

Three-year Follow-up of Conservative Direct Composite Veneers on Eroded Teeth

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Clinical Relevance

The direct resin composite veneer is a conservative procedure to restore eroded teeth that results in satisfactory outcomes. A polishing protocol appears to be important for both esthetic and periodontal reasons.

SUMMARY

This clinical case describes an esthetic rehabilitation of a young patient presenting with erosive tooth wear. The etiological factors for the erosion in this clinical case was excessive carbonated beverages and lemon water intake. The patient's main complaint was the yellowish aspect of her smile. The treatment procedure selected was direct resin composite veneers in the six maxillary anterior teeth. A three-year follow-up of the case is presented. The three-year follow-up showed a successful clinical performance of the treatment procedure after a finishing/polishing protocol.

INTRODUCTION

Dental erosion is a multifactorial condition defined as loss of dental hard tissue due to exogenous or

endogenous acids without bacterial involvement.¹⁻⁶ Based on the etiology, erosion can be classified as intrinsic or extrinsic.⁶⁻⁹ Intrinsic dental erosion results from regurgitation of stomach contents due to gastroesophageal reflux disease or eating disorders, like anorexia nervosa, bulimia nervosa, and rumination.^{2,4,8-10} Extrinsic dental erosion is caused by the regular consumption of carbonated beverages, natural citrus fruits, low pH foods and candies, intake of some medications and dietary supplements or occupational factors, such as professional wine tasting, regular swimming in pools with low pH water or workers who are exposed to acidic liquids or vapors.^{2,4-7,9}

The initial aspect of dental erosion is softening of the enamel surface.^{2,7,10,11} The softened enamel structure is vulnerable to mechanical abrasive forces, such as tooth brushing, the movement of the tongue, and bruxism.^{2-4,7,12} This combination of factors leads to tooth wear with dental erosion as the primary etiology,

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<http://doi.org/10.2341/20-308-S>

which is defined as erosive tooth wear (ETW).^{1,3,4,7} Patients are often late in perceiving that they suffer from ETW.¹¹ The clinical appearance is the most important feature for dental professionals to diagnose ETW, even though the early clinical signs of ETW may be difficult to diagnose.^{3,10} The typical signs of ETW that may be evident at an early stage include a silky-glazed or a smooth dull enamel surface, yellowing of the teeth (due to enamel loss), increased incisal translucency, and cupping and grooving on the occlusal surfaces.^{2-4,8,10,13} In the more advanced stages, the convex areas on smooth surfaces flatten, concavities may become present in intact enamel along the gingival margin, restorations may stand above the level of the adjacent tooth surface, and a rounding of the cusps or even hollowed out surfaces can develop on the occlusal surface of the posterior teeth.^{2,9,3,5,13}

It is important to detect ETW as early as possible to prevent further progression.⁵ After identifying all the possible etiological factors, a preventive program and a treatment plan based on dental tissue wear severity should be suggested to the patient.^{2,9,11,14} If a restorative treatment is necessary it should be as minimally invasive as possible, ie, additive adhesively bonded resin composite restorations.^{2,8,11} This case report demonstrates a conservative approach for restoring esthetics and function with direct resin composite veneers in the six maxillary anterior teeth in a young patient with initial ETW with three-years of follow-up. Also, a finishing/polishing step-by-step protocol is presented to establish high-gloss resin composite surfaces at baseline and also at follow-up appointments.

CASE REPORT

A 32-year-old woman presented at a clinical appointment complaining about dentin hypersensitivity and the yellowish aspect of her smile. An extensive patient history revealed that the patient consumed

excessive acidic beverages, including an isotonic sport drink (Gatorade) and energy drink (Red Bull). Gatorade has a pH value of 2.7,¹⁵ and Red Bull has pH value of 3.08.¹⁶ Also, the patient routinely drank lemon water early in the morning followed by tooth brushing. The initial clinical examination revealed that the patient presented ETW involving mainly the cervical third (on the facial surface) and incisal third (on the palatal surface) of the six maxillary anterior teeth due to extrinsic acid intake and bruxism. A more severe erosive wear was observed on both maxillary central incisors. Enamel loss, probably due to resin remnant removal after orthodontic bracket debonding and pre-existing resin composite restorations, were also seen on the facial surfaces of the six maxillary anterior teeth (Figure 1). All anterior teeth responded positively to a pulp sensibility test (cold test).

