



## Review Article

# A literature review on complications and management of use sodium hypochlorite in endodontics

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## ABSTRACT

The most commonly used irrigant in the field of endodontics is sodium hypochlorite in the procedure of root canal therapy. Although the use of sodium hypochlorite is quite safe but on the other hand when it comes in to direct contact with the soft tissue, it can result in soft tissue injury.

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## 1. Introduction

Sodium hypochlorite was firstly recognized and function as an anti bacterial agent in the year of 1843, when initially it was used for the process of hand wash among the patients and was found that, patients done there hand wash with sodium hypochlorite tend to spread infection less among them as compared to patients those don't wash there hand with the solution of sodium hypochlorite.<sup>1</sup> in the year of 1920 sodium hypochlorite was first used as an irrigant solution during the endodontic procedure.<sup>1</sup> The solution of sodium hypochlorite is most commonly used in the routine endodontic procedure due to its antimicrobial properties and it tissue dissolving capabilities. Some other reasons of sodium hypo chlorite solution to be used in routine endodontic procedures are, it is inexpensive, easily available, have good shelf life, its low viscosity property helps in easy application of sodium hypochlorite solution in the canal.

The only disadvantage of sodium hypochlorite solution is its toxic effects when it comes in direct contact with the soft tissue and it also results in corrosion of metal instruments.<sup>2</sup> As the concentration of the sodium hypochlorite solution increases, its antibacterial action and tissue dissolution action actions also increases, so in other words concentration of sodium hypochlorite solution is vice versa to its antibacterial and tissue dissolution action. Sodium hypochlorite solution results in liquefaction of organic tissue as sodium hypochlorite solution reacts with fatty acids and amino acids in the pulpal tissue.<sup>3</sup>

If the temperature of sodium hypochlorite solution is increased its bactericidal action as well as tissue dissolution action also increases.<sup>4</sup> spillage of sodium hypochlorite solution over the clothes also results in damage of clothing. If the solution of sodium hypochlorite solution is transmitted beyond the root apices, it may results in extensive soft tissue injury as well as extensive injury to the underlying nerve or extensive injury to the air sinus.

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### 1.1. Various complication related to sodium hypochlorite solution and its management

Accidental spillage of sodium hypochlorite solution over the clothing while using in the routine endodontic procedure is found to be the most common. It results in bleaching of the clothing that too irreparable. So the patient as well as the practitioner should wear the apron or gown while dealing with the sodium hypochlorite solution.

If the solution of sodium hypochlorite comes in direct contact with the EYE, it may result in serious complications like damage to cornea, blurring of the vision. As the alkali comes in the direct contact with the epithelium of the corneal cells which contains lipids, results in blurring of the eye vision and results in formation of patch in the eyes.<sup>5</sup> The first line of treatment is, rapidly wash the eye with cold water or with the normal saline followed by referring of the patient to the ophthalmologist.<sup>6</sup> so in the prevention act for the same accident the practitioner as well as the patient must be wearing eye protective glasses to avoid any accidental eye injury. Literature revealed that accidental contact of sodium hypochlorite solution with the cornea, the eye should be rinsed with one litre of sodium hypochlorite solution for 15 minutes.<sup>7,8</sup>

Skin injury with the use of sodium hypochlorite solution requires urgent washing of the skin surface with water and soap. As the alkalis come in direct contact with the proteins, they tend to make soluble complexes of the protein. These complexes ultimately results in the passage of the hydroxyl ions deep into the tissues, therefore limiting the contact with the water dilutant over the skin surface. The management process includes thorough rinsing of the surface under low pressure of the water, as high pressure rinse may cause spreading of the sodium hypochlorite solution to the operators eye or to the patient eye and may cause corneal irritation or corneal damage.

