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# Transformation of the Safety Paradigm and Technological Protocol in the Nail Care Industry (2011-2024): A Comparative Analysis of Dry and Hydro-Mechanical Impact on Keratin Structures in the Context of Podological Safety and Aesthetic Longevity

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**Abstract:** ***The present work offers a comprehensive, systematic study of the evolution of nail service technologies over the period from 2011 to 2024. The study is based on the integration of global market data, dermatological research on the pathogenesis of nail apparatus injuries, and an empirical 13-year experience in implementing the proprietary wet grinding technique in clinical and aesthetic practice. The central hypothesis of the study is that the adaptation of podological spray technologies into aesthetic manicure protocols mitigates the risks of thermal necrosis of the matrix and mechanical traumatization of the eponychium inherent in popular techniques of dry hardware manicure. Particular attention is paid to the analysis of the safety of the method for patients with diabetes mellitus and impaired tissue trophics. Using the case study of the Nailslab salon, the economic efficiency (reduction of procedure time to 1 hour 40 minutes) and clinical safety of the proposed protocol are demonstrated. The study confirms the need to revise educational standards in the industry with an emphasis on hydro-mechanical treatment methods.***

**Keywords:** hardware manicure, wet grinding, spray technologies, diabetic foot, onycholysis, Russian Manicure, thermodynamics of grinding, nail service safety, professional education.

## 1. Introduction

Over the period 2011–2024, the nail service industry has undergone a qualitative reorientation: from a field of predominantly domestic hygienic services it has evolved into a high-tech sector located at the intersection of aesthetic medicine and podology. Whereas in the early 2010s the leading practice remained the classic cuticle-removing manicure with preliminary maceration, by 2024 machine and combined techniques, designated on the international market by the term Russian Manicure, had become the de facto standard in the premium and professional segments [1].

At the same time, the technological complication of procedures has been accompanied by the formation of a fundamentally new group of iatrogenic complications. The widespread introduction of aggressive cuticle treatment with a rotating instrument (diamond and carbide burs) in a dry mode correlates with an increase in the number of procedure-induced injuries, ranging from linear and pinpoint cuts of the nail plate to thermal damage to the matrix with subsequent development of persistent onychodystrophies and onycholysis [3]. In 2023–2024, dermatological communities in the USA and European countries declared serious concern about the uncontrolled spread of techniques for deep debridement of the proximal nail fold, drawing attention to disruption of the barrier function of the epidermis and an increased risk of secondary infection [6].

In the post-pandemic period, when regulatory and social expectations regarding hygiene, asepsis and antisepsis have reached a historically maximal level, consumer focus is shifting from an exclusively decorative outcome to parameters of safety and health-promoting effect. A stable demand is emerging for protocols that combine the visual perfection associated with Russian manicure with the atraumatic nature and controllability of medical interventions.

As of 2024, the global and, in particular, the US markets for nail services demonstrate steady expansion despite persistent economic volatility.The nail salon market size is forecast to increase by USD 9.48 billion, at a CAGR of 10.7% between 2024 and 2029 [8]. Growth is driven by the combined influence of several factors: an increase in the share of spending on self-care, the spread of complex nail art, and greater consumer awareness of the condition and health of the nail apparatus [11].

However, a detailed analysis of the structure of demand reveals a number of alarming trends. According to podological reports, up to 75% of salons in the USA do not adhere to strict multistage disinfection and sterilization protocols, creating a substantial basis for the spread of fungal and bacterial infections [13]. Studies conducted in 2024 record a high prevalence of onychomycoses and contact dermatitis associated both with the use of gel polishes and with aggressive methods of removing artificial coatings [3]. In parallel, marketing and sociological consumer surveys for 2023 show that in the client value system the indicators speed and precision are effectively equated in importance with

safety, and the demand for reducing procedure time while maintaining or improving quality is becoming dominant [11].

The existing scientific literature describes in sufficient detail the chemical risks of manicure technologies (in particular, allergic reactions to methacrylates) [15] and the infectious aspects associated with mycoses and bacterial complications [17]. There is also a body of technical works devoted to the physics of grinding and cutting of materials [18]. Nevertheless, there is a pronounced lack of interdisciplinary studies in which the physics of interaction between a rotating abrasive instrument and biological tissues (nail keratin and epidermis) would be considered in a comparative analysis of dry and wet environments specifically in the context of a manicure procedure. Most of the available data on wet processing relates to the highly specialized field of medical podology (pedicure), whereas the overwhelming majority of manicure interventions are still performed dry, under conditions of an increased risk of tissue overheating.

