

Periradicular tissue necrosis caused by accidentally injected sodium hypochlorite through *fausse route* in upper maxillary canine

Đorđe Pejanović¹, Milana Čabrillo², Dušan Đurić³, Vladimir Biočanin¹

¹University Business Academy in Novi Sad, Faculty of Stomatology, Department of Oral surgery and Dental Implantology, Serbia;

²University Business Academy in Novi Sad, Faculty of Stomatology, Department of Periodontology, Serbia;

³University of Kragujevac, Faculty of Medical Science, Department of Pharmacology, Kragujevac, Serbia

SUMMARY

Sodium hypochlorite (NaOCl) is a strong antiseptic agent that is usually used as endodontic irrigant for dissolving organic parts of pulp and dentin and neutralizing toxic products. However, the use of sodium hypochlorite may cause destruction of blood vessels, soft tissues and bone necrosis if extruded into the periapical region. Urgent treatment of the NaOCl accident should be oriented on pain relief, infection control and recovery.

This paper shows a case of periradicular tissue necrosis after accidental extrusion on NaOCl through *fausse route* of right maxillary canine, and complete tissue regeneration after surgical debridement and bone augmentation with addition of platelet rich fibrin (PRF) that occurred in a 53-year old patient at the dental clinic of Faculty of Dentistry in Pancevo.

Keywords: sodium hypochlorite toxicity; periradicular extrusion; bone necrosis; tissue regeneration

INTRODUCTION

Root canal treatment is routinely performed using a combination of mechanical and chemical debridement of pulp remnants and bacteria from the root canal system. Sodium hypochlorite (NaOCl) is most commonly used irrigant in endodontics that dissolves organic component of soft tissue in the root canal [1, 2]. It has high pH value (11-12.5) and great antimicrobial effect [3]. It is useful adjunct to mechanical debridement of the canal, especially in curved, accessory or lateral canals [4]. In some rare cases, NaOCl may cause bone and soft tissue necrosis if extruded trough the apex into the periapical tissue or maxillary sinus [5, 6]. *In vitro* study has shown that even low concentrations of NaOCl were lethal to human fibroblasts [3].

NaOCl is very toxic to intraoral tissues where it causes dissolution of organic parts and destruction of blood vessels [7]. For that reason, it is very important to prevent extrusion of NaOCl from root canal into periradicular and surrounding tissues.

Urgent treatment of the NaOCl accident should be oriented on pain relief, infection control and recovery. Analgesics and local anesthetics may help in pain control. Cold compresses may be useful in reducing oedema and discomfort in patients, such as burning sensations. Surgical debridement of necrotic tissue is very important in infection control and tissue regeneration [8].

The aim of this report was to show periradicular tissue necrosis after accidental extrusion of NaOCl throughout *fausse route* of right maxillary canine, and complete tissue

regeneration after surgical debridement and bone augmentation with addition of platelet rich fibrin (PRF).

CASE REPORT

A 53 year-old female patient presented at the dental clinic of the Faculty of Stomatology in Pancevo for endodontic treatment of right maxillary canine. The patient had neither systemic diseases nor allergy, and was classified in ASA I group. She complained of severe, dull, almost constant pain in the region of right maxillary canine. The young dentist who was in the office that day took anamnestic data, did the clinical examination, and analyzed ortopantomogram image of the patient. The tooth #13 was diagnosed with irreversible pulpitis. Vital pulpectomy was performed after injection of local anesthesia (4% articaine with adrenaline 1:100 000). Instrumentation was done with hand and rotary endodontic files. Irrigation of the root canal was achieved by 2% NaOCl. Immediately after irrigation, oedema of the right cheek was evident, and the right nasolabial fold was completely erased (Figure 1). After the local anesthesia ceased, the patient felt strong pain in the right upper vestibule, above the root of the upper canine. Following two days the patient was filling strong pain, resistant to common painkillers and came back to our clinic. Clinical examination revealed necrotic alveolar mucosa, in diameter, in the upper vestibule, above the region of right maxillary canine and first premolar (Figure 2).

