Prosthesis Installation Technique Using the Reverse Margin™ Design and Supporting Principals to Control Excess Cement

Emil L.A. Svoboda PhD, DDS, Published to www.ReverseMargin.com. July 8, 2015.

ReverseMargin™
Protecting Your Foundation

Introduction

Dentists have been cementing prosthetics into the mouths of patients for over 100 years. Many have studied the process of cementation, but few have looked at the effect of gingiva on the flow of cement. A recent book edited by Chandur P.K. Wadhwani reviews the state of knowledge. (1) In summary, Thomas G. Wilson Jr has shown the positive relationship between residual subgingival ce-ment and peri-implant disease.(2) Tomas Linkevicius has shown that the problem of subgingival cement, and its removal becomes worse with the increased depth of the subgingival margin. (3) Wadhwani discusses the complex nature of the cementation process and proposes ways of reducing cement volume and pressure that drives excess cement into the tissue environment. He also gathered information from failed implants and shows how excessive the amount of residual cement can be. Wadhwani suggests using custom abutments to control margin position, because it is diffi-cult to achieve control of margin position with stock abutments that are mass produced. (4) Dr. Svo-boda discusses the evolution of stock to "well designed" customized abutments and their impact on intra-oral prosthesis design and cementation. (5)

In 2013 Svoboda created a new margin design, the Reverse Margin™, that redirects excess cement out of the tissues rather than into them.(6, 7, 8, 9) Most current margin designs face towards the tis-sues and thus direct excess cement into them.

However, Svoboda observed that the margin design did not work as well as expected, when the margins were placed in a subgingival location. He then developed an "in vitro" model to study the effect of Gingiva on the flow of excess cement. He discovered that the Gingiva had a profound effect on cement flow, and called those effects the "Gingival Effects". He also observed the components that comprised these Gingival Effects and named them the Deflection Effect, Plunger Effect and Bellows Effect.(10) Later he observed the Eddy Effect.(11) In any case, he was able to overcome the Gingival Effects "in vitro" by modifications to the design of the custom abutment-prosthesis complex. (12, 13, 14, 15) This article is the current proposal for intra-oral prosthesis cementation and it is based on the above work and Dr. Svoboda's ample experience restoring both dental implants and natural teeth.

Fig 1 is a picture of a custom abutment with the Reverse Margin™ design attached to an ITero model beside a solid zirconia crown with a complimentary margin.

1) Have a dental laboratory* create custom abutments with the Reverse MarginTM and supporting features that include cur-rent concepts for better cement control. (Fig 1) These include:

a) Use custom abutments to control margin position. Be aware that the difficulty in controlling excess cement

Contact
Dr. Emil Svoboda PhD, DDS
110 Queen St East
Brampton, ON L6V 1B1, Canada
905-866-6657,
Fax 905-866-6244
drsvoboda@reversemargin.com

during the intra-oral cementation process increases when margins are placed deeper into the soft tissues surrounding the dental implant. Margins between ½ mm to 1 mm subgingival are easier to access for cleaning away excess cement than deeper margins. (1, 2, 3, 1, 13)

b) Use custom abutments to control the emergence profile of the abutment and stretch the soft tissues to create a better barrier against the penetration by excess cement. This will help keep cement out of the deeper soft tissues surrounding the abutment. The custom abutment design effectively becomes the bottom part of the prosthesis. (3, 4, 12, 13)

c) Avoid tissue facing margin designs that direct cement into the peri-implant tissue spaces. (6 -14)

d) Avoid abutment-prosthesis designs that do not account for the "Gingival Effects" that can cause excess cement to be driven deeper into the peri-implant environment where it is difficult to locate and clean away. Use a design that allows excess cement escape out of the sub-gingival environment into a location that makes cleanup more predictable. (10, 11, 12, 13, 14)

2) Install the custom abutment(s) individually and tighten them into position (Fig 2). This process usually requires soft tissue local anesthesia, as the patient may feel too uncomfortable when their gingival tissues are being stretched by the abutment as it is tightened into place. Anesthesia will also be useful during cement cleanup.

If there is any doubt about the full seating of the abutment, confirm seating of abutments by x-ray imaging. This is advisable when the implant or abutment design does not prevent tissue impingement or does not have a clear seating position. Note, both x-ray imaging and tactile assessment of the implant-abutment connection may be unreliable. (1, 3, 9, 14) Pixel sizes of most digital x-rays are about 20 microns, which are too large to detect small implant-abutment misfits. Tactile reliability can be misleading as any 3 legged table feels stable. Bacteria are in the order of 1 micron in diameter.