The present study aims to fill this gap by providing a scientific rationale for the use of spray technologies in aesthetic manicure as a method for preventing procedure-related complications.

**The aim of the study** is to perform a comparative analysis of the efficacy and safety of various methods of nail apparatus treatment, to identify the advantages of integrating hydromechanical processing (spray systems) into the combined manicure protocol, and to validate the authorial technique developed on the basis of 13 years of empirical experience.

**The scientific novelty** lies in the fact that, for the first time, data on the thermodynamic parameters of machine manicure have been systematized; it is shown that the use of spray systems provides a reduction of temperature in the working area to values below the threshold of protein coagulation. The clinical effectiveness of wet grinding has been substantiated in patients belonging to risk groups (primarily those with diabetes mellitus), for whom dry manicure is potentially hazardous due to the presence of peripheral neuropathy and angiopathy. An original authorial technique (Nailslab) is described, which makes it possible to reduce the total duration of a complete procedure to 1 hour 40 minutes by optimizing the parameters of abrasive exposure and eliminating the need for pauses intended for tissue cooling.

**The authorial hypothesis** is that integrating the continuous supply of a finely dispersed liquid (water or an antiseptic solution) into the zone of contact between the bur and the skin and cuticle transforms the mechanisms of interaction from chipping to a mode of grinding with aquaplaning. This, according to the author, completely eliminates the risk of thermal burn, prevents the formation of microcracks and hangnails, and also binds keratin dust, ensuring the maximum degree of safety for clients with impaired tissue trophism.

## 2. Materials and Methods

To achieve the stated objective and comprehensively verify the working hypothesis, a comprehensive methodological design was implemented, combining a theoretical meta-analytical block and an empirical case study.

The study was based on the principles of evidence-based medicine and a systems approach. The following methods were employed in the study:

1) Systematic literature review. A targeted search and critical appraisal of publications were carried out in the PubMed, Scopus, and Web of Science databases, as well as in specialized industry reports. The search strategy included the following keywords: nail drill safety, onychomycosis prevalence 2024, diabetic foot care nail files, wet vs dry grinding temperature.
2) Comparative technological analysis. A comparison was performed of the physical parameters of the treatment process during dry and wet grinding: temperature regimes, friction coefficients, and characteristics of the resulting dust fraction (particle size and distribution). Data obtained in studies on industrial grinding of materials were extrapolated to the conditions of interaction between the abrasive instrument and biological tissues.
3) Empirical study (case study). An analysis was conducted of longitudinal empirical data provided by the leading expert and instructor of the Nailslab salon.

## 3. Results and Discussion

Analysis of the author's 13-year practical experience with the methodology, combined with global technological trends in the nail service industry, makes it possible to reconstruct three fundamentally distinct stages in the evolution of manicure technologies. Each of these stages formed its own system of norms and views on proper manicure and clinical risks, while simultaneously creating the preconditions for a subsequent technological shift.

Stage 1: Classical era (2011–2015). At the beginning of the 2010s, the unquestioned standard was the classic cut manicure with mandatory maceration in a bowl. Prolonged soaking of the hands was perceived as a necessary step for softening the skin that enabled careful removal of the cuticle and roughened areas. The short-term advantage of this technology indeed consisted in a visual softening of tissues and the subjective sensation of deep cleansing of the surfaces. However, from the standpoint of the biophysics of the nail plate, this approach proved conceptually vulnerable. The nail, being a porous keratin structure, actively absorbs water and increases in volume; after drying it inevitably contracts, altering its curvature and internal stresses. This leads to microcracks in the varnish layer and explains the situation typical of classic manicure, in which decorative coating begins to chip as early as day 3–4 of wear. An additional systemic problem remained the insufficient control of sterilization of bowls and instruments and the high risk of cross-contamination with bacterial and fungal pathogens, especially under high client load and violations of disinfection protocols [19, 20].

