

# Severe inflammatory and keloidal, allergic reaction due to para-phenylenediamine in temporary tattoos

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## ABSTRACT

Hair coloring with henna has been popular in Turkey for years. In recent years since the tattoos are applied by the street vendors in most of the beach places in Turkey, skin coloring with henna has also increased. Henna can be used alone or in combination with other coloring agents. Henna alone can be safe but due to additives such as para-phenylenediamine (PPD), *p*-toluenediamine and various essential oils, allergic contact reactions may occur. We report a 22-year-old man who developed severe inflammatory and keloidal, moderately bullous allergic reaction after henna paint-on tattoo. We did a patch test separately with these painting products (henna powder, PPD) and with the European standard series. PPD was strongly positive (+++) on day 2 and remained positive for following days. After treating with topical clobetasol-17 butyrate, resolution was obtained in two weeks. But some keloidal reaction remained.

**Key words:** Allergic contact dermatitis, henna, keloidal, para-phenylenediamine

## INTRODUCTION

Hair coloring with henna has been popular in Turkey for years. In recent years since the tattoos are applied by the street vendors in most of the beach places in Turkey, skin coloring with henna has also increased. Henna is a vegetable dye obtained from the dried leaves of *Lawsonia inermis* or *Lawsonia alba* (family Lythraceae).<sup>[1,2]</sup> Henna can be used alone or in combination with other coloring agents, such as para-phenylenediamine (PPD), for speeding up dyeing, improving pattern definition, to darken its red color and to give the appearance of permanent tattoos.<sup>[1,3]</sup> Henna alone can be safe but due to additives such as para-phenylenediamine (PPD), *p*-toluenediamine and various essential oils, allergic contact reactions may occur.<sup>[4]</sup> A review about tattoo-associated dermatoses showed three categories of conditions: 1) allergic, lichenoid, granulomatous; 2) inoculation, infection and 3) coincidental lesions.<sup>[5]</sup>

We report a case who developed severe inflammatory and keloidal, moderately bullous allergic reaction after henna paint-on tattoo.

## CASE REPORT

A 22-year-old man had a henna tattoo on his left forearm while on holiday in July. Two weeks after painting with henna, he developed itchy, slightly painful and bullous, keloidal eruption at the application side [Figure 1a,b]. On henna painting only paste was used, needle was not used. His past medical history revealed that he had never used henna tattoo for painting his skin nor coloring his hair, he had no personal or family history of atopic eczema and allergic diseases. Patient also did not mention any keloidal reaction in his past medical history. On his dermatologic examination, there was no keloidal reaction on any part of his body. At the application side, there were severe inflammatory and keloidal, moderately bullous eruption [Figure 1a,b]. Patient brought us all the ingredients, which were used for the temporary tattoo. We did a patch test separately with these painting products (henna powder, PPD) [Figure 2a] and with the European standard series. Because of the severity of the allergic reaction, patch test with PPD was applied open and patient followed up everyday. PPD was strongly positive (+++) on day 2 [Figure 2b]

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Figure 1a: Keloidal reaction due to temporary henna tattoo



Figure 1b: Keloidal reaction due to temporary henna tattoo



Figure 2a: Patch test results showing 2+ reaction to all the ingredients (left); negative reaction to pure henna (right)



Figure 2b: Strong positive reaction to PPD

and remained positive for the following days. Patch tests with pure henna powder and in alcohol solutions and with other allergens were negative. He was treated with topical clobetasol-17 butyrate and resolution was obtained in two weeks. But some keloidal reaction remained.

**DISCUSSION**

Natural henna paints the skin with a brownish-orange pigment. A variety of oils, powders and dyes are often added to henna to obtain various colors.<sup>[6]</sup> The combination of PPD and henna is marketed as ‘black henna’. Skin reactions due to black henna tattoo has been reported from all over the world.<sup>[1,3,4,7-10]</sup> In all the reported cases dermatitis occurred due to PPD and not due to henna powder. There are various types of allergic reactions reported to PPD such as persistent leukoderma,<sup>[7]</sup> severe bullous contact

dermatitis<sup>[8]</sup> and lichenoid reactions.<sup>[11]</sup> These patients developed strong positive patch test reaction to PPD as we observed in our patient. Our patient developed hypertrophic lesions in exact pattern of original skin painting. In addition to delayed type reactions, there are reports of immediate contact urticaria on the hands of hairdresser and doll makers exposed to the PPD containing dyes.<sup>[12-14]</sup> Systemic toxicity may be due to percutaneous absorption or to ingestion.<sup>[15]</sup> Contact anaphylaxis,<sup>[16]</sup> renal insufficiency<sup>[17]</sup> and acute respiratory failure<sup>[18]</sup> have been reported due to topical application of PPD-added dyes.

PPD is available in patch test material in white petrolatum in 1% concentration.<sup>[19]</sup> There is no upper limit of PPD concentration legally permitted in many countries.<sup>[15]</sup> The European Economic Community has permitted a concentration limit of 6% PPD.<sup>[15]</sup> Australia requires a warning label for PPD concentrations

>5%.<sup>[6]</sup> It may be possible that to darken the shades, PPD is being used in higher concentration than the permitted usual dose. Black henna tattoo inks have been found to have PPD concentrations as high as 15 to 30%.<sup>[20]</sup> This may lead to severe and more frequent reactions. Kligman estimated that a single application of 1.0 mL of 10% solution would sensitize about 80% of the population.<sup>[21]</sup>

Coloring and tattooing with henna is maintaining its popularity. Also children and teenagers use of hair dyes and tattooing their body is increasing. Besides allergic contact dermatitis, immediate reactions such as contact urticaria and systemic toxicity due to the PPD may also occur. Some of these reactions are severe and necessitates hospitalization and acute treatment. To avoid severe and immediate reactions, it is advisable to do a patch test before the coloring procedure and/or use the PPD concentration in a permitted dose. In other words, PPD concentration in the henna products should be reevaluated. Clinicians should also be aware of the potential complications of PPD. To decrease these complications, there are attempts to substitute p-phenylenediamine in hair dyes with less sensitizing and cross-reactive chemicals.<sup>[22]</sup>

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