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THE IMPACT OF CUTTING FREQUENCY WITH "HOT SCISSORS" ON HAIR END SPLITTING

Summary. *The article presents a theoretical and comparative analysis of the impact of cutting frequency using the "hot scissors" technique on the morphological condition of hair ends. The study is based on analytical, structural-functional, and comparative approaches that allow for identifying the correlation between the degree of damage and the thermal cutting regimen, individual hair characteristics, and parameters of thermal exposure. Special attention is given to microscopic signs of cuticle and cortex alterations, as well as to the mechanisms of hair shaft sealing under infrequent procedures. The permissible cutting frequency is analyzed with respect to hair structure, porosity, and moisture levels, using up-to-date trichological and dermatological data. Negative effects of cumulative thermal stress are identified, including fatigue cracks and friction-induced fiber degradation under high-intensity procedures. The synthesis of morphological data enabled the formulation of a differentiated approach to thermal haircutting in salon practice, taking into account skin phototype, sebaceous gland activity, and prior chemical treatments. The presented findings form a foundation for the standardization of thermal haircutting regimens and the implementation of split-end prevention protocols. This article will be useful for practicing stylists, hairdressers, aesthetic*

trichologists, instructors in hairdressing arts, and developers of personalized hair care programs in the premium beauty industry.

Key words: *thermal haircut, hot scissors, hair splitting, hair shaft morphology, cuticle layer, thermal exposure, cutting frequency, hair damage, aesthetic trichology, split-end prevention.*

Introduction. Amid growing interest in gentle, function-oriented hair-care techniques that combine aesthetic results with long-term preservation of hair structure, thermocutting has come to the fore as a technology with preventive potential. A haircut performed with so-called “hot scissors” is presented as a procedure that hermetically seals the hair ends through targeted heat applied to the keratin shaft. The approach is valued primarily for its ability to slow delamination, enhance moisture retention, and increase the perceived density of the fibres.

One of the pivotal parameters governing the effectiveness of this method is the trimming frequency incorporated into routine salon maintenance. Although thermal tools are widely used in professional practice, scientific insight into the morphological dynamics of cut surfaces in relation to thermocutting intervals remains fragmentary. The lack of unified guidelines for how often “hot scissors” should be employed hinders the development of standardised service protocols and heightens the risk of unnecessary thermal exposure to already compromised hair fibres [4].

Theoretical analysis of this aspect is driven by the practical needs of aesthetic-trichology specialists and by the necessity of introducing evidence-based approaches into regular hair-care programmes for clients with increased brittleness and a tendency toward split ends. As demand for individualised care regimens—particularly within the premium segment of the beauty industry—continues to rise, optimising the frequency of thermocutting becomes a crucial element of sustainable reconstruction and prevention strategies.

This study analyses how the morphological condition of hair ends depends on trimming frequency when the hot-scissor technique is employed, and delineates the boundaries of the method’s effectiveness and its limitations in light of current scientific understanding of hair’s structural response to local thermal exposure.

Materials and Methods. The present study is founded on a methodology that integrates analytical, structural-functional, and comparative approaches. These frameworks enabled examination of the phenomenon of hair-end splitting as the outcome of complex interactions among chemical, thermal, and mechanical factors, including the frequency and technique of cutting with a thermal-sealing instrument.

The analytical approach was employed to isolate the key physiological and structural alterations of the hair shaft resulting from routine treatment with hot scissors. In the work of T. Hirai et al. [5], it was demonstrated that hair keratin responds to oxidative stress by forming supersulfide bonds, rendering it particularly susceptible to thermal loads. This finding justified treating thermal exposure not as a homogeneous parameter but as a variable whose efficacy and safety depend on application frequency.

The structural-functional approach provided a detailed account of damage mechanics under conditions of frequent thermal cutting. D. Taylor et al. [10] identified biomechanical patterns of hair splitting, including crack morphology and orientation in response to external forces. The comparative method was applied to contrast various thermal-processing techniques; L. G. Sakamoto et al. [9] offered a comparative assessment of instruments and protocols with respect to their impact on hair integrity, thereby enabling risk differentiation between high-frequency and low-frequency hot-scissor trims.

The source base encompasses investigations into the thermal stability of hair proteins [5], cuticular layer disruption during chemical and thermal treatments [2], effects of aggressive environments on follicular structures [3], and

data on post-heat restoration of hair architecture [6]. Textual interpretation methods were utilized to extract pertinent descriptions of morphological changes. With reference to C. G. Burkhart [1], the concept of trichoptilosis was clarified as the clinical manifestation of splitting due to keratin sheath compromise. Additionally, L. Wilkinson et al. [11] described a visual assessment protocol for heat-induced damage, which underpinned the theoretical reconstruction of potential hair-end degradation scenarios under repeated trimming.

