Galvanization and burning teeth root pulpa by means of iodine electrophoresis

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Abstract. This article is devoted to the study of the treatment and administration of the drug through the skin and mucous membranes into the body under the action of direct current. It is indicated that the method depends on the specific resistance of organs and tissues. The numerical values of the specific resistance of some organs and tissues are given. The article is divided into two parts. The first section provides a brief overview of galvanization, electrophoresis of drugs and dissociation of drugs. The second part describes the methods of treatment of tooth pulp using electrophoresis which are now common. Iodine electrophoresis has been shown to be used for the treatment of acute and chronic pulpids passing through narrow or impenetrable, straight and crooked canals of single and multi-rooted teeth. The topic can be of interest to masters and dentists studying dentistry at medical institutes.

1. Introduction
Galvanization is a treatment method based on exposure to organs and tissues with low DC voltage (up to 80 V) and low current (up to 50 mA) using DC electrodes installed by contact in the client's body.

The penetration of a constant current into a tissue is determined by its electrical conductivity. The constant current has almost no penetration into the skin, adipose tissue and bone tissue. From tissues with high current permeability, blood, lymph, intercellular fluid, muscle, etc. passes well [1,2].

2. Methodical part
Under the influence of DC, the body reacts, which changes the functional state of the nervous system, improves blood and lymph circulation, trophic, metabolic, regenerative and resorption processes, increases the body's immunological reactivity. The action of a constant current enters the body through the tissues and leads to physicochemical changes. The complex structure of the microstructure of ions in the tissue leads to uneven distribution of current. Pathways with low current resistance to the body spread well through blood vessels, lymphatic vessels, nerve fibers and muscle. Due to the high resistance of the skin barrier a large part of the voltage during galvanizing falls on the skin and, this is where the absorption of electricity occurs. Therefore, skin receptors are affected, tissue becomes hyperemic, swollen, tissue water - electrolyte balance changes [1-6].

The occurrence of physicochemical changes in biological tissues is manifested in the primary effect of galvanization. The ratio of ions in tissues depends on their quantity and quality. Under the action of a constant current, cations move towards the cathode and anions move towards the anode. The speed of
movement of ions is different, it depends on the chemical-physical property, i.e. charge, radius, hydration. The intercellular barrier prevents the movement of ions in the path of electric current. The acid-base state changes, as a result ON + ions are deposited on the anode at the N + cathode in the tissue, the pH changes that also affects the enzymatic, biocalloid state.

After the electrodes are exposed, the ions lose their electrical charge and turn into a neutral atom that has the property of initiating a chemical reaction, resulting in an electrolysis process. As a result, the skin surface is affected and damaged. To prevent this, a hydrophilic gasket is used placed between the skin and a metal electrode. Under constant galvanization, nerve receptor exposure, local reaction, and changes of a general nature occur.

3. Indications for treatment by galvanizing method

- Reduction or elimination of pain syndrome (neuralgia, neuritis, neuromyositis, glossalgia).
- Intensification of inhibitory processes (sleep disturbances, peptic ulcer disease, hypertension).
- Stimulation of regenerative processes of nerve fibers.
- The effect on the functional state of the nerve fibers of the brain neurosis, organic diseases of the central nervous system.
- Progressive muscular dystrophy, paralysis, spondylosis, tetany.
- Early stage of atherosclerosis, angina pectoris.
- Bone fractures, osteomyelitis.
- Chronic inflammatory processes of organs and tissues.
- In skin diseases and many other diseases.

The electrical conductivity of tissues and organs depends on their functional state which means that conductivity can be used as a diagnostic indicator. For example: In the detection of tumors formed in the body and organism, thrombi formed in blood vessels, crushed tissue and organs [4, 5, 7].

The following are the specific resistances of different tissues and biological fluids for the human body: spinal fluid 0.55 ohms, blood 1.66 ohms, muscle 2 ohms, brain and nerve tissue 14.3 ohms, fat tissue 33.3 ohm, dry skin 105 ohm, bone 107 ohm. Most of the human body is made up of biological fluids. They contain ions involved in various exchange processes. Under the influence of an electric field, ions move at different speeds and accumulate near cell membranes to form an electric field called the polar field. The primary effect of direct current depends on the movement of ions, the change in the concentration of ions released from different elements of the tissue. The effect of direct current on the body and tissues depends on the current strength, electrochemical equivalent and duration of exposure.

\[ m = kI t \]

where \( I \) is the current, \( k \) is the electrochemical equivalent, and \( t \) is the time.