Address for correspondence: Vladimir BIOČANIN, University Business Academy in Novi Sad, Faculty of Stomatology, Pančevo, Serbia; vladimirbiocanin@gmail.com



Figure 1. Swelling of the right cheek immediately after irrigation with sodium hypochlorite

Slika 1. Otok desnog obraza neposredno posle irrigacije kanala natrijum-hipohloritom



Figure 2. Soft tissue necrosis

Slika 2. Nekroza mekog tkiva

Under local anesthesia, trapezoidal mucoperiosteal flap was raised, involving necrotic mucosa, and necrotic bone was observed. Tooth #13 was examined carefully and *fausse route* was found in the cervical third of the root. After the tooth #13 extraction, *fausse route* in the cervical third of the root was confirmed extraorally with endodontic file (Figure 3). Surgical debridement of the wound was done using Lucas surgical curette. In order to improve soft and bone tissue healing, we decided to make PRF membranes from patient's blood. PRF was prepared according to the instructions. Briefly, 10 mL of patient's blood (in dry, 10-mL Monovette tubes without anticoagulant or other additional chemical agents) was obtained from venous blood and centrifuged immediately for 10 min at 3,000 rpm in a laboratory centrifuge (TDZ5-WS,



Figure 3. *Fausse route* – extracted right maxillary canine
Slika 3. Perforacija korena na izvađenom gornjem desnom očnjaku

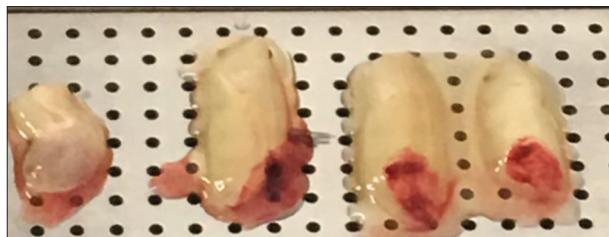


Figure 4. Prepared PRF membranes

Slika 4. Pripremljene PRF membrane



Figure 5. Bone defect filled with cortico-spongious bone granules mixed with PRF

Slika 5. Defekt kosti ispunjen granulama kortikosponziozne kosti pomešane sa PRF

XIANGYI, Hunan, China). The centrifuged product consisted of three layers, with the PRF clot being located in the middle layer. The PRF clot was harvested with forceps and gently pressed into a membrane between two sterile pieces of gauze using soft compression for 10 seconds to maintain the wetness of the membrane (Figure 4). The alveolar bone defect was filled with granulated bone particles (BioOss®, Geistlich, Switzerland) mixed with patient's blood and the particles of PRF (Figure 5). Then, double layer of PRF membranes was placed over the bone graft (Figure 6), and mucoperiosteal flap primarily sutured with silk suture 4-0. Postoperative antibiotics (Amoxicillin®, Hemofarm, Serbia) were prescribed three times a day for 7 days. The wound healed uneventfully. Complete soft tissue healing was observed 15 days after the surgery.



Figure 6. PRF membranes placed over the bone graft
Slika 6. PRF membrane postavljene preko koštanog grafta



Figure 7. Complete wound healing two weeks after surgery
Slika 7. Kompletno zarastanje rane dve nedelje posle hirurške intervencije

DISCUSSION

Sodium hypochlorite is the most important irrigant in everyday endodontic practice. In rare cases, NaOCl may cause tissue necrosis if extruded over the root apex [9]. It was shown, in few case reports, that NaOCl can be accidentally injected instead of local anesthetic and cause gingival and bone necrosis [10, 11]. Although rarely, inadvertent extrusion of NaOCl beyond root apex could cause permanent nerve damage [12]. In our patient, there was no permanent nerve damage. Haton et al. reported a case of accidentally injected NaOCl throughout root perforation of the first upper premolar [8]. Their patient experienced oedema and pain of the right cheek that resolved after palliative treatment with intravenous antibiotics, corticosteroids and painkillers. In our patient, NaOCl was injected through *fausse route* of right upper canine, and caused painful bone and soft tissue necrosis.

