Geristore®
Dual-Cure Composite
Research Reference Guide

1. "Geristore Syringeable," The Dental Advisor, Vol. 21, No. 1. Best of 2003, January/February 2004.

THE DENTAL ADVISOR ++++½

The Dental Advisor awarded Geristore® Syringeable a rating of 4 1/2 pluses after 24 consultants used the multi-use resin ionomer restorative in 377 clinical applications. Geristore Syringeable was found to be "a versatile material with its multitude of potential applications." The automix delivery system scored high ratings among the consultants. "Geristore Syringeable exhibited very good flow, stacking, marginal adaptation, and ease of finishing. When used for cementation, consultants noted a general lack of post-operative sensitivity." Testing consultants found "Geristore Syringeable was as good as or better than the material they were currently using; 58% stated that they would switch to it, and 71% would recommend it."

2. Yu, Xinyi, "Saving a Cracked Tooth Using Geristore," DentalTown, September 2003.

This is a case study using Geristore® to save a cracked tooth (root)—the traditional treatment option was extraction. Using Geristore, with Core Paste and Tenure®, the author sealed, bonded, and built up the remaining root structure and was then able to complete the restoration with a Cerinate® porcelain crown. Geristore was used because of its superior biocompatibility and its ability to be a successful, subgingival restorative material.

3. Camp, Mark A., Jeansonne, Billie, Lallier, Thomas, "Adhesion of Human Fibroblasts to Root-End-Filling Materials," Journal of Endodontics, Vol. 29, No. 9, September 2003.

The purpose of this study was to evaluate the attachment of cultured explants of human periodontal ligament fibroblasts and gingival fibroblasts to different root-end-filling materials and the role of integrins during the attachment process. Geristore was one of four root-filling materials used in the study. Human PDL fibroblasts and gingival fibroblasts were introduced to the four root-filling materials. The fibroblasts attached immediately to Geristore and not to the other three materials. After incubation, the attachments improved and proliferated on the Geristore material and the fibroblasts did not attach or grow on the other test materials.

4. Yu, Xinyi, "Solving Dental Practice Restorative Dilemmas with Geristore," DentalTown, 4(1):40, January 2003.

A review of practitioner testimonials, as well as published studies and clinical case reports, provides an insight into the many uses and attributes of Geristore. Among

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 826046700 04/07

the topics presented are repair of root perforations, treatment of furcation defects, treatment of external root resorption, treatment of root fractures, restoration of root caries, evaluation of microleakage, and use as a barrier for guided tissue regeneration.

5. Ouellet, David, "Use of Geristore in the Treatment of a Split, Vital Tooth," DentalTown, December 2002.

   This case report demonstrated the use of Geristore and Tenure® Uni-Bond® on a split, vital, first bicuspid. The tooth was first prepared with Tenure Uni-Bond and then Geristore was syringed into the cracked area. After the split was sealed and bonded, the tooth was restored with a three-quarter gold crown. The patient is symptom free, percussion free, and has no sensitivity.

6. Al-Sabek, Fuwad, Bush, Peter, Kirkwood, Keith, "*In Vitro* Assessment of Gingival Fibroblasts with Resin Modified Glass Ionomer," School of Dental Medicine, University at Buffalo, Buffalo, NY, 2002 Annual Meeting, American Academy of Periodontology, New Orleans, Louisiana.

   The purpose of this *in vitro* study was to evaluate cellular growth and morphology of human gingival fibroblasts on a newer resin modified glass ionomer and compare relative biocompatibility to another resin modified glass ionomer, and intermediate restorative material by scanning electron microscopy.

   Results indicated that fibroblasts in this study attached and spread well over the newer resin modified glass ionomer (Geristore) with a morphology close to that of the control glass coverslips after 72 hours. Fibroblasts did not attach and spread as well on the other resin modified glass ionomer or the intermediate restorative material after 72 hours incubation, where these cells appeared rounded and less fibroblastic in appearance compared to the newer resin modified glass ionomer and the glass controls. These results suggest that human gingival fibroblasts may have a favorable response to this newer ionomer material compared to existing glass ionomers and intermediate restorative materials.

7. McCann, Charles, "Histological Evaluation of the Periodontal Response to Geristore Resin Ionomer Placed Subgingivally in Human Patients," University of Nebraska Medical Center, College of Dentistry, Department of Periodontology, 2002.

