Two approaches and one goal

State-of-the-art CAD/CAM materials are offering clinicians the possibility of producing certain types of restorations in the dental practice using a semi-direct technique. Ceramic veneers, for example, are easy to fabricate in-office with IPS CAD Multi, without the need for glazing.

By Dr. Eduardo Mahn, Chile

Recently developed restorative materials have opened up a myriad of exciting possibilities for dental practitioners. In the restoration of anterior teeth, clinicians have to select the most appropriate material for the case at hand on the basis of specific criteria. In situations where teeth show signs of erosion, abrasion, attrition or a combination of these phenomena, practitioners will tend towards using ceramics or composite resins, depending on how much intact tooth structure remains available. Traditionally, composites are used for Class III, IV and V defects. However, ceramic veneers are preferred in cases where a large amount of tooth structure is missing or a major change is planned (e.g. smile makeover).

The challenge

When two central incisors need esthetic enhancement, the choice of approach is not so clear. Irrespective of the material used a minimally invasive route involving very little preparation of the tooth structure can be taken nowadays due to the high strength of modern materials (e.g. lithium disilicate glass ceramic). Nevertheless, it is important to remember that minimal preparation is an option, only if the teeth are properly aligned. As long as the desired changes of the tooth shape and shade are limited, preparation can be optimized by means of restorative procedures. This minimally invasive approach requires the dental practitioner to convince the patient of the necessity of undergoing preliminary orthodontic treatment.

The solution

It is our aim to remove as little of the tooth structure as possible in every case that we treat. With modern materials such as lithium disilicate or leucite-reinforced ceramics, we can produce poly-chromatic monolithic veneers and crowns in less than one hour, without having to glaze them. Nonetheless, many dentists still believe that dental technicians with their well-honed manual skills produce better esthetic restorations than a machine, and they do not see the need to embrace digital technology. As a result of this point of view and the high acquisition costs of the milling machines some clinicians are reluctant to invest in this technology. On the basis of the present clinical case study we would like to highlight the following aspects: the importance of having the right treatment plan, the possibilities currently available for the fabrication of veneers, the potential of the press and CAD/CAM technologies and the latest improvements made in the field of cementation.

Clinical case

Patient history

A thirty-one-year-old female patient came to our office because she was dissatisfied with her anterior teeth. She complained about the misalignment of the upper and lower central incisors (Fig. 1). A detailed clinical examination revealed that the composite restorations in these teeth were defective. As a result of erosion, a considerable amount of tooth structure had been lost. In addition, the misalignment of tooth 11 and 41 in particular was quite obvious. The treatment plan presented to the patient included initial orthodontic treatment followed by minimal preparation of the two central incisors for two ceramics veneers. The patient was subsequently referred to an orthodontist for treatment. Unfortunately, it took more than a year before she presented to the practice again. At this consultation, we were quite surprised to find that the two central incisors had been restored with poorly finished direct composite veneers (Fig. 2). Many clinicians simply underestimate the challenging nature of this type of restoration, and this was a case in point. In addition to preventing any contamination of the working field, the clinician must also accomplish the arduous task of creating an appropriate emergence profile, proper contours and contact areas and producing a suitable micro and macro-texture, and all this within a single appointment.

The treatment

The composite veneers had to be removed and replaced with new ones. In this particular case, the advantages of using the indirect technique were obvious. The patient agreed to have two ceramic veneers made for her. For this purpose impressions were taken and a master cast was produced. This working model provided the dental technician with the opportunity to evaluate the situation in detail. He or she has the time to think about possible ways of correcting the misalignment.

Dentists do not have this "luxury" of time when they are treating a patient in the dental chair. They have to finish the restorations as quickly as possible in order to prevent contamination of the treatment field and keep chair time to a minimum for the comfort of the patient. In the present case, an additional hurdle had to be overcome. Any composite material that might have remained on the tooth structure had to be clearly identified and carefully removed without damaging the healthy tooth structure. Transillumination with white LED light came in helpful.