Two main symptoms of root perforation (*via falsa*) are intensive bleeding from root canal (periodontal ligament) and intensive pain. Both symptoms were masked in our patient, having in mind that 4 ml of articaine with adrenaline (1:100 000) as a vasoconstrictor was administered. Namely, local anesthetic blocked pain impulses, so the moment of perforation of the root and damage of periodontal

ligament were not painful. Likewise, adrenalin from local anesthetic solution caused vasoconstriction and for that reason bleeding from root canal perforation was not obvious as usually in *fausse route* cases. Beside canine root perforation, the possible explanation for massive periradicular tissue necrosis may be the anatomical variation in bone morphology. In our patient, dehiscence of vestibular alveolar bone was probably present and may be the reason for severe and easy extrusion of NaOCl in connective tissue.

Panfacial oedema is the most frequent sign of extrusion of NaOCl into periapical tissues [13]. Oedema of facial soft tissues could be explained by toxic and hyperosmotic properties of NaOCl. In some cases, NaOCl had dissolved blood vessel walls and produced ecchymosis of facial or even neck region [14]. In our patient only facial oedema without ecchymosis of the skin was present. Strong pain that our patient felt could be explained by tissue ischemia and direct neurotoxic effect of NaOCl. Pain completely disappeared after surgical debridement of necrotic tissues.

Platelet rich fibrin (PRF) is a natural biomaterial, with high concentration of thrombocytes, growth factors and leucocytes [15]. Autologous PRF membranes provide enhanced healing of soft and bone tissue [16]. PRF has been used in dentistry for different procedures, such as: alveolar socket preservation, sinus-lift, periodontal flap surgery, augmentation of bone defects and implant therapy [17]. Growth factors in high concentration in PRF provide fast and stimulative effect to new blood vessels formation and faster regeneration of soft and bone tissue, with direct stimulative effect on bone marrow stem cells and osteogenic differentiation [18]. Our case confirmed excellent soft tissue healing after using PRF membranes. Indirectly, we assumed that bone tissue was also regenerated successfully, but without bone biopsy and histological evaluation, we cannot be completely sure.

CONCLUSION

NaOCl accident is very stressful incident for the dentist. Appropriate and fast diagnosing and treatment are necessary, as well as follow up. To date, there are no national guidelines available on the management of this condition, so precaution should be taken by dental practitioner in order to reduce potential damage caused by extrusion of NaOCl into the periradicular tissues.

REFERENCES

1. Fedorowicz Z, Nasser M, Sequeira-Byron P, de Souza RF, Carter B, Heft M. Irrigants for nonsurgical root canal treatment in mature permanent teeth. Cochrane Database Sys Rev. 2012;9:CD008948. [DOI: 10.1002/14651858.CD008948.pub2] [PMID: 22972129]
2. Mohammadi Z. Sodium hypochlorite in endodontics: an updated review. Int Endod J. 2008;58(6):329–41. [DOI: 10.1111/j.1875-595x.2008.tb00354.x] [PMID: 19145794]
3. Heling I, Rotstein I, Dinur T, Szwee-Levine Y, Steinberg D. Bactericidal and cytotoxic effects of sodium hypochlorite and sodium dichloroisocyanurate solutions in vitro. J Endod. 2001;27(4):278–80. [DOI: 10.1097/00004770-200104000-00009]

