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Case Report

Spontaneous subcutaneous emphysema of the scalp following hair coloring/treatment

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ABSTRACT

Subcutaneous emphysema of the scalp is a process often attributed to secondary factors such as trauma, infection, or a myriad of iatrogenic etiologies. Here, we are presenting a case report of an adult patient with spontaneous subcutaneous emphysema of the scalp following a hair coloring/treatment. We performed an extensive review of literature on this topic, however, could not find a single case with similar presentation of subcutaneous emphysema. This case demonstrates an unreported etiology for this diagnosis and is thus being reported for its uniqueness and to raise clinical awareness.

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Case report

A 32-year-old afebrile female without history of surgery or trauma, including no recent history of dental procedure, and no significant past medical history presented to the emergency department with swelling of her scalp and headache. Prior to presentation, the patient received hair coloring/treatment at her local beauty parlor. The treatment consisted of the following in chronological order: an organic coloring system, a volume developer, bleach which was only applied to the tips of her hair, a pH balancer, and shampoo followed by a rinse. Upon rinsing, the patient received a deep conditioning treatment and

was placed under an overhead steamer for 25 minutes after which she received conditioner spray and defrizz serum thus completing her hair treatment. The ingredients for each of these products are listed in [Table 1](#). Patient denied having any episode of cough, sneezing, hiccups, bowel movement, or any other form of valsalva maneuver between the time of her treatment and symptom onset. Patient also denied any use of oxygen, smoking, or illicit drug use.

Approximately 1 hour after the treatment, the patient began to experience swelling of her scalp, most prominent along the crown of her head and forehead. In addition, she began to experience a mild frontal headache which she described as

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Table 1 – Ingredients for products administered during the hair coloring/treatment in chronological order.

Product	Ingredients
Ionic permanent shine hair color	Aqua/water/eau, ethanalamine, cetearyl alcohol, glycol distearate, Ceteareth-20, behentrimonium chloride, oleic acid, propylene glycol, glycerin, dimethicone, aloe barbadensis leaf extract, nonfat dry milk, hydrolyzed silk, olea europaea (olive) fruit oil, sodium erythorbate, bertholletia excelsa seed oil, sodium sulfite, amodimethicone, cetrimonium chloride, Trideceth-8, dimethiconol, mica, titanium dioxide, silica, alumina, acrylates/Steareth-20 itaconate copolymer, PEG-150 distearate, fragrance (parfum), coumarin, butylphenyl methylpropional, limonene, toluene-2,5-diamine sulfate, p-aminophenol, 2-amino-3-hydroxypyridine, and resorcinol
Organic coloring system	Aqua, hydrogen peroxide, cetyl alcohol, methyl glucose, sesquistearate, Ceteth-2, Ceteareth-25, oxyquinoline sulfate, phosphoric acid, and foeniculum vulgare (fennel) seed extract
Volume developer	Aqua/water/eau, hydrogen peroxide, cetearyl alcohol, Ceteareth-20, hydrolyzed silk, pentasodium pentetate, disodium phosphate, and phosphoric acid
Bleach color system (tips of hair only)	Potassium persulfate, sodium silicate, silica, hydroxyethylcellulose, sodium lauryl sulfate, tetrasodium EDTA, hydrolyzed wheat protein, bisabolol, panthenol, CI 77007, parfum, and geraniol
pH balancing therapy	Water/eau, cetearyl alcohol, cetrimonium chloride, fragrance/parfum, phenoxyethanol, methylparaben, tocopheryl acetate, guar hydroxypropyltrimonium chloride, titanium dioxide, and vanilla panifolia fruit extract
Shampoo (two washes)	Aqua/water/eau, disodium cocoamphodipropionate, Trideceth-7 carboxylic acid, cocamide MIPA, disodium laureth sulfosuccinate, polysorbate 20, glycol stearate, polyquaternium-7, polyquaternium-10, hydrolyzed wheat protein, citric acid, fragrance/parfum, tetrasodium EDTA, caprylyl glycol, phenoxyethanol, benzyl salicylate, hexyl cinnamal, linalool, alpha isomethyl ionone, and yellow#5 (C1 19,140)
Hair treatment(under steamer for 25 minutes)	Water, behentrimonium methosulfate and cetyl alcohol, stearyl alcohol, behentrimonium chloride, cyclomethicone and dimethiconol, lauryl alcohol, cetyl alcohol, cyclopentasiloxane, Butyrospermum Parkii (shea butter), fragrance, dimethicone, DMDM hydantoin and iodopropynyl butylcarbamate, Ceteareth-20, hydroxyethylcellulose, hydrolyzed soy protein, lpsome (Centella Asiatica), aloe barbadensis leaf juice, EDTA disodium, tocopheryl acetate, mangifera indica (mango) seed butter, D&C Red#33, and citric acid
Conditioner (spray)	Water/aqua/eau, cetearyl alcohol, behentrimonium chloride, propylene glycol, cyclomethicone, fragrance/parfum, panthenol, silk amino acids, helianthus, annus (sunflower) seed extract, camellia sinensis leaf extract, Quaternium-80, methylparaben, propylparaben, eugenol, coumarin, cinnamal, linalool, methylchloroisothiazolinone, and methylisothiazolinone
Smoothing serum	Cyclotetrasiloxane, cyclopentasiloxane, cyclotrisiloxane, parfum (fragrance), hexyl cinnamal, linalool, benzyl salicylate, limonene, geraniol, amyl cinnamal, and citronellol