The patient received professional education regarding the importance of her habits in relation to her tooth wear condition. Also, the patient was educated about the etiological factors to treat and control the sequelae of ETW. The proposed treatment plan to the patient was direct resin composite veneers in the six maxillary anterior teeth to protect enamel and dentin from further ETW, to prevent dentin hypersensitivity, and to restore dental esthetics. After dental prophylaxis using a rubber cup and a prophylaxis paste (Odahcam, Dentsply Sirona, York, PA, USA), a mock-up procedure (Figure 2) was performed using a micro-hybrid resin composite (Essentia, GC Corp, Tokyo, Japan). The similar resin composite flexural strength and elastic moduli after 24 hours in distilled water or 30 days in a soft drink (Coke, Coca-Cola Company, Atlanta, Georgia, USA),¹⁷ and the high polishing surface with low surface porosities analyzed under scanning electron microscope helped in the restorative material selection.¹⁸ The mock-up restorative procedure allowed the correct resin composite shade selection. Two composite shade were

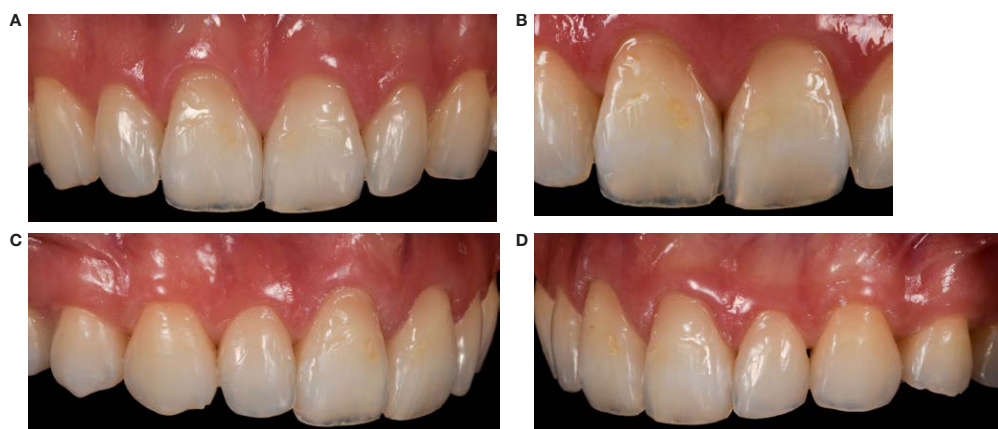


Figure 1. Initial intraoral aspect of the maxillary anterior teeth: (A) Tooth erosion and loss of dental structure due to resin clean up after orthodontic bracket debonding; (B) Pre-existing resin composite restorations and tooth erosion exposing cervical dentin; (C) Right side view; (D) Left side view.



Figure 2. Resin composite mock-up to choose resin composite shades.

selected: medium dentin (MD), as dentin substitute; and light enamel (LE), as enamel substitute.

All restorative procedures were done under rubber dam isolation (Figure 3). Dental retainers (Hygenic Brinker B4, Coltène/Whaledent Inc, Cuyahoga Falls, OH, USA) were used to reveal the cavities cervical margins. The restorative procedures were performed two teeth at a time: first the two maxillary central incisors, followed by the two maxillary lateral incisors, then the two maxillary canines. Prior to the phosphoric acid etching step, a 7.0-mm metal matrix band was positioned in the proximal surfaces to avoid acid-etching the surfaces of other teeth. Then, 35% phosphoric acid (Ultra-etch, Ultradent, South Jordan, UT, USA) was applied for 15 seconds on dentin and 30 seconds on enamel and rinsed off using copious amounts of water from dental syringe. Tooth moisture contamination was controlled using an endodontic aspirator. A two-step etch-and-rinse adhesive system (Single Bond Plus, 3M Oral Care, St Paul, MN, USA) was applied on both enamel and visibly moist dentin using a disposable brush, air-dried and light-activated for 10 seconds using a LED light-curing unit (VALO Cordless, Ultradent) with output of approximately 1,000 mW/cm². On the two maxillary central incisors and on the two maxillary canines, a first increment of resin composite (shade MD, Essentia, GC Corp) was applied on the cervical third and light-activated for 20 seconds. Afterwards, a final increment of resin composite (shade LE, Essentia, GC Corp) was applied over the entire buccal surface of the teeth and light-activated for 20 seconds. On the two maxillary lateral incisors, a single increment of resin composite (shade LE, Essentia, GC Corp) was applied on the entire facial surface of the teeth and light-activated for 20 seconds. A dental composite brush (#3, Cosmedent Inc, Chicago, IL, USA) was used in the last increment of all restored teeth in order to adapt, shape, and get a smooth surface of the resin composite. The use of a dental composite brush from