If the solution of sodium hypochlorite comes in to direct contact with the oral mucous membrane, it may cause inflammation of the oral mucous membrane, itching sensation or burning sensation of the oral mucous membrane. The surface injury is done by reaction between the alkali and the fats. Thorough rinsing of the oral mucous membrane is done with distilled water or with normal saline. If episode of pain persist, symptomatic medication can be given to the patient.

The clinician should know the symptoms of sodium hypochlorite solution, it includes urticarial, skin rashes, hypotension, bronchospasm. In this situation the patient should be shifted to hospital as early as possible.

Extrusion of the solution of sodium hypochlorite beyond the apex of the root results in chemical injury to the soft tissue which may lead to localized tissue necrosis at the site of exposure. This type of injury is least seen with the use of sodium hypochlorite solution. But if it occurs it may results in rapid tissue swelling both intra

orally as well as extra orally between the skin and the sub cutaneous tissue. The swelling that develop may be edematous or may be haemorrhagic or may be both.<sup>7,8</sup> The prime most symptom after extrusion of the solution of sodium hypochlorite beyond the root apex is sudden onset of the pain. Which is totally due to damage occur to the tissue locally. This damage to the soft tissue occur immediately after the extrusion of the solution or may take few minutes to several hour to develop the symptoms.,<sup>9,10</sup> if the extruded solution of sodium hypochlorite enters the maxillary sinus cavity it may results in the condition known as sinusitis, cause inflammation of the sinus membrane.,<sup>11,12</sup> and if bleeding may occur in to the interstitial tissues it may results in formation of ecchymosis over the skin and may ultimately leads to formation of the hematoma.<sup>13</sup> If this condition happens to the patient, immediately refer the patient to the hospital, hospitalize the patient and administration of steroids and antibiotics should be started.,<sup>14,15</sup> and if there is severe tissue necrosis happened after the extrusion of the solution of sodium hypochlorite beyond the root apex, surgical drainage or debridement may be required for the same.

Some of the neurological complications with the use of solution of sodium hypochlorite can be made, if the solution is extruded beyond the root apices and where the vital anatomical structures like nerve, artery or vein is present and gets affected by the solution, may result in permanent parasthesia or temporary parasthesia of the area. The first incidence of facial nerve damage was first described by the Witton et al. in the year of 2005. In both the cases only the buccal branch got affected by the solution and patient complaints of loss of naso labial groove and down turning of the angle of the mouth, it took several months for the patient to re gain the sensation.<sup>11</sup>

Throat irritation can also be done due to lack of proper isolation while using sodium hypochlorite solution, it may get ingested or inhaled that may result in throat irritation. A case was presented by Ziegler in which a 15 months old girl ingested house hold high concentrated solution of sodium hypochlorite and presented with severe laryngotracheal bronchitis, along with severe drooling from the mouth. Treatment process includes naso tracheal intubation followed by surgical decompression required.<sup>13</sup>

Initial management if sodium hypochlorite infection was suspected includes cold compression. Swelling of the soft tissue whether it is from intra oral site or from the extra oral site, by the application of cold compression over the swelling helps in reducing the inflammation at the site of the injury. If the patient complaints of perception of pain it can be treated with prescribing analgesics like ibuprofen or paracetamol, the dosage of ibuprofen to be prescribed is 400 mg tds and dosage of paracetamol to be prescribed is 1gm tds , till the pain persists. In order to prevent the spread of secondary infection, antibiotics should be prescribed, that

include amoxicillin 250 mg and in case patient is allergic to penicillins, metronidazole 200 mg twice a day should be prescribed in order to stop the spread of secondary infection.<sup>16,17</sup>

## 2. Conclusion

There is no such specific treatment plan for the complications associated with the use of solution of sodium hypochlorite. One should avoid vigorous use of the solution in the oral cavity, one should use proper application of rubber dam and should maintain proper isolation while using the solution of sodium hypochlorite in the oral cavity. In case any complication occur with the use of sodium hypochlorite solution, hospitalization of the patient is must required and after than symptomatic treatment plan should be followed.

## 3. Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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