

Mogućnost primene rastvora izbeljivača kao sredstva za ispiranje kanala korena

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The possibility to use home bleach solutions for root canal irrigation

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**INFORMATIVNI RAD (IR)
INFORMATIVE ARTICLE****KRATAK SADRŽAJ**

Natrijum hipohlorit je danas zbog svojih osobina, irigans izbora u endodontskoj terapiji. U stomatološkoj praksi u ove svrhe najčešće se koriste gotovi fabrički preparati ovog rastvora različitih koncentracija. Cilj ovog rada je bio da se ispituju neki rastvori kućnih belila za rublje kao moguća sredstva za ispiranje kanala korena zuba. Kao materijal u istraživanju korišćeni su rastvori za kućno beljenje rublja SNEŽNIK (Panonija AD Pancevo) i BARIKIN (Briksol Hemijska Industrija Vršac). Metodom atomske apsorpcione spektrofotometrije (AAS) je proveravano prisustvo i koncentracija teških metala u ovim rastvorima. Dobijeni rezultati su pokazali da je koncentracija teških metala u testiranim rastvorima Snežnik i Barekin ispod maksimalne dozvoljene koncentracije (MDK) koje važe za pijaće vode. Testirani rastvori se mogu preporučiti za pravljenje rastvora za ispiranje kanala korena zuba nakon obavezne provere koncentracije teških metala u njima.

Ključne reči: belila za rublje, natrijum hipohlorit, teški metali.**SUMMARY**

Nowadays, sodium hypochlorite is the irrigant of choice in endodontic therapy because of its characteristics. In the dental practice, the most often used are commercial solutions of different concentrations. The aim of this study was to investigate the possibility of using some home bleach solutions as possible agents for root canal irrigation. Snežnik (Panonija AD Pancevo) and Brekin (Briksol Chemical Industry Vrsac) were used as the materials in this study. The presence and concentration of hard metals were detected using atomic absorption spectrophotometry (AAS).

The results have shown that the concentration of hard metals in the tested solutions, Snežnik and Brekin, was below maximum allowed concentrations for tap water. Tested solutions could be recommended for root canal irrigation but only after hard metal concentration is checked.

Keywords: bleaching agent, Na-hypochlorite, hard metals

Mehanička obrada kanala instrumentima tokom endodontske terapije ne može potpuno očistiti kanal i ukloniti ostatke pulpnog tkiva i razmazni sloj sa zidova kanala korena, pa je u cilju njihovog uklanjanja neophodno ispiranje ili irigacija kanala različitim rastvorima.¹

Savremena istraživanja pokazuju da je gotovo 30% prostora kanalnog sistema nedostupno kanalnim instrumentima tokom obrade, te je značaj irigacija u savremenoj endodontici od velikog značaja.²

Mechanical treatment of the root canal using the instruments during endodontic therapy cannot clean the canal completely and remove the remnants of the pulp tissue and smear layer. In order to remove that, it is essential to rinse and irrigate root canals with various solutions.¹ Modern research has shown that almost 30% of the root canal space is inaccessible to canal instruments during the treatment, so that the importance of irrigation in modern endodontology is significant.²

Kao medikament izbora u stomatološkoj praksi preporučuju se različite koncentracije rastvora natrijum hipohlorita.^{1,5,7-13}

Ovaj rastvor je bistra tečnost sa jakim mirisom i baznog je karaktera. Hidrolizom preko hipohloraste i hlorovodonične kiseline oslobađa se hlor.⁷ Hlor prolazi kroz membranu ćelija i oksidišući sulfohidrilne grupe enzima, prekida metabolizam, taloži belančevine i dovodi do smrti bakterijske ćelije. Na sličan način deluje i na kolagen dentinskog zida, na razmazni sloj, kao i na ostatke pulpe, koje razlaže, pa ih je lako ukloniti iz kanala korena.^{12,13}