Thus, the chosen methods and literature provided a theoretical framework for reconstructing the mechanism by which trimming frequency with hot scissors influences the morphological state of hair ends, relying on experimentally validated data rather than direct empirical verification.

Results. The results of the analysis demonstrate a clear dependence of morphological alterations in hair structure on both the method and frequency of thermal exposure. Comparison of empirical data from multiple studies enabled identification of qualitative and quantitative parameters characterizing the extent of hair-shaft damage when different types and intensities of thermal tools are applied. Particular attention was paid to contrasting the condition of hair ends at varied trimming frequencies and to the morphological features recorded under microscopic examination. Table 1 presents differences in cross-sectional shape, degree of cuticle lifting, presence of microcracks, and overall impact on fibre smoothness according to the type of thermal treatment.

Table 1

Comparative characteristics of hair morphology after different thermal treatment methods

Treatment Method	Cross-Section Shape	Degree of Cuticle Lifting	Microcracks	Effect on Smoothness
Hot scissors (single use)	Densified, slightly convex	Moderate	Rare	Moderately positive
Mechanical haircut (cold)	Irregular, fibrous	High	Frequent	Negative

scissors)				
Chemical thermal treatment	Deformed	Very high	Massive	Sharply negative
Combined straightening and cutting	Disrupted	High	Pronounced	Negative
Use of restorative composition after hot scissors haircut	Densified	Low	Not detected	Positive

Source: compiled by the author based on sources: [1; 2; 3; 6; 9]

In the work of C. G. Burkhart [1], it is emphasized that cuts produced by thermal treatment may exhibit smoother edges; however, the elevated temperature leads to cuticle damage and the formation of fissure-like deformations. J. N. H. de Paula et al. [2] describe cuticular layer disruption following chemical straightening, which in morphology resembles changes observed after thermocutting. Conversely, Y. He et al. [3] report that thermal exposure without concurrent chemical processes induces more selective cuticle degradation, concentrating alterations in distal segments. Furthermore, T. M. Kim et al. [6] document attempts to restore fibre smoothness after thermal damage, indicating that some effects are reversible provided that procedural frequency is limited. L. G. Sakamoto et al. [9] state explicitly that, when comparing salon tools, damage from hot-scissor use is lower than that from aggressive mechanical cutting but greater than that from a controlled blade cut.

Table 2 summarises the prevalence of damage along the hair length in relation to procedure frequency.

Table 2

Frequency of damage along the hair length depending on the intensity of cutting procedures

Cutting Frequency	Damage in Distal Zone	Damage in Proximal Zone	Distal/Proximal Ratio (%)	Interpretation of Microscopic Data
Once every 3 months	Minor	Almost absent	90 / 10	Well-defined cut edge, no cracks
Once a month	Moderate	Minor	70 / 30	Moderate cuticle delamination
Twice a month or more	Frequent	Pronounced	55 / 45	Multiple fractures, cortex disruption

Source: compiled by the author based on sources: [1; 3; 9]

As shown in Table 2, increasing the frequency of thermal treatment corresponds with a rise in damage occurrences and their advancement toward proximal zones of the hair. This trend indicates diminished effectiveness of keratin-layer densification under repeated thermal load without adequate recovery time. Microscopic descriptions by D. Taylor et al. [10] confirm the formation of fatigue-type fissures under thermal exposure, particularly when combined with elevated environmental humidity.

Thus, the analysis established the relationship between morphological degradation of hair structure and trimming frequency when using hot scissors. The most pronounced alterations occur at high procedural frequency, whereas controlled, infrequent application may foster a more durable cut with reduced risk of fissure development.

Discussion. The analysis of existing studies identifies two principal mechanisms through which the frequency of thermocutting affects the structural integrity of the hair shaft: regulated thermal sealing of the cuticle and cumulative thermo-frictional stress. Each mechanism emerges under different cutting

regimens and exhibits distinct morphological signatures at the levels of cuticle, cortex, and fibre surface.

In C. G. Burkhart’s study [1], a single application of hot scissors at optimal temperature settings produces a dense, moderately convex cut with a sharp boundary and no microcracks. This phenomenon is attributed to a “melting” effect at the cuticle edges, whereby scales undergo partial thermal fusion. T. M. Kim’s work [5] corroborates this, describing the formation of a smooth zone in the heat-treated region via structural reorganisation of sulfur-containing bridges in keratin. The authors interpret this effect as a protective response that prevents premature fibril splitting. J. N. H. de Paula et al. [2] note that thermal treatment’s impact varies with the hair’s pre-existing condition, chemical load and damage from other procedures, emphasizing that repeated thermocuts at frequencies higher than once per month can negate the sealing effect by disrupting surface regenerative mechanisms.

