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Partial denture teaching programmes presented to undergraduate students at Dental Schools in the Republic of South Africa

J Collis*, J C G Slabbert*, P E Cleaton Jones** and P Fatti***

* Department of Prosthetic Dentistry.
** M.R.C. and University of the Witwatersrand Dental Research Institute,
***Department of Applied Mathematics, University of the Witwatersrand, Johannesburg.

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ABSTRACT

A survey of four dental schools in South Africa was carried out by means of postal questionnaires. The purpose of this investigation was to gauge the teaching principles and philosophies of these schools in relation to the design and fabrication of partial dentures and to compare the results with those obtained by Barsby and Schwarz (1979) in their survey of dental schools in the United Kingdom. The South African responses pertaining to the use of study casts, surveying and tooth alteration procedures were almost identical. Similarities were also noted in the prescription of designs to the laboratory, the taking of occlusal relation records, sources of referrals and the choice of impression materials. Many schools deplored the lack of integration between the various departments involved in the process of providing a partial denture service. Although South African schools favour text-books published in the United States of America, the results also provide evidence that much common ground exists in the teaching philosophies of South African schools and schools in the United Kingdom.

OPSOMMING

'n Vraelys is gerig aan die vier tandheelkundige skole in die Republiek van Suid-Afrika met die doel om die metodes en denke met betrekking tot onderrig op die gebied van gedeeltelike kunsgebitte te peil. Hierdie resultate is op die beurt vergelyk met die gegewens van Barsby en Schwarz (1979) wat spruit uit 'n soortgelyke ondersoek onder tandheelkundige skole in die Verenigde Koninkryk. Die antwoorde wat verkry is ten opsigte van studiemodelle, opmeting en tandvoorbereiding was bykans dieselfde onder Suid-Afrikaanse skole. Daarbenewens was daar ook ooreenstemming met betrekking tot voorskrifte vir ontwerp, bronne waaruit pasiente verwys word en die keuse van afdrukmateriale. Baie skole het die gebrek aan samewerking betreur by die verskeie departemente wat gemoeid is met dienslewering van hierdie aard. Alhoewel die Suid-Afrikaanse skole voorkeur gee aan Amerikaanse voorgeskrewe boeke oor gedeeltelik kunsgebitte is daar tog 'n groot mate van ooreenstemming met onderrigmetodes en doelstellings wat in skole in die Verenigde Koninkryk van toepassing is.

INTRODUCTION

Several authorities (Henderson, 1974; Loveland, 1979; Payne, 1962 and 1976) have expressed their concern about certain factors which could have an adverse effect on the future and standing of partial denture prosthodontics. Broadly speaking these concerns involve two major issues, namely, the relationship between the dental practitioner and the technician, and the teaching of partial denture prosthodontics to the undergraduate student.

According to a comparative study conducted in the United States of America (Bowman, 1970) there has been a decrease in the laboratory and lecture time allocated to the teaching of partial denture prosthodontics. This development is attributed to an attenuation of theoretical instruction in favour of the time allocated to the clinical training of students.

Many authorities believe that the careful attention to details of partial denture design is secondary in importance to the maintenance of a high standard of oral hygiene (Addy and Bates, 1979; Bates, 1974; Carlsson, Hedegard and Koivumaa, 1976; Derry and Bertram, 1970). Nevertheless, it would be unwise to decry the importance of teaching an undergraduate student the basic principles and procedures of partial denture fabrication. Such teaching often calls for a formal didactic approach because of the relative inexperience of the undergraduate student, the limited time available for teaching the subject and the need for the student to assimilate established principles which should be used in general dental practice.

On the other hand, the results of past surveys suggest that it would be presumptuous for a teacher of partial denture prosthodontics to assume that the methods and philosophies that he propagates are accepted and practised by his former students (Barsby and Schwarz, 1979; Basker and Davenport, 1978; Bowman, 1970; Franz, 1973 and 1975; Schwarz and Barsby, 1978 and 1980). It therefore becomes important that the teacher should investigate the principles and methods taught at other schools because such action should lead to an improvement in his own teaching programmes. In addition, the ideas and methods that the teacher propagates would possibly also find wider acceptance in general practice. The purpose of this study was, therefore, to investigate the teaching programmes in the field of partial denture prosthodontics at South African dental schools and to compare the results with the findings of Barsby and Schwarz (1979) who conducted a similar survey in the United Kingdom.

