

## eviDent Project 002:

### A 5-Year Retrospective Assay of Implant Treatments and Complications in Private Practice: The Restorative Complications of Single and Short-Span Implant-Supported Fixed Protheses.

Wang JH, Judge R, Bailey D..

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## INTRODUCTION

Previous meta-analyses have shown a high frequency of technical and mechanical complications compared with biologic complications in single implant-supported crowns and implant-supported fixed partial dentures (FPD). When the studies were updated using material published after 2000 there was a decrease in technical complications. However, there was an increase in other complications such as veneer material fracture which was reported in greater detail. Studies of outcomes of implant restorations in general private practice have been limited.

The aim of this study was to retrospectively describe restorative outcomes of 5491 implant-supported single crowns and FPD restorations within the period between January 2005 and December 2009. Outcomes were examined in regards to clinician, patient and implant variables. This study was part of a larger project examining surgical and prosthodontic implant procedures.

## METHODS

This retrospective cohort study involved dental clinicians who had qualified on or before December 2004 and were placing and/or restoring implants in private practice. The study was conducted through the eviDent Foundation. Clinicians were visited by a research team who used treatment codes within the study period to identify suitable patients. Data collected from enrolled and referred clinicians were included. If records were incomplete or

the patient chose an alternative restorative option, then these subjects were excluded.

Data were collected using a template, which was generated and modified by the study steering group comprising of restorative and surgical dentists and specialists and a statistician. This template was tested and modified using sample records. Data extraction was conducted by two calibrated research assistants. Data were collected in regards to the clinicians, patients, comorbidities, oral status, surgical data, implant and restoration details and complications. In this study, single to three-unit implant or implant/tooth-supported fixed restorations were included.

Complication rate was calculated per 100 prostheses per year. Generalised linear mixed modelling was used to analyse the dataset as the responses were binary and due to the retrospective nature of the study resulted in unbalanced representation of data under different operators. Analysis was performed with the operator as the overall random effect and each fixed effect (operator experience, gender, location, attrition, crown type and method of retention) was used to predict response variables (screw loosening excluding lateral screws, aesthetic complications, veneer material fracture, food packing and contact point complications).

## RESULTS

Four hundred and ninety-nine restorative complications were

**Table 1** Retentive Complications Observed During Study Period (Occurrence Rate out of 100 per Year)

	N prostheses (N)	Mean time (y) observed in function (T)	Retention Issues				
			Abutment screw loosening	Prosthetic screw loosening	Lateral screw loosening <sup>a</sup>	Screw loosening (unspecified)	Abutment screw fracture
Single implant	<b>4,760</b>	3.15	11 (0.07)	4	15 (1.06); n = 468, T = 3.03	80 (0.53)	9 (0.06)
Single-implant cantilever	<b>175</b>	2.95	2 (0.39)	1	2 (1.91); n = 35, T = 2.99	15 (2.91)	0
Two-unit splinted crown	<b>181</b>	3.55	1 (0.16)	0	2 (2.30); n = 23, T = 3.78	7 (1.09)	0
Three-unit implant-supported FPD	<b>343</b>	3.25	0	1	3 (2.47); n = 46, T = 2.64	6 (0.54)	0
Three-unit splinted crown	<b>24</b>	3.04	0	1	1 (8.59); n = 4, T = 2.91	0	0
Tooth-implant combination	<b>8</b>	3.21	0	0	0	0	0
<b>Total</b>	<b>5,491</b>	3.16	14	7	23	108	9

T = average years observed in function

<sup>a</sup>Lateral screw loosening annual rate per 100 was calculated using only lateral screw-retained prostheses

<sup>b</sup>Decementation annual rate per 100 was calculated using only cemented prostheses

recorded for the study period. Single-implant crowns had a complication rate of 2.56 per 100 prostheses per year. Please see table 1 for further data.

The mean observation time for single-implant crowns was 3.15 years. Observation times were not recorded for all prostheses.

