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Dental Implications of Intellectual and Developmental Disabilities; Oral Health Status and Retention of Sealants in Intellectually Disabled Patients – 2 Years Clinical Program

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1. Introduction

1.1 Impact of environmental conditions on the incidence and course of dental diseases in people with intellectual disabilities

Caries and periodontal diseases are the most common oral diseases and their prevention, despite the existence of knowledge and methods of active prevention in the general public, are still not quite effective. Patients with intellectual disabilities, according to the World Health Organization (WHO), (WHO, 2001) are different from the general population in terms of the incidence and severity their oral disease; caries and periodontal diseases among patients with intellectual disabilities, compared with the normal population, are larger.

All of these persons have a right to good oral health. The British Social Attitudes Survey from 1998 has reported that they are frequently treated with prejudice and discrimination (Fortune, 2004). Later research has showed that these biases still prevail. One of the most difficult tasks in health care services in every country is providing them with dental care. From one side, an approach within the realm of dental treatment and materials should aim at combating discrimination as well as protecting the disabled people. From the other side, epidemiological studies have demonstrated difficulties in maintaining the oral health of this group, and the causes involved in this process are complex.

Difficulties in providing dental care for these patients are encountered because of lack of knowledge about specific methods of treatment. People with disabilities constitute a group of a patient who are reluctant to cooperate with dentists during dental procedures (including ones that are therapeutic), due to difficulties in communication, and this depends of the degree of the child's disability. The reluctance of doctors to treat these people is not the only reason for the considerably worse state of health of this group of patients as compared to healthy subjects. Lack of funds for treatment and dental care programs for this group are other reasons. In addition, medical caregivers and / or general practitioners who are dealing with these patients, primarily focus on medical disorders. Oral health, despite having been proven to have a significant impact on the whole body of the patient, is noticed only in case of general health complications. This results in treating disabled people with intrusive procedures, usually involving the extraction of teeth. The reason for this is a lack of awareness, among dentists, of modern methods of prevention for patients with mental or physical retardation.

Another reason is the lack of awareness of treatment methods which take into account the physical and mental limitations of this group of patients (Tsai et al. 2007).

2. Dental implications of intellectual and developmental impairment

An example of poor oral conditions is when there is delayed eruption of deciduous and permanent teeth. Causes of an abnormal sequence of tooth eruption are Down's syndrome, congenital, thyroid or ectodermal diseases (Sindoor & Desai 1997). Frequently malocclusion is a consequence of these abnormalities. A significant number of malocclusions begin early with bad habits that become solidified during a child's development. Other important coexisting risk factors are complications from the presence of caries, which can lead to a premature loss of deciduous and permanent teeth. The development of malocclusion is rapid and depends largely on heredity and local conditions, as well as parafunctional habits and dysfunctions. Examples of parafunctional habits are sucking on an empty bottle pacifier, tongue thrusting, lip and cheek biting, biting on a foreign object, clenching, frequently resting the chin on the palm of the hand and repeated face grimacing. Dysfunctions include incorrectly established body position during sleep and feeding time, distorted speech, abnormal chewing and an improper breathing pattern. Both groups of factors cause a loss of equilibrium between mandibular adductors and abductors. This disequilibrium can lead to dorsal shifting of the mandible and macrostomia, together with habitual mouth breathing and result in the formation of an abnormal dental arch. As a consequence, retrognathism with protrusion of upper incisors develops.

Malocclusion, multiple disorders, medications and poor oral hygiene can increase the risk of periodontal disease. The most common form periodontal problem is gingivitis, which is due to collection of plaque around teeth. During gum inflammation, marginal gingivae and papillae are red in color, and additionally a slight swelling of the gingivae can be observed. Other symptoms are bleeding following even a slight touch, tenderness, deeper gingival pockets and possibly a slight loss of tooth attachment. Sometimes gingival inflammation is excessive due not only to plaque and food deposits, but also hormonal changes. It is reversible when daily oral hygiene is encouraged and followed. Rinsing with mouthwash which contains an antimicrobial agent (e.g., chlorhexidine, triclosan) can help. Sometimes rinsing is impossible for a patient who has swallowing problems (dysphagia) or who cannot expectorate. In this situation an antimicrobial agent supplied in a spray bottle or gel or toothpaste is equally efficacious.

Very few studies have analyzed the oral microbial flora in patients with intellectual disability. Low intra-oral pH from poor oral hygiene, cariogenic diet and lower immunoresistance could theoretically manifest as a change in normal flora to a more acidogenic and aciduric type. It is not clear if cariogenic *Streptococcus mutans* and *Lactobacillus* differ in levels in these patients. Factors causing disturbances in the oral cavity may be accompanied by changes in the composition and secretion of saliva and a reduced immune response (e.g., in Down's syndrome). Further research in this area would be of value (Edgar et al. 2004; Sindoor & Desai, 1997).

Research carried out recently (after the year 2000) among Polish children with intellectual disabilities between the ages of 6 and 18 years, has shown that tooth decay has increased in this group since 1992 from 86% to 100% (Baranska-Gachowska et al. 1986; Borysewicz-Lewicka et al. 1996; Gerreth et al. 2007; Orlik & Mielnik-Blaszczak et al. 1997; Strozak-Wysokinska et al. 1984). This means that throughout the past 18 years dental caries among children with

intellectual disabilities has not changed and remains worsened, significantly higher the level within the general population. Based on epidemiological studies conducted in other European countries, it is known that improving oral health in this group is possible. This is demonstrated by the results of studies conducted within the same age group in Belgium, where 21% of children were free of caries, and studies in Greece, where it was found that nearly 40% of children were free of dental caries. An example of people with good oral health are also Special Olympics participants, who are more likely to have no fillings and untreated caries (Feldman et al. 1997; Reid et al. 2003; Turner et al. 2008). In patients with disabilities caries can only be significantly arrested by adhering to performance-oriented dental care and proper health habits, such as good oral hygiene and diet. In addition to systemic solutions, there is a great need to create an effective program of promotion, prevention and dental care for this group of patients (Petersen, 2003; Petersen & Kwan, 2004).

Individuals with intellectual disabilities more frequently wear down their tooth surfaces, grind their teeth (in dental term is bruxism) and have self-inflicted traumatic injuries (Bath & Nelson, 1989). Tooth grinding can be an expression of muscular tension releasing this habit. Bruxism can delay the loss of primary teeth and disturb eruption of permanent teeth. If an individual's tooth surfaces are worn down, if possible, the cause should be found and eliminated. Frequently the cause is gastro esophageal reflux, which requires treatment by a gastroenterologist. If the tooth surfaces are severely worn away, other causes should be looked for such as ear and salivary gland infections. The condition of the worn teeth could also be a sign of pain in another part of the body. Severe wearing down of tooth surfaces can lead to exposure of dentin and pulp. This requires rebuilding of the tooth with as little preparation of tooth structure as possible.

