NEW APPROACH TO MULTICOLORED PRESSING WITH A CONTROLLED PRESSING PROCESS

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Pressable Ceramic Systems have gained worldwide popularity in the dental community despite the development of advanced all-ceramic alternatives. This article shows a new approach to the pressing technique that can be used with any pressable ceramic. These techniques allow for the controlled pressing of different shade ingots in the same mold with the same plunger, simultaneously. The savings in time and materials are beneficial to production and small laboratories alike. In addition, a patient case involving the restoration of maxillary central incisors will also be discussed.

Key Words: pressable ceramics, separating discs, special spruing, optimum viscosity, controlled pressing process, press release, press delay

Pressable Ceramic Systems

Pressable Ceramic Systems are financially attainable and have a relatively short learning curve. The method is simple and easy to understand, making it ideal for most laboratories. Other than a pressing furnace, it does not require additional equipment in order to process. Manufacturers of ceramic furnaces have recently added the pressing function to their existing furnace platforms. Furthermore, the pressed ceramic method is based on the lost wax technique, which is familiar to all dental technicians. Metals are typically cast into a mold using centrifugal force or air pressure in combination with vacuum. However, the viscosity of dental Ceramics is too high to cast using centrifugal force, so vacuum with mechanical pressure is the casting method of choice. Because materials are better pressed when they are viscose rather than liquid, ceramics must reach the ideal viscosity level to attain optimum results.

Pressable ceramic systems are limited by the lack of uniformity in furnaces and materials, and the ability to press only one color ingot at a time. Because of this, pressing a variety of different colored ingots will consume a great deal of time and material.

New Developments

The Shenpaz Industries ltd. has developed a controlled pressing process, which allows you to press up to three different shades into one mold at the same time. Separating Buttons (SB) are placed between ingots of different colors; this makes it possible to sprue at two different levels *(figs. 1a and 1b)*. The 200-gram investment ring shows the distance between the waxed crowns and the ring wall *(fig. 2)*. The system works on the conventional investing principals of existing pressable systems. To demonstrate the technique, we will press a W++ and A3 ingot together *(fig. 3)*. The disposable plunger (Microstar Corp.) is sectioned with a diamond disk to create the Separating Buttons *(figs. 4a and 4b)*. If you desire to press three different shades, then another separating button would be sectioned from the same plunger. After sectioning, both sides must be smoothed with fine sand paper to create the flat surface that is required *(figs. 5a thru 5c)*. In conjunction with the spruing technique, the separating buttons play an important role in maintaining the spaces created between the levels and prevent the different ceramic colors from mixing. Because the separating discs are made from the original plungers, they meet all the minimum requirements for the pressing process. The vertical dimensions of the discs can be varied between 2-4 mm to control the flow of the different colors into the appropriate channels.

Fig. 1a and 1b. Spruing technique for two or three different shades

Fig. 2. Conventional pressing guidance for investing

Fig. 3. Authentic ingots

Once the ceramic is viscose, the ingot at the end of the plunger is pressed into the upper boarding channels. The plunger continues to press to fill the space between the Separating Bottom and the second level of sprues. The second ingot becomes soft and enters through the boarding channels of the second level in the mold. The maximum number of ingots that can be used in one pressing is three. To accomplish this, the same disposable plunger must be sectioned twice as shown in figures 6a and 6b. Weighing the wax units and sprues is essential. The ratio of wax to ceramic is 0.6 grams of wax per 2-gram ingot. If the 300-gram investment ring is used to press 5 grams ingots (Authentic, Microstar), the ratio is 1.5 grams of wax (crowns and sprues) per 5-gram ingot.

