

to call for an ambulance. The infant or child should not be left alone. The subject's mouth is opened and a single finger sweep is done to try to remove any loose object. This should be done while the provider observes the mouth and not as a blind or repeated sweep. The airway is then opened and 5 ventilations are attempted. The effectiveness of each ventilation is gauged by the rise of the chest. If nothing occurs, the head should be repositioned and ventilations tried again.

If no response occurs, chest compressions are commenced, continuing CPR at a ratio of 30 compressions to 2 ventilations. Ventilations should not be done until the mouth is checked for the obstructing object. If a single rescuer is present, CPR should be done for 1 minute before calling for an ambulance.

## FOLLOW-UP PROCEDURES

After the FBAO has been successfully managed, the subject should be checked for additional foreign bodies, dysphagia, persistent cough, or complaints of having something stuck in the throat. If any of these are present, medical help should be sought. When abdominal thrusts and chest compressions have been required, the subject should be evaluated by a medical professional to determine if internal injuries have occurred.

The dental practice team should evaluate the event to determine what was done correctly and what should be changed in any future event. A written record of the analysis should be kept and all lessons learned communicated to the entire team.

### Clinical Significance

All dental professionals should be prepared to handle choking emergencies in the dental setting. Even though the use of rubber dams has diminished the number of instances where dental materials are swallowed, the risk still remains, especially in patients who have conditions that compromise their swallowing or coughing reflexes. Keeping a poster outlining what to do and practicing regularly so that everyone knows the drill will help to avoid having a choking episode turn into a tragedy.

Jevon P: Management of choking in the dental practice. *Br Dent J* 226:183-187, 2019

Reprints available from P Jevon; e-mail: [phil.jevon@walsalhealthcare.nhs.uk](mailto:phil.jevon@walsalhealthcare.nhs.uk)

# CHRONODENTISTRY

## Tailoring dentistry to body rhythms



### BACKGROUND

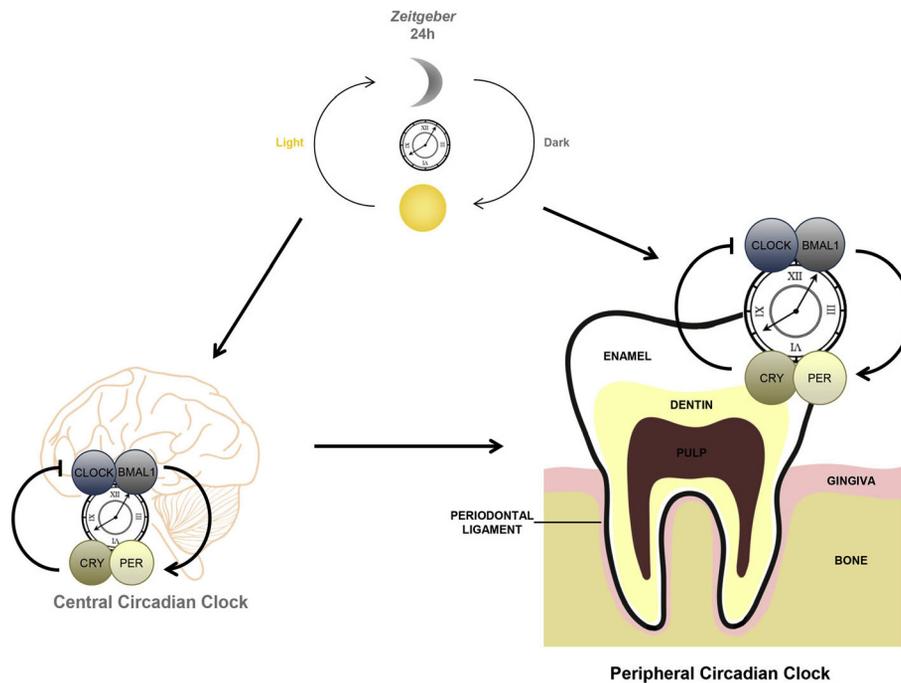
Molecular clocks in humans are designed to help the body adapt to environmental changes. Their proper functions are essential to a healthy body. Various types of molecular clocks have been identified based on the cycle length of the biological rhythms; these include the circadian clock (24-hr periods), which adapts to daily changes; the circalunar clock (29.5-day periods), which adapts to moon phases; and the circannual clock (365-day periods), which adapts to seasonal changes. In addition, the circadian clock includes the central and various cell-autonomous peripheral circadian clocks in different organs (Figure 1). Many factors serve as input (*zeitgeber*) that determines the pace for circadian clocks. These factors include light, food, body temperature, and cellular redox status. Depending on the input received, the circadian clock modulates the synchronization of physiological processes. With better understanding of molecular clocks, especially circadian clocks, researchers may develop ways to alter the body's responses in disease as well as in health. Chronodentistry is the study of the role of molecular clocks specific to oral health and has identified their

