

# Dental treatment of children during the COVID-19 crisis

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**Caries, especially in children, does not take a break in the times of COVID-19, and dentists are confronted with the complex task of ensuring a safe dental treatment under challenging conditions, particularly for young children who are often present with limited ability to cope with dental procedures. In this article we present comprehensive possibilities and recommendations for treatment of carious lesions in primary teeth.**

At the beginning of January 2020, a novel coronavirus ("SARS-CoV-2") was officially identified as the causative agent of coronavirus disease (COVID-19). Due to its rapid spread, the World Health Organization (WHO) declared COVID-19 a global pandemic in mid-March 2020 (1). Worldwide governments have taken extensive measures (including distance regulations, contact restrictions, etc.) to contain the pandemic. Nevertheless, millions of COVID-19 infected cases and thousands of corona deaths have been registered around the world so far (2).

In dentistry it is essential to identify a suspected case of COVID-19 at an early stage. The telephone triage process is ideal to assess the acute need of treatment, especially in the case of corona-positive patients. The triage decision should be made by trained personnel. The idea behind this is to determine the condition of the patient, whether there is a crucial need for treatment and in what period of time a dental treatment should be carried out. In addition, it should be clarified whether a COVID-19 infection or a corresponding suspicion exists (3,4).

In general, it is not recommended to treat a patient with COVID-19 in the acute phase of the disease or in quarantine, though a treatment can take place only afterwards (in around 2-3 weeks). Exceptions are "dental emergencies", such as the need to alleviate severe (tooth) pain. In paediatric dentistry, the high hygiene standards for treating Covid-19 patients, along with the use of personal protective equipment (PPE) and visors, might limit the acceptance and cooperation among (young) children. Therefore, a sufficient and temporary solution including the use of pharmacologic strategies to reduce pain or antibiotics should not be overlooked. Only acute facial swellings of dental origin or cellulitis secondary to an odontogenic infection, and also dental trauma should receive prompt dental attention.

Overall, according to current knowledge and recommendations, dental interventions that produce droplets or aerosols should be critically looked upon in order to minimise the transmission of COVID-19 (3,5). Unfortunately, most dental procedures with high-speed handpiece or air-water syringe generate large quantities of aerosols. Therefore, this paper presents some general low-aerosol dental procedures and alternatives, as well as evidence-based caries management options for the dental treatment of children, which in contrast to conventional fillings, generate little or no aerosol.

## Low aerosol dental measures

### Telemedicine

During the COVID- 19 pandemic, telemedicine swiftly became an important tool for identifying cases of infection or suspected cases, assessing the urgency of treatment and, if necessary, prescribing drug therapies without direct contact (6,7). In addition, telemedicine offers the possibility of providing advice on oral hygiene and caries prevention. Telemedicine can be used to communicate the importance of brushing teeth with fluoridated toothpaste or the optimal use of fluorides depending on age. In addition, it can also be used to provide adequate dietary advice.

### Examination and treatment without air-water

Aerosol generating procedures such as the use of the 3-way syringe should be minimized, e.g. by using cotton rolls to dry the teeth. If the use of the air-water syringe cannot be avoided, only air or only water at once should be used (3).

## Preference for extraoral radiography

Procedures that increase the probability of coughing should be avoided, by any chance. Intraoral radiography is the most commonly used and available radiographic technique in dental practices; however, it can stimulate salivary secretion and consequently evoke coughing (5). Notably in children, where the number of underlying teeth and the condition of multiple carious teeth must be assessed, the use of extraoral dental radiographs such as the panoramic radiograph (orthopantomogram) can be considered.