4. Siqueira Junior JF, Rocas IN, Favieri A, Lima KC. Chemomechanical reduction of the bacterial population in the root canal after instrumentation and irrigation with 1%, 2.5%, and 5.25% sodium hypochlorite. *J Endod.* 2000;26(6):331–4. [DOI: 10.1097/00004770-200006000-00006] [PMID: 11199749]
5. Faras F, Abo-Alhassan F, Sadeq A, Burezq H. Complication of improper management of sodium hypochlorite accident during root canal treatment. *J Int Soc Prev Community Dent.* 2016;6(5):493–6. [DOI: 10.4103/2231-0762.192939] [PMID: 27891318]
6. Zairi A, Lambrianidis T. Accidental extrusion of sodium hypochlorite into the maxillary sinus. *Quintessence Int.* 2008;39(9):745–8.
7. Zhu WC, Gyamfi J, Niu LN, Schoeffel GJ, Liu S, Santarcangelo F, et al. Anatomy of sodium hypochlorite accidents involving facial ecchymosis – a review. *J Dent.* 2013;41(11):935–48. [PMID: 23994710] [DOI: 10.1016/j.jdent.2013.08.012]
8. Hatton J, Walsh S, Wilson A. Management of the sodium hypochlorite accident: a rare but significant complication of root canal treatment. *BMJ Case Rep.* 2015;2015:bcr2014207480. [DOI: 10.1136/bcr-2014-207480] [PMID: 25809429]
9. Guivarc'h M, Ordioni U, Ahmed HM, Cohen S, Catherine JH, Bukiet F. Sodium Hypochlorite Accident: A Systematic Review. *J Endod.* 2017;43(1):16–24.
10. Gursoy UK, Bostancı V, Kosger HH. Palatal mucosa necrosis because of accidental sodium hypochlorite injection instead of anaesthetic solution. *Int Endod J.* 2006;39(2):157–61.
11. Hermann JW, Heicht RC. Complications in the therapeutic use of sodium hypochlorite. *J Endod.* 1979;5(5):160.
12. Perotti S, Bin P, Cecchi R. Hypochlorite accident during endodontic therapy with nerve damage – A case report. *Acta Biomed.* 2018;89(1):104–8. [DOI: 10.23750/abm.v89i1.6067] [PMID: 29633752]
13. Lam TSK, Wong OF, Tang SYH. A case report of sodium hypochlorite accident. *Hong Kong J Emerg Med.* 2010;17(2):173–6. [DOI: 10.1177/102490791001700212]
14. Gernhardt CR, Eppendorf K, Kozlowski A, Brandt M. Toxicity of concentrated sodium hypochlorite used as an endodontic irrigant. *Int Endod J.* 2004;37(4):272–80. [DOI: 10.1111/j.0143-2885.2004.00804.x]
15. Ravi S, Santhanakrishnan M. Mechanical, chemical, structural analysis and comparative release of PDGF-AA from L-PRF, A-PRF and T-PRF - an in vitro study. *Biomater Res.* 2020;24:16. [DOI: 10.1186/s40824-020-00193-4]
16. Al-Hamed FS, Mahri M, Al-Waeli H, Torres J, Badran Z, Tamimi F. Regenerative Effect of Platelet Concentrates in Oral and Craniofacial Regeneration. *Front Cardiovasc Med.* 2019;6:126. [DOI: 10.3389/fcvm.2019.00126] [PMID: 31552270]
17. Castro AB, Meschi N, Temmerman A, Pinto N, Lambrechts P, Teughels W, et al. Regenerative potential of leucocyte- and platelet-rich fibrin. Part B: sinus floor elevation, alveolar ridge preservation and implant therapy. A systematic review. *J Clin Periodontol.* 2017;44(2):225–34. [DOI: 10.1111/jcpe.12658] [PMID: 27891638]
18. Wang Z, Han L, Sun T, Wang W, Li X, Wu B. Preparation and effect of lyophilized platelet-rich fibrin on the osteogenic potential of bone marrow mesenchymal stem cells in vitro and in vivo. *Helijon.* 2019;5(10):e02739. [DOI: 10.1016/j.heliyon.2019.e02739]

Received: 12.8.2020 • Accepted: 29.10.2020

Apikalna ekstruzija materijala za kanalno punjenje tokom uklanjanja gutaperke i resilona