3) Try in the prosthesis to confirm passive fit over its abutment(s) and confirm optimal fit against soft tissues, occlusion with opposing teeth and contacts with adjacent teeth. (14) It is often possible to have some visible supra-gingival margins, to help confirm the proper seating of the prosthesis, otherwise one would have to rely on margin probing with an explorer. Make adjustments to the abutment and prosthesis as necessary. Use a large enough cement space (60-120 microns) to avoid binding of the prosthesis on abutment.

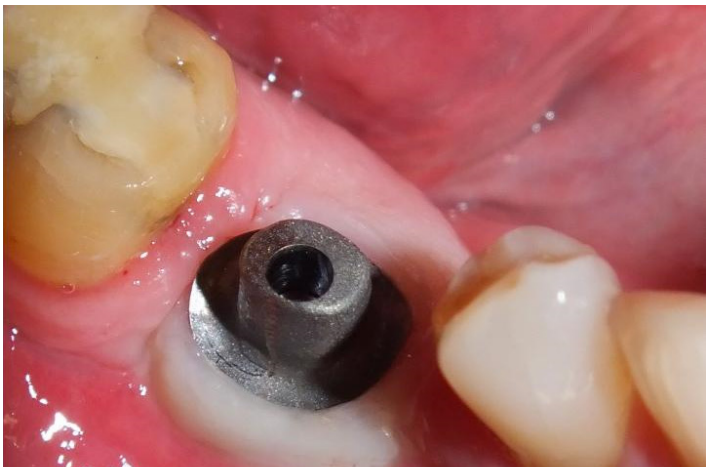

Fig 2 is a picture of a custom abutment with the Reverse Margin™ design attached to an implant inside the oral cavity. Note the blanching of the minimally subgingival margin.

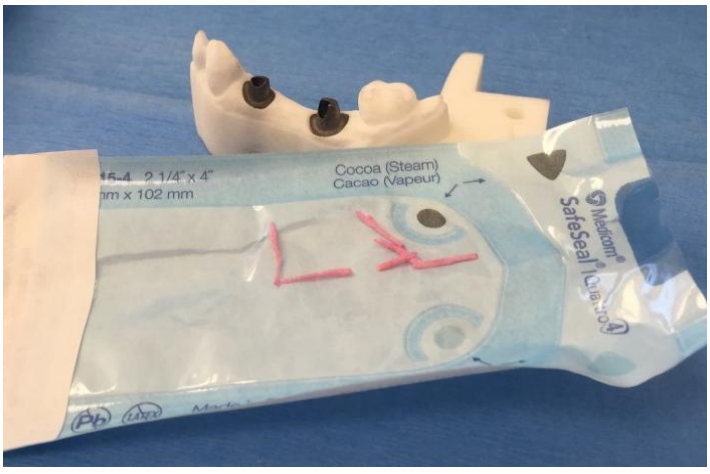

Fig 3 is a picture of several piec-es of cut and rolled pink Teflon tape in a sterilization bag beside an iTero model with 2 custom abutments.

Contact
Dr. Emil Svoboda PhD, DDS
110 Queen St East
Brampton, ON L6V 1B1, Canada
905-866-6657,
Fax 905-866-6244
drsvoboda@reversemargin.com

4) Isolate one abutment at a time and stuff pieces of pink sterilized Teflon (Plumbers Tape) into the screw access hole(s) (Figs 3, 4). If it is difficult to maintain a dry environment, consider leaving some space over the top of the Teflon tape and fill it with a flowable light-cured resin. This protects the Teflon from saliva contamination. Ensure the resin or Teflon does not impede the seating of the prosthesis. Clean and dry abutments be-fore cementation.

Note: The Teflon pink Plumbers Tape is cut and rolled into manageable strips and then sterilized prior to stuffing it into the screw access chimney of the abutment(s). The author, and others, have found Teflon to be superior to cotton as a space maintainer, as it is easy to remove when necessary to access the retaining screw. Also unlike cotton, it prevents penetration of cement during the intra-oral cementation process. When cement penetrates into the cotton, it sticks to the walls of the access channel and makes it difficult to remove the retaining screw.

5) Use a lubricant such as Vasaline™ (™ owned by Unilever) to cover adjacent tooth contacts, soft tissues and external parts of the prosthesis that are not necessary for the adhesion of the prosthesis. This will prevent the dental cement from stick-ing to protected surfaces and aid in cleanup of excess cement.