## Pharmacologic therapy

Dentists should consider all available options for pain and odontogenic infection management. The use of a pharmacological therapy should be considered the first treatment approach during the COVID-19 pandemic. For children, ibuprofen and paracetamol are the analgesics of choice; nevertheless, recommendations at the country level should be considered. Each medicament has its own benefits and risks, which are reflected in the product's information sheet. In light of pharmacologic strategies in case of odontogenic infections, the current national recommendations at the country level should be followed e.g. the guidelines on "Odontogenic Infections" of the German Society for Oral, Maxillofacial and Facial Surgery (8). For abscesses, amoxicillin and penicillin G/V (with clavulanic acid) are primarily indicated. In case of a penicillin allergy, clindamycin should be used as an alternative. Due to aerosol generation, trepanation of primary teeth with irreversible pulpitis or abscesses should rather be avoided. Instead, a pharmacological therapy can be used, followed by extraction of the affected tooth in a further appointment, if necessary. For management of deep carious lesions with risk of pulp involvement, endodontic treatment (pulpotomy or pulpectomy) are commonly performed; however, especially during the COVID-19 pandemic, extraction of an affected primary tooth may be the more reasonable alternative. In these cases, space management via space maintainer should be considered (9).

## Alternative caries therapies especially during the COVID 19 crisis

The contemporary therapeutic spectrum for managing carious lesions offers a variety of minimally-invasive, biologically-based therapies for treatment of carious (primary) teeth (10,11). Considering the COVID-19 pandemic or for treatment of moderately cooperative children, the management of carious lesions using minimally invasive concepts without 'drilling' could be advantageous.

Currently, a biologically based caries management concept includes, for example, caries inactivation by means of silver diamine fluoride (SDF) or 'sealing techniques' specifically for deciduous teeth, such as the Hall technique (HT) and the Atraumatic Restorative Treatment ("atraumatic restorative treatment"/ART).

### Caries inactivation with silver fluoride products

This technique uses the ability of silver fluoride products to inhibit caries progression while preventing the formation of new carious lesions. The most commonly used product is silver diamine fluoride (SDF). The SDF solution consists of diammine silver ions and fluoride ions, which prevent the demineralisation process and the degradation of dentin collagen and additionally promote the remineralisation of carious demineralised enamel and dentin (12,13). Clinical studies as well as systematic reviews have shown that cavitated coronal carious lesions can be better inactivated by semi-annual application of SDF compared to the application of Sodium Fluoride varnish (NaF; 14).

In general, there is consistent evidence demonstrating the effectiveness of SDF to inactivate coronal caries in primary dentition and to arrest and prevent root caries in adults (14,15). In Europe, SDF can be found in the only available product (Riva-Star®, SDI Dental Limited), containing silver diammine fluoride and potassium iodide. However, unlike in Canada, Latin America and South Africa, where Riva Star® is registered as caries arresting agent and desensitizer, this product is used in Europe mainly as a desensitizer for hypersensitive teeth. For caries therapy, the use of silver products is "off-label", but still safe and effective. The clinical pictures of a child treated with SDF is shown in figures 1a-b.



Fig. 1a-b: (a) Active carious lesions in the maxillary deciduous molars in a 4-year-old child without any reported pain prior to application of Riva-Star®. (b) One week later, these carious lesions are clearly inactivated, but also darkly discoloured as foreseen. Photos: © Dr. Santamaría.

## Caries treatment of primary molars using the Hall technique

The Hall technique (HT) is a minimally invasive treatment for managing asymptomatic carious deciduous molars. In contrast to the traditional procedure of performing preformed metal crowns (PMC), for the HT, local anaesthesia, tooth preparation or caries removal are not needed, however the affected tooth is restored with a PMC (16,17). Given the condition of very close proximal contacts, orthodontic separators may be placed in the approximal spaces 2-3 days before fitting the Hall crown to facilitate the crown placement. On grounds of high-level evidence in the available scientific literature, the success rates of the Hall technique have shown to be superior to the one from standard fillings (2-year success rates of 90% - 100% for the HT vs. approx. 50% - 80% for fillings; 17-19). The clinical pictures of a patient with the HT is shown in figures 2a to 2c. Further literature about the "Hall technique" can be found in the instructional documentation in English, which is freely available online: [https://dentistry.dundee.ac.uk/files/3M\\_93C%20HallTechGuide2191110.pdf](https://dentistry.dundee.ac.uk/files/3M_93C%20HallTechGuide2191110.pdf).