Stage 2: Revolution of electric files and dry manicure (2015–2019). The mass introduction of electric files (E-files) became a turning point and effectively launched the era of hardware dry manicure. Aqueous maceration was eliminated, and treatment of the cuticle and nail plate began to be performed

on a dry surface, which sharply increased the adhesion of gel-polish systems: the coating began to last for 2–3 weeks without significant defects. For the industry this represented a qualitative leap toward durability, reproducibility of results, and economic efficiency for both the technician and the client. However, the rapid growth in popularity of this technology was accompanied by an avalanche-like influx of specialists with an insufficient level of training and a lack of clinical understanding of the consequences of thermal and mechanical impact on tissues.

The key problem of this stage was overheating of tissues due to dry friction of the bit against the skin and nail. Diamond and ceramic bits, when the diameter, abrasiveness, and rotational speed are chosen incorrectly, create a significant thermal load on the epidermis and nail matrix. Clients began to regularly report burning and pain sensations during the procedure; in response, some technicians attempted to compensate for this by further increasing rotational speed or pressure, which led to the formation of drill-throughs, microgrooves and thinning of the nail plate, as well as thermal burns in the areas of the cuticle and proximal nail fold [16, 20]. At the industry level, this exposed a systemic deficit of standardized training protocols for hardware techniques and objective safety assessment criteria.

Stage 3: Era of Russian Manicure and the safety crisis (2020–2024). This stage is associated with the global popularization of the Russian Manicure concept, which in the public consciousness became associated with perfect cleanliness and deep treatment of the cuticle down to zero with application of the coating as close as possible to the proximal nail fold. Social media (primarily Instagram and TikTok) transformed this technique into a viral visual code: the glossy surface of the nail without a single gap between the gel polish and the cuticle line garnered millions of views and shaped inflated client expectations [1, 2]. As a result, the aesthetic ideal came to be defined primarily by the depth of invasion into the eponychium zone rather than by a dermatologically safe balance between neatness and preservation of barrier function.

Figure 1 below will reflect the transformation of the safety paradigm and technological protocol in the nail service industry.

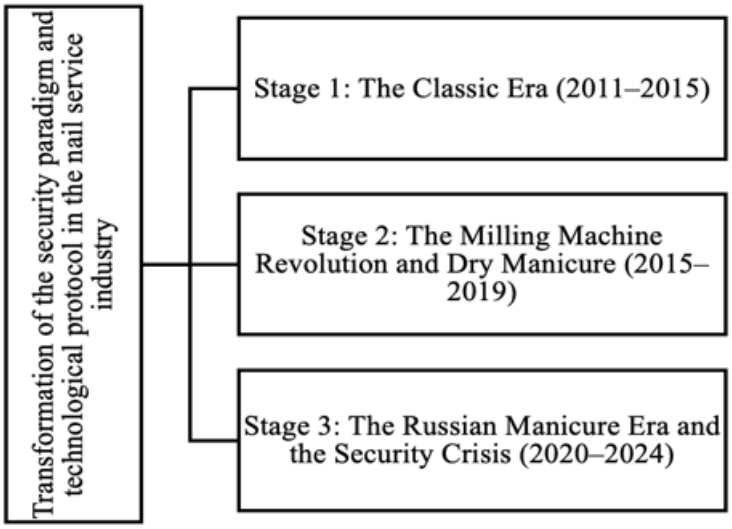


**Figure 1:** Transformation of the security paradigm and technological protocol in the nail service industry (compiled by the author based on [1, 2]).

A paradox arises: such an impeccable outcome is achieved at the cost of aggressive intervention in the structures of the eponychium and proximal nail fold. Professional dermatology communities (including under the aegis of AAD) emphasize that complete removal of the cuticle deprives the nail plate of its natural protective barrier, increasing the risk of bacterial and fungal infections and promoting the development of chronic paronychia [6]. The practice of active use of flame-type burs in the nail sinuses under completely dry conditions further amplifies the risk of microtrauma: microscopic tears of the skin and nail bed, invisible to the naked eye, become entry points for pathogens and trigger delayed inflammatory processes [3]. Against the background of the lack of strict regulatory requirements for practitioner qualification and instrument sterilization, this has created a situation of a persistent safety crisis with an outwardly flawless result.