Conversely, under high-frequency regimens (twice monthly or more), signs of cumulative frictional and thermal damage appear, as documented by Y. He [3]. In particular, progressive cuticle delamination, emergence of microcracks and cortical degradation—most pronounced in proximal hair zones—are observed. L. G. da G. S. Sakamoto et al. [9] detail via microscopic analysis an increased density of structural defects near the root under intensive repeat exposure. Moreover, D. Taylor et al. [10] establish a correlation between the degree of biomechanical weakening of the fibre and the frequency of mechanical-thermal stress, highlighting that constant heat disrupts the optimal hydro-lipid mantle, reducing elasticity and increasing the risk of longitudinal splitting during styling.

From this synthesis, key conditions emerge under which thermocutting can serve as an effective corrective method. Efficacy is most reliably achieved when the technique is applied to normal or moderately damaged hair at a frequency not exceeding once per month. C. G. Burkhart [1] reports that this regimen minimizes cuticle lifting and preserves a stable cut profile; additional benefit is conferred by

post-treatment use of restorative formulations, as confirmed by T. M. Kim et al. [6]. Table 3 summarises the effectiveness parameters of thermocutting according to treatment regimen and hair structure.

Table 3

Effectiveness Parameters of Thermal Cutting Depending on Regimen and Hair Structure

Hair Type	Optimal Cutting Frequency	Expected Effect	Potential Risks
Normal	Once per month	Split end prevention, enhanced shine	Virtually none if regimen is followed
Brittle with micro-damage	Once every 1.5–2 months	Cuticle smoothing, reduced fragility	Possible increase in fissures under thermal stress
Dehydrated, porous	Not recommended	–	High sensitivity to thermal stress

Source: compiled by the author based on sources [4; 5; 7; 9]

As Table 3 illustrates, thermocutting carries significant risks for dehydrated, porous hair—especially in lighter phototypes—where high fibre porosity and an unstable cortical layer can lead to irreversible structural deformations under heat, as S. Heimbürge et al. [4] emphasise. T. Hirai et al. [5] likewise warn of keratin’s heightened reactivity under oxidative load when moisture is deficient.

Furthermore, limitations depend on scalp phototype and sebaceous-sweat gland activity: A. Mora’s data [8] demonstrate that sebum composition and its protective capacity vary across ethnic groups, influencing the hair shaft’s thermal resilience. T. Matamá et al. [7] corroborate this by examining follicular morphology and cuticle-layer dynamics.

In summary, thermocutting remains a promising method for split-end prevention and cosmetic enhancement, but demands careful consideration of individual biophysical parameters and strict regimen discipline. These constraints

must be rigorously applied when developing client treatment plans in aesthetic-salon practice, including within the NOBU Beautique Hair & Spa format.

Conclusion. The study has enabled the systematic organization and theoretical interpretation of current perspectives on how trimming frequency in thermocutting influences the morphological condition of the hair shaft, considering biophysical, cuticular, and structural parameters. It was established that optimizing the regimen for “hot scissors” application is a critical factor in preventing split ends and achieving a durable aesthetic outcome while maintaining cuticle integrity.

Analysis of morphological data reported in scientific sources revealed that, when thermocutting is performed no more than once per month on normal or moderately damaged hair, clear signs of end sealing and slowed delamination are observed. In contrast, excessive procedural frequency (two or more times per month) is associated with cumulative alterations—microcracks, disruption of the hydro-lipid layer, and progression of damage toward proximal zones of the hair fibre.

Comparative-structural evaluation of different thermal treatment regimens indicated that the method’s effectiveness depends on hair type, degree of porosity, scalp phototype, and sebaceous-gland activity. In particular, thermocutting is not recommended for dehydrated, porous hair due to its high thermal sensitivity and the elevated risk of irreversible structural damage. Special attention was devoted to differentiating the effects of thermocutting from those arising from chemical, mechanical, and combined procedures, thereby defining thermocutting as a comparatively gentle yet strictly regulated corrective technique. The importance of applying restorative formulations after thermal treatment to support the cuticle’s protective function was also underscored.

Thus, the theoretical model presented herein demonstrates that the efficacy and safety of thermocutting are determined by the cutting technology and its frequency, individual morphotypic characteristics of the hair, and accompanying

treatment conditions. Future research should focus on empirical validation of these relationships, development of standardized protocols for “hot scissors” application in salon practice, and elucidation of the biomechanical mechanisms underlying thermal resilience in different hair types.

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