Source of bad habit	Bad habit "check up" and result
Lip biting	Chapped lips, lower lip larger than upper lip
Tongue thrusting	Muscles over chin wrinkling when patient swallows
Nail biting	No need to cut nails
Cheek biting	Swollen flap of tissue inside cheek
Finger biting	Callus on finger
Thumb sucking	A clean thumb

Table 1. Shows a guide on detecting the most common bad habits (Moss, 1993).

It is true that bad habits used for a short periods of time are not dangerous, but they should be discouraged from doing any of these habits constantly, day after day (Moss, 1993).

2.1 Guidelines on how to care about an intellectually disabled patient in a dental office

There are people with numerous illnesses and disabilities that require special care in the dental office and among these are patients who are intellectually disabled. The dental team should treat every disabled patient as an individual, taking into account their specific needs. A dentist may need to modify the way he relates to and treats a disabled patient, going beyond what would normally be done with a "healthy" patient.

The first visit should be regarded as being for the purpose of adapting the intellectually disabled patient to our environment. During this visit the patient's general health status should be evaluated and a dental examination performed. An assessment of the patient's

communication level should also be made, which is important in planning future treatment. The disabled patient's parents or caregivers can help the dentist in this aspect by telling the dentist to what extent communication with the patient is possible. It's important to have direct contact with the patient, ask him questions, and adapts our conversation to whatever situations may appear. During every dental visit it is important to try and maintain eye contact with the patient, avoid loud noises and bright light to the extent that this is feasible. It is recommended that the same procedures, statements or phrases be repeated in future dental appointments with the patient. That is to say, that "cohesiveness" is maintained among the appointments. Appointments should be planned in the morning and involve one prophylactic or therapeutic procedure. When planning an appointment the dentist should reserve more time for the disabled patient than is customary with a "regular" patient. Future dental appointments might involve more time than is usually foreseen. 4 handed ergonomic dentistry with an assistant might have to be performed because a disabled patient frequently has increased muscle tension, uncontrolled movements of the head and limbs, weak motor and manual coordination, and sometimes problems with hearing, speaking, and seeing (Valachi, 2008). If it is feasible, the dental unit should be adapted to meet the needs of a disabled patient in a wheelchair by having a movable platform for the wheelchair and mobile parts in the dental chair, thereby making access to the patient easier. It is also important to determine how dental accessories can modify to meet the daily oral hygiene needs of the physically disabled patient. The dentist should remember to tell parents or caretakers that they should repeat dental hygiene instructions with the patient at home. Before a dental visit, parents and caretakers should also simulate dental procedures that will be performed during the appointment (e.g., opening the mouth, insert a dental mirror, having an oral examination). The caretaker accompanying the patient can also help the dentist during a dental procedure (Mehr, 2009; Piotrowski, 2009).

A strategy to follow when having a disabled patient in the dental office
• The first visit should be for adapting the patient to the dental office • Future appointments might require more time than is usually foreseen for „healthy" patients • Determine the level of the patient's communication skills is very important • Some patients don't understand, can't keep peace during a conversation or have trouble expressing their thoughts and emotions • Parents or caretakers should inform the dentist at what level the patient can be communicated with • When communicating, it is important to directly relate with the patient and not with the person who is accompanying him • Appointments should be scheduled during the morning • Dental appointments should be short • Be sure to repeat the same dental procedures multiple times (cohesion) Be sure to maintain eye contact • Loud speaking and bright lights should be avoided • It is recommended that before a dental appointment, the procedures that are to be performed should be simulated at home • Maintaining a gentle and caring approach is generally the best way to motivate an intellectually disabled patient

Table 2. Advices when treating a patient with intellectual disabilities in the dental office.

In the aforementioned ways the dentist creates a pleasant atmosphere during the dental appointment, but most importantly, gains the trust of the patient and his caregivers. A gentle, caring, and warm approach and attitude by the whole dental team is usually the best motivation for patients with disabilities.

Fig. 1. An example of dental unit which allows patient comfortable entry and exit, especially for disabled and elderly persons (Planmeca Sovereign, Finland).

2.2 Traditional preventive treatment options

It is very important to have knowledge of contemporary concepts of prevention and treatment of hard dental tissues, in order to streamline processes towards remineralization. Equally important is understanding which of the available dental materials used in the treatment support resistance to caries and release fluoride into the surrounding enamel. Due to needs of special care patients, the next question is which methods are simple and non-painful to use.

Historically, preventive treatments in dentistry have been divided into first, second, a third tier prophylaxis. Prophylaxis is different than health promotion because it is focused on disease and preventing the occurrence of that disease. In first tier prophylaxis the goal is to control the risk factors leading to a disease, and thus prevent the occurrence of the disease. The second tier involves discovering disease manifestations as early as possible. In the third tier the goal is to stop the disease from progressing. All of these methods can be applied to the disabled, preparing them for patients and those who are under someone else's care, and they can also be used by dentists in their practices. When choosing a preventive method the patient's health status and age have to be taken into account (0-6 years for deciduous teeth, 6 years and up for permanent teeth). The traditional methods of prophylactic dentistry in childhood are based on various reliable scientific studies. However, the number of scientific studies performed on adults is limited (Longbottom et al. 2009). In dentistry, the traditional forms of preventive methods are: maintaining the hygiene of the oral cavity; applying fluoride; controlling the diet and intake of carbohydrates; sealing the occlusal surfaces of deciduous and permanent teeth (Batista et al. 2009; Longbottom et al. 2009; Liu et al. 2010).

2.2.1 A professional guide to oral hygiene

Clean teeth indicate that are healthy and without caries. In order to believe in this slogan one first has to understand the role of plaque and the etiology of caries. Plaque is a transparent film continuously created by bacteria that adheres to tooth surfaces. The bacteria create a very strong substance called dextran by which they firmly adhere to tooth surfaces, and which cannot be detached simply by washing the oral cavity with water. Plaque also contains food particles. When oral hygiene becomes insufficient the bacteria multiply and form additional plaque deposits. The surface bacteria metabolize oxygen while the bacteria in the deeper layers of plaque make use of carbon dioxide. They use carbohydrates as a source of energy and then release metabolic acids, which initiates the demineralization of tooth surfaces. Plaque also harms the oral cavity in the regions of the gingiva by causing gingivitis. Additionally, subgingival plaque is a factor in the progression of periodontitis. The symptoms of gingivitis are erythema, edema, and bleeding. Gingival bleeding during brushing indicates that oral hygiene habits should be continued, or intensified, and not discontinued. Plaque caused gingivitis is reversible and in a couple of weeks the gingiva can be returned to a healthy state. Daily brushing and flossing are recommended because these actions prevent plaque accumulation on tooth surfaces. After three days adherent plaque mineralizes and becomes calculus, which cannot be removed by toothbrushing. It then becomes necessary for a dentist or dental hygienist to remove the plaque with special hand held conventional or ultrasonic instruments.