“discomfort.” Physical examination was significant only for crepitus to palpation of the scalp and forehead. In addition, there was no evidence of laceration, puncture, or any other violation of the dermis or epidermis. Brain and sinus computed tomography (CT) scan was performed to evaluate for any intracranial or sinus pathology. Both scans revealed subcutaneous emphysema of the scalp without any evidence of intracranial or sinus pathology (Fig. 1). Incidental findings on both studies included pneumatization of the petrous apex and prominent sphenoid sinuses. There was no evidence of pneumocephalus on either CT examination, and the skin was intact.

Patient was treated with close observation. After approximately 3 hours, patient’s swelling had notably decreased and her headache had resolved at which time she was discharged home. On telephone follow-up 3 days after presentation, patient stated that her symptoms had completely resolved without further incident. Preliminary and final clinical

diagnosis in the case was charted as subcutaneous emphysema of the scalp from topical treatment.

Discussion

Subcutaneous emphysema of the scalp has often been reported as a process secondary to traumatic or infectious etiologies including multiple types of iatrogenic causes such as dental procedures, tonsillectomy, oxygen administration via nasal cannula, and placement of a nasogastric tube [1–6]. In addition, there is at least one reported case of spontaneous subcutaneous emphysema of the scalp which was attributed to the patient’s prominent sphenoid sinuses with eventual finding of a small sphenoid sinus defect [7]. However, that particular patient presented with pneumocephalus, in addition to subcutaneous emphysema, which was absent in our

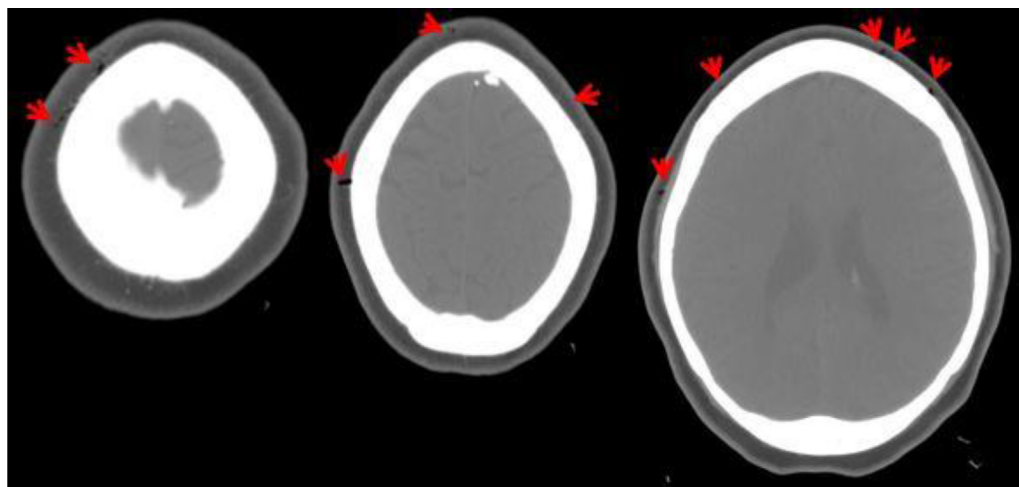


Fig. 1 – High-resolution axial CT of the head using a lung window demonstrating subcutaneous emphysema of the scalp (arrows). CT, computed tomography.

case. Spontaneous pneumocephalus with subcutaneous emphysema is something which has been reported a number of times with varying proposed etiologies [8,9], as opposed to isolated spontaneous subcutaneous emphysema of the scalp which we report here.

Our case demonstrates a reasonable likelihood for the spontaneous subcutaneous emphysema to be related to the myriad of topical products administered directly to the scalp as detailed in Table 1, possibly exacerbated or incited by overhead steaming. Further investigation and correlation with additional cases would be helpful to better understand the etiology including possible offending chemicals for the isolated spontaneous subcutaneous emphysema observed in our case.

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