U endodontskoj terapiji koriste se rastvori Natrijum hipohlorita u koncentracijama od 0,5 – 5,25 %. Niže koncentracije rastvora (0,5 i 1%) imaju blag ne iritirajući efekat, ali je klinički efekat obilne irigacije, uglavnom zadovoljavajući.¹⁰

Visoke koncentracije rastvora imaju značajno veći efekat rastvaranja, ali i izraženiji toksični i nadražajni efekat.⁹

Zbog neprijatnog ukusa i mirisa i često nadražajnog dejstva na sluzokožu usne duplje, sve koncentracije NaOCl iznad 2% zahtevaju obaveznu primenu koferdam gume.

U stručnoj stomatološkoj praksi postoji nedoumica, da li se osim gotovih i fabričkih rastvora hipohlorita, pripremljenih samo za irigaciju kanala, mogu koristiti i neki rastvori izbeljivača rublja (kućna belila), koji se inače u svetu koriste kao osnov rastvora za ispiranje kanala korena.⁸ Problem je još veći što postoje brojni fabrički rastvori, sa različitim stepenom nečistoća, koje mogu štetiti njihovoj osnovnoj nameni.

Cilj ovog rada je bio da se metodom atomske apsorpcione spektrofotometrije ispita prisustvo štetnih materija, pre svega teških metala u dva rastvora natrijum hipohlorita koji se koriste za izbeljivanje rublja (kućnih belila).

Materijal i metod

Istraživanje je sprovedeno na uzorcima fabričkih litarskih rastvora natrijum hipohlorita za izbeljivanje – kućna belila SNEŽNIK, proizvod Panonija AD Pancevo i BARIKIN (Briksol Hemijska Industrija Vršac). Izvršeno je ispitivanje pH vrednosti kao i sadržaja teških metala.

Istraživanja su obavljena u Laboratoriji za zaštitu radne i životne sredine, A.D. Zaštita na radu i zaštita životne sredine u Beogradu, metodom atomske apsorpcione spektrofotometrije (AAS).

Ispitivani uzorci su usisani u vazduh-acetilenski plamen i atomizovani. Svetlosni izvor iz AAS emituje linijski spektar svetlosti koji prolazi kroz plamen u monohromator i dalje u detektor, merići pri tome količinu svetlosti koju je je absorbovao atomizirani element u plamenu.

Specifičnost svakog prisutnog metala u rastvoru je njegova apsorpciona talasna dužina. Količina energije karakteristične talasne dužine apsorbovana u plamenu,

As a solution of choice in the dental practice, diverse concentrations of sodium hypochlorite are recommended.^{1,5,7-13}

This solution is a transparent liquid base with a strong odour. Chlorine is released through hydrolysis via hypochlorite and hydrochloric acid.⁷ Chlorine runs through the cell membranes of enzymes and stops the metabolism, deposits proteins and kills bacterial cells by oxidizing sulphohydryl groups. It has the similar effect on the collagen of dentinal walls, smear layer, as well as pulp remnants, inducing their decomposition, so they are easily removed from the root canal.^{12,13}

In endodontic therapy, sodium-hypochlorite in concentrations of 0.5%-5.25% is used. Lower concentrations of the solution (0.5 and 1%) have a mild non-irritating effect, but the clinical effect of abundant irrigation is mostly satisfactory.¹⁰ High concentrations of the solution have a significantly greater effect on dissolving, but also a distinct toxic or irritating effect.⁹ All the concentrations of NaOCl above 2% demand an obligatory use of the rubber dam because of an unpleasant smell and taste and frequent irritating effect on the mucous membrane of the oral cavity. In the professional dental practice, there is a dilemma whether to use a commercial solution of sodium hypochlorite, or some other solutions of home bleach agents. Anyhow, these bleaching agents are used at large as the basis of the solution for irrigation of the root canal.⁸ The problem is getting bigger since there are numerous commercial solutions with a various degree of impurity, which could impair their basic function.