METHODS

A postal questionnaire, identical to the one used by Barsby and Schwarz (1979) was sent to each of the Heads of the Departments of Prosthetic Dentistry at four dental schools in South Africa. A covering letter explained the nature and purpose of the survey and a stamped, addressed return envelope was also enclosed.

The questionnaire (Barsby and Schwarz, 1979) included twenty-two questions seeking information about a range of activities pertaining to the teaching of partial denture prosthodontics. For many questions a graduated response was used. Other questions required a choice of one or two alternative answers.

Statistical Analysis

Since the results were obtained from whole populations, analytical techniques were not relevant and only descriptive statistical techniques were used. For ease of comparison all the results were tabulated as percentages.

RESULTS AND DISCUSSION

In this analysis the various related questions are grouped together for the sake of coherence and readability.

Results are given in a tabular form and immediately thereafter a discussion pertinent to the findings follows. This facilitates immediate reference and also provides an easier understanding of the material presented.

Data pertaining to the United Kingdom schools are reproduced in the accompanying tables with the kind permission of Barsby and Schwarz (1979).

Use of text-books

Question 1 asked respondents to list the recommended text-books and also queried whether the departments produced their own texts for the teaching of removable partial prosthodontics. The responses are listed in Table 1.

In addition to the books listed in the United Kingdom survey, eight other texts not directly concerned with partial denture construction were also mentioned. These books dealt with subjects like periodontics, occlusion and minor tooth movement and are not included in Table 1. Two schools made no response, while one school answered that no text-books were considered suitable. Another replied that they used all the British and some American publications. Department-produced texts as hand-outs were used by nine schools in the United Kingdom (fifty per cent).

Table I. Recommended Texts for Students

Author of text book	Percentage of total number of schools	
	U.K.	S.A.
Osborne & Lammie (1974) UK	44,4	
Henderson & Steffel (1973) US	22,2	
Henderson & Steffel (1977) US		50,0
Fenn, Liddelow & Gimson (1962) UK	11,1	
Neill & Walter (1977) UK	11,1	
Applegate (1959) US	5,5	
Bates (1978) UK	5,5	25,0
Harty & Roberts (1974) UK	5,5	
Miller (1973) US		25,0
Dykema, Cunningham & Johnson (1969) U.S.		25,0

One South African school did not recommend any text-book, but provided students with department-produced notes. Another school recommended two books and in addition, also used a departmental hand-out.

A third school prescribed two text-books, but did not hand out any notes.

At the fourth South African school surveyed, the one text-book recommended was augmented by partial denture notes provided in manual form. Three South African schools supplied department-produced texts (seventy-five per cent).

Amongst ten text-books used in the schools surveyed, *Osborne and Lammie* (Partial Dentures) proved to be the most popular in the United Kingdom (forty-four per cent) while in South Africa this book received no support.

It is clear from the table that there is little similarity in the choice of set works in the two countries as South African schools favour textbooks published in the United States. Bowman (1970) in his study of partial denture curricula in the United States of America found that thirty out of forty-three American schools used *Henderson and Steffel* (McCracken's Removable Partial Prosthodontics).

The predilection of South African schools for American text-books could possibly be attributed to the fact that most of the prosthodontists who are invited to lecture in South Africa come from the United States of America.

The question arises as to whether the choice of text-books is in any way reflected in the teaching of partial denture prosthodontics. A more comprehensive survey may very well show that the text-books used have an effect on teaching philosophy.

Table II. Use of Study Casts and Maxillo Mandibular Relations

Response	Use of study casts		Articulated study casts		Examination for disturbance of Jaw relations	
	U.K.	S.A.	U.K.	S.A.	U.K.	S.A.
Always	83,3	100,0	50,0	50,0	72,2	50,0
Generally	5,5		27,7	25,0	5,5	50,0
Frequently			5,5		5,5	
Occasionally	11,1		16,6	25,0	11,1	
Rarely						
Never						

Use of study casts

Questions 2, 3 and 4 related to the use of study casts and asked whether these are articulated and whether the patient requiring partial dentures should be examined for possible disturbances of maxillo-mandibular relations.

The results are shown in Table II.

There were no meaningful differences in the use of study casts. Their use was always recommended and most schools taught the necessity of mounting them on an articulator.

The United Kingdom schools were inclined to use study casts more often for the examination of possible disturbances of jaw relations.

Surveying of study and master casts

Questions 5 and 6 dealt with surveying and the responses were as in Table III.

