

## TREATMENT OF DENTAL FLUOROSIS

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### SUMMARY

Dental fluorosis is the result of chronic endogenic intake of fluorides in amounts exceeding the optimal daily dose of 1 ppm

In our country different mineral waters with high content of fluorine are on the market. As a result in numerous regions and settlements the cases of fluorosis with different degrees of seriousness have become more frequent in recent years.

The aim of this study is to test the application of hydrochloric acid-pumice abrasion for the removal of fluorosis stains and remineralisation of the enamel.

At the Department of Children's dental medicine to the Medical university - Sofia 18 children aged 4 - 15 were treated for different degrees of fluorosis. The method of microabrasion was applied employing the ready-made product „Opalustre”, and the remineralisation - employing Tooth Mouse. In the case of all children individual prophylactic programs were implemented, including motivation and training in oral hygiene, a food regimen and rules of carbohydrate intake, avoiding fluorine water, control of the local fluorine toothpastes used, etc.

The treatment with microabrasion conducted and the subsequent remineralisation give very good results. These results include a recovery of the aesthetics of the teeth, remineralisation of the enamel, full disappearance of the enamel erosions and a diminution of the dentine erosions.

Dental fluorosis is the result of chronic endogenic intake of fluorides in amounts exceeding the optimal daily dose of 1 ppm (8, 13). Depending on the quantity of the intake different degrees of changes in the enamel are observed. These changes can be slight, namely involving the emergence of white lines or stains on the enamel, the lines in question being vertical or horizontal. The medium degree of changes involves yellow to brown stains, the hard degree of changes involving an overall affection of the enamel with chalk-white stains, as well as with numerous dark-coloured stains and enamel losses (8, 11, 12, 13). The microscopic changes come down to a disturbed mineralisation of the enamel, the process involving different degrees of increased porosity of the subsurface layers (6, 13).

Dental fluorosis is observed in regions with excessive

occurrence of fluorine in the drinking water or is the result of overdoses of fluorine within an endogenic fluorine prophylaxis. In children the reason can even be the daily intake of the fluorine tooth paste. In our country different mineral waters with high content of fluorine are on the market. For instance the Devin water has 4 milligrams of fluorine per litre, the Hissar water has 4.8 milligrams of fluorine per litre, etc. The absence of public programs for prophylaxis of the dental caries brings about a chaotic intake of fluorine of different origin, with no control on the part of competent and knowledgeable personnel. As a result in numerous regions and settlements the cases of fluorosis with different degrees of seriousness have become more frequent in recent years. Part of these cases bring only about a cosmetic defect, while others represent a serious medical problem requiring medical treatment.

It was in the 80-ties that the successful removal of the stains on the enamel surface caused by fluorine started as a medical procedure. In the beginning an 18% solution of hydrochloric acid was used for treatment of the surface of the enamel (10). Later Croll and Cavanaugh introduced a modified procedure called „change of the enamel colour through controlled abrasion by means of hydrochloric acid and pumice” (1, 2, 3, 4). After that different schemes of treatment through different concentration of hydrochloric acid and different durations of the procedure were implemented, the term for the technique applied remaining „microabrasion” (5, 6, 9, 13, 14).

It is the aim of this study to test the application of hydrochloric acid-pumice abrasion for the removal of fluorosis stains and remineralisation of the enamel.

### MATERIAL AND METHODS

At the Department of Children's dental medicine to the Medical university - Sofia 18 children aged 4 - 15 were treated for different degrees of fluorosis. Through the anamnesis of all children's condition an excessive and of many years intake of fluorine was ascertained. Most cases had to do with the consumption of mineral water “Devin” as drinking water in the family. Part of the mothers had consumed this mineral water during their pregnancy. In other cases “Devin” was given to the child immediately after birth. One of the cases with very serious fluorosis the

condition was caused by the intake of “Hissar” mineral water. In the case of two children the mothers had undergone a multiple fluorine prophylactic program involving the combined endogenic and local application of fluorine. The participants in the program had not been informed that consumption of water with high content of fluorine should be avoided. Yet another 6 children from different towns in the country had participated in prophylactic anti-caries programs and had simultaneously drunk “Devin” mineral water.

The method of microabrasion was applied employing the ready-made product „Opalustre”, and the remineralisation - employing Tooth Mouse.

The scheme of application of the method involved three procedures within a period of one month. The teeth were cleaned professionally and were isolated by means of Kofedram. Under the Kofedram, the teeth and gingivae were oiled with Vaseline. The cervixes of the teeth were pasted with a mixture of baking soda and water. The treatment of the enamel surface was conducted by for 5 seconds employing Opalustre and a rubber from a prophylactic set. The procedure was repeated until a reduction of the pigmentation of achieved, but not more than 5X5 seconds for a dental surface per visit. After that the dental surfaces were washed abundantly with water later drained off by means of saliva-sucking instrument, dried up and covered amply with Tooth Mouse paste. The child was left in that position for five minutes and then asked not to consume anything for 2-3 hours. The daily use of the Tooth Mouse paste at home was prescribed for brushing the teeth after dinner for the periods between the separate visits to the dentist. Once an improvement of the colour of the teeth has been achieved the domestic use of the paste was preserved for a period of one year.