"With the advent of CAD/CAM technology, clinicians now have the possibility of making semi-direct restorations."
Fabrication of the restorations

Two different routes were pursued in the fabrication of the veneers. We instructed our lab technician to make two ceramic veneers using the press technique with IPS e.max® Press (shade HT A1, stained). At the same time, we milled two ceramic veneers with our in-office CAD/CAM machine using an IPS Empress CAD Multi block (shade A1). The veneers made in the dental office were not glazed, just polished (Figs. 6 and 7) and so the difference was clearly visible when the pastes were applied. Even though the darker shade (Warm+) was very close to that of the natural tooth structure and would have worked well with the veneers, we decided on choosing the lighter shade. This was a typical decision. In most cases, we tend to prefer the lighter version, since it provides a better contrast to the tooth structure and therefore renders the removal of excess cement easier and faster. Before the veneers were seated, retraction cords were placed and the enamel was etched; the dentin remained unetched. Adhese® Universal was used as the bonding agent to place the veneers (Figs. 10 and 11). Then the excess luting composite was carefully removed and a glycerine gel (Liquid Strip) was applied (Fig. 12). This gel prevents the formation of an oxygen inhibition layer at the margins. The luting composite was cured with two curing lights (Bluephase® Style) simultaneously and cooled with plenty of water (Fig. 13). Figure 14 shows the harmonious result produced by the lithium disilicate veneers.

Placement

Figures 8 and 9 show the try-in pastes (Variolink Esthetic LC) on the prepared teeth. The most suitable composite cement was determined on the basis of two differently coloured pastes. Two extreme options were compared: Light+ and Warm+. The difference was clearly visible when the pastes were applied. Even though the darker shade (Warm+) was very close to that of the natural tooth structure and would have worked well with the veneers, we ended up choosing the lighter shade. This was a typical decision. In most cases, we tend to prefer the lighter version, since it provides a better contrast to the tooth structure and therefore renders the removal of excess cement easier and faster. Before the veneers were seated, retraction cords were placed and the enamel was etched; the dentin remained unetched. Adhese® Universal was used as the bonding agent to place the veneers (Figs. 10 and 11). Then the excess luting composite was carefully removed and a glycerine gel (Liquid Strip) was applied (Fig. 12). This gel prevents the formation of an oxygen inhibition layer at the margins. The luting composite was cured with two curing lights (Bluephase® Style) simultaneously and cooled with plenty of water (Fig. 13). Figure 14 shows the harmonious result produced by the lithium disilicate veneers.

Conclusion

State-of-the-art restorative materials have immense potential. Depending on the particular requirements of the patient and the indication, they allow a suitable treatment option to be found quickly and easily. The case presented here shows that highly esthetic ceramic veneers can be fabricated with minimal effort using in-office equipment (IPS Empress CAD). Nevertheless, pressed ceramic veneers were chosen for this patient, since they offered the possibility of applying stains, through which a very close match to the neighbouring teeth could be attained. In principle, however, highly esthetic results can be achieved with both approaches if the appropriate treatment protocol is followed.

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Bad sleep is the new hokey pokey, threatening the overstimulated, overworked masses with disease and even an early death. Numerous scientific studies from researchers around the world have demonstrated the harmful effects of sleep deprivation on human health. When stress levels go up, people gain weight and forget things. Without shut-eye, the body doesn’t have a chance to produce enough growth hormones to build itself back up.

Sleep Apnea (SA) is a disorder that causes pauses in breathing during sleep that expose the heart to oxygen deprivation. It is common in patients with heart failure (HF) where it is associated with increased risk of hospitalizations and death. In the treatment of snoring and sleep-disordered breathing the mandibular repositioning devices are an increasingly important instrument.

Its mechanism is based on the advancement of the mandible, which increases the dimensions of the upper airways and the air flow during sleep. Aim of this study was to investigate the efficiency and tolerability of two types of adjustable devices: one with a screw jaw advancement, opening and jaw protrusion, and TAP, custom made appliances placed in 34 patients (25 men and 9 women), mean age 47 years old, undergoing an ambulatory, uncontrolled sleep screening during one month (placed onto the teeth during sleep).