The value of direct current is dosed according to the milliammeter reading, in medicine the formula of current density \( j = I / S \) is used for galvanization and electrophoresis, for organs and tissues it should not exceed \( j = 0.1\text{mA} / \text{cm}^2 \) [1,6]

4. The main part

In therapeutic practice, DC is used for the introduction of drugs into the body through the skin or mucous membranes through the skin or mucous membranes. This method is called electrophoresis of drugs. For this purpose, the same operation is carried out as during galvanization, but the active electrode gasket is soaked in a solution of the appropriate substance. The drug is injected through the same pole of the instrument as it has a polar charge.

This means that if anions, including iodine, are introduced through the cathode, cations such as Sa or Na are introduced through the anode. The duration of the process of introduction of drugs into the human body by electrophoresis is large. This is because the mobility of the ions is small. A drug that
enters the body carries with it a certain amount of charge. From this, the total amount of drugs injected into the body is equal to the total amount of charge, and Faraday’s generalized formula

\[ m = \frac{1}{F} A n q \]

found by the formula Here \( F = 9.648 \text{ kl/mol} \), which is the Faraday number, \( A \) is the mass of the atom, \( n \) is the valence.

All the movements performed by the dentist in endodontic procedures, tooth enlargement, removal of pulp and tooth decay, drug treatment and finally its filling can be monitored on the screen, using special X-ray equipment. The physician can control his movements and, most importantly, the patient can also follow these endodontic procedures to the extent that the canals are completed [2,8].

Currently, there are four different approaches to treating pulp in the narrow, impenetrable canal and curved area of the tooth:

- therapeutic method - prevention of pathological changes that may develop around the root in the future while maintaining the viability of the tooth by terminating the inflammatory process in the root pulp cavity using dental means;
- therapeutic method - prevention of periodontal and other pathological changes that may develop around the root of the tooth that is further treated with mumification treatment after devaluation (anesthesia) of the pulp cavity;
- physiotherapeutic method - prevention of periodontitis and other pathological changes that may develop around the root of the treated tooth after a certain period of time after treatment (necrosis) of the pulp of the tooth using iodine electrophoresis;
- opening, transitioning and widening of narrow, impenetrable dental canals using endodontic instruments, i.e. after removal of the pulp cavity to the root tip hole the canal is passed to the root tip hole (in the absence of pathological changes in the surrounding tissue) or through the root tip hole (there are pathological changes in the root tissue) to prevent periodontitis and other pathological changes that may develop around the tooth root treated with complete filling.

Although the g-path which is more difficult to perform than the root pulp in the narrow, impenetrable, crooked canals of single-rooted or multi-rooted teeth with pulpitis, is more suitable for the prevention of complications that may occur after treatment. It is necessary to have endodontic instruments and appropriate apparatus, devices. The essence of the method of treatment of pulpitis under anesthesia is that in surgical methods, the pulp is removed from the canal of the tooth, and after mechanical and pharmacological treatment of the canal, it is filled and treated with periodontitis and other root. The pathological changes that may develop around it are taken.

Iodine electrophoresis method is used in all forms of pulpitis, especially residual pulpitis, pulpoperiodontitis, in acute and chronic, passing through the narrow or impenetrable, crooked channels of multi-rooted teeth. Iodine is not used in the treatment of electrophoresis when the patient is hypersensitive to iodine and antiseptics applied to its drugs.

After electroodonto diagnostics on the presence of pulp in the canals of multi-rooted teeth, sometimes electrodiagnostics on itching, dry lips revealed an immediate infiltration or conductive analgesia — anesthesia 2% novocaine or 2% lidocaine hydrochloride and others are done and pulpexpeted using diathermocoagulation in the transient canal. The canal is treated using appropriate medications and instruments and is sealed.

To fill a wide, well-permeable dental canal we use a paste formed by mixing zinc oxide and iodoform powder in a 2:1 ratio into the Albrechtar mixture. Iodoform-cement paste can also be used for this purpose. The antiseptic effect of iodoform is known to be harmless to the surrounding tissues. In practice, therefore, pathological changes that may develop around other roots are prevented.