Figure 3. Rubber dam isolation using dental retainers (Hygenic Brinker B4, Coltène/Whaledent Inc). Note that the existing resin composite restorations were carefully removed. No tooth structure was removed to perform the restorative treatment.

the cervical third towards the incisal third of the teeth helped to sculpt the composite similar to natural tooth volume, removing the excess of resin composite. This is an important step, to obviate necessity of using rotatory finishing instruments at the restorative procedure appointment. Delaying finishing/polishing with rotary instruments for 24 hours improves the marginal seal with less microleakage compared to immediate finishing.¹⁹ A final light-activation was performed for 60 seconds on the facial surface of each restored teeth. Finally, occlusal adjustment was performed, verifying proper contacts in protrusive and lateral excursive movements of the mandible.

Finishing and polishing of the composite restorations were performed under constant water cooling after 24 hours of the restorative procedure as follows: 1) a fine LTA Lamineer tip (Dentatus, Spånga, Sweden) mounted on a Profin contra-angle (W&H, Bürmoos, Austria) was used to remove resin composite overhangs close to the gingival margins (Figure 4A); 2) 3/8-inch medium abrasive disks were used to reduce surface roughness and to shape marginal recontours (2381M Sof-lex, 3M Oral Care) (Figure 4B); 3) finishing strips (Epitex, GC Corp) were used for interproximal finishing in decreasing abrasive grade (from coarse to extra fine) (Figure 4C); 4) a finishing silicone rubber point (Astropol F, Ivoclar Vivadent, Schaan, Liechtenstein) was used to refine surface contours and to remove marginal composite excess (Figure 4D); 5) a polishing silicone rubber point (Astropol P, Ivoclar Vivadent) (Figure 4E) followed by a rubber finishing cup (Blue FlexiCups, Cosmedent) were used to smooth the resin composite surfaces (Figure 4F); 6) a super fine rubber polishing cup (Pink FlexiCups, Cosmedent) (Figure 4G) followed by a spiral shaped diamond polisher (DT-DCP14f, Diacomp Plus Twist, EVE, Keltern, Germany) were used to establish a high gloss composite surface

