Ceramic flat irons: Improper use leading to acquired trichorrhexis nodosa

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Many newer flat iron devices used to obtain straight hair have a ceramic coating on top of the traditional metal tongs. These devices are widely available, affordable, and marketed as providing more rapid and uniform heat transmission with less hair damage. In previous years, flat irons were used mostly by individuals with curly and kinky hair types. However, the current devices have found a more widespread market including those with wavy or even straight hair of various ethnic backgrounds who desire a sleek look.

Temporary hair straightening using a flat iron is achieved by applying heated tongs to the length of the hair.1,2 This heat temporarily breaks and then reforms the hydrogen bonds in the cortex of the hair shaft.1,2 Although the goal of straightening is to alter the inner structure of the hair, the unwanted consequence may be damage to the outer protective cuticle, causing weathering-like damage and hair breakage as a result of trichorrhexis nodosa. Acquired trichorrhexis nodosa is the most common hair shaft anomaly in which the hair is fragile and easily broken; on microscopic examination, filaments of the hair shaft can be seen splayed apart3-5 (Fig 1). Prior reports have noted that hair breakage occurred in up to 18% of African American women using a hot comb.6

Ceramic coating of metals has been extensively used in the automotive and aeronautical industry, to decrease the impact of heat on the underlying metal. This technology, known as “thermal barrier coating,” allows for more desirable heat distribution, heat retention, and heat transfer characteristics and prevents failure of underlying metal parts.7 The ceramic coating on flat irons is used to transfer heat from the metal to the hair in a more even and efficient manner. Although the ceramic-coated flat irons may be more efficient than metal ones, the notion that they may be safer for the hair is misguided. In addition, the widespread use of these devices may account for more at-risk individuals who may develop hair damage from improper use of the implement. The difficulty, however, is in defining “improper use,” because different hair types will have a highly variable tolerance for heat,8-10 thus a user may not know she is overusing the implement until damage has occurred. Hair damage is usually noticed as a change in the quality of the hair, dry ends, or flyaway hair.10-14 If breakage occurs, it can happen anywhere along the length of the hair causing a shaggy or skimpy appearance to the hair. When this occurs, flat iron users may use the device even more frequently to try to tame the broken or uneven appearance of their hair, which leads to more damage (Fig 2).

Many ceramic flat irons on the market today have variable settings with maximal temperatures of up to 210°C.15,16 Skin burns can occur in users and, recently, there have been reports that these devices
should be considered household hazards because of the risk of accidental skin burns in children.\textsuperscript{15,16} Studies have shown that temperatures of 175°C to 215°C for 5 minutes are sufficient to damage most hair; this threshold may be lower if the heat is applied to damp or chemically treated hair\textsuperscript{1,8-10,17} (Figs 3 and 4). Proper use of flat irons involves application of the implement to dry hair, and specialized products may be applied to the hair before pressing to help prevent the burning and allow for smoother hair that remains straight longer.\textsuperscript{2,10} If there is a temperature setting on the device, it should be set no higher than 175°C or on the low/medium setting. How frequently the flat iron can be used depends on the individual’s hair type, but should probably not be used more than one time per week. Chemically treated hair is considered more vulnerable.

Dermatologists seeing patients with the symptom of hair loss should be aware of the widespread use of ceramic flat irons. A comprehensive assessment of hair care practices should include questions about the use of such an implement, frequency of use, and temperature setting. Hair damage can be identified on physical examination by the presence of broken blunt-ended hair of uneven lengths. In addition, small hair fragments can be easily broken off with gentle tugging on the distal ends (tug test) and microscopic evaluation of the broken bits will demonstrate trichorrhexis nodosa fractures. Counseling

\textbf{Fig 2.} A 24-year-old Hispanic patient who was using ceramic flat iron on high setting almost daily had hair of varying lengths and flyaway ends.

\textbf{Fig 3.} A 26-year-old African American woman who had been using ceramic flat iron weekly developed hair breakage after she colored her hair. Note that her nondyed black hair was largely unaffected.

\textbf{Fig 4.} A 32-year-old Hispanic woman experienced 3 months of hair shedding. She used color rinse monthly and flat iron one to two times weekly. The lower half of her hair was unruly, courser in texture, and broke off easily.
of the patient involves a discussion of the variable response to heat and the need to alter current hairstyling practices. Treatment of damaged or broken hair includes avoidance of any heat or chemicals, cutting off the damaged hair, and gentle care (minimizing friction to the hair). Full recovery may take 2 or more years.5

REFERENCES