

Negative Effects of Devices and Materials Used in Beauty Centers

Zahraa Ali Aswad

University of Baghdad, College of Science for Girls, Department of Medical Physics

Yassin Sobhi Eada Abd

University of Fallujah, College of Applied Sciences Department of Medical Physics

Hassan same mhool

Madenat al_Elem University College, Department of Medical Physics

Nour Al-Huda Ali Kazem

University of Wasit, College of Science, Department of Medical Physics

Abstract:

Beauty centers are not always disinfected and can be a source of many contagious diseases such as skin infections, the spread of herpes simplex, and more. Centers not following proper sanitation can lead to serious side effects to customers who undergo services at these centers. The materials and devices used in beauty centers also have their side effects. Harsh creams and gels may lead to skin infections and rashes. Lasers and IPL can cause skin burns and discoloration. Manicure and pedicure equipment may lead to nail and skin infections, as they come in direct contact with the body. Beauty is considered important by most people in the modern era. There is a lot of competition to look beautiful, both in personal life and in professional life. This is the reason behind the dramatic increase in beauty centers, beauty salons, and beauty parlors. Beauty or cosmetology has become a great career option as it is in great demand. Beauty centers and beauty salons make use of a variety of materials such as creams, gels, masks, and devices such as lasers, IPL machines, and more to enhance beauty.

Introduction

Beauty is considered important by most people in the modern era. There is a lot of competition to look beautiful, both in personal life and in professional life. This is the reason behind the dramatic increase in beauty centers, beauty salons, and beauty parlors. Beauty or cosmetology has become a great career option as it is in great demand. Beauty centers and beauty salons make use of a variety of materials such as creams, gels, masks, and devices such as lasers, IPL machines, and more to enhance beauty. Beauty centers are not always disinfected and can be a source of many contagious diseases such as skin infections, the spread of herpes simplex, and more. Centers not following proper sanitation can lead to serious side effects to customers who undergo services at these centers. The materials and devices used in beauty centers also have their side effects. Harsh creams and gels may lead to skin infections and rashes. Lasers and IPL can cause skin burns and discoloration. Manicure and pedicure equipment may lead to nail and skin infections, as they come in direct contact with the body. [1][2]

2. Common Devices and Materials Used in Beauty Centers

Beauty centers often offer various beauty services using many devices and materials. But these devices and materials are potentially damaging. This section will introduce common devices and materials that are used in beauty centers.

2.1. Laser Machines

The laser machine is favored by beauty salons for reshaping the eyebrows. It uses a point laser beam to mark dots on the eyebrow, achieving a neatly curved line. This method is favored for its efficiency and cost savings, particularly because maintaining natural brows often requires repeated threading. Moreover, its permanence causes concern among women.

Completely reshaping the eyebrows using the laser machine is not as simple as it seems. While the machine can easily remove dark color brow tattoos, it struggles with lighter color brow tattoos due to older technology. Moreover, the operation of the machine must follow the curve of the brow; otherwise, the color of the brow tattoo will change. Therefore, brow tattooing is still quite dangerous. [3][4]

2.2. Chemical Peels and Acids

This beauty service involves applying chemicals to the face—often at-home peels in a pack as gifts and promotional offers, making it a cheap and widely available service. The chemicals are usually highly acidic, such as TCA (Trichloroacetic acid), AHA (Alpha hydroxy acid), or phenol. However, most clients are unaware of the risks, as these pack peels do not provide any guidance about restrictions or procedures to follow beforehand and afterward. [5][6]

2.3. Microdermabrasion Tools

This technology was introduced in Europe over 20 years ago. Beauty salons have recently begun importing the machines, promising a smooth and glowing skin surface with a crystal exfoliation process. However, clients are often unaware of the potential risk damage since there have been no official documents regarding safety and harmful substances. Clients need to thoroughly investigate all these devices and materials and their side effects before undergoing these beauty procedures.

2.1. Laser Machines

Beauty centers around the world are preferred places for many to undergo beauty procedures or maintenance for different purposes. Procedures and materials used in many beauty centers can have their advantages and disadvantages. A few devices and materials used in beauty centers will be discussed, focusing on their negative effects.

