:301-8.

Table 1. Inclusion criteria used in the review of impressions for complete dentures

Human clinical study
Edentulous subjects
Clinical outcome measures
Comparison between methods
Comparison between materials
Peer reviewed articles
English, German or Scandinavian language

Table 2. Number of citations listed in PubMed for various combinations of search terms*

Search Terms	Citations	Reviews	RCTs[a]	Clinical Trials
Complete denture and Impression	1175	26	8 (4)	15
Complete denture and Impression methods	235	11	7 (4)	13
Complete denture and Border moulding	27	0	1 (1)	1
Complete denture and Post-dam	8	0	0	0
Complete denture and Functional impression	118	1	1 (1)	1
Complete denture and Mucostatic impression	7	0	0	0

* As of March 19, 2012

[a] Relevant studies in parentheses