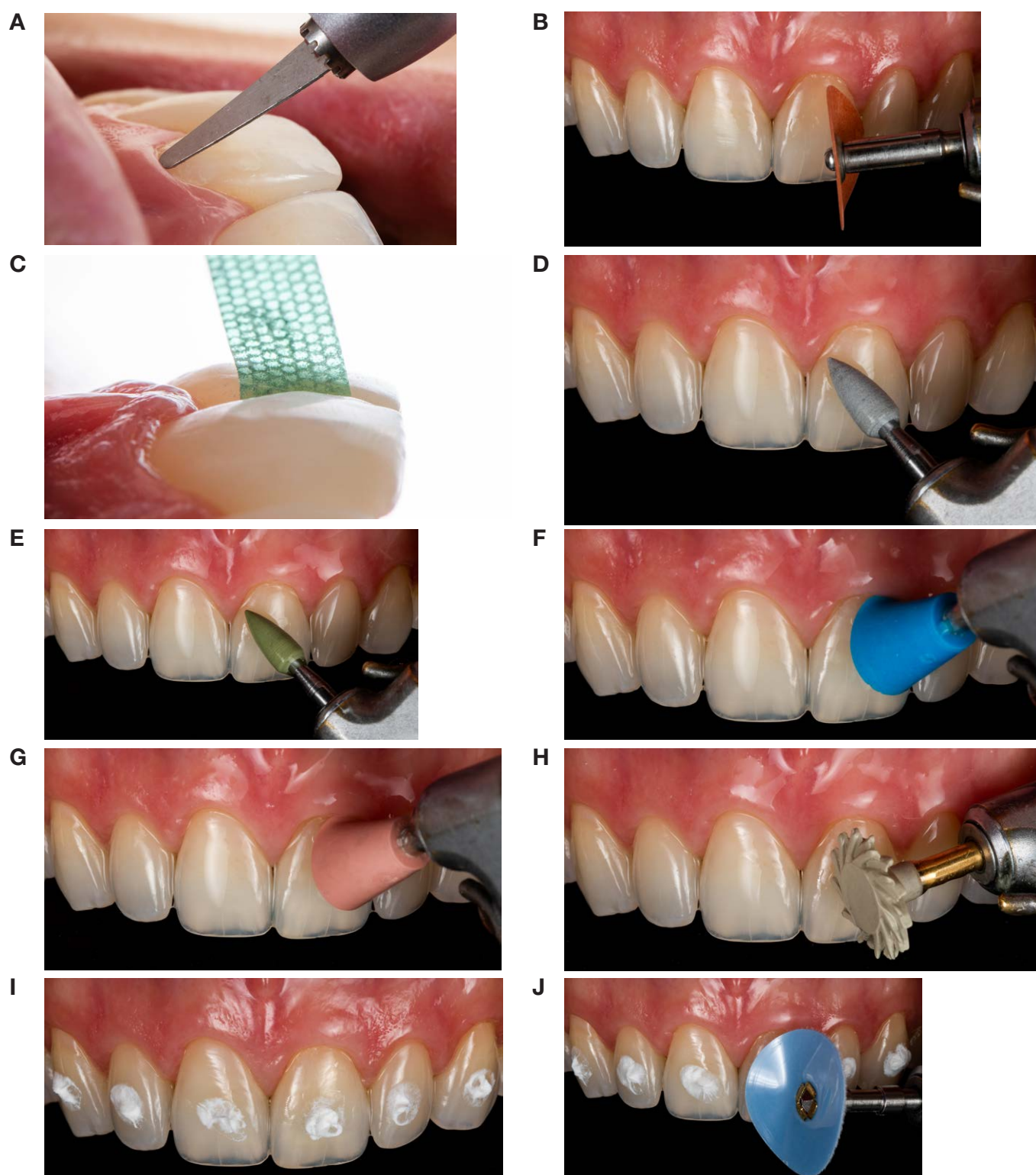


Figure 4. Finishing and polishing procedures: (A) Overhangs removal at gingival margin; (B) Shaping and contouring the restorations; (C) Finishing strip for interproximal area; (D) Contouring and refining the margins of the restorations; (E) Smoothing the surfaces of the restorations, step 1; (F) Smoothing the surfaces of the restorations, step 2; Note that this rubber finishing cup (Blue FlexiCups) can easily polish gingival margins due to its flexibility; (G) Polishing the margins of the restorations; (H) Polishing the facial surface of the restorations; (I) Polishing paste on facial surfaces of the restorations; (J) Final polishing step of the restorations with polishing paste and felt disk.

(Figure 4H); 7) an aluminum oxide polishing paste (Enamelize, Cosmedent) was applied (Figure 4I) before using a felt disk (FlexiBuff, Cosmedent) (Figure 4J) for final polishing purposes to increase the gloss, luster and surface smoothness of the composite restorations (Figure 4I). The final aspect of the resin composite veneers shows a high-gloss surface (Figure 5).

When the patient was recalled each year, polishing was performed as mentioned in steps 6 and 7 to provide maintenance of the composite restorations (Figure 6 A-C). At the three-year appointment, a satisfactory appearance of the patient's smile was still seen, showing the stable performance of the composite restorations (esthetic success) and absence of additional ETW (biological success) (Figure 7A). However, some dental plaque and chipping at gingival margins, mild inflammation of the gums, and a dull surface in all resin composite veneers could be seen (Figure 7A). Also, some wear at the lingual surface at the incisal third of the teeth 6, 8, 9, and 12 was observed. At this appointment, resin composite restorations were placed on the lingual surfaces at the incisal third of teeth 6, 8, 9, and 12 using the already mentioned etch-and-rinse adhesive system (Single Bond Plus, 3M Oral Care) and resin composite (Essentia, shade LE, GC Corp). Then, the finishing and polishing procedure of the resin composite veneers (all steps except step number 2) and the lingual composite restorations (all steps) were performed. In this way it was possible to refine the margins and to reestablish the polishing luster of the restorations. Figure 7B shows the final aspect one week after the polishing procedure from the three-year follow-up.

DISCUSSION

Ideally ETW etiological factors should be controlled prior to restorative procedures, since tissue loss stops progressing only when the cause is eliminated.^{11,13} For this reason, from the moment that ETW has been



Figure 5. Final aspect of the direct resin composite veneers immediately after finishing and polishing.

detected, the patient should be informed about his or her condition, encouraged to follow a preventive program, and receive a treatment plan based on dental tissue wear severity.^{2,9,11,14} The importance of the preventive program should be highlighted. The patient must be aware that ETW progression will continue to occur if the beginning of the preventive program is postponed.⁵

As with all dental operative procedures, longevity of a treatment involving teeth with ETW can only have a positive prognosis with accompanying preventive measures, so regular follow-ups are mandatory.^{2,3,11} In the present case report, the annual follow-ups had two main objectives: monitoring the management of ETW and evaluating the resin composite veneers. The monitoring of the management of ETW at each follow-up was done by investigating the patient's dietary habits, history of dentin hypersensitivity, and examining unrestored tooth surfaces for absence of progressive or