One of the most common devices used in beauty centers all around the world are laser machines; laser hair removal, tattoo removal, and skin treatment devices are popular devices used in many beauty centers every day. Lasers used in beauty treatment devices include diodes, Alexandrites, Ruby, etc. Laser machines have been shown to cause severe damage to skin, eyes, and internal organs if proper protection and procedures are not utilized. It must be understood that laser devices are not simply machines that beauticians use. Light exposure can severely damage tissue (skin), and a few millimeters of distance under high power light exposure can cause skin burns. Most lasers are designed to dissipate energy as heat, thus causing burns in skin tissues. Most untrained beauticians are not aware of the dangers of misuse of laser devices and heat transfer. The first line of defense against improper usage of laser devices should be CRY devices. CRY devices usually include a Peltier cooler. CRY devices lower tissue temperature naturally, hence stopping the burn on laser misuse. However, Peltier coolers are expensive and seldomly found in beauty centers. The second line of defense against improper usage of laser devices should be Cryoguns which are CO₂-based devices. Cryoguns cool surrounding tissues using CO₂ cooling gas vapor against laser misuse. However, Cryoguns are also seldomly found in beauty centers. The most probable common reasons for burns are improper usage of laser devices near nearby nerves. It is roughly 15mm from skin to subdermal epidermis, and beauty laser devices are used directly near major nerves. This poses severe risks to nervous systems if lasers are used in these spots. 1064nm NIR lasers such as Nd-YAG can also raise body temperature and pose additional dangers in heat transfer in these spots. Conclusively, laser devices pose a high risk of burns, skin/nerve damage, blood loss in beauty centers due to a high likelihood of beauticians with no prior training. [7][8]

2.2. Chemical Peels and Acids

Chemical peels are one of the most popular beauty treatments, and they have been for many years already. There are different types of acids, from the strongest to the mildest, with the lightest being glycolic acid. Acids are sometimes referred to as cosmeceuticals and can be found in many products used in beauty salons and even purchased for home use. Acids are recommended very often for very different skin types, such as oily skin, dry skin, aging skin, sensitive skin, acne-prone skin, skin with hyperpigmentation, etc. With so many different acids, many therapists do not even know what those acids actually are. These materials and devices can be used incorrectly, and clients do not always know what they are getting; in most cases, they trust the hands of their beauty experts. However, it's good to be informed about what is being used and if these procedures should be avoided.

What are these materials? Acids are used in cosmetic formulations for two main reasons: chemically exfoliate the skin and pave the way for other cosmetic products to penetrate the skin. These were the first type of cosmetics that were approved by the FDA for over-the-counter sale in concentrations as high as 10%. Although acids are sometimes compared with salicylic acid, they are entirely different. Alpha hydroxy. A hydroxy acid is an organic compound with both hydroxyl (-OH) and carboxylic acid (-COOH) groups attached to the same carbon atom. Alpha hydroxy acids are also known as fruit acids because they are derived from a variety of natural sources: glycolic sugar cane, citric lemons and limes, tartaric grape, lactic sour milk, mandelic bitter almonds, pyruvic acids, cooper, etc.

Acids can be synthetic or natural. Natural hydroxy acids come from plants or fruits and are naturally harmless, biodegradable, and non-corrosive to the skin. Chemical peeling can be defined as the application of an irritating agent, such as fruit acid, on the skin to accelerate the natural desquamation process caused by age and sun exposure. This is a commonly performed procedure in beauty salons. Chemical peels using alpha hydroxy acids are at present popularly used in many cosmetic systems and thus have led to increased professional interest in their use for skin care.

Acids have now gained importance not only in cosmetics but in the area of dermatology as well. [9][10]

2.3. Microdermabrasion Tools

Microdermabrasion is another mechanical procedure used to rejuvenate the skin. It was introduced in the late 1980s and has gained popularity thereafter. There are various microdermabrasion devices available, but commonly used are the diamond microdermabrasion devices. Water-spray microdermabrasion devices are also available, but some studies say that diamond microdermabrasion devices are better.

In simple language, microdermabrasion is a procedure in which a diamond-tipped wand is used to exfoliate the uppermost layer of the skin. During this procedure, fine, dust-like particles of natural ingredients (like alumina crystals) are sprayed onto the skin surface while the diamond-tipped wand scrapes off the crystals and the uppermost layer of the skin. This lowers the chance of redness after the procedure. This system is basically a vacuum one. As the crystals come in contact with the skin, they are suctioned back up using a thin tube connected with a vacuum. This whole setup is connected with a motor that powers the suction pump.