In this historical and technological context, the author's technique of wet filing can be interpreted as an evolutionary synthesis of classical and device-based approaches. The key idea is not a return to traditional maceration, but the introduction of a controlled water factor in the form of a directed spray. In this format, water functions not as a means of complete swelling of the nail plate, but as a controllable moderator of friction, allowing a reduction in local overheating, minimization of dust formation, improvement of comfort for the client and practitioner, and simultaneous preservation of the high coating adhesion typical of dry techniques. Thus, the technique relies on device-based precision and durability, while neutralizing the key risks of stages 2 and 3 associated with tissue overheating and microtraumatization [4, 5].

An additional advantage of the hybrid format of wet filing is its conformity with modern principles of evidence-based cosmetology and infection control. Reduction of the amount of airborne dust particles in the working area decreases the

inhalational burden on the practitioner and the client, which is particularly important in the context of long-term occupational exposure. At the same time, the use of a controlled amount of water in combination with appropriate antisepsis protocols and instrument sterilization allows preservation of the low risk of cross-contamination characteristic of a well-organized device-based service, while reducing the intensity of mechanical impact on the skin in the cuticle area. From a dermatologist's perspective, this shifts the procedure from the category of highly aggressive invasive interventions to the category of sparing ones, provided that regulations are followed and practitioners receive adequate training [3, 6].

Finally, the wet filing technique defines a new vector of professional specialization for the manicurist, shifting the emphasis from a purely aesthetic outcome to a comprehensive assessment of the condition of the nail plate and periungual tissues. For long-term preservation of the effect, it is necessary to take into account the individual characteristics of the client: nail thickness and density, propensity to hyperhidrosis, presence of dermatological diseases, and current medication regimen. This opens the possibility of integrating manicure protocols with dermatological consultation in cases of chronic paronychia, deformities, and recurrent infections [1, 6]. Thus, the author's technique does not merely propose a technical modification of the procedure, but creates the prerequisites for the transition of the nail service industry from a visually oriented to a clinically oriented paradigm, in which the safety and biocompatibility of interventions become criteria of quality as significant as the aesthetic perfection of the coating.

The key scientific explanation for the advantages of the wet filing method lies in the field of the physics of friction and contact heat transfer (tribology). In the bur–nail plate–skin system, under dry treatment a regime of dry friction is realized: all kinetic energy in the contact area is converted into heat, which is practically not removed from the zone of impact. Studies of industrial grinding processes demonstrate that, under similar load regimes, dry grinding can increase the temperature in the contact zone up to 186 °C, whereas with the use of a cooling medium (wet grinding, Wet Grinding) the temperature peak is kept within approximately 98 °C [18]. For inorganic materials this is critical in terms of their structure and fatigue strength, but for biological tissues the situation is even more sensitive: protein coagulation begins already at 42–45 °C, and the pain threshold of the skin lies in the range of about 50 °C. Thus, temperature regimes acceptable for technical grinding are inherently traumatic for human tissues.

During dry manicure, the bur under conditions of high rotational speed and significant pressure heats the keratin plate and the superficial dermal layers within fractions of a second. In the absence of an intermediate cooling medium, the local temperature in the microcontact zone can instantly cross the critical threshold without having time to dissipate into the surrounding tissues. Wet grinding in the Nailslab technique fundamentally changes the thermal balance of the system. Water, which has high heat capacity and thermal conductivity, is supplied as a controlled spray and forms a thin film between the instrument and the treated surface. This layer acts as a dynamic heat sink: the generated heat is immediately dissipated by convection and partially by evaporation, as a result of which the tissue temperature stabilizes in the range of 25–30 °C [18]. Maintaining this level ensures both client comfort and complete prevention of thermal necrosis of the matrix, as well as damage to the cells of the germinal zone.

From a tribological point of view, the water film shifts the system from the regime of dry friction to the regime of mixed or boundary lubrication. This leads to a reduction in the coefficient of friction, a decrease in vibrations, and a more uniform removal of material. For the practitioner, this means that it is possible to work safely at higher rotational speeds without provoking overheating and, consequently, to reduce the duration of the procedure without compromising the tissues. From a psychophysiological perspective, it is also important that the absence of pain and thermal discomfort reduces muscle tension in the client, which facilitates access to hard-to-reach areas and increases the accuracy of the practitioner's movements.

