Case report

Tattoo pigment reactions- A case series

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Abstract:
The practice of tattooing with various natural dyes dates back to ancient civilizations, having its own set of social and religious implications. In the recent past an increasing trend of reactions to tattoo dyes has been noted. A plausible explanation for this phenomenon as rendered by researchers points towards increasing use of allergic ornamental chemicals in the tattoo dyes. The present case series describes a variety of histological reactions to tattoo dyes most of which were artificial chemicals rather than natural dyes.

Keywords: Tattoo pigments, granuloma annulare, lichenoid reactions.

Introduction:
Tattooing has been practiced for centuries in many cultures and spread throughout the world. Some decades ago it was uncommon but nowadays practice is increasing and more cases are being reported. The exact incidence of tattoo reactions is unknown. In advertent use of variety of dye materials in the tattoos has led to a spectrum of histological reactions. Majority of the cases present with a lichenoid reaction pattern, however rarer morphological patterns have also been described.

Case Reports:
Case 1
A nineteen year old healthy male presented with complaint of itching over tattoo since past one year immediately after tattooing with blue and red dye on arm. Patient had more itching on red dye portion of tattoo. On examination erythematous plaque with scaling was observed over red dye tattoo. The H & E stained sections of biopsy as shown in figure 1 showing granuloma annulare like tattoo reaction. Dermis was showing aggregates of lymphocytes and histiocytes with multinucleated giant cells and degenerated collagen. Macrophages containing granular brownish black tattoo pigments were also seen.

Fig 1: A photomicrograph showing central sclerotic area in the subepithelium surrounded by fragmented collagen and reminiscent histiocytic infiltrate,
of granuloma annulare morphology. (H&E, x 100)

Case 2
A twenty year old male presented with complain of itching over tattoo on forearm as shown in figure 2 since two months. The tattoo was injected one year back. On examination erythematous nodules with scales and mild induration were present on red dye tattoo sparing areas of blue dye tattoo. Biopsy was taken from erythematous lesion as depicted in figure 3. It showed moderate hyperkeratosis with areas of parakeratosis focally forming neutrophilic crusts and hypergranulosis. Marked acanthosis was seen. Dermis showed dense lichenoid infiltrate composed of lymphocytes and few histiocytes, suggesting diagnosis of lichenoid reaction to tattoo pigment.

Fig 2: Clinical photograph showing plaque like reaction to red dye tattoo.

Case 3
Eighteen year old male presented with itchy lesion over dorsum of hand since three months preceded by tattoo trauma. On examination well defined plaque over the tattoo noticed. Section studied from biopsy of lesion showed irregular acanthosis, parakeratosis and hyperkeratosis. Dermis showed dense inflammatory infiltrate of lymphocytes and black pigment. Occasional foreign body giant cells were also seen, suggesting lichenoid reaction tattoo.

Fig 3: Photomicrograph showing dense band like lichenoid infiltrate and tattoo pigment in the subepithelium with basal cell degeneration. (H&E, x 100)

Case 4
A eighteen year old developed itching and plaque formation with scaling over the tattoo. On examination lesions were crusty showed verrucous surface. Histopathologically it showed features of chronic non-specific inflammatory reaction. Epidermis showed mild hyperkeratosis. Dermis showed moderate degree of perivascular and periadnexal lymphocytic infiltrate. Few macrophages were showing granular brownish black pigment suggesting chronic inflammatory response to tattoo.

Discussion
Tattooing can be temporary or permanent. Natural henna is used for temporary tattooing, it paints skin with brownish-orange pigment. Different kinds of dyes, oils and powders are added to henna for obtaining various colours. Black Henna causes skin reactions because of additional chemical component para-phenylenediamine (PPD) [1, 2, 3, 4, 5, 6, 7].
Dyes or inks used in permanent tattooing are made up of organic compounds and metal salts. Inks with their contents are given in Table 1.

Table 1. [8,9,10]

<table>
<thead>
<tr>
<th>Inks</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Black ink</td>
<td>Iron oxides and various carbons</td>
</tr>
<tr>
<td>2 Blue ink</td>
<td>Cobalt, chromium and copper salts</td>
</tr>
<tr>
<td>3 Green ink</td>
<td>Primarily chromium and copper</td>
</tr>
<tr>
<td>4 Red ink</td>
<td>High levels of mercury</td>
</tr>
<tr>
<td>5 Contemporary red ink</td>
<td>Mixtures of cadmium and sometimes iron oxides</td>
</tr>
<tr>
<td>6 Purple</td>
<td>Manganese</td>
</tr>
</tbody>
</table>

Organic azo dyes and pthaocyanines are increasingly being used because of their intense colour. Originally these products are used in car paint and printing [11, 12]. Nowadays machine has been used for tattooing. Tattoos used to be done manually, that is the tattoo artist would puncture the skin with a needle and inject the ink by hand. Histopathologically all banal tattoo show tattoo pigments in dermis. Extracellular deposits of tattoo pigment are seen between collagen bundles and intracellular deposits are seen in macrophages and fibroblasts in upper and mid dermis [13].

Classification of tattoo pigment reactions-

1. Acute inflammatory response-
   Infections reported are pyogenic infections, leprosy, syphilis, tuberculosis [14], tetanus, verruca vulgaris [15, 16], herpes simplex and zoster, molluscum contagiosum [17], viral hepatitis and a dermatophyte infections [18].

2. Chronic inflammatory reactions-
   A) Lichenoid
   C) Pseudolymphomatous [21]

3. Allergic reaction- I) Contact II) Photoallergy [21]

4. Perforating reactions [19]


6. Koebners Response [22]
7. Scleroderma or morphea like [21]
8. Neoplasms-
   Basal cell Carcinoma [23], melanoma,
   keratocanthoma, lymphoma [24] and
   reticulohistiocytoma may be coincidental
   [25].

The first case described in present study showed
granuloma annulare like reaction with palisading
histiocytes surrounding central area of degenerated
collagen and fibrin deposition. Similar case has been
described by Kashyap S et al. [26] where they have
also noted granuloma annulare like reaction to tattoo
pigment.

The second and third case in the present series
showed lichenoid pattern of reaction to tattoo
pigment with dense chronic inflammatory infiltrate
abutting the dermoepidermal junction. Several
authors including Sanghavi SA et al. [27] and Bimbi
C [28] have reported similar finding in their case
series. The fourth case in our series showed a chronic
nonspecific inflammatory response which was not
classifiable under any of the specific categories.

Conclusion:
The spectrum of reaction to tattoo pigments ranges
from mild nonspecific inflammation to severe
reactions causing significant morbidity. Red dye in
the tattoo pigment has been documented to elicit
more reactions.

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