For control of the degree of mineralisation of the enamel affected measurement by means of Kavo’s DIAGNodent pen was employed. All surfaces affected were examined and recorded in the child’s card. At each next visit of the child the degree of mineralisation of the enamel was checked up.

In the case of all children individual prophylactic programs were implemented, including motivation and training in oral hygiene, a food regimen and rules of carbohydrate intake, avoiding fluorine water, control of the local fluorine toothpastes used, etc.

## RESULTS AND DISCUSSION

The original values arrived at by means of examining the affected dental surfaces employing the method of laser fluoescence varied pretty much in accordance with the degree of fluorosis. In the case of slight whitening of the enamel involving the occurrence of separate stains and lines and snow-whitening of the cutting edges of the teething

permanent teeth, the values varied between 3 and 6. These are values corresponding to a minimum disturbance of the mineralisation of the enamel. In the more serious cases the values reach a value of up to 10, and when brown stains were observed – values of up to 15 - 20. When an overall whitening of the enamel resembling the colour of chalk was observed the values were between 10 and 20, which corresponded to a condition when a major part of the enamel has been affected.

**Fig. 1.** Fluorosis stains on the enamel surface of a 9-year old child.



On the enamel surface white perikimatic lines were observed. In some places the whitening formed vertical zones with a value - 7. Over the cutting edge of the right central incisor enamel erosion can be observed with a value of 19.

Immediately after the application of the first procedure a shrinking of the white stains and noticeable whitening of the brown and black stains was observed. The best results were obtained in the case of dark-coloured stains, and especially if the treatment had started soon – up to a year - after the teeth had started to teethe. In the case of the white stains, especially if the treatment had started as late as 5-6 years after the teeth had started to teethe, the improvement was not that noticeable.

A month after the first treatment of the dental surfaces, the Tooth Mouse paste being daily used, the improvement was even more evident, including to the parents and children. Examination by means of DIAGNodent showed a reduction of the value measured. In the case of the white stains the values are around 1-2. The dark stains, which now look yellowish, have values around 6-7. The entirely affected chalk enamel too reacted to values between 8 - 15. A remineralisation of the enamel lesions with affected surface layer is observed. These

lesions have shrunk in size and have become shallower in depth and react with lower values than originally. With each next procedure the visible results become more evident. The enamel loses its chalk tinge and begins to recover its slightly yellowish colour. The enamel erosions become shallower and their edges lose their chalk colour. After the second procedure the effect improves and the improvement becomes bigger in the next month. After the third month the milder forms of fluorosis reach a condition of visibly normal enamel with good mineralisation and restored values of laser fluorescence of 0 or 1. There were three cases in which certain whitening remained in the zones of the approximal surfaces of the upper central incisors.

The improvement is most noticeable in the case of the lower incisors, and then – in the case of the upper incisors. Particularly good are the results in the case of multiple point-like enamel erosions, which were left with the above treatment, the recovery by means of composite being planned after the third month. Decrease of the size, improvement of the mineralisation and creation of good conditions for the retention of the composite onto the enamel edges of the lesions was expected. In most cases with purely enamel lesions a disappearance of the lesions and a remineralisation of the enamel surface was observed with values between 0 and 1.

**Fig. 2.** A disappearance of the enamel erosion and a recovery of the values to 2 after the remineralisation



**Fig. 3.** The enamel surface after 18 months



Particularly valuable was this effect in the case of the first permanent molars, often with multiple erosions, which cannot be efficiently obturated. After the third month none of the molars was in a condition requiring operative treatment. The enamel erosions on the upper incisors disappeared too and no operative treatment was necessary either.

A sharp decrease in the size and depth of the dentine lesions was observed. The degree of mineralisation of the dentine had improved too. Operative treatment proved necessary only in the cases of massive dentine lesions, which had shrunk in size, nevertheless, and had fully remineralised surrounding enamel.

The treatment with microabrasion conducted and the subsequent remineralisation give very good results. These results include a recovery of the aesthetics of the teeth, remineralisation of the enamel, full disappearance of the enamel erosions and a diminution of the dentine erosions. The results from the treatment are corroborated by means of laser fluorescence that confirms the fact of remineralisation of the enamel. Moreover, the results are highly appreciated by the parents and improve the children's self-confidence. This kind of treatment is the only appropriate one since it aims at the maximum preservation of the dental structures and avoids the damages that are inflicted during the operative recovery of the dental surfaces affected with fluorosis. According to data from the relevant literature, by means of microabrasion an enamel layer

between 100 and 200µm is removed. The active remineralisation using amorphous calcium phosphate and casein phosphopeptids ensures the resistance of the enamel layer only to a minimum degree reduced by microabrasion. The method is not time-consuming and provides a solution for the complex situation created by dental fluorosis.

## CONCLUSION

The method of acidic microabrasion, followed by remineralisation procedures, assures a considerable recovery of the dental surfaces affected by fluorosis.

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