Pressing with this technique requires a furnace with a multi-step pressing function. This unique feature allows the viscose ceramic material to flow in an optimal way to activate a pressure/release combination that temporarily maintains the pressure at each "close step". During this period the pressure is gradually descending. These pressure/release cycles are performed repeatedly during the whole "press delay". This improvement in pressing technology not only insures that the entire mold will be filled with pressed ceramic, it also safeguards against breakdown of the investment mold. The user can control the pressing procedure by selecting continuous pressing or step-controlled pressing. Prof. Wolfgang Lindeman evaluated the Gemini furnace in the Material Science and

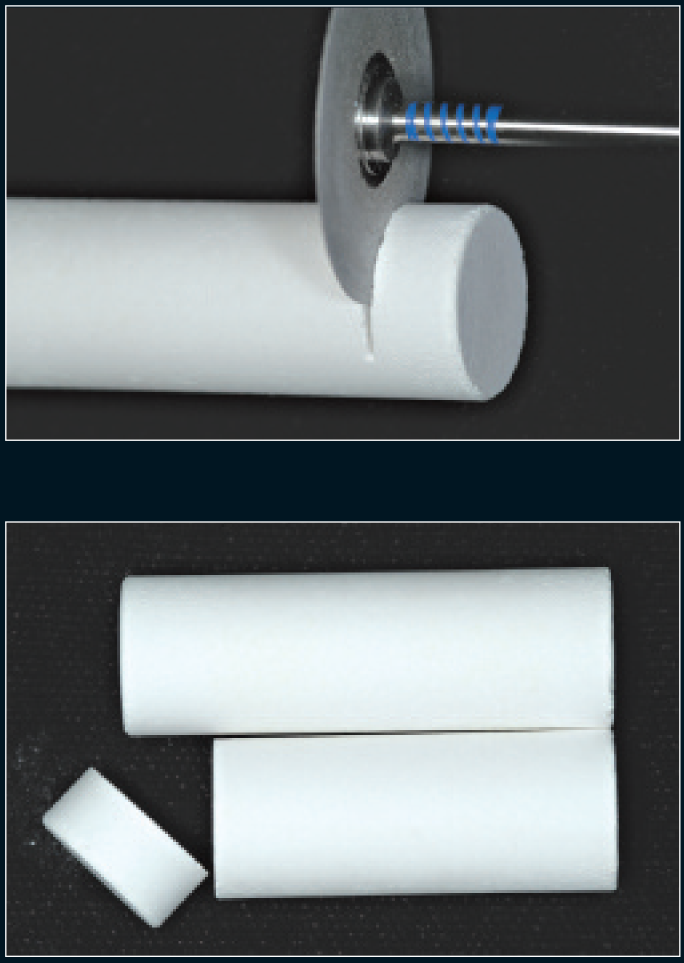


Fig. 4a and b. Sectioning disposable plunger from Microstar Corp to create Separating Buttons

Fig. 5a. Uneven surface of the plunger from sectioning with a diamond disc

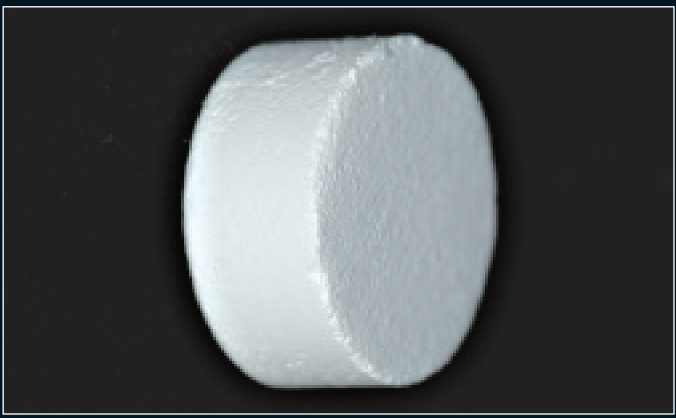


Fig. 5c. The flat surface after sanding

Technology Department of Tubingen University. This oven was found to have the most accurate and stable temperature control for ceramic firing *(fig. 7)*.

Using these separating discs, two or three different colored ingots can be pressed into one mold *(figs. 8a thru 8d)*. To optimize this process, manufacturers of ceramic materials will need to produce ingots in different vertical dimensions. Until then, existing disposable plungers can be sectioned as many times as necessary depending on the number of different shades to be pressed as was previously illustrated. These advances make the use of pressable ceramic systems more attractive for all segments of the laboratory industry.

Fig. 5b. Shaping the Separating Button

Utilizing This Technique

Some of the applications of this technique include:
1. Single anterior crowns with different body shades.
2. Separate cases pressed at the same time.
3. A smile design that requires darker cuspids and lighter centrals.
4. A combination case that requires different opacity levels due to the thickness of the desired porcelain restoration.