role in oral and maxillofacial surgery, restorative dentistry, endodontics, periodontics, and orthodontics.

### CLINICAL ROLE OF CIRCADIAN CLOCKS

#### Oral and Maxillofacial Surgery

The circadian clock has a role in regulating blood vessel formation as well as the cell cycle and growth rates of cells. As a result, it may offer a target for addressing tumor growth and in cancer treatment. In addition, implant therapy may be altered by the interaction of biomaterials and circadian clock core components. In healthy individuals, tumor suppressor genes and oncogenes serve as clock-controlled genes in the human oral mucosa. Thus surgeons may be able to develop therapeutic strategies to interact at more complex levels than drugs or therapies targeted to a specific target. The directed use of circadian clock effects may be especially applicable for oral cancer patients and is termed chronotherapy. Disrupted cell cycle control is a characteristic of many cancers. Using this knowledge, chemotherapeutic adverse effects may be less severe if the agents were applied at lower doses in a specific time frame. Several studies have



**Figure 1.** The circadian clock mechanism. Daily alternation between light/dark periods during days/nights are stimuli from the environment (*zeitgeber* [official technical term]) that entrain 24-hr circadian rhythms. The stimuli are received by the central circadian clock in suprachiasmatic nucleus of the brain, regulating the transcriptional-translational feedback loop between the core components of the circadian clock circadian locomotor output cycles kaput (CLOCK), aryl hydrocarbon receptor nuclear translocator-like (BMAL1), cryptochrome (CRY), and period (PER). Peripheral circadian clocks in different oral tissues receive signals from the central circadian clock or directly from the *zeitgeber* providing time keeping of physiological functions. (Adapted from [91]). (Courtesy of Janjić K, Agis H: Chronodentistry: The role & potential of molecular clocks in oral medicine. *BMC Oral Health* 19:32:2019.)

identified a reduced incidence of adverse effects, increased treatment tolerance, improved survival time, and reduced stomatitis when chronochemotherapy was used against oral squamous cell carcinoma and nasopharyngeal carcinoma.

### Restorative Dentistry

Enamel and dentin are mineralized tissues that are adversely affected by caries. Restorative materials used to fill enamel defects may be supplemented by circadian clock effects to develop new therapeutic strategies. Genetic polymorphisms in the circadian clock system may produce individual variations in enamel morphology, thickness, and hardness. This information may be used to target new therapies that offer regenerative potential for the dental hard tissues rather than focusing on reparative strategies that are of unknown durability.

### Endodontics

Root canal treatment is a routine therapeutic intervention, but its success depends on the elimination of infectious microorganisms. Photodynamic treatment has been proposed as a way to achieve root canal system disinfection through its production of reactive oxygen species (ROS), which are toxic to tumor cells, bacteria, and fungi. Light is the primary *zeitgeber* for the circadian clock, so photodynamic treatment may also modulate the circadian clock feedback mechanism.

The results of this treatment may be improved by the circadian clock's stimulation of cell survival.

Zinc oxide eugenol is often used for pulp capping, and zinc is known to influence the formation of a key circadian clock component in the dental pulp. The effects of pulp capping on the circadian clock in the dental pulp are as yet unknown but may be a useful target for treatment. Elderly diabetic and hypertensive patients have an altered pulp sensitivity rhythm; the pulp sensitivity rhythm of healthy individuals seems to follow a diurnal rhythm. Using this information, appointments for endodontic treatment could be altered based on the individual's pulp sensibility rhythms or chronotype. Circadian clocks are also being studied for their influence on pain perception in the tooth, with the goal of improving patient comfort during treatment.