Using a diamond microdermabrasion device reduces the chances of complications post-procedure like a rash or discoloration of skin, but care must be taken that an instrument with a smaller diamond size should be used as a starting point, and only those patients should be treated for whom the treatment is advised. One should avoid treating the patients simultaneously, so that there is no chance of cross-infection. Another important factor is that treatment planning should be done very carefully and communicated to the patients properly so that they are not disappointed.

Microdermabrasion has become one of the most common procedures performed at cosmetic surgery clinics all over the world. It is primarily used to treat acne scars and other post-acne scars, surgical scars as well as stretch marks. It is also being used to treat skin conditions like melasma, which were otherwise difficult to treat. But this treatment too has certain limitations and side effects like all other commonly used procedures. A few studies have reported that granules in crystals might enter the skin and are not splattered during the procedure, but studies on that are still awaited. [11][12]

3. Potential Risks and Side Effects

Facial treatment equipment is currently a necessity in beauty centers and clinics providing skin treatments. They allow beauty establishments to provide advanced skincare and beauty treatments that are effective, safe, and compliant with established quality standards. Beauty devices and cosmetics that are used inside beauty centers should be considered by customers since they may cause various side effects. There are potential risks and side effects from the use of devices and materials in beauty centers.

3.1. Skin Irritation and Allergic Reactions

One of the most common risks that arises after the treatment is skin irritation caused by the use of devices and materials. Broken skin, redness, swelling, scaling, and an itching or burning sensation are all associated with an irritating reaction. Microdermabrasion, chemical peels, and laser treatment equipment, which are devices that severely ablate the skin, all may cause such side effects.

Redness that occurs a few hours after treatment usually subsides within 8 hours. For beauty centers utilizing lasers, redness should rather subside in a few days. The fact that skin used on such devices will be less immune to external stimuli makes such devices more prone to irritation. Moreover, if post-care is not performed accordingly (for example, applying a proper soothing cream or avoiding sun exposure), irritation may last longer.

Another possible side effect of light exposure treatments is skin allergy. Allergic reactions may present as rashes, itchy spots, or a burning sensation. This usually occurs due to the use of photosensitizing materials in skincare. These materials may be derived from various sources, such as skincare products, soaps, or antibiotics. Some herbs or slimming products may also cause allergic reactions when exposed to light. [13][14]

3.2. Hyperpigmentation and Hypopigmentation

As mentioned in the previous discussion, exposure to light in certain conditions, either a source of light or a broad range of light, may cause burns. For burns, it is better to leave it treat it the old-fashioned ways, that is, applying cooling gels only. However, this may result in other complications like hyperpigmentation or hypopigmentation.

Patients who get treated with brightening agents often complain that their skin becomes darker after treatment. Though usually harmless, hyperpigmentation causes a bad skin tone and uneven color. While post-inflammatory hyperpigmentation refers to discoloration caused after an injury, epidermal hyperpigmentation occurs as a result of increased melanin synthesis (or turnover), still leaving melanosomes intact. Induction of new melanin production would be a complex process depending primarily on increasing the secretion of infrared radiation.

Another potential side effect that occurs after treatment is hypopigmentation. This is the opposite of hyperpigmentation, possibly caused by ablative lasers or peels. Normally, this is rather unlikely to aggravate; however, some patients might not heal as expected, resulting in persistent whiteness in many areas of the treated region. [15][16]

3.3. Scarring

Scarring is regarded as a more severe side effect than burns. It is felt as a burning sensation, and scarred areas appear dark red or dark brown (in a skin-lightening treatment). There are adverse events that the device has hurt the customer's skin, most commonly caused by a machine accidentally bumping too hard (for example, equipment going out of control or a sudden jerky motion) or incorrect positioning of equipment on the face.

3.1. Skin Irritation and Allergic Reactions

Beauty centers are increasingly becoming popular, as various devices and materials, such as lasers and chemical peels, are used to enhance and treat the skin. However, beauty treatments may be harmful to skin, as many devices and materials are used in beauty centers that may cause negative effects. This paper aims to provide a review of the negative effects of devices and materials used in beauty centers.