All nine abutment screw fractures were in single-implant crowns. Lateral screw loosening occurred at a rate of 1.06 per 100 lateral screw-retained single-implant crowns per year while decementation occurred at 0.57 per 100 cement-retained single-implant crowns per year. The rate of prosthetic screw loosening was not calculated based on the data provided. Aesthetic complications were recorded in regards to colour, arrangement, contour and metal display. Tooth to implant, single-implant cantilever and three-unit implant-supported FPDs had a higher rate of aesthetic complication. Single-implant crowns had a

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## Questions

1. **The annual rate of veneer chipping per 100 single-implant crowns was:**
  - a. 0.14
  - b. 0.41
  - c. 0.53
  - d. 9.35
  
2. **How many total restorative complications were noted during the study period?**
  - a. 5491
  - b. 4760
  - c. 499
  - d. 108
  
3. **TRUE or FALSE?**  
Screw loosening was greater in the anterior area due to faster loss of pre-load.
  
4. **Limitations of the study did NOT include:**
  - a. Patient self-reporting
  - b. Quality of patient records
  - c. Insufficient number of subjects
  - d. Self-selection bias
  
5. **Veneer material chipping was mainly seen in the:**
  - a. Mandibular posterior area
  - b. Maxillary posterior area
  - c. Mandibular anterior area
  - d. Maxillary anterior area
  
6. **When was decementation of implant crowns likely to occur?**
  - a. Early during the observation period
  - b. In the middle of the observation period
  - c. Late during the observation period
  - d. Continually during the observation period
  
7. **The study did NOT include which of the following implant restorations:**
  - a. Single-implant restorations
  - b. Three-unit implant restorations
  - c. Tooth to implant restorations
  - d. Full arch implant restorations
  
8. **Problems identified with aesthetics included:**
  - a. Contour
  - b. Phonetics
  - c. Food impaction
  - d. Screw fracture
  
9. **TRUE or FALSE?**  
Cemented prostheses had less screw-loosening
  
10. **How many implant fractures were noted during the observation period?**
  - a. 23
  - b. 9
  - c. 4
  - d. 2

### Clinical Update Review – FEBRUARY 2017

Completion and return of this questionnaire with 9 correct answers will gain 1 scientific CPD hour towards satisfying Dental Board of Australia requirements. This is an ADAVB members only service. An administration fee of \$11 (GST inclusive) applies. Circle the correct response on this form (or a photocopy) and return it with payment to: CPD Coordinator, ADAVB, PO Box 9015, South Yarra, Victoria 3141 - Submit by 28 February.

Or submit your answers online AT NO COST at [www.adavb.net](http://www.adavb.net)

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Answers to last issue's Clinical Update (December 2016)  
1 D, 2 B, 3 FALSE, 4 B, 5 D, 6 B, 7 C, 8 B, 9 TRUE, 10 C

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Retention Issues			
Screw fracture (unspecified)	Screw head/thread damage	Decementation <sup>b</sup>	Unclassified retention issues
0	2 (0.01)	11 (0.57); n = 578, T = 3.36	35
0	0	1 (3.08); n = 13, T = 2.50	0
1 (0.16)	1 (0.16)	0	0
0	1 (0.09)	0	3
0	0	0	0
0	0	0	0
1	4	12	38

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veneering material fracture rate of 0.41 per 100 prostheses per year and food impaction/contact point complications at a rate of 0.53 per 100 prostheses per year. Occlusion issues included failure to achieve contact in centric occlusion and unwanted excursive contacts. In single-implant crowns, occlusal problems were noted at a rate of 0.14 per year per 100 prostheses. The only two implant fractures noted during the study period were supporting single-implant crowns. Other complications such as excess cement, pontic issues and remakes due to a change in prosthesis type were recorded in limited numbers.

Operator experience was categorised into three groups by the number of implants restored (1-100, 101-500 and >500). The locations of the prostheses were divided into anterior maxilla, posterior maxilla, anterior mandible and posterior mandible.