Fig. 2a-b. (a) Cavitated, active carious lesion on a first upper primary molar with loss of the marginal ridge. (b) Tooth separation using orthodontic separators. (c) The preformed metal crown was cemented with glass ionomer cement. Cement should be removed and occlusion checked before discharging the patient. © Dr. Santamaría

## Atraumatic Restorative Treatment (ART)

In the ART, treatment of cavitated carious dentine lesion is carried out without utilizing rotating instruments, thus using exclusively hand instruments for caries excavation and adhesive restorative materials such as highly viscous glass ionomer cements (HVGIC). Originally, ART

was developed for countries lacking technical equipment, but it is now increasingly being used in industrialized countries. ART/HVGIC has proven to be an adequate management option for the treatment of single surface carious lesions in deciduous teeth (2-year success rate 94%) (20). Multi-surface restorations show significantly higher failure rates. The clinical pictures of a patient treated with the ART and HT are shown in Figure 3.

Fig. 3: Mandibular first right and left primary molars (74, 84) treated with the Hall technique. The mandibular second right and left primary molars (75 and 85), were treated with the ART technique, where the entire occlusal fissures were 'sealed'. Photos: © Dr. Santamaría



Table 1 provides a brief overview of the indications and contraindications described in the literature regarding the use of SDF, HT and ART at the tooth level. What is remarkable about all these three caries management options is not only that they are low-aerosol generating procedures, but also that they are usually achievable in children presenting with moderate or even minimal ability to cope.

Table 1: Indications for the use of SDF, the Hall technique and Atraumatic Restorative Treatment at tooth level (14,16,19,21-23)

| Method                                | Indications  | Contraindications  |
|---------------------------------------|--|--|
| <b>Caries inactivation with SDF</b>   | <ul style="list-style-type: none"> <li>✓ Hypersensitivity</li> <li>✓ Active (asymptomatic) cavitated carious lesions on any coronal surface in deciduous and permanent teeth without any evidence of pulp involvement</li> <li>✓ Root caries</li> </ul>  | <ul style="list-style-type: none"> <li>- Silver allergy</li> <li>- Irreversible pulpitis</li> <li>- Pulp necrosis, fistula, abscess</li> <li>- Apical or interradicular radiolucency or pathological root resorption</li> </ul>  |
| <b>Hall technique</b>                 | <ul style="list-style-type: none"> <li>✓ Carious primary molars without evidence of pulp involvement, especially in the case of multi-surface carious lesions</li> <li>✓ Large, inactive carious defects</li> <li>✓ Missing cusps, fractured primary molars</li> <li>✓ Teeth with anomalies of the tooth structure (e.g. Molar ncisor Hypomineralisation)</li> </ul> | <ul style="list-style-type: none"> <li>- Deep carious lesions with the risk of pulp complications</li> <li>- Irreversible pulpitis</li> <li>- Pulp necrosis, fistula, abscess</li> <li>- Apical or interradicular radiolucency or pathological root resorption</li> </ul>  |
| <b>Atraumatic Restorative Therapy</b> | <ul style="list-style-type: none"> <li>✓ Single-surface (in particular occlusal) carious lesions</li> </ul>  | <ul style="list-style-type: none"> <li>- Unsuitable for large cavities</li> <li>- Lack of access to cavity</li> <li>- Deep carious lesions with the risk of pulp complications</li> <li>- Irreversible pulpitis</li> <li>- Pulp necrosis, fistula, abscess</li> <li>- Apical or interradicular radiolucency or pathological root resorption</li> </ul> |



## Conclusion

COVID-19 has become a major challenge worldwide, especially for dental practices. A learning curve for living with the virus has been needed for everyone. In dentistry, this has resulted in recommendations for carrying out standard procedures in dental practices during the global outbreak. The above-mentioned recommendations provide general guidance; nonetheless, these should be continuously adapted to new findings. The use of low-aerosol generating procedures has been strongly advocated, considering evidence-based, minimally-invasive methods for caries treatment that are easy to use, and at the same time have high success rates. These include caries inactivation with silver fluoride products (SDF), Atraumatic Restorative Treatment (ART) and the Hall technique (HT). Ultimately, the advantages and disadvantages of these caries management options should be weighted with the conventional measures, and individually balanced at the patient and tooth level.

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