Key Words
CSAS, sleep apnea, snoring, protusion

Introduction
The OSA Syndrome (obstructive sleep apnea syndrome) is one of the clinical pictures that play an important role in the chronic diseases. It has been demonstrated that a timely diagnosis and an adequate treatment can decrease neurological consequences and have a favorable effect on the cardiovascular health status of affected patients. Clinically it consists in the obstruction of the air flow during sleep that is caused by a partial or total collapse of the upper airway structures. These respiratory obstructions are accompanied by “snoring” and frequent arousals.

Patient have a number of symptoms: daytime sleepiness and fatigue, due to restless sleep, morning headache, loss of intellectual capacities and nighttime incontinence. Sleep apnea affects approximately 7% of the adult population, but the problem may be underestimated, due to the growing global prevalence of obesity. For decades the continuous positive airway pressure (CPAP) mask has been the treatment option of choice, but its disadvantages, rejection and intolerance on part of the patients complicate the option of choice, but its disadvantages, rejection and intolerance on part of the patients complicate the therapy and thus have lost its therapeutic hegemony. Mask has been the treatment option for patients who suffer from with snoring and mild or moderate sleep apnea.

Why is important the treatment of snoring and sleep apnea? Importance is based on the following reasons:

1. High prevalence in today’s society, as various studies have demonstrated in the last years. There exists an incidence of 28% for snoring, approximately 49% of adults snore frequently and 35% habitually. The prevalence of OSA ranges from 6-8% in males and 4-6% in women among the general adult, middle-aged population and this numbers increase markedly with age.

2. It represents a problem in two aspects, the social that converts these patients in intolerable bed partners and the more serious clinical impact of significant morbidity. These impacts can reach a noise level of about 78-88dB (equal to the noise of a truck at high speed on a highway). The limit for hearing damages is estimated at an intensity of 75 dB. Snoring disturbs social and family relationships of patients. Its psychological pressure influences both lives, the daily routine of people who snore, as well as the every day life of people, who
suffer from the noisy consequences causing problems in the partners.
3. Disordered breathing by sleep is very habitual and, therefore, a constant source of problems regarding health and economic impacts. Poor sleep habits aggravate the impairments of health and quality of life causing, countless traffic accidents, elderly accidents and occupational/household injuries. The majority of these disorders lead to drowness in its clinical description, disabling affected patients to drive. In all countries the number of fatal accidents increases constantly.
It is the first cause in men aged between 25 and 45.
4. The access to diagnosis possibilities is the major problem facing the specialists, as only about 6% of the population with relevant OSA is diagnosed. Clinical researchers seek for diagnostic alternatives to the costly polysomnography that is currently the first diagnosis commendation (6). The OSAS is rarely known to the public. The lack of diagnosis is the main medical problem to solve. Recent studies show that in only 7% of medical examinations of primary care, explicit references regarding possible sleep disorders are included. This incorrect diagnosis involves fatal consequences because the pathology is ignored by patients that, without being diagnosed, do not know how to justify and cope with the symptoms that they face day by day.
To conclude, school and work absence and the reduced capacity at work also cause economic damages.

**Exclusion Criteria**
- Patients with severe OSAS
- Patients with rhino-pharyngeal pathology
- Inappropriately denatured, peri-odontal diseases without treatment
- Serious problems in the temporomandibular joint (TMI)
- Insufficient protrusion capacity

**Methods**
1. Cardio-respiratory polygraphy
2. Dental impressions
3. Appointment for adaptation and user instructions

**Procedures**
- The study and evaluation were performed by the same professional with over 20 years of experience in the treatment of mandibular advancement devices. Objective and subjective assessments were performed prior to placement and after one month of treatment. The study subjects had to fill in the Epworth test and undergo the Apnealink after one month of treatment, the Apnealink also a questionnaire of satisfaction that the subjects answered in collaboration with the specialist. This test evaluates the satisfaction of both regarding a better quality of life and noise.
- The analyzed variables were: age, sex, MAD type, AH before and after the MAD therapy, risk index before and after MAD therapy. Epworth index and IAH and the level of satisfaction of the patient and his partner after MAD therapy.