In a case such as the one shown in *figure 9*, one ingot with high opacity (AO++) and one with more translucency (AO+), were pressed together in one mold. The pressed crown and veneer were placed in the patient's mouth to evaluate shade and decide on the layering sequence prior to cut back *(fig. 10)*.

After reducing the pressed crown and veneer to make space for enamel and special effects *(fig. 11)*, opacious dentin A1 was applied in the cervical third *(fig. 12)*. The incisal frame was then developed using enamel 58 on the mesial and distal. Enamel 59 mixed with 50% blue opal translucent was alternated with straight 59 as part of the segmental build-up *(fig. 13)*. After the incisal frame was built to the desired length, intense opacious dentin was mixed with dentin and applied to create a mammalon effect *(fig. 14)*. It was then fired according to manufac-

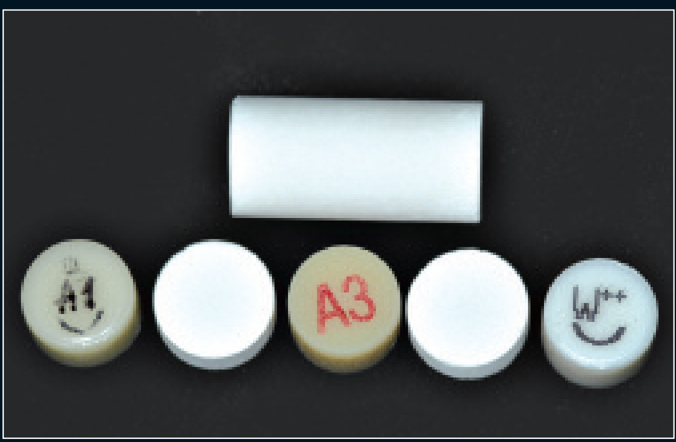


Fig. 6a. Plunger sectioned twice for pressing three different shades with two-gram ingots

Fig. 6b. Larger plunger sectioned twice for pressing three different shades with 5-gram ingots

Fig. 7. The Gemini Pressing oven is the only one currently on the market with multi-pressing features.

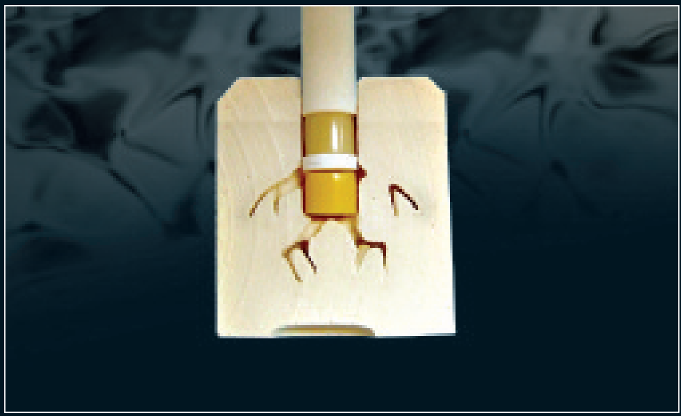


Fig. 8a. Cross section of the investment illustrating the position of the lost wax units, ingots and Seperating Buttons

Fig. 8b. Cross section of two shades pressed prior to complete devesting

tures specifications. After the first bake, the units were adjusted on the model then sand blasted with 50 micron Aluminum Oxide to roughen the surface. At this point, the crown is a smaller version of the desired final contour *(fig. 15)*.

To enhance the internal effects, characterization was done with fluorescing stains and then fired at a low temperature to set them in place *(figs. 16)*. After baking, the effects cannot be seen until glaze liquid is applied *(fig. 17)*. The full shape was completed with a second application of ceramic using A1 opacious dentin around the interproximal and cervical areas *(fig. 18)* and Enamel 59+T Opal in the incisal. A1 Opacious dentin was placed at the incisal edge to create a halo effect *(fig. 19)*. The units were baked at a slightly lower temperature, then shaped and texturized with diamond burs *(figs. 20a and 20b)*.