   The purpose of this study was to evaluate histologically the gingival tissue response to Geristore placed on teeth subgingivally in human patients. Block sections (a segment including: tooth, cementum, gingival, and some alveolar bone) were used to test Geristore on teeth that were scheduled for extraction. The results revealed that both epithelium and connective tissue were found to adhere to Geristore, no resorption of the alveolar crest was observed, and no clinical recession was noted. In conclusion, Geristore was compatible in the subgingival environment on the facials of human teeth.

8. Ciancio, S.G., "New Life for Hopeless Teeth", Biological Therapies in Dentistry, 17(2):S5, September 2001.

A review of clinical case reports and studies pertaining to the use of Geristore in teeth that would ordinarily be considered hopeless is provided. The reports and studies feature the use of Geristore in subgingival lesions, such as, root caries, furcally involved periodontitis, endodontic perforations, and root resorption. Also, restoration of teeth with carious exposures is included. Clinical outcomes were evaluated at various time periods up to 18 months and all of the outcomes were favorable at the time of evaluation. The clinical cases illustrate the many clinical applications that are possible due to the uniquely favorable properties of Geristore.

9. Ibsen, R., Ouellet, D., Yu, Xinyi, "Geristore—A Lifeline in Everyday Practice," DentalTown, March 2001.

This article discussed two case reports where Geristore was used to treat subgingival caries. One case had a large carious lesion under a PFM bridge. Instead of extraction, Geristore was used to save the tooth. A one-month, follow-up revealed healthy gingival tissue with good tissue adherence. The second case had a deep carious lesion on the lingual surface of tooth #30 to the alveolar crest. Because the patient could not tolerate any anesthetics for involved procedures, the choice was to apply Geristore to the lesion and save the tooth. Geristore was applied to the lesion and after a three-month recall, the patient had normal vitality with no discomfort. Both cases showed that Geristore was able to replace tooth structure subgingivally with direct contact with the alveolar bone, pulp, and gingival tissue.

10. Kurthy, Rodger, "Use of a Resin-Ionomer for Subgingival Restorations (External Root Resorption): Case Report," Dentistry Today, Vol. 20, No. 2, February 2001.

This case report is about the use of Geristore on a large resorptive lesion located in the lingual root surface. After two years, the patient still has excellent results and the tooth is stable. It was determined that biocompatible Geristore offers restorative options for traditionally difficult-to-treat, clinical problems.

11. Harris, Randall J., "Treatment of a Cracked Tooth with a Resin-Ionomer Restoration and a Connective Tissue Graft: A Case Report," The International Journal of Periodontics & Restorative Dentistry, Vol. 20, No. 6, 2000.

This case study was about using a resin-ionomer, Geristore, to repair a cracked tooth. The treatment involved a resin-ionomer restoration and a connective tissue with partial-thickness, double-pedicle graft. After fifteen months, the final evaluation revealed a clinical success. There was no evidence that a crack was present.

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12. Aboushala, Ayman, "Resin-Ionomer Restoration of Molar Furcation in Humans," The Journal of Cosmetic Dentistry, Vol. 16, No. 3, Fall 2000.

    The purpose of this study was to evaluate the feasibility of Geristore to treat multi-rooted teeth. Geristore was selected for the study because it provided an additional seal not provided by sutures, the membrane could be placed more subgingivally with reduced incidence of membrane exposure, and the resin-ionomer served as a delivery system for local, antimicrobial therapy during healing. The results determined that Geristore restorations of Class 1 furcation lesions showed biocompatibility to the surrounding periodontal tissue, with stable results after one year.

13. Behnia, Ali, Strassler, H., Campbell, R., "Case Report: Repairing Iatrogenic Root Perforations," JADA, Vol. 131, 2000:196–201.

    Subosseous root perforations can be difficult to treat. In many cases, the prognosis of these, even with surgical and restorative treatment, is guarded. In this article, a novel surgical and orthograde approach to the treatment of a mechanical root perforation was presented. The choice of material used to restore and seal root perforations should be based on sound clinical judgment. Geristore was used based on favorable clinical reports of its biocompatibility.

14. Breault, L., Fowler, E., Lyons, J., "Subgingival Restorations With Resin-Ionomer: A Periodontal Alternative," Compendium, Vol. 21, No. 9, September 2000:733–737.

    The successful use and placement of subgingival resin-ionomer restorations (Geristore) in both anterior root and molar furcation defects are demonstrated in this article. Sustained tissue health and minimal probing depths at the surgical site demonstrate clinical success. These case reports illustrate the continued success of alternative treatment procedures for restoring subgingival, mechanical, root, or periodontal lesions.