**Analysis study**
In table 2 the mean values of the corrected indices before and after using MADs during one month are compared.
- The comparison of the parameters taken by the Wilcoxon test, as it is about paired and small quantity data. In table 3 the same analysis for MAD 2 is repeated.
- The value of the differences in all indices, this diminution is statistically significant (p<0.05).
- Also in the use of MADs we analyzed a statistically significant (p<0.01) diminution of all indices. To compare both MADs we calculated the mean values of the differences (index MAD after MAD index MAD before MAD) for each type of MAD and its comparison to the test of the U of Mann-Whitney is reported, it is about two different sample groups, and the group-size is relatively small. It can be evaluated that MADs achieves a greater reduction of all indices than MAD2, although the only statistically significant parameter (p<0.005) is the EPW.

**Conclusions**
1. With regards to the medical complications of snoring and OSA and the social restrictions and high economic factor the quality of life the physician should identify the patients that need support. It is a public health problem that can be easily diagnosed and treated. Recent studies even demonstrated that the consumption of public resources is 2-3 times higher in patients with not treated snoring and OSA than in the population without OS.
2. Totally advised all patients to obtain an objective evaluation of the multidisciplinary diagnosis results. The specialist should perform a clinical diagnosis, a prior nocturnal monitoring and, after a period of adaptation, a new clinical evaluation and objective and subjective examination. The experienced specialist dentist in the treatment of sleep apnoea with MADs should select adequate cases, perform a multidisciplinary design and adaptation of the devices and control possible side effects through a regular follow up.
3. We prove the efficiency of the mandibular appliance treatment was proven. In both cases the mean values of all indices decreased and the only statistically significant index was the Epworth test result (p<0.05).
4. Our medical trial should be performed through a cost and efficiency analysis, as the basic advantages of the treatment, like the decrease of the morbidity rate in the long and short term, are very evident.
6. This study support the use of cardio-respiratory polygraphy monitoring for the evaluation of sleep apnoea, detecting in subjects of high probability of disease suspicion and a high prevalence or in populations of high prevalence of sleep breathing disorders. Although the controlled PSG is the standard diagnostic tool for sleep apnoea, not all patients have access to such a study in the sleep unit. The sleep unit installations could differ from the patients sleep standards, therefore exist long waiting lists in the neurology services, the sleep study is connected with high costs and the patient’s willingness to sleep one night in a sleep unit undergoing a nocturnal PSG without confirmed OSAS could be very low. This results show that the cardio-respiratory polygraphy is a useful complementary technology for the diagnosis of sleep apnoea, due to the sensitivity, specificity, and simple use of the device and the resulting low costs of the sleep study. The cardio-respiratory polygraphy can be useful in situations where the PSG is a practical principle or in populations with high prevalence of sleep apnoea supporting the opening of diagnostic polygraphy units. This could lead to a timely evaluation of sleep apnoea and a better attention to this patient who is in a better health status and life style.
7. Can conclude that the adjustable mandibular repositioning device is an efficient treatment alternative for patients with snoring and sleep apnoea. The severity of the OSAS motivates the specialist to get a better knowledge about it and makes him aware of the importance of its multidisciplinary character. Including the participation of a dentist that is well experienced in the treatment of OSAS patients through the use of MAD, it is a treatment alternative with a high patients’ acceptance, because of its low treatment costs and high efficiency being a generalised treatment option or in combination with other treatment.
8. It is a good recommendation that the public health authorities formulate a valid preventive dentistry plan, as it was demonstrated that the sleep apnoea problem is a sanitary priority of high relevance because the efficiency of mandibular advancement devices for the treatment of snoring and mild and moderate sleep apnoea.

**“Bad sleep is threatening the overstimulated, overworked masses with disease and even an early death”**