Despite the fact that a caries vaccine has not been created, it is possible to control the formation of bacterial plaque. If plaque is removed within 24 hours of it's formation by brushing and flossing then bacteria are unable to produce a sufficient amount of acid to destroy tooth structure.

It is frequently observed that due to impaired physical coordination some of patients are not able to clean teeth individually. There is a need to speak to caregivers about daily oral hygiene how they are "professional" in dental knowledge. The minimal requirements for good oral hygiene are cleaning and flossing (the lateral surfaces) one's teeth two times a day, after breakfast and before sleep.

The simplest brushing technique is to perform lateral movements from „up-and-down and from side-to side." In order to teach oneself or a child proper brushing, tooth brushing movements can be performed with a toothbrush on tooth model or on the palm of the hand (Moss, 1993). As the brush contacts the surface sweeping motions should be performed with the tooth bristles, maximally utilizing the elasticity of the bristles. A slight tickling or scrubbing sensation should be felt when the palm is just brushed. Next, movements of the brush should increase in rapidity, thereby creating vibrations. At all times excessive pressure with the tooth brush should be avoided because, after several years, this can lead to abrasion, the forming of gingival area lesions on the tooth, recession of the gingiva, and sensitivity of the enamel. Currently, on the market there are many different companies that offer a selection of toothbrushes. A proper toothbrush should have a straight base, soft bristles of the same length those ends should be flat, arranged in at least three rows, and a small brush head to facilitate precise brushing-vibrating movements. The brush should be exchanged for a new one every 3-4 months because it develops mechanical flaws after being used for this amount of time. Tooth brushes should be stored in areas where they can quickly dry and will not come into contact with other user's brushes. It takes the fibers of completely nylon bristles a dozen or many hours to dry and thus two different brushes should be used because wet bristles are less effective in removing bacterial plaque. Electric toothbrushes are a good solution for the disabled or those otherwise unable to properly perform the movements of brushing. These brushes perform three different types of movement at once: oscillating, pulsating, and vibrating. The speed can be regulated so the brush performs up to 9000 of these movements a minute, thus reducing brushing time and massaging the gingiva, which improve the gingiva's metabolism and circulation. However, it has to be pointed out that conventional and electric toothbrushing methods are different. According to manufacturers of electric toothbrushes, the user should touch the crown of a tooth with the brush for 5 second without performing any sweeping motions and then perform the same action on the next tooth. A drawback to these types of toothbrushes is that the apparatus as a whole as well as its disposable parts are expensive. Furthermore, electric brushes are noisy when being used and require replacement or recharging of batteries. Brushing with conventional toothbrushes should still be taught despite the fact that electric toothbrushes are easier to use. The brushing technique can be taught and reinforced in individual and group games. Specific attention should be paid to brushing the lingual surfaces of lower molars and the buccal surfaces of upper molars, regardless of the type of toothbrush, because these are usually cleaned the least efficiently. Statistically people brush their teeth on average for less than 2 minutes, which is insufficient for adequate cleaning.

When we take into account that each tooth has 5 surfaces, it should be possible for all types of toothbrushes to remove plaque from the surface with which they come into contact, namely: occlusal, buccal or labial, and lingual and palatal. Dental floss is required to remove plaque from posterior interproximal surfaces, from between other teeth, and below the gingival margin. In adults, caries frequently occur in these hard to clean surfaces. In children caries develops most frequently interproximally between the 2 first molars. The reason for this is that during eruption these teeth have a large space in between them and thus they are prone to carious attack. Flossing should be performed at least once a day, preferably before bedtime. There is then 24 hours of safe space in which bacteria won't be able to multiple enough to produce acids. Teaching flossing should be done in front of a mirror. The floss should be pulled between two fingers on opposite hands. Alternatively, a special flossing holder can be used, which makes flossing easier. It is important that when flossing the floss should be pushed through the interproximal contact while touching the wall of one of the

teeth. This prevents harming the gingival papilla, which is located between the teeth. After flossing one of the tooth surfaces, the other neighboring tooth surface in the same interproximal space should be flossed because there are two teeth in interproximal surface. Cleaning interproximal surfaces is made easier by water irrigators, which generate a stream of sufficient intensity (either linear or rotary) to clean in between teeth. Mouth washes can also be used to clear away food debris and bacteria below the gingival margin. Water irrigators are recommended for patients wearing orthodontic appliances, permanent prosthodontic appliances, such as crowns, bridges, implants and for patients whose wisdom teeth are erupting.

Proper oral hygiene consists in using toothpaste while brushing. The paste itself doesn't remove plaque, but is meant to deliver fluoride ions and antibacterial substances to tooth surfaces (contact fluoridation) and refresh the oral cavity. To sum up, good toothpaste should be able to protect teeth from caries, prevent the appearance of plaque and calculus, prevent gingivitis, and combat tooth sensitivity and discoloration. To have these effects, manufacturers add active elements into toothpastes that make up only 0.2%-10% of its substance. The remaining 90% of chemical substances act as fillers. Examples of these fillers are: humectants, water, abrasives, binders, buffers, surfactants, flavourers, sweeteners, colors and preservatives. An active element in every toothpaste is fluoride, which comes in various forms such as: Sodium Fluoride (NaF), Sodium Monofluorophosphate (SMFP) (Na_2FPO_3), AluminumFluoride (AlF_3), Stannous Fluoride (SnF_2), and Amine Fluoride (AmF). The concentration of fluoride in conventional toothpaste for adults is 1000ppm-1500ppm, and for children is 250-500ppm. It has not yet been established which type of fluoride compound has the most protective effect on enamel. Most publications concerning the efficacy of fluoride in prophylactics have analyzed sodium fluoride and sodium monofluorophosphate. Fluoride in toothpastes is recognized as a preventive agent in the fight against enamel demineralization. It creates fluoroapatites, which help remineralize enamel. Hypothetically, if there are existed two equal populations with the same hygiene habits, amount of plaque, and dietary habits, adding a small amount of fluoride to the oral cavity environment can cause a reduction in caries progression of up to 50%. Adding a small amount of fluoride into the oral cavity environment during the early tooth eruption process can reduce caries even more than if it is added at a later age. During the pre-eruption period fluoride in the oral cavity reduces the solubility of enamel to acids by incorporating itself into the enamel. After tooth eruption fluoride helps in remineralizing tooth surfaces and slows down or stops demineralization in the early stages of caries. It also impedes the glycolysis process of cariogenic bacteria. It must be emphasized that fluoride released from a tooth surface covered by plaque is tardy and less effective. This is that reason that clean teeth make better use of the anti-cariogenic potential of fluoride. Fluoride works the most effectively on interproximal and anterior-posterior surfaces of teeth. It is less effective on occlusal surfaces. A source of fluoride in the micropores of enamel is calcium fluoride (CaF_2). If all the CaF_2 is dissolved (used), it should be recreated by continually having additional amounts of fluoride available. Dissolving CaF_2 is indispensable because only free ions of fluoride can be incorporated into enamel [1].

$$\begin{aligned} &Ca_{10}(PO_4)_6(OH)_2 + 20F^- + 11H^+ \rightarrow 10CaF_2 + 3H_2PO_4^- + 3HPO_4^{2-} + 2H_2O \\ &CaF_2 \rightarrow Ca^{++} + 2F^- \\ &Ca_{10}(PO_4)_6(OH)_2 + F^- \rightarrow Ca_{10}(PO_4)_6(OH)F + OH^- \end{aligned} \quad (1)$$

When the pH in the oral cavity is lower below the neutral level of 6.8, more F ions will be released from CaF_2 into the enamel, but only until a pH of 4.5 is reached. In patients at a high risk of caries development, who also have active demineralization, the reserve of CaF_2 will quickly be depleted. The precipitation of fluoride to enamel is quicker if the tooth is healthy.