Đorđe Pejanović¹, Milana Čabrilovć², Dušan Đurić³, Vladimir Biočanin¹

¹Univerzitet „Privredna akademija u Novom Sadu“, Stomatološki fakultet u Pančevu, Klinika za oralnu hirurgiju i dentalnu implantologiju, Srbija;

²Univerzitet „Privredna akademija u Novom Sadu“, Stomatološki fakultet u Pančevu, Klinika za parodontologiju, Srbija;

³Univerzitet u Kragujevcu, Fakultet medicinskih nauka, Odsek farmakologija, Kragujevac, Srbija

KRATAK SADRŽAJ

NaOCl predstavlja jako antisepsično sredstvo koje se najčešće koristi kao endodonstki irrigans zbog svoje sposobnosti rastvaranja organskog dela dentina, razgradnje vitalnog i nekrotičnog tkiva i neutralizacije toksičnih materija. Međutim, upotreba NaOCl može imati i neželjene efekte u vidu oštećenja krvnih sudova, okolnog mekog tkiva i nekroze kosti ukoliko se rastvor ekstrudira u periapeksno tkivo.

Hitani tretmani oštećenja izazvanih dejstvom NaOCl treba da se bazira pre svega na otklanjanju bola, sprečavanju razvoja infekcije i pospešivanju tkivne regeneracije. Na slučaju 53-godišnje pacijentkinje sa klinike Stomatološkog fakulteta u Pančevu prikazano je oštećenje periapeksno tkiva gornjeg desnog očnjaka izazvanog dejstvom akcidentalno ekstrudiranog rastvora NaOCl kroz fos rut pomenutog zuba, kao i primer kompletne tkivne regeneracije primenom koštane augmentacije i trombocitima obogaćenog fibrina (PRF).

Ključne reči: toksičnost natrijum-hipohlorita; ekstrudiranje u periapeks; nekroza kosti; tkivna regeneracija

UVOD

Postupak lečenja kanala korena predstavlja kombinaciju mehaničke instrumentacije i primene hemijskih agenasa u cilju uklanjanja nekrotičnih ostataka pulpe i mikroorganizama iz kanalnog sistema korena [1, 2]. Natrijum-hipohlorit neretko predstavlja irrigans izbora u endodontskoj terapiji zbog visoke pH vrednosti (11–12,5) i zadovoljavajućeg organolitičkog i antimikrobnog dejstva [3]. Upotreba NaOCl prilikom intersumentacije omogućava lakšu evakuaciju debrisa, rastvaranje tkiva i uklanjanje razmaznog sloja, što je naročito značajno kod povijenih korenova odnosno kompleksnijih kanalnih sistema [4]. Međutim, upotreba NaOCl može imati i neželjene efekte u vidu oštećenja okolnog mekog tkiva i nekroze kosti ukoliko se rastvor ekstrudira u periapeksno tkivo [5, 6].

Pojedine *in vitro* studije su dokazale da čak i jako niska koncentracija NaOCl ima toksičan efekat na humane fibroblaste [3].

Imajući u vidu da NaOCl može izazvati ozbiljna oštećenja krvnih sudova i mekih tkiva, od izuzetne je važnosti naglasiti da se samo pažljivim i savesnim rukovanjem može izbeći transportacija rastvora u periapeks [7].

Hitani tretmani oštećenja izazvanih dejstvom NaOCl treba da se bazira pre svega na otklanjanju bola, sprečavanju razvoja infekcije i pospešivanju tkivne regeneracije. Primena analgetika i lokalnog anestetika može biti efikasna u otklanjanju bolnih senzacija, dok korišćenje hladnih obloga može smanjiti otok i neprijatan osećaj pečenja koji se javlja kod pacijenata. S druge strane, adekvatan hirurški debridman nekrotičnog tkiva sprečava nastanak infekcije i omogućava lakšu regeneraciju tkiva [8].