15. Shuman, I.E., "Repair of a Root Perforation with a Resin-Ionomer Using an Intentional Replantation Technique," General Dentistry, Vol. 47(4):392, July/August, 1999.

    A case report regarding the use of Geristore in a situation that would ordinarily be considered hopeless is presented. A maxillary lateral incisor with a root perforation in conjunction with prior endodontic therapy was exhibiting symptoms including pain, suppuration, and swelling. The position of the perforation was not conducive to surgical access. Therefore, the tooth was removed, treated by placement of Geristore restorations at the perforation as well as the root apex, and then the tooth was replanted. Also, a proximal composite restoration was placed joining the mesial of the lateral incisor and the distal of the adjacent central incisor to serve as a splint stabilizing the replanted tooth. Despite this extremely adverse situation, the replanted tooth exhibited satisfactory healing at three month and one year

postoperative evaluations. (Note: There are some inconsistencies in the radiographs included in the figures of the published report due to publishing error.)

16. Nup, C., et al., "An Evaluation of Restorative Materials Produced by the Den-Mat® Corporation When Used to Prevent Coronal Microleakage in Endodontically Treated Teeth", New York University College of Dentistry, March 1999.

    This report is an *in vitro* study evaluating Geristore as a material to seal the pulp chamber of edodontically treated teeth. Geristore used with Tenure Quick® with Fluoride is compared to a composite resin with Tenure Quick, and to amalgam with Tenure Quick. All pulpal tissue was removed from extracted human teeth with single roots and the canals were prepared as for endodontic treatment. The root canal openings were sealed at pulp chamber floors with one of the three restorative materials and the pulp chambers were inoculated with a culture of microorganisms. Then, the
    specimens were incubated for an overall period of 60 days. At various times during incubation, the root canals were monitored by color change and by culturing to determine if leakage of microorganisms from the pulp chambers to the root canals occurred. For Geristore, 16 of 20 samples resulted in no penetration of microorganisms into the root canals. Geristore performed statistically better than amalgam and the composite resin.

17. Abdel-Aziz, A.H., Alhadainy, H.A., "Evaluation of Interfacial Bond Strengths Between Amalgam and Composite Inlay", American Journal of Dentistry, Vol. 11, No. 3: 131-133, June 1998.

    Tensile testing of bond strengths between amalgam alloys and composite resin cements is presented. Two amalgam alloys and two resin cements were included in the study. "The specimens bonded with Geristore showed higher tensile bond strength than those bonded with All-Bond 2 regardless of the type of amalgam alloy."

18. Resillez-Urioste, F., Sanandajt, K., Davidson, R.M. "Use of a Resin-Ionomer in the Treatment of Mechanical Root Perforation: Report of a Case," Quintessence International, Vol. 29, No. 2, 1998:115–118.

    This clinical study used Geristore to repair a mechanical root perforation. It was concluded that when Geristore is used to repair a root perforation, the procedure involves less chairtime and fewer appointments; the procedure is less invasive; the treatment maintains crown-to-root ratios; the therapy involves less expense for the patient; and postoperative recovery is usually faster.

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19. Murray, M., Vertucci, F., Nixon, E., "The Sealing Ability of Retrograde Filling Materials: Spectrophotometric Study," Journal of Dental Research, Vol. 77 Abstract No. 1104, 1998.

    The purpose of this *in vitro* study was to evaluate apical dye penetration when SuperEBA or Geristore (Den-Mat® Corp.) was used as a retrofilling material. It was concluded that placing a bonding agent over the SuperEBA and across the beveled root surface significantly decreased apical dye penetration. Geristore placed solely in a retropreparation or completely across a concave root surface allowed no apical dye penetration.

20. Chadwick, T. C., "Fluoride Release Kinetics – Geristore", Den-Mat Corp., July 1997.

    A methodology is described for measurement of fluoride release into distilled water from Geristore disks. Fluoride release data is presented from time zero to 550 days. The release is linear from about 20 days post-initiation until the end of data collection at 550 days.

21. Ferrari, M., "Biocompatibility of Geristore Restorative Material in the Absence of Bacterial Infection in Humans", Tufts University, November 1997.

    Outcomes at up to 6 months are presented for pulp caps of purposely created mechanical exposures in third molar teeth. The third molars involved were all teeth for which tooth removal had been prescribed. All of the pulps remained vital during the experimental period, and histological evaluation after tooth removal demonstrated good pulpal healing and reparative dentin formation in all of the subjects.