In the XX century the presence of caries decreased in developed European countries (Anderson, 1989). The cause of this was the widespread use of fluoridated toothpaste. In order to protect teeth, fluoride should be supplied to the oral cavity environment throughout the entire life of an individual. A lack of F in the oral cavity lowers the threshold for active tooth demineralization.

After cleaning teeth with a toothbrush and fluoridated toothpaste, a mouthrinse should be used. These active solutions do not remove plaque, but rather are meant to deliver fluoride to the enamel (contact fluoridation), retard the colonization by microorganisms and the emergence of plaque, and keep the mouth fresh after toothbrushing. Mouth rinses are used in caries prophylaxis and in treating periondontal diseases. These rinses can contain compounds of fluoride in the form and concentration of 0.2% NaF (if they are used for 1 x week) or 0.025% F (for everyday use). Programs that were based on rinsing the oral cavity once a week with a high concentration fluoride mouthrinse had worse results than those based on rinsing every day. The anti-bacterial efficacy of mouthrinses is increased when manufactures add compounds such as chlorhexidine (CHX), essential oils, triclosan, cetylopyridine chloride or tin ions. The usefulness of mouthrinses arises from the fact that toothbrushing alone only removes bacteria mainly from the surfaces of teeth. However, bacteria are not only present on teeth, but also on the tongue, cheeks, in gingival pockets and in saliva. The bacteria in these areas also need to be retarded in their progression. Even after professional tooth cleaning, along with scaling and root planning, bacteria from the tongue and gingival region recognize the oral cavity. Rinsing the oral cavity for 30-60 seconds is supposed to suppress biofilm by destroying bacterial cell wall membranes, inactivating enzymes and bacterial toxins, neutralizing oxygen and penetrating bacterial plaque. Rinsing the oral cavity with anti-bacterial mouth rinses is especially recommended for people with symptoms of gingivitis and other periodontal diseases. Mouthrinse in the form of spray is available for the disabled persons who are unable to rinse their mouths properly.

2.2.2 Systemic and topical fluoride treatment

In anti-caries prophylaxis fluoride can be delivered to the oral cavity in one of two ways – exogenic and endogenic. The endogenic supply of fluoride entails delivery of needed fluoride through the digestive tract and then the circulatory system to the teeth, where it is preferentially deposited. In this method fluoride can be transported via drinking water, tablets, vitamins, milk, dietary supplements for children, table salt, chewing gum and neutral food products such as vegetables, fish, and herbs. The most fundamental method of endogenic delivery of fluoride is through drinking water. The WHO has lowered its recommendation of fluoride in drinking water because of fluoride increasing in availability through other sources. The current recommendation for fluoride concentrations in pipe-delivered water is 0.5-1.0 mg/l. A side effect of endogenic fluoridation is dental fluorosis, which never appears in exogenic fluoridation. This disease process appears when there is

an oversupply of fluoride during the formation of a tooth. Dental fluorosis appears as white or light brown trails or spots on the enamel, which manifest decreased mineralization in these areas and indicate that the tissue is more porous. These types of changes are irreversible, but the extent of the process can vary among different teeth. This is a major disadvantage of endogenic method of fluoride use for caries prevention.

The evidence on the effect of topical fluorides on the prevention of dental caries in children has been extensively reviewed (Marinho et al. 2009). In the exogenic method of fluoride delivery - fluoride is applied locally by rinsing, rubbing, and coating the surfaces of teeth. Supervised exogenic fluoridation can be based on rinsing the oral cavity with a fluoridated solution, rubbing on a gel or paste to teeth, and coating the surface of teeth with varnish (table 1). Fluoride gels can be applied to trays or self-applied use a toothbrush. They do not contain abrasives; their fluoride concentration is much higher from toothpastes that are why they should be applied at infrequent intervals (min. twice a year). During application an excessive ingestion can be occurred. Approximately 5 ml of gel is used in one tray application. For instance, the use of 12.300 ppm F APF gel represents an exposure of 61.5 mg of fluoride ions. A probable toxic dose of 100mg of fluoride for a 20 kg child is contained in only 8 ml volumes. Then, there is a risk of acute toxicity and their symptoms are: nausea, vomiting, headache, abdominal pain (Ripa, 1990). Use of fluoride gels should be under supervision.

Applying varnish is more safe for any patient because it dries and adheres to tooth surfaces. The excessive ingestion of fluoride during application is an uncommon occurrence. The release of fluoride ions is much longer than from fluoride gels. A frequency of professional application is rarer than gels to rub on teeth. Varnishes are especially recommended for disabled patients.

Gels to rub on teeth	Varnishes to coat teeth
<u>A gel with a neutral pH</u> Fluocal gel 2.75% F <u>Acidic gels with acidulated orthophosphate fluoride (APF)</u> 1.23% F (12300ppm) <u>Gels with tin fluoride</u> 10% SnF_2 <u>Gels with organic fluoride elements</u> Fluormex 1.25% AmF Elmex gel 1.25% AmF	<u>Varnishes without color</u> Fluor Protector 0,1% difluorosilane Bifluorid 10 6% NaF <u>Colored varnishes</u> Cavityshield 5% NaF Clinpro White Varnish 5% NaF Duraphat 5% NaF Fluoridin 6% NaF Fluorlaq 5%NaF Profluorid 5% NaF
2-10 times a year depending on the fluoride concentration, every 2 weeks	2-4 times a year depending on the fluoride concentration

Table 3. Examples of various forms of exogenic fluoride anti-caries prophylaxis (F-fluoride, AmF-aminofluoride, NaF-sodium fluoride).