The aim of this study was to investigate the presence of harmful substances using atomic absorption spectrophotometry, primarily the presence of hard metals in two commercial solutions of sodium-hypochlorite which are used for home bleaching.

Materials and methods

The research was carried out on 1 l samples of commercial solutions of sodium-hypochlorite - Sneznik (Panonija AD Pancevo) and Barikin (Briksol Chemical Industry Vrsac). The determination of pH values and hard metal concentration was conducted. The research was done in the Laboratory for the protection of working and living environment, A.D. in Belgrade, using atomic absorption spectrophotometry (AAS). The investigated samples were vacuumed in the air-acetylene flame and atomized. The light source from AAS emitted the linear range of light which passed through the flame into a monochromator and afterwards into a detector, measuring the quantity of light which the atomized element in the flame had absorbed. The specific feature of each metal present in the solution is its absorbing wavelength. The amount of energy of the characteristic wavelength absorbed in the flame

proporcionalna je koncentraciji prisutnog elemenata u ispitivanom uzorku rastvora.

is proportional to the concentration of the element present in the sample.

Rezultati

Rezultati istraživanja su prikazani u Tabelama 1 i 2.

Dobijene Ph vrednosti rastvora pokazuju neznatno veću alkalnost kod rastvora Snežnik (11,55) u odnosu na rastvor Barikin (11,51).

Koncentracije gvožđa (<0,06), bakra (<0,03), hroma (<0,06), nikla (<0,10), kadmijuma (<0,02) i olova (0,10) mg/l, u oba ispitivana rastvora su identična. Koncentracija cinka je nešto veća kod Snežnika (0,06mg/l) nego kod rastvora Barikina (0,05 mg/l).

Poredeći ove vrednosti sa vrednostima MDK za flaširanu vodu za piće (Privredni pregled "Voda za piće" iz 1990.god., standard za ispitivanje higijenske ispravnosti), uočene su samo neznatne razlike.

Tabela 1. pH i koncentracija teških metala u dva rastvora NaOCl

Table 1. pH and hard metal concentration in the two NaOCl solutions

UZORAK	"SNEŽNIK"	"BARIKIN"
ph vrednost	11.5	11.51
Gvoždje (mg/l)	<0.06	<0.06
Bakar (mg/l)	<0.03	<0.03
Hrom (Cr) (mg/l)	<0.06	<0.06
Nikl (mg/l)	<0.10	<0.10
Kadmijum (mg/l)	<0.02	<0.02
Cink (mg/l)	0.06	0.05
Olovo (mg/l)	<0.10	<0.10

Diskusija

Ispitivanje koncentracije teških metala u rastvorima je neophodna i vrlo značajna mera u ispitivanju higijenske ispravnosti određenog rastvora.

Metoda atomske apsorpcione spektrofotometrije je korišćena u ovim istraživanjima pre svega zbog svoje superiornosti i osetljivosti (preciznosti) u odnosu na druge korišćene metode.

S obzirom da kod nas ne postoje norme, tkz. maksimalne dozvoljene koncentracije (MDK) teških metala za ovakve rastvore, ovi nalazi su upoređivani sa normama nemačkog kodeksa. Ovaj kodeks za lekove, za rastvore

Results

The results of this study are given in Table 1 and Table 2. The pH values showed slightly greater alkalinity in Snežnik (11.55) compared to Barikin (11.51). The concentration of iron (<0.06), copper (<0.03), chromium (<0.06), nickel (<0.10), cadmium (<0.02) and lead (0.10) in both solutions were identical. The concentration of zinc was slightly greater in Snežnik (0.06 mg/l) than in Barikin (0.05mg/l).

Comparing these values with the maximum allowed concentration values for bottled drinking water (Economic Journal "Drinking water" from 1990, the standard for hygienic validity) only insignificant differences were noticed.