To prevent current from entering the sealed channel its entrance is sealed with an adhesive wax consisting of 40% beeswax and 60% rosin or using a cotton swab dipped in melted wax. A cotton swab
dipped in 10% iodine is placed at the entrance to difficult-to-pass, narrow or impassable canals. It is inserted between the tampon and the tooth cavity or into a tampon, coated with amino chloride, wrapped in a thin wire with a tip 1-2 mm wide and cleaned, immersed in 10% iodine and used as an active electrode.

The iodine swab and the iodine swab at the end of the wire are squeezed with a dry cotton swab before being placed in the cavity, excess iodine is removed, i.e. a swab and cotton swab moistened with iodine are used. In order to separate the treated tooth cavity with the active electrode from the oral cavity and ensure good grip of the active electrode the adhesive wax is melted over an alcohol flame, cooled slightly, placed in the caries cavity and the cavity is filled and tightly closed. Particular attention should be paid to the closure of cavities on the lateral surfaces of the teeth neck or collision. Because, if the cavity is not well separated and closed iodine can pass into the gums and burn it, especially when the treatment is performed under anesthesia the patient does not feel the gums burn. Once the active electrode is mounted on the tooth, a cotton swab is placed between the upper and lower jaw teeth. These tampons prevent the antagonist teeth from touching each other when the mouth is closed and also help to protect the active electrode. When the active electrode is opened by 1-2 cm the other end is connected to the negative pole of the galvanizing apparatus. The function of the passive electrode is performed by a lead plate or staniola plate with a surface area of 20–40 cm² which is placed on a sterilized clip before placing a soft cloth 1 cm thick on the patient’s skin and tied with a bandage. Then the current is connected. The current should not exceed 3 mA. The treatment lasts 30 minutes. Iodine electrophoresis is sometimes performed without anesthesia. At the initial stage of treatment, even at a current of 0.2-0.3 mA applied to the tooth the patient's teeth may be painless. With necrosis of the root pulp the current should be gradually increased over 30 minutes depending on the patient's perception. However, there is a disadvantage of iodine electrophoresis when performed without analgesia - which is that the root pulp does not burn completely for 30 minutes. Therefore, in the absence of contraindications to anesthesia it is always advisable to carry out iodine electrophoresis under anesthesia. In this case, from the beginning to the end of the treatment, i.e. for 30 minutes the pulp is exposed to a current of 3 mA and usually at once it is possible to completely necrosis - burn. It should be noted that if the current in iodine electrophoresis exceeds 3 mA periodontal burns can occur and related complications can occur [9].

At the end of the treatment under anesthesia a clean cotton swab moistened with 10% iodine is placed on the bottom of the cavity with the inlet parts of the canals and the cavity is temporarily covered with aqueous dentin paste. At the next visit of the patient the cleaned cotton is removed and the electrophoresis of the root pulp is checked for sensitivity to electric current using an electrodent diagnostic device. If the root pulp is completely necrotic, i.e. they are not sensitive to a current of 100 μA, the burnt pulp in the canals is removed as much as possible, the rest is mummified and the canals are filled with the above pastes, clamps are placed and the tooth is permanently filled. If the channels are impermeable the pulp is mummified, mummification pastes are applied to the inlet parts of the channels, clamps and permanent fillers are placed.

If a single iodine electrophoresis is not sufficient for complete necrosis of the pulp in the channel, i.e. if the sensitivity of the remaining pulp to electricity is significantly reduced to 70-85 mkA the treatment is repeated.

5. Conclusion
In addition, galvanization and electrophoresis apparatus simultaneously show the following therapeutic effects: [3].

- Against colds.
- Promotes the release of water from tissue tumors.
- Analgesic.
- Soothing.
- Dilates blood and lymph vessels.
- Relaxes muscles.
• Normalizes metabolism, helping to improve the nutrition of tissues and organs.
• Promotes the processing of biologically active substances in the blood.

Contraindications to the practice of galvanization and electrophoresis are the following:

• When skin integrity is compromised
• In complete loss of pain sensation
• Inability to carry individual current
• In case of suspicion of tumors, tumors
• Acute inflammatory and purulent processes
• Diseases of the circulatory system
• Atherosclerosis with obvious symptoms
• Heart failure
• Cachexia
• Pregnancy
• Epilepsy

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