Cilj ovog rada bio je prikaz oštećenja periapeksno tkiva gornjeg desnog očnjaka izazvanog dejstvom akcidentalno ekstrudiranog rastvora NaOCl kroz fos rut pomenutog zuba, kao i prikaz kompletne tkivne regeneracije primenom koštane augmentacije i trombocitima obogaćenog fibrina (PRF).

PRIKAZ BOLESNIKA

Pacijent ženskog pola, starosti 53 godine, javlja se na kliniku Stomatološkog fakulteta u Pančevu radi lečenja gornjeg desnog očnjaka. Pacijentkinja negira bilo kakva sistemska oboljenja, prisutvo alergija i svrstava se u prvu ASA grupu.

Dežurni lekar tog dana izvršio je klinički pregled pacijenta, analizu ortopanskog snimka i na osnovu anamneze zabeležio je prisustvo konstantog, jakog i pulsirajućeg bola u predelu gornjeg desnog očnjaka.

Na osnovu prikupljenih podataka postavljenja je dijagnoza irreverzibilnog pulpitsa na zubu 13.

Posle aplikacije lokalnog anestetika (4% artikaina sa adrenalinom 1:100 000) izvršena je vitalna ekstirpacija puple. Prilikom mehaničke obrade kanala korišćeni su ručni i mašinski endodontski proširivači. Irrigans izbora bio je 2% NaOCl. Ne-posredno posle ispiranja kanala rastvorom NaOCl primećen je otok desnog obraza, dok je desna nazolabijalna brazda bila evidentno „izbrisana“. Nakon što je prestalo dejstvo anestetika, pacijentkinja je počela da oseća bolove u predelu gornjeg desnog vestibuluma u nivou projekcije korena očnjaka.

Ni posle dva dana bol nije nestao niti se smanjivao na analgetike, što je pacijentkinju navelo da se ponovo obrati za pomoć. Ponovnim kliničkim pregledom otkrivena je nekroza alveolarne mukoze gornjeg desnog vestibulum, promera 3 cm, koja je zahvatila regiju očnjaka i prvog premolara.

U lokalnoj anesteziji izvršeno je odizanje trapezoidnog mukoperiostalnog režnja nakon čega je dijagnostikovana i nekroza kosti. Detaljnijom opservacijom zuba 13, uočen je fos rut u cervicalnoj trećini korena. Posle ekstrakcije zuba 13, fos rut je potvrđen i ekstraoralno pomoću endodotske iglice. Hirurška sanacija rane obavljena je pomoću Lukasove hirurške kirete. U cilju boljeg zarastanja mekotkivnih i koštanih struktura, odlučili smo se za primenu PRF-a. Naime, uzeli smo 10 ml venske krvi pacijenta (u suvu, Monovet serumsku epruvetu, bez prisustva antikoagulanasa i drugih hemijskih agenasa) koju smo potom

centrifugirali 10 min. na 3000 rpm u laboratorijskoj centrifugiji (TDZ5-WS, XIANGYI, HUNAN, China).

Posle procesa centrifugiranja, dobija se troslojna struktura u čijoj sredini se nalazi ugrušak PRF-a. Pomocu klešta, izdvojili smo ugrusak PRF-a i nezno ga prislonili na membranu između dva sloja sterilne gaze i potom nežno pritisnuli 10 s. kako bi se očuvala vlažnost membrane.

Alveolarni koštani defekt popunjena je granuliranim koštanim partikulama (BioOss, Geistlich, Switcerlanda) pomešanim sa krvlju pacijenta i delovima PRF-a. Potom, dvoslojna PRF membrana je postavljena preko koštanog grafta, mukoperiostalni režanj je vraćen na svoje mesto i zašiven sviljenim koncem 4-0.

Pacijentu je prepisana antibiotska terapija u trajanju od sedam dana (Amoxicil, Hemofarm, Srbija 3× na dan).

Nakon 15 dana zabeleženo je potpuno zaceljenje mekih tkiva.