6) About ½ fill the intaglio surface of the prosthesis with cement, ensuring that the cement wets the entire internal surface. The author uses more cement volume than necessary, to avoid underfilling and to make it easier to locate and remove excess cement. It sticks to itself and forms manageable pieces when dislodged from intra-oral surfaces **(Fig 5)**.

Place the prosthesis over the abutment(s) and gently tap it into place with minimal finger pressure. [15] Since the cement has a long working time, there is no rush and there is no need for clinician anxiety during intra-oral prosthesis cementation. There must be sufficient pressure hold the prosthesis in place during initial light polymerization. Light cure 4 seconds per side and clean

Fig 4 is a picture of roll of pink Teflon (Plummer's Tape) beside a dental model with attached custom abutments. Rolled pieces of tape from **Fig 3** have been stuffed into the access holes of the custom abut-ments to prevent cement from entering them during the intra-oral cementation process.

Fig 5 is a picture of a custom abutment with the Reverse MarginTM design attached to an ITero model beside a solid zirconia crown with a complimentary margin.

while it is still in the rubbery state. Hold prosthesis in place to counteract unseating forces during initial cleanup. Fig 5 shows the crown in place with visible excess cement. **Fig 6** is a picture of a peri-apical x-ray showing the excess cement around the prosthesis and on the gingiva prior to cleanup. The cement is in a large piece that is easy to break up and remove. The bulk of cement has flowed onto the outer surface of the gingiva. This excess cement

Contact Dr. Emil Svoboda PhD, DDS
110 Queen St East
Brampton, ON L6V 1B1, Canada
905-866-6657,
Fax 905-866-6244
drsvoboda@reversemargin.com

is relatively simple to locate and remove with a scaler or small straight carver.

I use RelyX Ultimate™ (3M) because of its excellent properties including high compressive strength, great retentive strength, easy flow characteristics, long working time, dual cure nature and easy cleanup. I use a large cement space to allow for easy flow of excess cement.

7) Fully polymerize cement with light, or simply wait until cement fully sets in 5 minutes. It is dual cure. Clean off remain cement, floss contacts and take x-ray to confirm fit and visible cement removal. **Figs 7 and 8** show the crown in place with the cement removed.

Conclusion

Congratulations! You have now optimized your control of the process of intra-oral prosthesis installation, optimized the implant-abutment connection and have significantly reduced or eliminated the possibility of leaving behind residual excess cement.

You have achieved cement control by the design of your abutment and prosthesis. This design should minimize the "Gingival Effects" and direct the cement up and out of the soft tissue spaces rather than into them. In addition you have used a cement with easy control features and have used "Super Low" cementation forces to enhance your cement control. By reducing or eliminating a known risk factor for implant failure, both you and your patients will be happier when your implant treatment lasts longer!

*Note the Reverse Margin is a protected Trade Mark and the Reverse Margin design and some peripheral design features are Patent Pending. Those wishing to incorporate these features into their prosthetics and or/ abutments must obtain permission from the au-thor. Go to www.ReverseMargin.com for more information.

Fig 8 is a picture of the zirconia crown with the excess cement removed.

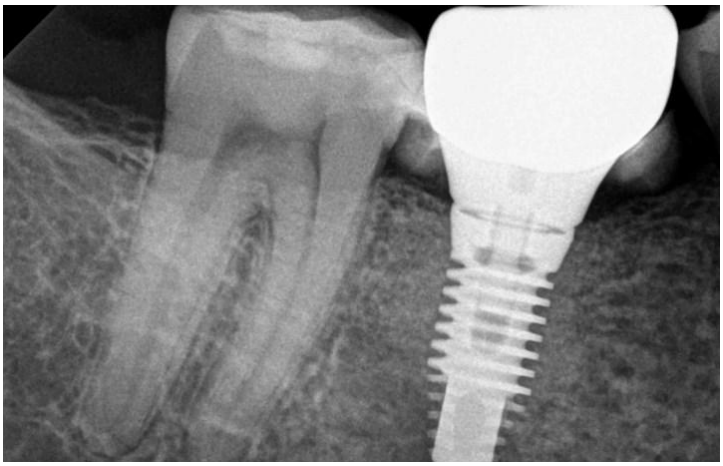

Fig 6 is a picture of peri-apical xray showing the position of excess cement. The cement has flowed upwards and onto the oral aspect of the gingiva.