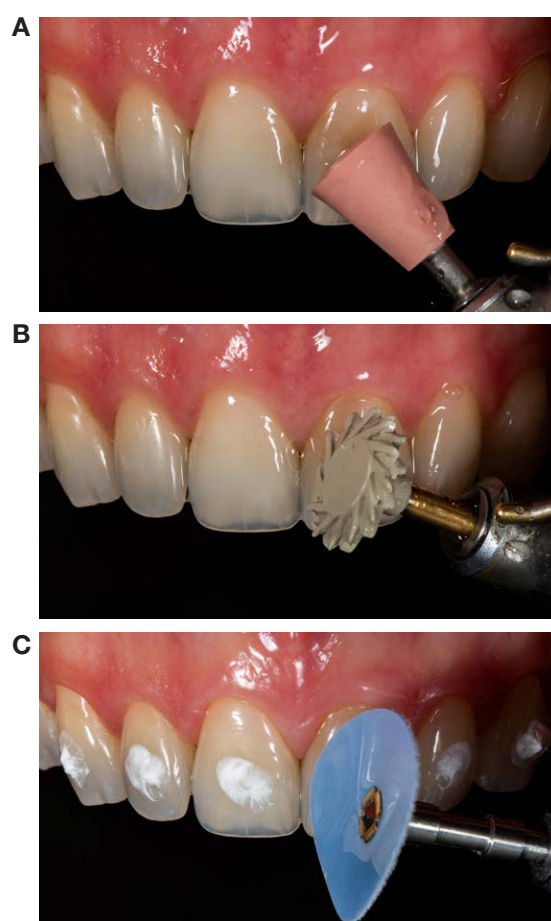


Figure 6. Annual polishing maintenance sequence: (A) Polishing of margins and facial surfaces of the restorations (Pink FlexiCups); (B) Polishing of buccal surface of the restorations (DT-DCP14f, Diacomp Plus Twist); (C) Polishing paste and felt disk.



Figure 7. Three-year follow-up: (A) Initial aspect. Presence of dental plaque, mild inflammation of the gums, and absence of surface luster of the restorations; (B) One week after resin composite repair at lingual surface at incisal third (teeth 6, 8, 9, and 12) and finishing and polishing sequence. Note the absence of dental plaque, the healthy periodontal aspect, and that the surface luster of the restorations was restored.

early signs of ETW.^{2,3,7,8,10} The resin composite veneers were examined following six main criteria: marginal integrity (marginal adaptation), marginal staining, surface staining, surface gloss/luster and roughness, incisal wear, and maintenance of periodontal health.²⁰

A highly polished resin composite surface is important for both esthetic and periodontal reasons, since it helps to maintain the surface luster and color, enhancing the longevity of the resin composite restoration procedure, and reduces plaque accumulation, avoiding periodontal inflammation.²¹⁻²⁴ At the three-year follow-up clinical examination, the consequences of a rough resin composite surface could be seen as a visible biofilm and mild inflammation of the gums detected along the gingival margins (Figure 7A). One week after finishing and polishing steps, good periodontal health and surface luster of the composite restorations were seen (Figure 7B), showing the importance of maintenance polishing of resin composite restorations.

Selecting the least invasive restorative treatment plan should always be considered to manage ETW.^{2,3,11} The objectives of the restorative treatment are: 1) to diminish or stop ETW progression, 2) to reduce or stop dentin hypersensitivity, 3) to restore esthetics, and 4) to restore dental function.^{2,3,9} Direct resin composite restorations or sealing of eroded posterior teeth generally are indicated in cases of slight or moderate tooth wear.^{9,11,13,25} In cases of extensive tooth wear, an indirect approach or a combination of indirect and

direct restorative procedures may be necessary.^{8,25} The possibility of using direct restorative materials should always be considered, since they allow a minimally invasive treatment that replaces only the lost dental tissues without the use of diamond burs for tooth preparation.

CONCLUSION

Direct resin composite restoration in anterior eroded teeth affords practical, feasible, and conservative dental treatment. Besides monitoring the ETW management, the key to success is the polishing aspects: select resin composite material with high polishing properties, perform finishing and polishing steps properly, and establish a strict polishing protocol over each follow-up session, if needed.

Conflict of Interest

The authors of this manuscript certify that they have no proprietary, financial, or other personal interest of any nature or kind in any product, service, and/or company that is presented in this article.

(Accepted 20 March 2021)

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