2.2.3 Anticaries dietary control

Traditional methods in fighting caries are based on dietary control which entails limiting carbohydrates. Caries develops in the presence of four factors: cariogenic bacteria, fermenting carbohydrates, susceptible tooth tissue, and an appropriate duration of time (Moss, 1993; Longbottom et al. 2009). A fundamental element in a person's diet that induces caries is fermentable sugar. All fermentable sugars are absorbed by bacteria and metabolized into lactic acid and other acids. The surplus is transformed into intracellular polysaccharides by bacteria. Sugars can be divided into the following:

monosaccharides - glucose and fructose
disaccharides - sucrose, maltose, lactose
polysaccharides - starch

Fermentable sugars are responsible for the caries epidemic in the XX century. The most popular industrial sugar is sucrose, which is used by bacteria as a substrate and transformed into extracellular polysaccharides. In industries glucose is used in the hydrolysis of starch and is called dextrose, glucose syrup. Fermentable sugars can be found in many forms and not just in candy and syrup but also in potatoes, rice, baked foods, fruit drinks (both carbonated and uncarbonated), pills, cereals and preservatives. There are many foods that contain hidden sugars, which means that we are unaware that the products contain sugar. Some examples of these are ketchup, mustard, salad dressings and yogurts. Additionally products with a lower pH have a deleterious effect in children because they can predispose teeth to caries progression and at the same time erode tooth substance. Examples of these types of products are lemon and grapefruit and the most deleterious acids for teeth are citric, malic, and phosphoric. Carbonated drinks that contain any of these acids should be particularly avoided. Phosphoric acid demineralizes teeth in much the same way that gastric acid does in gastric esophageal reflux disease (GERD). Dietary acids acidulate the saliva, which then is unable to neutralize lowers levels of pH in the oral cavity. After consuming large amounts of acids it is recommended that neutralizing solutions be used in the oral cavity (e.g., rinsing with water, drinking milk, rinsing with an alkaline mouthwash) and that saliva flow be increased by chewing sugarless gum for 10-15 minutes (the gum should not have a sour taste). Other good salivary stimulators are yellow cheese and nuts, which contain calcium and phosphates and helps reduce the demineralization of enamel.

If the patient is used to eating foods with a sweet taste, there are many food products and drinks that contain non-fermentable sugars substitutes. There are two main groups of substitutes: non-caloric sweeteners (e.g., cyclamate, saccharine, aspartame) and caloric sweeteners (e.g., sorbitol, lycasin, xylitol). All of these sugars have a very intense sweet taste and are not metabolized by bacteria into acids in the oral cavity. They are added to many products such as drinks, jam, sweets and candies, substances for diabetics, toothpastes, mouth rinses, chewing gums, and foods with the label of „healthy food." These sugar substances are also available separately in the form of drops, tablets and powders. Of the previously mentioned substances xylitol has the most anti-cariogenic properties. Analyzing the diet of a disabled patient the dentist should pay particular attention to the following patterns included in Table 4.

pay attention to the amount of carbohydrates consumed
limit the amount of times fermentable sugar is consumed (e.g., 1 meal a day)
eliminate eating during the night
eat main meals regular everyday
eliminate snacking in between meals
avoid foods with a high level of stickiness
frequently eat products that stimulate salivary secretion and stimulate masticatory and taste receptors, e.g., nuts, yellower cheese (aged Cheddar, Swiss), coarse-grained foods
rinsing the oral cavity with mouthwash after meals, even if this only means using regular water

Table 4. Nutritional suggestions about diet to maintain dental health.

Remember, dietary counseling always has a pedagogical significance for patients and others who are under someone's care.

2.2.4 Optimal selection of dental materials for restorations and sealing teeth

Currently, there is wide range of dental materials on the market used for sealing teeth, but controversy surrounding their efficacy tend to look for new, conditioning their term maintenance of the product. It is also important that the sealing material, which contains fluoride, shows prolonged cariostatic action by releasing fluoride into the surrounding enamel. Sealers containing fluoride are the IV generation of dental material for fillings, the most commonly used being glassionomer cements and composite materials based on light-BIS-GMA resin. There have been a lot of studies comparing the effectiveness of the above materials. However, due to unharmonized methodology in testing, differences in age groups, and the number of repeat applications, the results of these studies have a limited comparison value. Therefore there is a need to look at positive properties of these two groups of dental materials. The release of fluoride from fissure sealing materials seems to be very important in the primary prevention of dental caries. The presence of fluoride inhibits demineralization of teeth and also increases the possibility of early re-mineralization of enamel defects. Fluoride connects to the hydroxyapatite of enamel and dentin and creates fluoroapatite, which is much more resistant to cariogenic acids. It was also noted that the surface of enamel, on which fluoride was applied, was free of bacterial plaque longer, possibly because fluoride lowers the surface energy of enamel. This may be another mechanism of action of cariostatic fluoride involving longer clean tooth surfaces. In vitro studies indicate that glassionomer cements are capable of stopping the demineralization of surrounding enamel in a higher degree than other fluoride-releasing materials, such as those that are resin-based. Additionally, in an acidic environment, the total amount of released fluoride increases. Recent studies have shown that in acidic solutions the proportion of bound to free fluoride is much higher than in the case of fluoride released into pure water. It is not known whether bound fluoride is able to incorporate into enamel (Czarnecka et al. 2007; Rothwell et al. 1996).

Resin-based materials (composites, compomers and resin-modified glass-ionomer cements) initially did not contain fluoride. Recently, manufacturers enriched the material

with fluoride compounds. In vitro studies have shown that composite materials with fluoride resins are less able to inhibit enamel demineralization than glassionomer cements. In the case of composite materials based on light-BIS-GMA resin, volume changes during binding are observed. The setting of these materials is based on additive polymerization, which is accompanied by polymerization shrinkage directly proportional to the degree of monomer conversion into polymer. For resin-based materials without filler, polymerization shrinkage is 2-5% by volume. The addition of filler to the material reduces the polymerization shrinkage, but does not eliminate it completely. Glassionomer cements set by a neutralization reaction which is accompanied by a minimal change in volume. In comparing resin-based materials to glass-ionomer materials, the second does not shrink at all.

The resin-based materials during setting release 2-hydroxyethyl methacrylate (HEMA), the most damaging substance, ranging from pulp inflammation to allergic contact dermatitis. Unfortunately there is a potential hazard from resin-based materials. Care needs to be taken with regard to their use in dentistry (Nicholson & Czarnecka, 2008). Conventional glass-ionomers do not release any allergic substances, therefore they are considered as the most biocompatible dental materials and are recommended for pediatric dentistry (Czarnecka et al. 2006, 2007; Nicholson & Czarnecka, 2006, 2008).

2.2.5 Clinical criteria of sealing teeth

If it is possible the occlusal surfaces of primary teeth should be sealed the same method. Sealing should be as soon as the tooth has erupted, sufficiently to permit moisture control. Any child with occlusal caries in one first permanent molar should have the fissures of the sound molars sealed. Occlusal caries affecting first molars indicates a need to seal the second permanent molars. Any stained fissures should always be investigated prior sealing. Any lesions into dentine should be restored with preventive restoration. Fissure sealant durability is a possible problem but we should remember that where necessary re-sealing is possible. An ideal situation is 5 years retention on the occlusal surface. A recent Cochrane review has shown that a retention rate of fissure sealants after 1 year is 79%-92%, after 2 years 61%-85%, after 9 years 39% (Ricketts & Pitts, 2009). Sealing teeth have improved a good preventive caries effectiveness. Unfortunately is also cost-effectiveness and expensive (Kervanto-Seppala et al 2009).