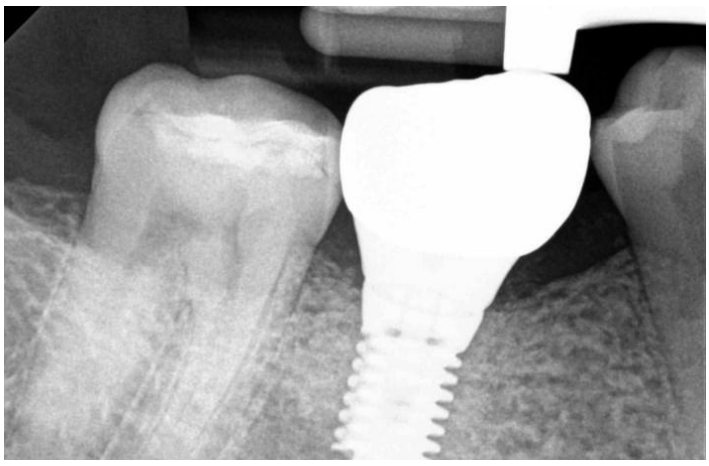

Fig 7 is a picture of peri-apical xray showing the excess cement removed.

Contact
Dr. Emil Svoboda PhD, DDS
110 Queen St East
Brampton, ON L6V 1B1, Canada
905-866-6657,
Fax 905-866-6244
drsvoboda@reversemargin.com

References

1. Cementation in Dental Implantology. An Evidence Based Guide. Edited by Chandur P.K. Wadhwani. Published by Springer 2015.
2. The positive relationship between excess cement and peri-implant disease: a prospective clinical endoscopic study. Wilson,T.G., J Periodontol 2009;80:1388.
3. The Influence of the cementation margin position on the amount of undetected cement. A pro-spective clinical study. Tomas Linkevicius et al. Clinical Oral Implants Research. Vol 24,Issue 1, 71-76, Jan 2013.
4. Cementation in Dental Implantology. An Evidence Based Guide. Edited by Chandur P.K. Wadhwani. Chapter 6 by T. Linkevicius, Published by Springer 2015:107.
5. The Evolution from Stock Abutments to Custom Abutments for better Prosthesis Design and Saf-er Intra-oral Cementation. Published to www.ReverseMargin.com. August 21, 2015.
6. Reverse MarginTM, Protecting Your Foundation. Emil L.A. Svoboda, Animation Video 1, Pub-lished to www.ReverseMargin.com, May 6, 2015
7. Reverse MarginTM, Margin Design is Important, Emil L.A. Svoboda, Video, Video 2, Published to www.ReverseMargin.com, May 6, 2015
8. Effects of Margin Design on the Direction of Flow of Excess Cement "in vitro". Emil L.A. Svoboda PhD, DDS, Video Published to www.ReverseMargin.com. Aug 13, 2015.
9. Reverse MarginTM, A Great Solution to a Big Problem. Emil L.A. Svoboda, Video 4 Slide Presen-tation, 2nd edition, Published to www.ReverseMargin.com, May 6, 2015
10. Gingival Effects on Intra-oral Prosthesis Cementation. Emil L.A. Svoboda PhD, DDS, Animation Video Published to www.ReverseMargin.com, July 13, 2015
11. The Gingival Effects can increase the problem of Excess Subgingival Cement. An "in vitro" Study. Emil L.A. Svoboda PhD, DDS, Video Published to www.ReverseMargin.com. Aug 13, 2015.
12. Controlling excess cement during the process of intra-oral prosthesis cementation. Overcoming the Gingival Effects. Emil L.A. Svoboda PhD, DDS, Published to www.ReverseMargin.com, July 4, 2015.
13. Overcoming the Gingival Effects by Prosthesis Design. An "in vitro" Study. Emil L.A. Svoboda PhD, DDS, Video Published to www.ReverseMargin.com. Aug 17, 2015.
14. Stop causing Implant Failures! Emil L.A. Svoboda, Video 5, Slide Presentation, Published to www.ReverseMargin.com, May 9, 2015
15. Super Low Cementation Forces. Emil L.A. Svoboda PhD, DDS, Video Published to www.ReverseMargin.com, July 13, 2015.

Contact
Dr. Emil Svoboda PhD, DDS
110 Queen St East
Brampton, ON L6V 1B1, Canada
905-866-6657,
Fax 905-866-6244
drsvoboda@reversemargin.com