An additional set of risks of dry manicure is associated not only with thermal but also with aerosol load. Dry nail and cuticle filings inevitably generate a large amount of fine-dispersed dust, a significant proportion of which falls within the PM2.5 fraction, particles with a diameter of less than 2,5 μm. Their composition includes keratin fragments, microbial bodies and fungal spores, as well as microparticles of the old coating containing acrylates and other chemical components. Owing to their small size, this dust penetrates into the distal sections of the respiratory tract, depositing in the bronchioles and alveoli. For practitioners who inhale this mixture daily over many years, this increases the risk of developing occupational bronchial asthma, allergic rhinitis, chronic cough, hypersensitivity to acrylates and contact dermatitis. Clients, although exposed only briefly, are nevertheless subjected to episodic inhalation exposure, which is particularly significant for individuals with pre-existing bronchopulmonary diseases [7, 14].

Even in the presence of exhaust ventilation and local filters, it is difficult to completely eliminate the circulation of PM2.5 in the air of the work space: part of the particles bypasses mechanical barriers, remains suspended for hours, and settles on surfaces, from which it can easily be re-entrained into the air by the slightest movement. In the context of sanitary and epidemiological safety, this creates an effect of chronic contamination background that is difficult to control solely by means of ventilation solutions and personal protective equipment. International occupational health recommendations for salon workers increasingly emphasize the need to minimize dust formation at the stage of its generation rather than dealing only with its subsequent capture.

Spray technology integrated into the wet technique addresses the problem precisely at this level. The supply of water to the filing area leads to the immediate binding of the particles generated: keratin dust fragments, microbial elements, and remnants of polymer coatings agglomerate with water droplets, forming a heavier suspension. These aggregates rapidly settle on the surface of the table and gloves, without having time to form a stable aerosol cloud. In effect, an inert

dust capture mechanism is created at the moment of particle generation. This radically increases the sanitary safety of the workplace, reduces aerosol load on the respiratory tract, and decreases cumulative occupational risk for technicians [20].

In practical terms, such process organization improves not only objective hygienic indicators but also the subjective perception of the procedure. The client does not see a dust cloud, does not sense the characteristic odor of overheated material, and does not experience dryness in the throat, while the technician is less exposed to chronic load on the respiratory system. At the same time, spray technology does not abolish the need for standard infection control measures (masks, exhaust, sterilization), but it substantially reduces the initial level of air contamination, shifting the system from a mode of dealing with consequences to a mode of preventing the formation of the dust factor [20]. Taken together with thermal protection of tissues, this makes wet grinding not only technically more comfortable but also scientifically substantiated as safer in terms of tribological and hygienic parameters.

A comparative description of the physical parameters of the techniques is presented in Table 1 below.

**Table 1:** Comparative characteristics of the physical parameters of the techniques (compiled by the author based on [9, 10, 12, 20]).

| Parameter | Dry hardware manicure (Dry E-file) | Author's wet spray technique (Wet Spray) |
|---|---|---|
| Temperature in the contact zone | High (>50°C), risk of burn | Low (25–30°C), spray cooling |
| Coefficient of friction | High (risk of tissue rupture) | Low (lubricating effect) |
| Dust state | Aerosol (volatile fraction), inhalation risk | Suspension (bound fraction), settles |
| Risk of microtrauma | High (especially with thinned skin) | Minimal (atraumatic polishing) |
| Effect on burs | Rapid clogging of abrasive pores (glazing) | Self-cleaning of the bur by the water flow |

The author's method of wet filing acquires particular significance when working with clients with diabetes mellitus (DM), who, from a clinical and podological standpoint, belong to a high-risk group and often even to the group of maximal risk. This is one of the most complex categories in nail service, since even a minimal technical error by the practitioner may trigger in such patients a cascade of complications that extend far beyond the aesthetic domain and already fall within the responsibility of the endocrinologist and the surgeon.