One school in South Africa never surveys study casts and another never surveys the master casts.

Ideally both sets of casts should be surveyed (Academy of Denture Prosthetics, 1977). The unaltered study cast is helpful for diagnosis, treatment planning and patient education and should be retained as a permanent portion of the patient's treatment file.

The master cast reveals the areas where tooth preparation procedures have been undertaken and should be re-surveyed. This would confirm that the objectives of these re-contouring procedures, for example the establishment of guideplanes or the removal of interferences, have been realised.

Practically, there is the problem that undergraduate students tend to damage and disfigure the master cast while re-surveying and therefore this step is often omitted.

Tooth preparation procedures

Questions 8 and 9 dealt with tooth preparation. All the schools surveyed teach tooth preparation as a standard procedure. The purposes for which tooth alteration procedures are carried out are shown in Table IV.

Additional purposes mentioned in the U.K. study included "correction of anomalies", occlusal correction, creation of undercuts, improving appearance, the cleanability and the creation of space.

Table III. Surveying of Study and Master Casts

Response	Surveying of study casts		Surveying of master casts	
	U.K.	S.A.	U.K.	S.A.
Always	77,7	75,0	100,0	75,0
Generally	11,1			
Frequently	5,5			
Occasionally	5,5			
Rarely				
Never		25,0		25,0

Table IV. Purposes for which Tooth Preparation is carried out

Procedure	Percentage of schools	
	U.K.	S.A.
Rest Seat Preparation	94,4	100,0
Creation of Guide Planes	61,1	75,0
Recontouring buccal/lingual shape	83,3	50,0
Others	22,2	50,0

Two South African schools added that they taught the correction of occlusal interferences; for example in the case of a partial denture opposed by a single complete denture. One South African school specifically stated that it never advocated the recontouring of buccolingual shape.

The preparation of rest seats was the most commonly taught procedure. All the procedures advocated serve the purpose of reinforcing basic considerations in partial denture design, viz.:

(a) support by rests on abutment teeth and by bases on edentulous areas
(b) primary retention by direct retainers placed in undercut areas of abutment teeth
(c) horizontal force transmission through the placement of rigid components of the partial denture in non-undercut areas.

Occlusal relation records

Question 10 sought to determine at what stage occlusal relation records are made (Table V).

Ambiguity may have affected the responses to this question. Most of the schools in this survey take preliminary records for the study casts in those instances where the occlusion is not obvious.

All South African schools record the occlusal relationship after the metal casting has been fabricated.

An accurate occlusal record should be made at the proper vertical dimension prior to the preparation of abutment and related teeth (Academy of Denture Prosthetics, 1977). In addition the recording of final jaw relation records for distal-extension removable partial dentures requires accurately fitted bases attached to the framework.

Laboratory Instructions

Question II related to drawing a partial denture design and making any relevant written comments to the laboratory (Table VI).

There were no meaningful differences in the responses received. All the schools found it necessary to prepare a written prescription of the denture design for the laboratory. This finding seems to contrast with the situation in the United States where according to Quinn (1971) the importance of a healthy dentist-technician relationship is not adequately stressed. He found that dental curricula appeared to be ineffective in teaching the proper use of dental laboratory personnel. Dentists who could not carry out laboratory work to the standard of a technician and who did not possess the knowledge to instruct them effectively were trained there.

Use of special trays

Question 7 referred to the use of special trays. The responses are shown in Table VII.

The majority of schools teach the use of special trays, since these are considered essential for making accurate impressions.

Choice of impression materials

Question 15 queried the respondents' use of impression materials for partial denture prosthodontics (Table VIII).

The consensus among South African schools was that the newer alginates were satisfactory materials. They are considered cheap, easy to use and give adequate detail.

It was the experience at one South African school that casts made from impressions taken in polyether rubber materials often suffer fracture of isolated teeth in the hands of students during separation procedures.

One United Kingdom school used composition as the only material for primary impressions. Schools which indicated the use of composition for the master impression also specified other materials, which were presumably used in combination with composition.

Mandibular distal extension removable partial dentures usually require a secondary impression technique (altered cast, functional or relining procedure) in order to enhance proper distribution of stresses in the prosthesis.

Treatment Planning

Questions 12, 13 and 14 related to the co-ordination with other disciplines involved in treatment planning for the partially edentulous patient.

All the schools teach that periodontal treatment should be carried out before prosthetic treatment.