The retracted view of the patient illustrates the differences in the color and size of the abutment teeth (fig. 21). The crown and veneer were tried-in to check the bite, tissue support, shape, alignment and interproximal embrasures *(fig. 22)*. Once the patient approved the overall look, the units were glazed and manually polished with fine pumice at a slow speed to mimic the texture and lus-

Fig. 8c. Two different shades pressed with one Separating Button

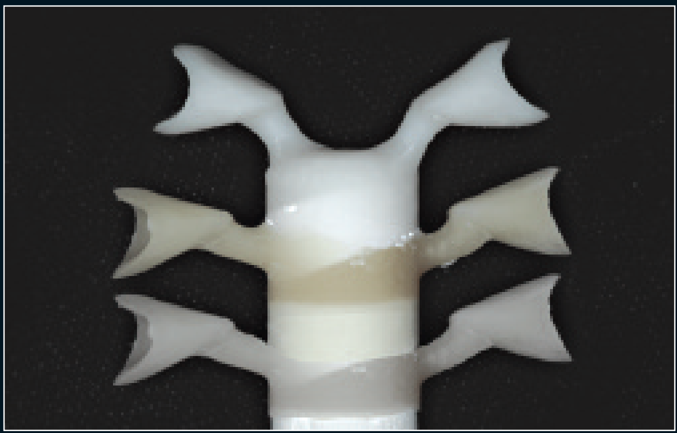


Fig. 8d. Three different shades pressed with two Separating Buttons

Fig. 9. Patient presented with a gray PFM on number 8 and a non-vital tooth #9

Fig. 10. The full contour pressed units are evaluated in the patients mouth

Fig. 11. Cut back of dentin to create space for enamel

Fig. 12. Application of opacious dentin on the cervical and interproximal areas

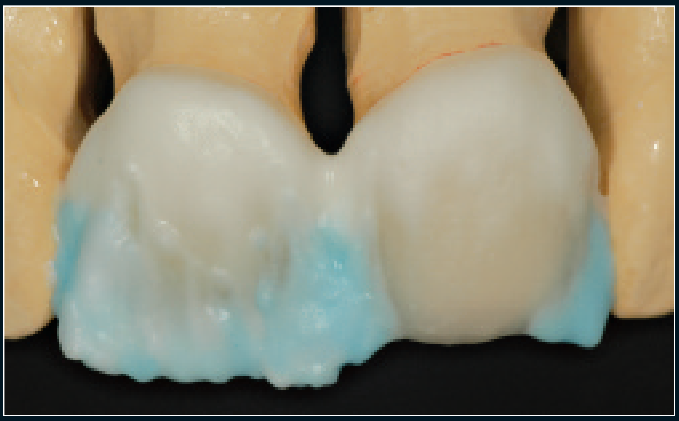


Fig. 13. Segmental build up of the incisal frame

Fig. 14. Application of internal effects such as mammalons

Fig. 15. The restorations on the model after first bake and sandblasting

Fig. 16. Internal effects such as white craze lines are applied and set fired at 700˚ C

Fig. 17. Wetting the surface with glaze liquid the check the internal effects

Fig. 18. Second application of porcelain with opacious dentin shade A1

Fig. 19. The incisal is layered with enamel and opal translucency. Opacious dentin A1 was used for the halo

Fig. 20a - Restorations after second bake on a solid model

Fig. 20b. Shaping and texturing the restorations

Fig. 21. Retracted view showing the different size and color of the prepared teeth

Fig. 22. Try-in of the restorations prior to glazing

Fig. 23. Glazed and polished crowns on a solid model

Fig. 24. Restorations on individual dies illustrate the contour of the interproximal space

Fig. 25. Restorations on a black background showing the different levels of translucency due to differences in thickness

ter of the patients' natural teeth *(fig. 23)*. To close the interproximal embrasures, the crown and veneer were contoured to ideally position the gingival architecture *(fig. 24)*.

Against a black background we can see the different translucencies. The veneer is 0.8mm thick and the crown has a thickness of 1.3mm *(fig. 25)*. The units were sand-blasted internally and etched with Super Etch (Mirage) for 90 seconds. The crown was tried-in separately in order to evaluate the marginal integrity and contact points *(fig. 26)*. The porcelain veneer which was fabricated with ingot A+ was then bonded in with translucent dual-cure composite cement *(fig. 27)*.