Skin is the most important part of the human body, which acts as a barrier against bacteria, viruses, and other germs. It is also the aesthetic layer for humans, indicating age, emotions, and health. It has three layers: the epidermis, the dermis, and the hypodermis. Skin types (oily, dry, normal, and sensitive) can also affect the beauty devices and materials used. Beauty centers have become increasingly popular as people spend a lot of time in various external environments and focus on their beauty; therefore, they want to keep their skin healthy and beautiful. Various devices and materials, such as lasers, ointments, and chemical peels, are used in beauty centers.

Beauty treatment is a procedure for skin enhancement and treatment. Beauty treatment may be harmful to the skin, and there are many cases of skin damage after treatment. Devices and materials used in beauty centers may cause the following negative effects: skin irritation and allergic reactions, hyperpigmentation and hypopigmentation, and scarring. Beauty devices affect the skin on which they are treated, as they are suddenly exposed to a new environment. As a result, negative effects occur. Beauty materials with chemical components may irritate the skin after treatment and

can cause redness and itchiness. Therefore, it is important to understand the skin type to avoid side effects.

Skin is the largest organ in the human body, and its primary function is to serve as a protective barrier against the external environment. However, skin can be irritated by many internal and external factors. Skin irritation is described as the burning, stinging, or tingling feeling experienced when the skin is damaged or sublethally injured. The skin is damaged when treatment is unusually hot, dangled, elder, scratched, or burned. Skin irritation after beauty treatment sometimes leads to allergic reactions. An allergy is defined as an exaggerated immune response or hypersensitivity to particular substances. Skin may be irritated and cause an allergic reaction when beauty devices and materials are used which contain chemicals. An allergic reaction may be an atopic dermatitis, contact dermatitis, or urticaria. [17][18]

3.2. Hyperpigmentation and Hypopigmentation

Hyperpigmentation and hypopigmentation are skin conditions that may arise due to various reasons. When these conditions result from adverse reactions to treatments performed at beauty and aesthetic treatment centres, they are considered treatment-induced. A wide range of chemical, physical, and laser treatment-related mechanisms may lead to skin colour changes. Many of these changes are short-lived but some may persist and may be permanent.

Hyperpigmentation is characterized by an increase in skin colour where dark patches appear on otherwise normal skin. Acquired hyperpigmentation can result from various pathologic, physical or treatment-related causes. Some treatment-related causes include the use of topical agents or procedures such as chemical peels, dermabrasion, laser, etc. The most common secondary causes of hyperpigmentation are post-inflammatory hyperpigmentation from an injury or wound (most common in darker skin types), melasma (chloasma), lentigines (solar lentigines and drug-induced lentigines), drug-induced hyperpigmentation, and endocrine-related. Pityriasis alba is a common cause of secondary hypopigmentation in children.

The most common cause of treatment-induced hypopigmentation is corticosteroid use. Topical, intralesional and systemic corticosteroids may result in skin lightening. Use of corticosteroids induces atrophy and thinning of the epidermis which results in a decrease in melanocyte number and function. As a consequence, there is a decreased transfer of melanin to keratinocytes, resulting in hypopigmentation. Other dermatologic agents that cause epidermal atrophy include topical Vitamin A acid, topical antimetabolites (5-FU, methotrexate), isotretinoin, and topical Dapsone. After treatment cessation, there may be a transient post-inflammatory hyperpigmentation followed by long-term recovery of skin pigmentation. [19][20]

3.3. Scarring

Scarring is a potential risk associated with the use of certain procedures employed within beauty centers. Some procedures, especially invasive ones, require invasive techniques that can result in permanent scars, which could become independent and further aggravate the beauty imperfections they were intended to eliminate. Other non-invasive procedures may cause abrasions that could become permanent scars due to mishandling or improper treatment. Beauty centers must ensure comprehensive training of staff and implement strict standards to avoid abrasion caused by non-invasive procedures.

Scars may remain reddish in color for 2-6 months after healing. If they do not go pale after 6 months, they are permanent. Common forms of permanent scars include atrophic scarring (acne scars), hypertrophic scarring (thickened raised scars), keloids (scars that spread beyond the original wound), and contractures (tight scars after burns). There is the presence of an unequal balance of

collagen types in keloids (separate scars), with a predominance of collagen type I without the normal organization of collagen fibers, resulting in the formation of scar fibrotic tissue.