2.2.6 Oral health status and sealants retention in intellectually disabled patients – 2 years clinical program

2.2.6.1 Aim of the study

We concluded that modern dental materials used in fissure fillings contain fluoride. However, it appears necessary to determine the retention of two materials currently considered the best sealants. The aim of the research was to establish a basis for practical application in the prevention and treatment of dental caries among high risk groups, and clinically to compare the 2 kinds of fissure fillings: glass-ionomer cement and resin composite.

2.2.6.2 Material and methods

The studies participants included 68 female residents in a Nursing Home for Children in Poznan, Poland with intellectual disabilities of a light to medium degree, between the ages of 16 to 25 (mean age 18.9 ± 6.4). The study group was not previously covered by any proposed dental treatment program and benefited from standard dental care guaranteed by the Polish National Health Service. The assessment of the occlusal surface of teeth was conducted on the basis of a dental examination in a dental office, in accordance with an assessment form recommended by WHO (WHO, 1997). Because of the specificity of the group selected for research, selecting teeth for sealing was based on the healthy state of hard dental tissues (no caries on the enamel and dentine), and not age. Prior to study oral hygiene instruction, repeated during the project at intervals of 6 months, was carried out. Brushing teeth was monitored 2 times a day by caregivers working in the Nursing Home. On 10 occasions over the year toothbrushing with Duraphat paste was under supervision performed (Colgate-Palmolive, Poland; concentration of sodium fluoride 5000ppm). An important aspect of the research group was a homogeneous diet for people residing in the Nursing Home, consisting of five meals a day. The project was based on a split mouth model (called split-mouth), which means that the same oral cavity was investigated and then used in the comparison group. On the test side of mandibular molars and premolars (occlusal surface) glass-ionomer cement Fuji VII (GC Corp., Japan), used as a fissure sealant, was applied as recommended by the manufacturers. On the opposite side (the comparative) a composite resin Helioseal F (Vivadent, Liechtenstein) was applied on the same surface. A random selection of the test and control side in each patient involved application of sealant on the right or left side. However, the location of the test teeth in the maxilla or mandible played a role in the analysis of clinical results. A total of 89 fissure sealants were applied. Sealing the surface of healthy teeth was performed by the same dentist in a dental office. A full oral examination was carried out before initiating the project and after two years of its application. A clinical assessment estimated the retention of sealing materials, the presence of any decay in the test teeth using DMFT (decayed, missing and filled teeth) and a periodontal status using CPITN (community periodontal index of treatment needs), (WHO, 1997). Control tests of teeth took place after 6, 12, 18 and 24 months after sealing. The following grading scale was provided: 0- an absence of sealant, 1- overall a presence of sealant, D - the presence of decay. Research results were recorded on a specially prepared clinical form. X-rays pictures were not performed. The research was approved by the Bioethical Committee of Poznan University of Medical Sciences (resolution 253/08 of 06.03.2008). In order to verify the hypothesis of the existence or absence of differences between the obtained results, a statistical analysis using the chi^2 test and Mann-Whitney test (* $p < 0.05$, ** $p < 0.001$) was carried out. Statistical analysis was performed using the program Graphpad InStat 1.ISD Dataset.

2.2.6.3 Results

The average number of teeth in the oral cavity was 26.25 ± 4.51 . Data on the prevalence of dental caries is contained in Table 5. Preliminary tests showed a high value DMFT (8.96) and high (52 %) percentage of quadrants with bleeding and the presence of tartar (22 %) (Figure 1). In the final test, carried out after a period of 2 years, no caries were found in any

of the sealed teeth, but changes in retention of the sealants occurred. After two years the maintenance of the sealing material was 91% in the case of Fuji VII and 83% in teeth sealed by Helioseal F (Figure2). The first loss of sealant was 0.5 years after the start of the project, and it concerned the material Helioseal F from premolar teeth. There was decreased gingival bleeding (43 %) and almost unchanged presence of calculus (21 %). An analysis of the individual components of the DMFT index showed that the greatest impact on its value were the number of teeth removed because of decay (M), which was 4.18. Additionally, the determined value of the average number of filled teeth (F) because of caries was high (3.71). This was reflected in the relatively high rate of the dental treatment index (DT) (0.78) and the low frequency of caries (42.85 %). An analysis of the individual components of the final DMFT study showed that the greatest impact on that value were the number of teeth treated and filled due to caries (4.89), with a total lack of tooth decay. The total number of the DMFT index increased, but this was statistically insignificant compared to the number in the preliminary examination.

2.2.6.4 Discussion

Based on the evaluation of decay indicators, it can be assumed that the oral health of intellectually disabled residents of the Care Home in Poznan is better when compared to the data published by other Polish authors. This is mainly in terms of a lower frequency of caries (42.85 %). Previously published Polish and foreign studies, which assessed the dental health of people with intellectual disabilities considerably varied. The data about caries frequency ranged from 37.93 % (Greece) (Mitsea et al 2001) to 100 % (Poland) (Borysewicz-Lewicka et al. 1996; Orlik & Mielnik-Blaszczak, 1997; Struzak-Wysokinska & Wysokinska-Miszczuk, 1984). A frequency of caries of slightly less than 100 % was achieved in our country in 1996 (Orlik & Mielnik-Blaszczak, 1997), from 92 to 94 %, in 1986, (Baranska-Gachowska et al. 1986) and in the period 1973-1974, - 94.9% (Struzak-Wysokinska et al. 1984). The differences in lower frequency, as compared to our study, can be explained by a more homogeneous group of patients which we examined. All members of our study lived in one place, which caused there to be the same level of oral care and hygiene. Additionally, the subjects received the same, regular diet, which consisted of 5 meals. In studies conducted in Ireland , Britain and Greece they obtained a significantly lower mean number of DMFT among people with disabilities, ranging from 3.2 to 5.6 (Evans, 1991; Holland & O'Mullane, 1986; Shaw et al. 1986; Liu et al. 2010). The results of the epidemiological studies, conducted in our country on the general public, indicate better trends in the incidence of caries. That trend is shown in the national study of Janczuk in 1996 (Janczuk, 1996) and Wierzbicka and coauthors in 2002 (Wierzbicka et al. 2002). Unfortunately, these authors examined mostly patients from a bigger agglomeration, which could also bias their findings. However, over the past 30 years, caries among children with intellectual disabilities in Poland has not changed, it still being on high level, which results in them still representing a high risk group for development of the oral diseases.