After removing the excess cement, the crown that was fabricated with ingot A++ was tried in. This crown was slightly too bright and did not match the veneer or the natural teeth despite the color influence from the underlying tooth. This was due to the increased opacity of the ingot selected and the differences in the thicknesses of the pressings *(fig. 28)*. A second crown that had been fabricated with an A+ ingot was tried-in. This crown exhibited greater translucency and blended harmoniously with the adjacent veneer and natural teeth *(fig. 29)*. The crown was cemented with translucent dual cure cement. The subtle internal effects create an illusion of reality. *Figures 30a thru 30c* illustrate the harmony and integration of the restorations with the adjacent natural teeth.

Summary

Sometimes the simplest techniques can help us to minimize the time we spend without sacrificing quality. Time is the one commodity that laboratories and dental technicians can never have enough of. This technique will enhance the productivity of all the laboratories that use pressable systems in their daily routine.

Clinical dentistry by Angela Gribble-Hedlund, DDS private practice, Atlanta, GA. Ceramics and photographs by Pinhas Adar, MDT, CDT, Oral Design Center Atlanta a division of Adar International, Inc., Atlanta, GA

The controlled pressing process patent by Shenpaz Industries Ltd., Baruch Ingig

Fig. 26. Try-in of the crown

Fig. 27. Porcelain veneer after bonding

Fig. 28. The first crown fabricated with ingot A++ was too bright compared to the vaneer and adjacent natural teeth

Fig. 29. Try in of the second crown fabricated with ingot A+

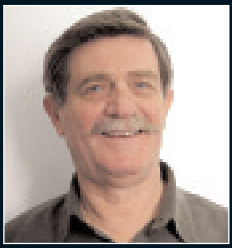
Fig. 30a thru 30c. The restorations after final cementation

Bio >> Pinhas Adar, MDT CDT

Master Ceramist Pinhas Adar studied initially in Tel Aviv, Israel and did his residency with Baruch Indig-Shenhav and then with Mr. Willi Geller in Zurich, Switzerland. He has more than twenty-five years of experience in all phases of dental laboratory technology. Mr. Adar practices, teaches and does research from his laboratory in Atlanta, Georgia. He works together with leading clinicians worldwide and specializes in the many facets of porcelain esthetic restorations on both natural teeth and osseointegrated implants. He is the president of Adar International, Inc., and an active member of the American Academy of Esthetic Dentistry and the International Oral Design group. He is also a center for Oral Design International. He is on the advisory board of the Amara Institute. He is on the editorial board of the Quintessence Yearly Journal, the Journal of Esthetic Dentistry and the Journal of Collaborative Techniques.

He has developed instructional videotapes on all aspects of porcelain laminate veneers, and has contributed chapters in texts on posterior ceramic restoration and porcelain laminate veneers, published by Quintessence Publishing Co., Inc. He has contributed text to a multi-disciplinary book published by Martin Dunitz – UK, as well as numerous magazine articles. He is also one of the co-authors for the upcoming Quintessence book entitled “Porcelain Laminate Veneers – An Esthetic Essential”.

Bio >> BARUCH INDIG, CDT, MDT



Master Ceramist Baruch Indig initially studied in Romania and then all throughout Europe and now resides in Israel. He has more than 45 years of experience in various aspects of dental technology. Mr. Indig is CEO of Shenhav Dental Laboratory that produces high quality dental restorations. He was instrumental in inspiring and developing many talented dental technicians in his career by providing residency opportunities in his laboratory. He is also CEO of Shenpaz Industries that develops and manufactures one of the leading dental ceramic furnaces in the world. He has several patents under his name.

He was an instructor of dental technology at the University of Tel Aviv. He is on the management team of the Dental Technician Association and has devoted himself to increasing the level of dental technology in Israel through courses and demonstrations. He founded the first school of dental technology at Haddasa University in Jerusalem and has served as the department head.

Today he shares his time between innovatively developing and manufacturing dental ceramic furnaces, his dental laboratory and his family.