Tabela 2. Maksimalne dozvoljene koncentracije teških metala u vodi za piće

Table 2. Maximum allowed concentrations of hard metals in the drinking water

Naziv hemijske supstance	MDK za flaširanu prirodnu vodu (mg/l)
Gvoždje	0,05
Bakar	0,1
Hrom	0,05
Nikl	0,01
Kadmijum	0,005
Cink	0,1
Olovo	0,05

Discussion

The study of hard metal concentrations is a necessary and important measure in investigating the hygienic validity of a certain solution. The method of atomic absorption spectrophotometry was used in this research for its superiority and accuracy in comparison to other methods. Since there are no standards of so-called maximum allowed concentrations of hard metals for these solutions, these findings were compared to the standards of the German code. This medical code prescribes concentrations of maximum 20 ppm for solutions of hypochlorite used for irrigation. ⁶

hipohlorita koji se koriste za irigaciju propisuje koncentraciju od najviše 20 ppm.⁶

Rezultati ovih istraživanja su dobijeni na osnovu uzoraka rastvora izbeljivača koji sadže 4 gr /l aktivnog hlora. Obzirom da se za upotrebu u endodontskoj terapiji najčešće koriste razblaženi rastvori (0,5 i 1%), koncentracije eventualno prisutnih metala su svakako daleko manje.

Zbog nepostojanja standarda za primenu ovih rastvora za izbeljivanje, upoređivane su MDK za sadržaj teških metala u vodi za piće

Upoređivanjem podataka za flaširane vode za piće i sredstava za izbeljivanje rublja Snežnik i Barikin uočeno je da su vrednosti gvozdža, hroma i olova, skoro identične kao i kod vode za piće.

Koncentracija cinka dvostruko je niža u testiranim hipohloritnim rastvorima od standarda koji važe za vode za piće. Takođe, vrednosti bakra, nikla i kadmijuma su nešto više u rastvorima hipohlorita, nego u vodi za piće, ali su ipak ove vrednosti ispod granice MDK.

Obzirom da se za dobijanje 0,5 i 1 % rastvora za ispiranje kanala korena zuba, rastvor izbeljivača razblažuje 4-8 puta, ove vrednosti su značajno niže od onih u vodi za piće. Kada se rezultati uporede sa nemačkim standardima rezultati su ispod vrednosti MDK.⁶

Na osnovu ovih nalaza može se zaključiti da testirana fabrička pakovanja izbeljivača (kućna belila) Snežnik i Barekin ne sadrže teške metale.

Ova sredstva se uz ozbiljan oprez i svakako obaveznu analizu mogu koristiti za ispiranje kanala korena. Naravno, uvek je sigurnije koristiti gotove preparate za irigaciju kanala korena zuba, od onih koji se pripremaju iz različitih fabričkih pakovanja.

The results of this study were obtained on samples of bleach containing 4 g/l of active chlorine. Given that in endodontic therapy diluted solutions are most frequently used (0.5 and 1%), the concentration of possibly present metals is certainly far less. Because there is no standard for using these solutions for bleaching, maximum allowed concentrations were compared to hard metals in drinking water. The data for drinking water and bleaching agents (Snežnik and Barikin) showed that the values of iron, chromium and lead were almost identical.

The concentration of zinc in drinking water was double compared to the hypochlorite solutions. In addition, the value of copper, nickel and cadmium were slightly higher in the hypochlorite solutions than in drinking water, but the values were still below the maximum allowed concentrations.

Since the bleaching solution was diluted 4-8 times in order to prepare 0.5 and 1% hypochlorite solution for root canal irrigation, these values were far less than those in drinking water. Compared to the German standards, the results were below the maximum allowed concentrations.⁶

According to these findings, it could be concluded that the home bleach products Snežnik and Barekin do not contain hard metals. These products, with serious precaution and necessary analysis before the preparation of suitable solutions, could be used for root canal irrigation. Certainly, it is always safer to use commercial products especially designed for root canal irrigation than altered commercial products of other nature.

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