With regard to the restoration of abutment teeth there was agreement that this should be taken into account in partial denture design. In their experience interdisciplinary participation was often not co-ordinated or sequentially planned.

Three schools in the United Kingdom and three in South Africa did not think other departments paid sufficient attention to the co-ordination of treatment planning. Examples of this lack of co-operation are:

(a) restorative work done on hopelessly periodontally diseased teeth;
(b) the construction of crowns without incorporating needed retentive undercuts or rest seat preparations;
(c) semi-precision partial dentures constructed on cases with crowns already cemented onto abutment teeth, instead of the crowns being an integral part of the master cast.

Table V. Stage at which Occlusal Relationship Records are made

Stage	Percentage of schools	
	U.K.	S.A.
For study casts	100,0	75,0
Before casting is made	66,6	—
After casting is made	72,2	100,0

Table VI. Requirement to submit full written prescription of denture

Response	Before mouth preparation		As instruction to laboratory	
	U.K.	S.A.	U.K.	S.A.
Always	72,2	75,0	77,7	100,0
Generally	16,6		16,6	
Frequently			5,5	
Occasionally	11,1	25,0		
Rarely				
Never				

Table VII. Use of Special Trays

Response	Percentage of schools	
	U.K.	S.A.
Always	38,8	50,0
Generally	38,8	50,0
Frequently	5,5	
Occasionally	5,5	
Rarely	11,1	
Never		

Table VIII. Choice of Impression Materials

Material	Primary impression		Master impression	
	U.K.	S.A.	U.K.	S.A.
Alginate	94,4	100,0	94,4	100,0
Silicone Rubber	5,5		41,1	25,0
Mercaptan Rub			41,1	25,0
Polyether Rub			16,6	25,0
Composition	22,2		16,6	

Three of the South African schools provide treatment through departmentalization. The fourth uses a vertical group system in which the "whole patient" is treated, with prosthetics usually being the last step.

A teamwork approach using the vertical grouping system may possibly eliminate many of the problems associated with treatment planning.

Distal extension saddle dentures

Two questions were included about free-end saddle dentures. Question 16 asked whether special procedures applicable to this type of denture were taught (Table IX). In the United Kingdom two schools did not respond to this question, but did answer question 17, which asked which procedures were employed. Nine schools teach the use of "stress-breaker" devices and fifteen schools teach the use of advanced impression procedures. Here again there was some ambiguity and the questionnaire did not specify the procedures envisaged.

One South African school queried whether stress-breaker devices included clasp assemblies such as the RPI system.

In the distal extension saddle type of denture two different support systems are used and the problem is to distribute the stresses optimally.

The responses indicate that most schools are acutely aware of the problem and advocate the use of "stress-breaking" devices and particular impression procedures (such as the altered cast) to achieve their objectives.

Major connectors

Questions 18, 19 and 20 related to major connectors. The results are shown in Table X.

For both cast metal and resin major connectors, one United Kingdom school gave a qualified response stating "wherever indicated". United Kingdom dental schools generally advocate the use of cast metal major connectors for lower partial dentures rather than for upper dentures.

Resin major connectors are more commonly used for upper dentures than for lower. Wrought metal major connectors are used more frequently for mandibular dentures than for maxillary partial dentures. According to Barsby and Schwarz (1979), who quote figures from the Dental Estimates Board, the ratio of resin dentures to metal based dentures produced in the United Kingdom is approximately 9:1.

Table IX. Free-end Saddle Dentures

Response	Percentage of schools teaching use of particular procedure	
	U.K.	S.A.
Always	44,4	50,0
Generally	22,2	
Frequently	16,6	
Occasionally	5,5	25,0
Rarely		25,0
Never		

Most schools in the United Kingdom do not advocate the use of acrylic resin major connectors, particularly in mandibular dentures, whereas it appears that the tendency in South Africa is to use them more frequently. This discrepancy could be related to the fact that some South African schools make use of additive partial dentures. This type of prosthesis is commonly used in those instances where the practitioner feels that the total removal of the patient's teeth should be delayed.

The dangers of "gum-strippers" are well documented (Addy and Bates, 1979) and ideally, major connectors should be constructed of materials which will enable them to be sufficiently rigid, both for the optimum distribution of forces throughout the dental arches and for the avoidance of gingival impingement (Academy of Denture Prosthetics, 1977).