In individuals with DM, at least two key pathological syndromes are formed that radically affect the safety of manicure and pedicure.

a) Diabetic polyneuropathy. Peripheral damage to nerve fibers leads to a decrease in tactile, thermal, and pain sensitivity in the distal segments of the extremities. Under these conditions, the client may not notice at all the moment of a cut, a deep clip, or a thermal burn during aggressive dry work with a bur, especially in the area of the proximal nail fold and lateral sinuses.
b) Diabetic microangiopathy. Chronic damage to the capillary bed disrupts tissue perfusion, slows reparative processes, and reduces the local immune response. Even a minimal microtrauma (a minor cut of the cuticle, a superficial groove made by the bur, pinpoint bleeding) in such a patient heals extremely slowly, with a high risk of secondary infection and transformation into hard-to-treat ulcerative defects or even gangrene.

Against this background, the traditional Russian Manicure with deep dry debridement of the cuticle and aggressive interference in the eponychial area becomes for patients with DM not simply an aesthetically advanced technique, but a potentially dangerous procedure. The risk of accidental damage to the capillaries of the proximal nail fold in the setting of reduced pain sensitivity, combined with impaired microcirculation, turns such a manipulation into a kind of Russian roulette: the absence of subjective complaints on the part of the client does not mean the absence of damage, and microtrauma may be detected only after some time, already at the stage of inflammation or infection. This is why international recommendations on hand and foot care in patients with diabetes emphasize the inadmissibility of traumatic, bleeding, and thermally aggressive technologies in aesthetic and podological care.

The author's method of wet filing offers a comprehensive solution to these risks, relying simultaneously on the principles of atraumatic technique, controlled heat exchange, and continuous antiseptic protection.

Absence of overheating. Thanks to the water-spray technology, any significant increase in temperature in the zone of contact between the bur and the nail plate and periungual tissues is excluded. The temperature is maintained within the physiological range, which effectively removes from the equation the risk of thermal burn, particularly dangerous for a client with diabetic neuropathy, who may not perceive the critical moment.

Atraumatic mechanical action. The water film forms a sliding layer between the attachment and the skin, reducing the coefficient of friction and preventing the effect of catching on the dry, dehydrated cuticle. The diamond ball bur does not tear tissues but instead grinds the keratinized areas layer by layer, selectively reducing the thickness of hyperkeratosis. As a result, the probability of an accidental cut or incision of the proximal nail fold tends toward zero, which is critically important in the presence of microangiopathy.

Indirect antiseptic support. The use of an alcohol-containing solution in the spray provides continuous low-intensity antiseptic treatment of the manipulation area in real time. This creates an additional barrier to bacterial and fungal contamination, provided that standard protocols for disinfection of instruments and the workplace are maintained.

The Nailslab case illustrates the transition from a theoretical model to a sustainable practical outcome under the conditions of a complex and competitive market. Miami represents a specific ecosystem of nail services:

- Climatic factor. High average annual humidity and temperature create favorable conditions for the spread of fungal infections of the skin and nails. Standard salons, in the setting of an insufficient level of infection control, easily turn into foci for circulation of onychomycosis and associated microbial flora [14].
- Regulatory features. In Florida, the formal requirements for obtaining a Nail Specialist license remain minimal: 180 hours of training are sufficient, and there is no strict examination filter at the entry. As a result, practitioners with an extremely heterogeneous level of training enter the market, often lacking a clinico-biomedical understanding of the risks associated with invasive techniques.
- Consumer demand. Against the background of a developed beauty industry and high competition, Russian manicure is perceived by clients as a marker of status, quality, and a European level of care. Demand for this service remains consistently high despite its potential traumaticity.

The organization of the work process is optimized from the perspective of both biomechanics and economics. The full service cycle, including removal of the old coating, manicure with wet grinding, and application of material under the proximal nail fold, takes approximately 1 hour 40 minutes. Time reduction is achieved by eliminating pauses associated with nail overheating and by the higher efficiency of the wet abrasive, which ensures uniform removal of material at stable rotational speed. For comparison, a classical high-quality Russian Manicure with all stages of aggressive dry debridement and subsequent polishing typically takes 2–2.5 hours, while remaining more traumatic and less physiological in terms of thermal and mechanical impact.