Our findings showed that inflammation of the gingivae was represented among 52 % of the respondents, while the presence of calculus had a 22 % representation among all respondents. That was a clear indication to improve oral hygiene. Despite the fact that after 2 years of dental care we were not able to completely eliminate symptoms of gingivitis, our

program made improvements in this area by decrease these symptoms about 10%. By comparison, sports athletes with intellectual disabilities examined during the Special Olympics Games in our country after year 2000 (Gerreth et al 2007) had gingivitis in 57.4% of cases, and the calculus was present among them in 38.2% of cases. Similar results were obtained in studies conducted during the Special Olympics Games in 1997 in United States by Feldman and coauthors (Feldman et al. 1997). There the incidence of gingivitis was 53%. One explanation for the frequent gingivitis among that group of people relates to the importance of assistance from caregivers in daily brushing teeth (Sindoor & Desai, 1997). In our findings, a reduction in the percentage of people with bleeding gums is at least partially caused by regular check-up every 0.5 years. One can also add to this the removal of gum deposits in the dentist's office during the project was performed during regular check-up every 0.5 years.

The uniqueness of the caries risk group was that it consisted of people with intellectual disabilities. Among these people there are difficulties in maintaining oral hygiene. That is why the physical and chemical properties of the dental materials used in prevention are particularly important (Simonsen, 1991). Results of a 2- year follow-up study of sealed teeth showed that the glass-ionomer cement Fuji VII maintained itself in 91% of cases. From the literature it is known that glass-ionomer cement mechanically protects occlusal surfaces against bacterial plaque adhesion and has a mechanism of release and accumulation of fluoride, which lowers the risk of caries (Rothwell et al. 1996; Smales et al. 1997). The action of fluoride in glass-ionomer cements was confirmed in vitro, especially in lower pH conditions. In the studies of Nicholson and Czarnecka (Nicholson & Czarnecka 2008) the decrease in pH increased the release of fluoride ions from conventional glass-ionomer cements. However, data obtained in vitro can not be directly applied to the conditions in vivo. In the mouth we constantly observe changes in the value of pH and the fluoride supply from outside, among whose causes are brushing with fluoride toothpastes or receiving fluoride from other resources. These will significantly effect the release of free fluoride ions from glass-ionomer cements . These mechanisms can explain presence of caries free teeth, which were sealed at the beginning of our survey. The second sealant used, which was the resin composite Helioseal F with the addition of fluorosilicic glass, also releases fluoride, but more slowly and in smaller quantities. Around this material there was also no evidence of decay, but maintenance on the occlusal surfaces was set at 83%.

According to available literature, maintaining 90% of the total retention of sealant in the first two years should be regarded as a highly positive result . The total retention can be reduced to about 30 % after 15 years (Simonsen, 1991). After such a long time, the proportion of teeth with caries remained low and was 30 % , which suggests that despite the loss, a part of the sealing material remains in the deeper part of the tooth fissures. Adjacent enamel can also be enriched by fluoride from the sealing material. Vrbic et al found that 2 years after sealant loss only each seventh sealed tooth had caries (Vrbic, 1983). In our studies the first loss of sealant was found after 0.5 year from the beginning of the project and concerned the material Helioseal F in premolar teeth. Additionally, a higher reduction in the prevalence of caries in first permanent molars, as compared to premolar teeth, was observed. This dependence may be explained by certain differences in the length of retention between molars and premolars, which is longer in molars.

Time of examination	Caries prevalence	DMFT	D	M	F
Baseline	42.9%	8.96	1.07	4.18	3.71
After 2 years	0	9.1	0**	4.21	4.89*

Table 5. Tooth decay frequency, DMFT index, mean number of caries teeth (D), missing teeth (M), filled teeth (F) in experimental group. Chi² test and Mann-Whitney test (* $p < 0.05$, ** $p < 0.001$).

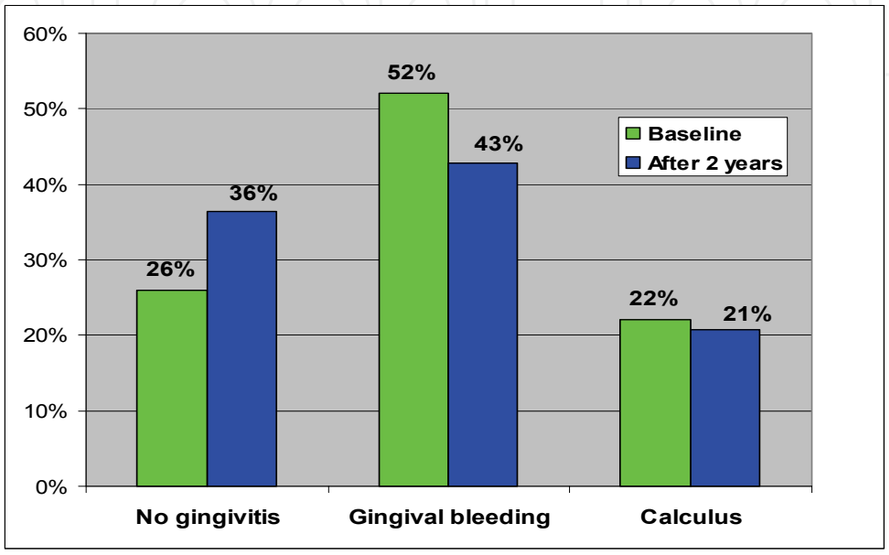

Fig. 2. Gingival health and calculus prevalence in examined group (%).

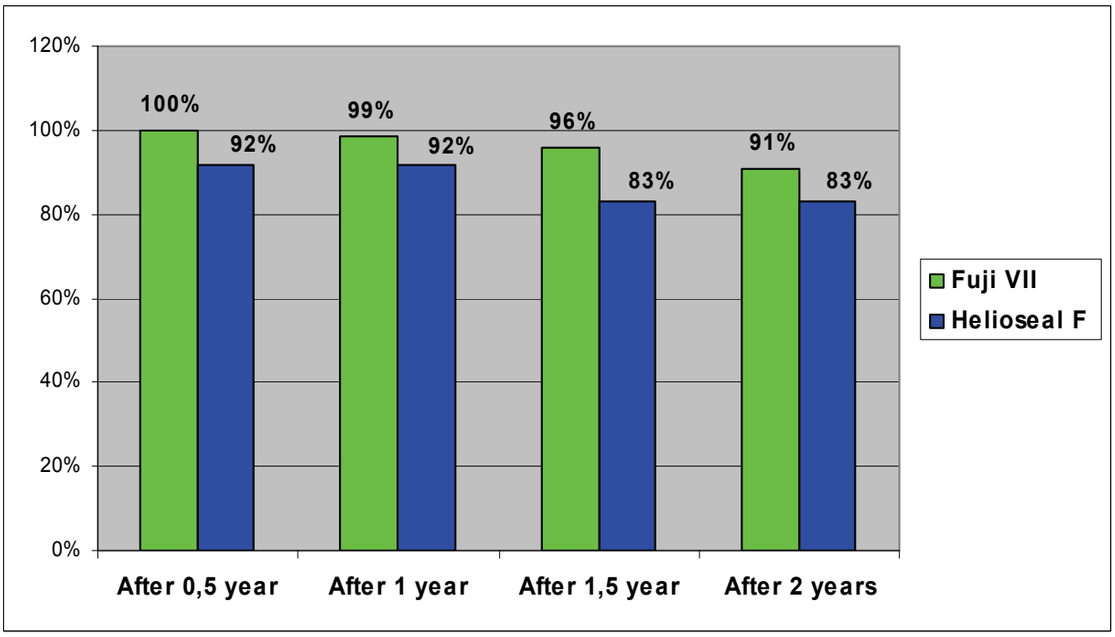

Fig. 3. Results of dental sealants retention in examined group (%).