22. Dragoo, M., "Resin-Ionomer and Hybrid-Ionomer Cements: Part II. Human Clinical and Histologic Wound Healing Responses in Specific Periodontal Lesions," The International Journal of Periodontics & Restorative Dentistry, Vol. 17, No. 1, 1997.

    This study consists of twenty-five patients with 50 subgingival restorations. Clinical applications included external root resorption, root fracture, root perforation, and facial root resorption. The study concluded there is clinical and histological evidence of epithelia and connective tissue adherence to a resin ionomer: Geristore. Recalls were after 1 year, 18 months, and 3 years in some cases.

23. Abitbol, T., Palat, M., Santi, E., Scherer, W., "The Use of a Resin-Ionomer in the Regenerative Treatment of an Interproximal Lesion: A Case Report," Compendium, Vol. 18, No. 2, February 1997.

    The purpose of this study was to introduce a new technique for guided tissue regeneration with the use of Geristore. The conclusions of this study are as follows: 1) Geristore may be used as a barrier in the regenerative treatment of an intrabony defect, 2) Geristore demonstrated a self-adhesiveness and biocompatibility with

surrounding tissue. When used subgingivally, it did not interfere with postsurgical wound healing, 3) Geristore's fluoride-releasing ability within the resin-ionomer reduces the gingival inflammatory state and postsurgical complications.

24. Aboushala, A., Kugel, G., Perry, R., Leone, C., "Resin-Ionomer Restoration of Molar Furcations in Humans," Journal of Dental Research, IADR Abstract No. 2573, 1998, Tufts University Dental School, 1997.

    This six-month clinical study involved 10 patients with Class I furcation lesions restored with Geristore. The results showed 100% retention of the restoration without discoloration of the margins of the restoration or postoperative sensitivity. The present study clearly establishes the biocompatibility of Geristore restorative material in Class I furcation lesions to the tooth structure and surrounding periodontal tissues. The results indicated that Geristore could be used in early prevention of furcation lesions.

25. Bhatt, A., Perry, R., Kugel, G., Gheewalla, E., "Comparison of a Compomer and Resin Cement for Bonding of Orthodontic Brackets," Journal of Dental Research, IADR Abstract No. 1259, 1996.

    Results are presented for an *in vitro* study of bonding orthodontic brackets. Geristore with Tenure® provided statistically greater bond strengths than a resin cement.

26. Dragoo, M., "Resin-Ionomer and Hybrid-Ionomer Cements: Part I. Comparison of Three Materials for the Treatment of Subgingival Root Lesions," The International Journal of Periodontics & Restorative Dentistry, Vol. 16, No. 6, 1996.

    This study compared the characteristics of three different resin-ionomer materials, specifically Dyract (Dentsply), Geristore (Den-Mat®), and Photac-Fil (ESPE Premier). Of the three materials tested, Geristore displayed the most favorable results.

27. Dennison, D.K., Keefe, T.F., "Cellular Response to Various Restorative Materials," Journal of Dental Research, Vol. 75, Abstract No. 709, 1996.

    Responses of gingival fibroblasts to various restorative materials were studied. Cells were monitored after 24 and 48 hours. Cells cultured with Geristore and three other restorative materials, were viable, firmly adherent to the plate and approximated the restorative material at each time point.

    In contrast, at 24 hours, cells incubated with Ionosphere and Vitremer showed a 1 mm acellular bond around the disks, cell death adjacent to the bond, and only a few viable cells at the extreme periphery of the culture plate. The conclusion indicated that there was variable biocompatibility among the restorative materials tested.

28. Li, Y., Ferguson, J.L., "Evaluation of Cytotoxicity of Geristore A.B. Using the Agar Diffusion Method," Indiana University School of Dentistry, November 1996.

The purpose of this study was to examine the cytotoxicity of Geristore using the agar diffusion method. The test was conducted following the procedures specified in ISO 10993-5 and the proposed ISO CD TR 7405. Using the agar diffusion method, Geristore is not cytotoxic.

29. Yu, Xinyi, et.al., "Shear Bond Strength and Microleakage of Four Hybrid Glass Ionomer Resin Systems," Journal of Dental Research, 74 (Special Issue):107, Abstract No. 764, 1995.

An abstract of an *in vitro* study of bond strength and microleakage is presented. The study involves comparison of 4 commercially available glass ionomer resin (GIR) systems to a widely used dentin bonding agent. None of the GIR systems exhibited microleakage, and three of the four GIR systems were statistically equivalent to the dentin bonding agent with respect to bond strength. Geristore had the numerically highest bond strengths of all of the products, including the dentin bonding agent.