DISKUSIJA

Najčešće korišćen irigans u svakodnevnoj endodontskoj praksi je NaOCl, koji zaista u jako retkim slučajevima ispoljava svoja toksična svojstva [9]. Prema literaturnim navodima, to su situacije kada se umesto anestetika greškom aplikuje rastvor NaOCl ili momenti nenamerne transporacije NaOCl u periapeks [10, 11]. U takvim slučajevima, osim nekroze kosti i okolnih mekih tkiva, može doći do ozbiljnih i trajnih oštećenja nerava [12].

Haton i saradnici [8] navode primer pacijenta kod koga je usled ekstrudiranja rastvora preko perforacije na korenju gornjeg prvog premolara došlo do pojave otoka i bola u predelu desnog obraza. To je uslovilo dalju palijativnu terapiju i primenu intravenski aplikovanih antibiotika, kortikosteroida i analgetika.

U slučaju našeg pacijenta, posledice ubrizgavanja NaOCl kroz *fos rut* na Zubu 13 bile su bolna nekroza mekih tkiva i kosti, bez oštećenja nervnih struktura.

Pouzdani znaci koji ukazuju na mogući nastanak perforacije korena (*fos rut*) jesu profuzno krvarenje iz samog kanala i oštar bol.

Oba simptoma u našem slučaju su bila maskirana usled dejstva lokalnog anestetika. Prisustvo adrenalina u anestetičkom rastvoru izazvalo je lokalnu vazokonstrikciju krvnih sudova, što

je sprečilo krvarenje, dok je dejstvo lokalne anestezije blokiralo prenos bolnih nadražaja.

Moguće objašnjenje za ovako masivno oštećenje periapikalnog tkiva, osim prisutnog *fos ruta*, može biti dehiscencija bukalne koštane lamele usled koje je rastvor NaOCl lako i brzo difundovao u periapeks.

Panfacijalni edem predstavlja prvi i najčešći znak da je došlo do transportacije NaOCl u okolno tkivo, što se objašnjava izrazito toksičnim i hiperosmotskim osobinama rastvora [13]. U nekim slučajevima, usled oštećenja krvnih sudova može doći do pojave ekhimoza po koži lica, ali i vrata [14]. Kod naše pacijentkinje, osim evidentno prisutnog otoka nisu zabeležene ekhimoze. Bol, koji se naknadno javio, najverovatnije je posledica tkivne ishemije i direktnog toksičnog dejstva natrijum-hipohlorita.

Na sreću, bol je prestao u potpunosti nakon hirurškog uklanjanja nekrotičnog tkiva.

Trombocitima obogaćen fibrin (PRF) predstavlja frakciju krvi bogatu trombocitim, leukocitima i faktorima rasta [15]. Autologna PRF membrana omogućava brže i lakše zarastanje tkiva [16], zbog čega se u savremenoj stomatologiji koristi za različite namene: sinus lift procedure, režanj operacije, augmentacija koštanog grebena ili ugradnju implantata [17].

Prisustvo faktora rasta, koji su u velikom broju sadržani u PRF-u, pozitivno utiče na stvaranje kolagena i novih krvnih sudova, deluje kao modulator rasta i razvoja ćelija, podstičući sintezu matriksa i transformaciju ćelija [18].

U slučaju našeg pacijenta, posle primene PRF-a došlo je do izvrsne i potpune regeneracije mekih tkiva. Mi prepostavljamo da je takođe došlo i do zaceljenja kosti, ali bez biopsije i histološke procene uzorka ne možemo to i da tvrdimo.

ZAKLJUČAK

Oštećenja izazvana primenom NaOCl, sasvim sigurno predstavljaju neprijatno i stresno iskustvo za svakog stomatologa. Danas, još uvek, ne postoji zvaničan protokol terapije oštećenja izazvanih rastvorom natrijum-hipohlorita, ali ono što je sigurno jeste da takva stanja zahtevaju hitan tretman i redovno praćenje takvih pacijenata.

Pažljivim i savesnim rukovanjem moguće je izbeći komplikacije koje toksičnost ovog rastvora nosi sa sobom.