2.2.7 Atraumatic restorative treatment technique (ART)

Operative methods for cavity preparation have a number of disadvantages. Rotary instruments with increased speed have allowed more rapid cavity preparation, but the heat and vibration during cutting may cause pain, trauma and apprehension to patient (Beeley, et al. 2000). The use of noninvasive methods of treatment in conservative dentistry for patients with disabilities should be obligatory. The World Health Organization has introduced a method of caries removal called the atraumatic restorative treatment (ART) technique. The original technique involves removal of carious dentine and enamel using only hand instruments, such as sharp excavators and hatchets, and restoring the cavity with glass-ionomer cement. In a modified ART technique dentists can use a drill handpieces to open a cavity, but carious dentine is removed already by hand instruments.

An advantage of glass-ionomers is that they are naturally adhesive to dentine and enamel. Recent improvements in this material have led it to have sufficient strength to resist biting forces in cavities in both deciduous and permanent teeth (Czarnecka, et al. 2007; Frencken, 1994, 1998). The ART approach requires neither electricity nor pipe water, and therefore it can be applied in almost any conditions. It can also be used in homes and hospitals. Since a patient has to have proper head support, regular chairs or armchairs cannot be used during such treatment. Atraumatic is equal to painless. This technique doesn't require local anesthesia and guarantees that the dentist will have better control over the dental procedure when removing cariously involved dentin, which is to say that there is less risk of pulp exposure. This technique doesn't cause vibrations or noise and a patient will not be afraid of the procedure. Colored hand instruments are helpful in communicating with the patient.

Another ART technique modification includes a use of chemical solutions or gels to help in the mechanical removal of carious dentine. One of them is known as a Carisolv ™ which consists of 2 syringes to mix into active gel when required. The first syringe contains sodium hypochloride (0.5%) and the second a mixture of glutamic acid, lysine, leucine, carboxymethylcellulose, sodium chloride, sodium hydroxide and dye erythrosine (E127B), (Ricketts & Pitts, 2009). Solution II is adjusted to pH 11 by adding sodium hydroxide. After mixing two solutions the pH of Carisolv is 12. The active Carisolv™ causes proteolytic degradation of collagen in the outer part of carious dentine and does not cause demineralization of the sound dentine. Isotonic, alkaline gel removes a smear layer which can help in bonding of dental materials. For the removal of dental caries from cavity the same hand instruments (excavators) are recommended as for ART technique. During the procedure there is no heat and vibrations, a local anaesthetic is not required. The main disadvantage of the chemomechanical caries removal system is the longer time required for treatment compared with drilling. The active solution needs from 5 to 15 minutes to finish the dental procedure. There have been reports on a cytotoxic reduction effect on cell growth and reactions of pulp tissue to Carisolv in vitro (Dammaschke et al. 2001; Sepet et al. 2003).

2.2.8 The hall technique

The Hall technique is a novel method of application preformed metal crown on carious primary molar teeth using no local anaesthesia, no caries removal and no tooth preparation.

Preformed crowns should tightly cover carious lesions beneath a gingival margin. Outcomes of the controlled trial after approximately 2 years showed that pulp infection and caries were arrested and the restoration retention was satisfied in primary molar teeth (Innes et al. 2006, Longbottom et al. 2009). The Hall technique may be recommended as the secondary and tertiary prevention for primary molar teeth in high caries risk groups.

2.2.9 Novel preventive methods

A novel preventive options can be used for person with disabilities include measures to help remineralize or increase enamel resistance to demineralization. 3 of them are based on calcium and phosphate ions (Enamelon ™, Novamin ™, Recaldent™) which could promote remineralisation of enamel (Ricketss & Pitts, 2009). Another mixture contains hydroxy apatite and a high dose of fluorides (Remin Pro ™). The first system forms amorphous calcium phosphate or calcium fluoride phosphates (Enamelon ™), the second (Novamin ™) is a calcium sodium phosphosilicate glass and the third (Recaldent™) contains besides amorphous calcium – phosphate complex a casein phosphopeptide (CPP-ACP™). All manufactures describe that the use of the novel mixing enhances an additional protection for teeth, which facilitates the neutralisation of the acid-bacteria in plaque. In laboratory studies have demonstrated to have topical anticariogenic effect because of its ability to stabilize calcium and phosphate in an amorphous state, preventing the growth of calcium phosphate to the size required for precipitation. Other research has reported a root caries reduction, caries inhibition around orthodontic brackets and successful hypersensitivity treatment (Reynolds 1997; Reynolds & Johnson, 1981; Rose, 2000; Uysal et al. 2010). Problem of the calcium-phosphate ion systems is a low solubility in the presence of fluoride ions and a need of regular application on teeth. However, efficiency of regular application of calcium and phosphate solutions are promising, therefore high caries group of patients could use it as additional prevention of demineralization.

The next type of novel prevention is the idea of using ozone to disinfect tooth surfaces. Ozone is a strong oxidizing agent, which in dentistry can be used to reduce cariogenic bacteria. It can also be used for root caries, before sealing teeth and applying a restoration. Many laboratory studies have shown the antimicrobial effects of the ozone. Clinically, ozone is applied one time before filling teeth, to remove cariogenic micro-organisms. Questions that still need to be answered are what are the long-term antimicrobial consequences of ozone and what is its influence on adhesion to enamel and dentine (Azarpazhooh & Limeback, 2008, Bojar et al. 2009; Nagayoshi et al. 2004; Ricketts & Pitts, 2009).

Probiotics consumed in milk or baby formula can be another novel option in preventive dentistry. They can help to modify the cariogenic bacteria in biofilm, such as streptococci mutans and yeast (Ricketts & Pitts, 2009).

The results of described novel preventive options are promising but further randomized long-term controlled trials are required. We need a systematic review in the clinical trials.

3. Conclusions

Appropriately used prevention methods, monitoring oral health, and the use of noninvasive methods of treatment in conservative dentistry, such as sealing the occlusal surfaces of

premolars and molars, the atraumatic restorative treatment (ART) technique, Hall technique should be the basis for dental care for persons with disabilities. Fluoride prevention methods are needed to be provided throughout life for optimal caries control.

The reported study used a 2-year preventive program which included supervised tooth brushing two times a day, fissure sealing teeth proved to be effective in preventing tooth decay among people with intellectual disabilities. Sealing materials based on glass-ionomer cement showed longer retention time on the occlusal surfaces of permanent molars. It can be assumed that the applied preventive program demonstrated the effectiveness of sealing the posterior teeth of people belonging to the risk groups, regardless of age.

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