**DISCUSSION**

Single-implant crowns comprised the largest group observed (4760) and the lowest rate of complications. Of the FPDs, the single-implant cantilever had the highest complication rate of 9.35 per 100 prostheses per year. Overall restorative complication rates were lower than previously reported which may be due to improvements in screw, abutment, framework and ceramic technology. These data were more consistent with data reported by Pjetursson et al. using studies published after 2000.

Unspecified screw-loosening encompassed the abutment screw, prosthetic screw or the lateral screw. Only 23 of 108 prostheses that had unspecified screw loosening were lateral screw-retained. Based on abutment design information it is likely that most of the rest were abutment screw loosening for single-implant crowns. An initial cluster of unspecified screw-loosening was seen and unspecified screw-loosening continued to be seen in single-implant crowns over many years of service. This initial cluster is not seen for abutment screw fractures and screw loosening. Previous studies have shown that most screw loosening occurs in the first two years after crown insertion. The increase in screw loosening may be due to loss of preload under function. In this study, the annual rate of recorded abutment screw loosening combined with unspecified screw loosening was lower than in other studies.

The more experienced the operator, the fewer screw-loosening complications were seen. Ceramic crowns and cemented prostheses had less screw-loosening. Anterior single-implant crowns had approximately half the screw-loosening of posterior crowns. The increase in screw-loosening in the posterior segment

may be due to increased bite forces, reducing the preload in the screw. In single-implant crowns, lateral screw-loosening continued over a longer observation period while decementation occurred early after restoration. Lateral screw-loosening may have occurred due to milling stock abutments, which would depend on the abutment design, the angulation and the milling process, which may have limited resistance due to the thin walls of the abutment.

Aesthetic complications occurred within the first four months of definitive restoration, which was consistent with anecdotal practice experience but had not been reported before in the literature. It was not associated with patient sex or operator experience. It was most often associated with single-implant crowns in the anterior maxilla. This complication rate was lower than for other studies.

Veneering material fracture rate ranged from 0.41-1.40% depending on prosthesis and clustered between the four to eight months and increased after four years and was noted mainly in the maxillary anterior area. Attrition was associated with material fracture. The timing of fractures has not been previously reported and early fractures may relate to problems in construction. In this study, there was no difference between screw-retained and cement-retained implant crowns in fracture. The effect of the screw access opening may be the possible reason for higher rates of veneer chipping in screw-retained prostheses (as found in other studies).

Greater operator experience was associated with reduced food packing and contact point complications. It was seen less frequently with cement-retained implant crowns. This study did not find significant differences between gender and regions of the oral cavity. Other studies have shown loss of contact point over time.

The limitations of this study were: the self-selection bias of those who volunteered to participate in the study; the quality of patient records; possible inconsistent detection of complications across operators; and patient self-reporting may also result in under-representation of the incidence of complications.

**CONCLUSION**

This study found varying restorative complications observed across different prosthesis types. Time effect (clustering) can be seen in some restorative complications particularly in the first year. Statistically significant correlations can be drawn between some restorative complications, operator, patient and implant factors.

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## Dr Cole appointed to head leading public healthcare body

ADAVB congratulates Dental Health Services Victoria (DHSV) CEO Dr Deborah Cole on her appointment as Chair of the Board of the nation's leading public healthcare body, the Australian Healthcare and Hospitals Association (AHHA).

Since joining DHSV in 2011, Dr Cole has worked to significantly improve the community's access to quality and equitable dental care.

Prior to joining the agency, Dr Cole held CEO positions at Calvary Health Care and Yarra City Council, as well as senior executive positions at Mercy Health and St Vincent's Health and the Dental

Practice Board of Victoria.

[www.dhsv.org.au/news/news-stories/general-news-stories/2016-news/dr-deborah-cole-appointed-chair-of-ahha-board](http://www.dhsv.org.au/news/news-stories/general-news-stories/2016-news/dr-deborah-cole-appointed-chair-of-ahha-board)