30. Scherer, W., Dragoo, M., "New Subgingival Restorative Procedures with Geristore Resin-Ionomer," Practical Periodontics and Aesthetic Dentistry, January/February 1995.

This article presented the clinical application of Geristore with emphasis on its use in subgingival and periodontal applications.

31. Abitbol, T., Santi, E., Scherer, W., "Use of a Resin-Ionomer in Guided Tissue Regeneration: Case Reports," American Journal of Dentistry, Vol. 8, No. 5, October 1995.

The presented cases demonstrated the clinical potential for the subgingival use of Geristore as a barrier in surgical regenerative procedures. The preliminary evidence with respect to surgical re-entries looks promising.

32. Kasloff, K., Galan, D., Williams, P.T., "Cuspal Deflection Studies Using an Electronic Probe to Evaluate Restorative Materials and Bonding Agents", Esthetic Dentistry Update, Vol. 6, No. 1, February 1995.

The ability of several types of restorative materials to diminish cuspal deflection upon simulated mastication is evaluated. Geristore used with Tenure® bonding agent performed as well as two types of composite resin restoratives used with Tenure as a bonding agent. All three of these types of restorations performed statistically better than unbonded amalgam restorations.

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33. Berry III, E. A., Powers, J. M., "Bond Strength of Adhesive Composites to Dental Substrates", Journal of Dental Research, 72(Special Issue):387, Abstract No. 2271, 1993.

Tensile bond strength data are presented for Geristore with and without the use of Tenure bonding agent, and also, for Marathon® with use of Tenure® bonding agent. The bonding substrates in the study are: amalgam, porcelain, Ni-Cr alloy, dentin, and enamel. The testing was performed for specimens stored at 23° C for 24 hours, and for specimens thermocycled 1000 cycles between 8 and 52° C.

34. Wieczkowski, Jr., G., Yu, X., Davis, E., Joynt, R.B., "Amalgam/Base Bond Strength in a V-Shaped Cavity Preparation," Journal of Dental Research, Abstract No. 1184, November 1993.

In evaluating the bond strength of amalgam used with various base materials in a three-dimensional cavity preparation, this study showed greater variability in bond strength with Geristore than with other groups. Failures were cohesive in amalgam. Results indicate that the use of adhesive base materials can significantly increase the bond strength of amalgam restorations.

35. Wieczkowski Jr., G., Yu, X., Davis, E., Joynt R.B., "Microleakage Evaluation in Amalgam Restorations Used with Bases", Journal of Esthetic Dentistry, Vol. 4, No. 2, March/April, 1992.

This study is an *in vitro* evaluation of microleakage around amalgam restorations with several different types of cavity liners containing glass ionomers compared to amalgam restorations with a Copalite varnish liner. The glass ionomer containing cavity liners evaluated were Geristore®, Vitrabond®, and Vitrabond with Silver Seal®. Geristore exhibited the lowest combined microleakage at both the liner – tooth and the liner – amalgam interfaces.

36. Glass Ionomer-Resin---State-Of-Art, CRA Newsletter, Vol. 17, No. 3: 1, March 1993.

The advantages of using glass ionomer/resin materials for liners, bases, fillers, build-ups, and tooth restorations are presented. A table describes properties and characteristics of five commercial products including Geristore. The information on Geristore is favorable for all of the categories of information given.

37. Pacropis, D. R., Ibsen, R. L., "Studies on a Fluoride Releasing Adhesive to Various Substrates", Journal of Dental Research, 70 (Special Issue): 479, Abstract No. 1703, 1991.

Shear bond strength data are presented for Geristore bonded to a wide variety of substrates encountered in dental treatment. (The specimens were light cured except as noted.) The substrates were: dentin, unetched enamel, porcelain, a gold alloy, a

non-precious alloy, stainless steel, amalgam, teflon, dentin (contaminated with eugenol), dentin (cured in the dark), stainless steel (cured in the dark), and Porcelain/porcelain. The substrate surfaces were not treated and no intermediary bonding agents were used between the substrates and Geristore. Shear bond strengths ranged from 4.7 MPa for bonding to amalgam to 18.1 MPa for bonding to porcelain. Also, fluoride release data is provided. Fluoride release after 60 days was 35 ppm and after six months was 53 ppm.

38. Galan, D., "Clinical Application of Geristore Glass-Ionomer Restorative in Older Dentitions", Journal of Esthetic Dentistry, Vol. 3, No. 6: 221, November/December, 1991.

    A review of the many clinical uses of Geristore is provided. The figures provide examples of some of these clinical applications.

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