The indices of client retention and loyalty merit special attention. According to salon data, clients describe the procedure as a SPA experience: a sensation of a cool spray, absence of burning and painful episodes, and a visually clean yet non-traumatized proximal nail fold. The durability of the coating in this case averages 3–4 weeks without lifting and pronounced chipping, which is comparable to or exceeds the parameters of classical hardware manicure. An important clinical and aesthetic effect is that the cuticle grows out with a smooth line, without fraying and hangnails, which often form after dry aggressive cutting due to microinflammation and compensatory hyperkeratosis. This additionally reduces the need for frequent traumatic corrections and decreases the cumulative load on the periungual tissues.

Histologically, the skin of the cuticle and the proximal nail fold is represented by layers of cornified keratinocytes organized in the form of overlapping keratin scales. During dry hardware treatment, the rotating bur often mechanically lifts and roughens the edges of these scales, creating a microscopic relief with multiple irregularities. In contrast, in the wet mode, water induces swelling of the stratum corneum, increasing the plasticity of keratinocytes and their ability to redistribute under the action of the abrasive. As a result, rotation of the bur in the presence of an aqueous medium essentially functions as a polishing mechanism: the scales are smoothed, their edges are sealed, and micropores are closed. This determines a pronounced and more prolonged effect of glossy skin of the periungual fold, accompanied by a significant reduction in the frequency of hangnail formation.

Additionally, damping of the vibrational component due to the water layer exerts a protective effect on the matrix area and the germinal layer of the nail, reducing the mechanical load on these structures and thereby preventing the formation of transverse grooves (Beau lines).

## 4. Conclusion

The study conducted makes it possible to formulate a number of theoretically and practically significant conclusions.

First, a change of technological paradigm in the nail service industry is clearly traceable. Historically, basic manicure protocols relied on the use of water baths, which provided softening of the stratum corneum but were accompanied by a high risk of microbial contamination, skin maceration, and a decrease in the barrier function of the epidermis. The transition to dry device-based techniques was driven by the aim to increase hygienic safety and the predictability of outcomes; however, it simultaneously intensified thermal and mechanical load on the tissues. The current stage of evolution is characterized by a return to water, but no longer in the form of baths, rather as controlled spray systems integrated into device-based protocols. Thus, a new hydrotechnological paradigm is being formed, combining controlled hydration with high precision of device-based impact.

Second, it has been shown that wet grinding is based on fundamental laws of thermodynamics and heat transfer. Under conditions of high rotational speed of the bit, intense friction arises, accompanied by a local increase in temperature within the contact zone adapter – nail plate – periungual tissues. When dry techniques are used, the temperature may approach the pain threshold and trigger denaturation processes of keratin proteins and dermal structures, which is particularly critical for patients with diabetic angiopathy and neuropathy. The presence of a water or water-spray layer increases the effective thermal conductivity of the system and acts as a heat-dissipating medium that redistributes and disperses excess thermal energy. As a result, the risk of burns, microcracks, and subclinical coagulative tissue damage decreases, which makes wet device-based treatment the most physiologically justified and safe method for individuals with diabetes, clients with impaired peripheral circulation, and increased skin sensitivity.

Third, the economic assessment of the implementation of the proprietary Nailslab technique demonstrates its high production efficiency. A reduction of the average procedure time to 1 hour 40 minutes without deterioration of the aesthetic outcome and without an increase in the frequency of complications indicates optimization of the technological cycle and more rational use of working time. With maintenance or increase of the average service fee, such temporal compression of the procedure leads to an increase in the technician's productivity per working day and, accordingly, improves the profitability of the workstation. An additional factor of economic attractiveness is the reduction in the probability of iatrogenic injuries, which in other cases may lead to reputational risks, client complaints, and potential legal claims from individuals with chronic somatic diseases.

Based on the above, it appears advisable to consider the module Wet device-based treatment in manicure as a mandatory component of educational programs for nail service practitioners. Integration of this module at the level of the basic professional standard will allow specialists to develop not only technical skills but also clinical and physiological thinking: understanding the mechanisms of tissue damage, the principles of thermoregulation in the intervention area, and the specific features of working with high-risk groups (individuals with diabetes, patients with autoimmune and vascular diseases, persons taking anticoagulants, etc.). Thus, the method can serve not only as a tool for increasing the commercial appeal of the service but also as a basis for shaping a new safety culture, preventing occupational diseases among practitioners, and minimizing medical risks for clients.

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