Source of referrals

Question 21 queried the source from which students obtained patients. The replies indicated that most patients came directly to departments of prosthetic dentistry, followed in order of frequency by referrals from departments of conservative dentistry, oral surgery and periodontology.

At one South African school other referrals came from a Temporomandibular Joint Clinic and from the Department of Speech Therapy. At another South African school, there is a multidisciplinary organization. Patients are part of the "whole patient treatment concept". Theoretically the above type of streaming should provide a more constant, controllable, integrated source of patients.

Another source is by referral from private practitioners. This type of patient usually required complicated treatment, often involving increases in the vertical dimension of occlusion.

A number of factors contribute to patients being referred to dental schools in South Africa. In the first instance, dentists may feel themselves inadequately quali-

Table X. Materials used for Major Connectors

Response	Cast Metal				Resin				Wrought Metal			
	P/		/P		P/		/P		P/		/P	
	U.K.	S.A.	U.K.	S.A.	U.K.	S.A.	U.K.	S.A.	U.K.	S.A.	U.K.	S.A.
Always	11,1	25,0	11,1	25,0	5,4	25,0	5,5	25,0			5,5	
Generally	27,7	75,0	61,1	75,0	5,5		5,5					
Frequently	44,4		11,1		38,8	75,0	16,6	75,0			5,5	
Occasionally	11,1		11,1		27,7		5,5				16,6	25,0
Rarely					16,6		61,1		16,6	25,0	38,8	50,0
Never									83,4	75,0	33,3	25,0

fied to provide the necessary treatment, while secondly, the patients may be unable to afford the fees demanded in private practice.

Time spent in the fabrication of partial dentures

Question 22 related to the average chairside time employed in providing a patient with a removable partial denture (Fig. 1).

Some respondents in the United Kingdom indicated a range, one quoted time taken by students and one commented that no simple cases were treated by staff members.

South African schools exhibited a wider spread and on average, spend slightly more chairside time on each case than schools in the United Kingdom (i.e. 3,75 hours compared to 2,84 hours). United Kingdom schools tend to be more homogeneous in their spread (Standard Deviation 0,80).

The reason for the larger standard deviation in the South African sample (1,35) is that one school spent very much less time on the procedures than the other three schools.

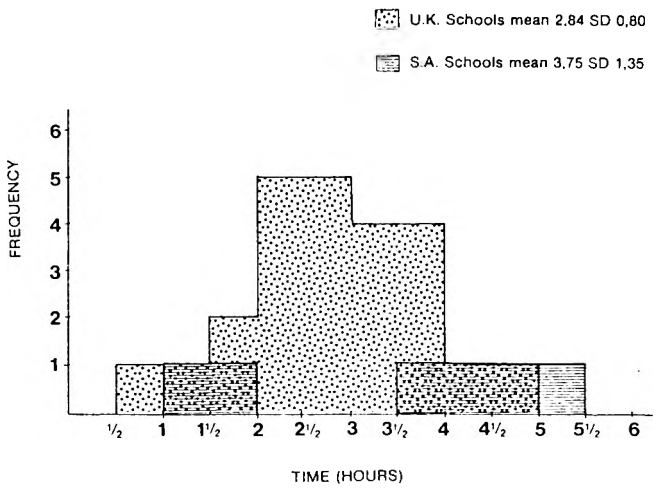


Fig. 1 Total average chairside time for Dental School Staff when treating a patient by provision of a partial denture

CONCLUSIONS

Teaching methods used in the various schools in South Africa and in the two countries surveyed have much in common. Thus the responses pertaining to the use of study casts, surveying and tooth alteration and preparation procedures were almost identical.

Marked similarities were also noted in the prescription of designs to the laboratory, the taking of occlusal relation records, sources of referrals and the choice of impression materials. Most schools recognised the problem of the distal extension denture and therefore advocated special measures for the treatment of such cases.

Many schools deplored the lack of integration in planning between the various departments involved in the process of providing a partial denture service.

One major point of departure between the two countries was in the choice of text-books. South African schools clearly favour text-books published in the United States of America.

Variations in the choice of major connectors and in the chairside time employed in the provision of a partial denture may be explained by prevailing local conditions, for example the National Health Scheme in the United Kingdom and the differing socio-economic levels of the populations treated at the various schools in the Republic of South Africa.

This survey establishes a base-line for further prospective studies which may be used to compare partial denture fabrication in dental practice with the teaching of removable prosthodontics in the Republic of South Africa.

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