### Periodontics

The diagnosis of periodontitis and successful control of this disorder after treatment are the primary goals of periodontal treatment. Increased interleukin (IL)-1 $\beta$  levels in crevicular fluid are markers for gingivitis or periodontitis. Success in therapy is indicated by reduced IL-1 $\beta$  levels. It's now known that levels vary over the course of a day even in individuals who have no periodontal inflammation. Clinical assessment could be more precise

if it were timed appropriately. Daily variations are also seen in the full-mouth bleeding score, full mouth plaque score, periodontal screening and recording, and periodontal risk assessment in healthy individuals, so timing is also an important consideration when monitoring these parameters.

Osteoblasts and osteoclasts also evidence variations related to circadian clocks that can affect bone resorption activity. Understanding the links between circadian clocks and bone resorption could advance diagnostics in periodontitis patients and possibly reveal new targets for therapeutic interventions.

Light therapy helps in wound healing, although the mechanism has not been well understood. Blue light exposure enhances *PER2* gene expression in a circadian rhythm in human oral mucosa samples; no such effect was seen with green light exposure. Circadian clock rhythms may be evaluated for their ability to stimulate oral soft tissue healing and periodontal regeneration in future therapeutic applications. In addition, salivary glands are an important part of a healthy oral mucosa and may have a peripheral circadian clock. Salivary cortisol levels also show daily variations, peaking in the morning.

### Orthodontics

The right amount of force and duration are essential components to successful orthodontic movement. The forces involved show evidence of circadian variation related to bone remodeling. Use of this information could guide the adjustment of periods when removable orthodontic appliances are worn to achieve a stronger effect with shorter wearing periods. In addition, pain perception and analgesic effectiveness are also associated with specific times each day in patients who have bone disorders. If orthodontic pain trajectories can be correlated with circadian phases, orthodontic treatment may also be improved.

## DISCUSSION

Although the specific functions of the various peripheral circadian clocks in oral tissues and the mechanisms by which they affect the various functions or behaviors of the body remain largely unknown, there appears to be a sound foundation for the application of chronodentistry principles. A dysfunctional clock mechanism has been identified in oral cancer and juvenile skeletal mandibular hypoplasia. In addition, genes are being investigated for their role in circadian rhythm. Overall, chronodentistry remains outside of patient application but shows potential in various dental fields.

### Clinical Significance

Today's lifestyles come with a number of factors that disturb circadian rhythms, including artificial light being available at all times, irregular food intake, and shift work. If the molecular clocks that are found in our bodies can be altered therapeutically, there may be important changes in treatments, with methods more closely tailored to individual chronotypes. Much work remains to be done to better understand these molecular clocks and how they interact with various body systems. For dentists, it will be important to clarify how working with circadian clock effects can provide better dental care for patients.

Janjić K, Agis H: Chronodentistry: The role & potential of molecular clocks in oral medicine. *BMC Oral Health* 19:32:2019

Reprints available from H Agis, Dept of Conservative Dentistry and Periodontology, Univ Clinic of Dentistry, Medical Univ of Vienna, Sensengasse 2a, 1090 Vienna, Austria; e-mail: [hermann.agis@meduniwien.ac.at](mailto:hermann.agis@meduniwien.ac.at)

# COMPLETE DENTURES

## Cleaning dentures



### BACKGROUND

Complete denture wearers often develop poor denture hygiene, with biofilm forming on the tissues and denture surfaces. The microbiological agents can contribute to denture stomatitis as well as several local and systemic diseases. Thus dentures can serve as a reservoir for distant infections, compromise the health of the patient, and produce a higher susceptibility to infection. Clinical evidence of the best way to disinfect and remove the biofilm from complete dentures is insufficient currently. A

crossover randomized clinical trial was performed to assess the effectiveness of several chemical hygiene clinical protocols in removing the biofilm on complete dentures.

### METHODS

One hundred forty-three complete denture wearers were evaluated, with 40 selected for participation in the study. The design included both crossover and triple-blind components and was structured into 4 phases of 14 days each. Four groups were