For the treatment of this kind of scars, surgical procedures can be performed for removal, cryotherapy, or laser therapy, although results are not satisfactory and relapses are frequent. Other more labor-intensive procedures involving the polishing of scarred areas may be performed at the expense of considerable depreciation. There are non-invasive methods of scar alleviation at the base of herbal medicine for dermatologic purposes and the improvement of collagen metabolism in scar tissue. Ingredients such as prickly pear oil and raspberry seed oil should have at least one of the compounds that possess free radical scavenging capabilities like vitamin E (tocopherol), polypeptides, or triterpenes. [21]

4. Regulations and Safety Standards

Many medical equipment, both therapeutic and diagnostic, have health risks that may not be immediately evident. Long-term exposure to radiation may cause skin and eyes to develop cataracts. Equipment that is the source of non-ionizing radiation, such as lasers, may damage the skin either through thermal effects or by directly affecting cell metabolism, leading to the development of tumors. There is also a risk of transmission of infections as a result of incorrect operation of vacuum aspirations, coagulating methods, and improper sterilization of instruments for aesthetic and surgical treatments.

Similarly, many chemicals used in beauty parlors or by patients at their home don't highlight the possible side effects. Some hair dyes may evoke allergic reactions, some creams contain hormones that badly affect one's looks afterwards. Also, ungrounded self-care and self-treatment may lead to injuries, burns, or escalation of the disease. The standard of beauty parlors was often written by the equipment providers themselves, focusing on properties of the devices they distribute, rather than on health risk control.

The last decades show an increase in the awareness of these issues and attempts to regulate this branch. In Poland, the standard for beauty parlors is being presently developed under the aegis of the Polish Center of Normative Quality. It takes into consideration both equipment and the methodology of treatments performed. Not only beauty parlors use this equipment, but also dermatological or surgical outpatient departments. Safety standards on working places have been developed for some of these devices. [22][23]

5. Conclusion

Advances in beauty equipment technology have given rise to sophisticated mass-produced machines that employ a multitude of cosmetics in centers primarily focusing on cosmetic applications. However, the equipment and materials used, daily struggles, and issues associated with them have largely gone unstudied. It is vital to consistently study the negative effects and healthcare strategy of equipment and materials used in beauty centers.

The risk of thermal burn, fire, or explosion with laser devices at some beauty salons is high. Various lasers such as the Nd-Yag and diode lasers that use water cooling systems, oily wax heating, and cryogen cooling are dangerous and can result in mycobacterium infections. Beauty materials are microinjected needles with hyaluronic acid or mix anesthetics of lidocaine, epinephrine, and tetracaine. Microinjected cosmetics can introduce bacteria into the skin and result in abscess or hematoma if tools aren't disposed properly. Beauty materials can be anaphylaxis and necrotizing fasciitis toxic substances. Also, higher concentrations of lidocaine and epinephrine toxic to patients have been medically noted. Raw materials for beauty materials go through precision formulation. There is a need for safety studies on materials used in beauty centers that relate to health issues, and lots of accidents should be monitored.

References:

1. M. Tagesse, M. Deti, D. Dadi, B. Nigussie, et al., "Non-combustible source indoor air pollutants concentration in beauty salons and associated self-reported health problems among the beauty salon workers," *Risk Management and Healthcare Policy*, vol. 2021, Taylor & Francis, 2021. tandfonline.com
2. NK Asare-Donkor, J Kusi Appiah, V Torve, "Formaldehyde exposure and its potential health risk in some beauty salons in Kumasi Metropolis," *Journal of ...*, vol. 2020, Wiley Online Library. wiley.com
3. C. Menozzi-Smarrito and S. Smarrito, "Laser removal of cosmetic eyebrow tattoos with a picosecond laser," *Dermato*, 2023. mdpi.com
4. I. Kurniadi, F. Tabri, A. Madjid, A.I. Anwar, "Laser tattoo removal: Fundamental principles and practical approach," *Dermatologic Therapy*, vol. 2021. Wiley Online Library. 103.195.142.203
5. Q. Zhao, Q. Ge, Y. Shang, M. Zheng, X. Sun, S. Bao, et al., "Eating with peel or not: investigation of the peel consumption situation and its nutrition, risk analysis, and dietary advice in China," *Food Research International*, vol. 2023, Elsevier, 2023. [HTML]
6. P. S. Parihar and S. Chaudhary, "An Ecofriendly Approach of Using Fruit and Vegetable Peels and its Various Uses or Benefits.," 2023. researchgate.net
7. E. Khalkhal, M. Razzaghi, M. Rostami-Nejad, et al., "Evaluation of laser effects on the human body after laser therapy," *Journal of Lasers in Medical Sciences*, vol. 2020, ncbi.nlm.nih.gov. nih.gov
8. [1] Commission on Non-Ionizing Radiation Protection, "Intended human exposure to non-ionizing radiation for cosmetic purposes," *Health*, 2020. journals.lww.com. lww.com
9. AFC Barote, EH Genelsa, FBJ Alaba, "POTENTIAL TOXICITY OF ALPHA AND BETA HYDROXY ACIDS IN COSMETIC PRODUCTS: A REVIEW," *academia.edu*. academia.edu
10. M. Contardi, M. Lenzuni, F. Fiorentini, M. Summa, et al., "Hydroxycinnamic acids and derivatives formulations for skin damages and disorders: A review," *Pharmaceutics*, 2021. mdpi.com
11. S. Razi, T.M. Truong, S. Khan, "In vivo assessment of early effects of diamond-tipped microdermabrasion through the lens of line-field confocal optical coherence tomography," *Journal of Cosmetic Dermatology*, vol. 2024, Wiley Online Library. wiley.com
12. N. Elmelegy, "Epiderm-abrasion-assisted Intensive Pulsed Light and Radiofrequency in aesthetic treatment extensive facial freckles," *Aesthetic Plastic Surgery*, 2020. [HTML]
13. J. Piquero-Casals, J. M. Carrascosa, et al., "The role of photoprotection in optimizing the treatment of atopic dermatitis," *Dermatology and Therapy*, vol. 2021, Springer, 2021. springer.com
14. SF Mujtaba, AP Masih, I Alqasmi, A Alsulimani et al., "Oxidative-stress-induced cellular toxicity and glycoxidation of biomolecules by cosmetic products under sunlight exposure," *Antioxidants*, 2021. mdpi.com
15. T. S. Alster and M. K. Li, "Dermatologic laser side effects and complications: prevention and management," *American Journal of Clinical Dermatology*, 2020. [HTML]
16. JD Lee, MJM Oh, "Complications and Management of Laser Therapy," in *Lasers in Dermatology: Parameters and Choice: With ...*, Springer, 2023. [HTML]

17. M. Kucharczyk, M. Słowik-Rylska, "Acrylates as a significant causes of allergic contact dermatitis—new sources of exposure," in *Dermatology and Allergology*, 2021, [termedia.pl](https://www.termedia.pl)
18. OA Olusegun, BS Martincigh, "Allergic contact dermatitis: a significant environmental and occupational skin disease," *International Journal of ...*, vol. 2021. Wiley Online Library. [HTML]
19. N. Masub and A. Khachemoune, "Cosmetic skin lightening use and side effects," *Journal of Dermatological Treatment*, 2022. [academia.edu](https://www.academia.edu)
20. M. Sommerlad, "Skin lightening: causes and complications," *Clinical and Experimental Dermatology*, 2022. [HTML]
21. K. Dastagir, D. Obed, F. Bucher, T. Hofmann, et al., "Non-invasive and surgical modalities for scar management: a clinical algorithm," *Journal of Personalized Medicine*, vol. 2021, [mdpi.com](https://www.mdpi.com), 2021. [mdpi.com](https://www.mdpi.com)
22. A. Gębska-Kuczerowska, I. Kucharska, et al., "Disposal of waste from tattoo and beauty parlors in Poland: a survey-based analysis on epidemiological safety," *International Journal of ...*, 2021. [mdpi.com](https://www.mdpi.com)
23. A. Gębska-Kuczerowska, I. Kucharska, and Co-authors, "Assessment of epidemiological safety in the cosmetic service industry in Poland: a cross-sectional questionnaire study," *International Journal of ...*, 2021. [mdpi.com](https://www.mdpi.com)