A Scientific Tale of a Tattoo with a Twist

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ABSTRACT

In pursuit of beauty, mankind explores new avenues. Tattoo is one such field that has a glorious past and a promising evergreen future. With a beautiful rose comes a painful thorn. Similarly, with a beautiful tattoo there is some pain while undergoing the procedure. This local pain usually subsides. But sometimes when new pain and swellings come at distant places—away from the site of tattoo—the joy of displaying and owning a beautiful tattoo fades into a ghastly fear. One such interesting scientific case is reported here.

Keywords: Ink, Lymphadenopathy, Pain, Swelling, Tattoo.


INTRODUCTION

In recent years, tattooing has become an unstoppable trend that indeed has brought some safety concerns into the spotlight.1,2 Tattoos and permanent makeup deposit insoluble pigments into the dermal layer of the skin. With the tattoo, pigmented and enlarged lymph nodes have been noticed in tattooed individuals for years. After the traumatic insertion of needle and ink during the tattooing procedure, the body will excrete as many components as possible via the damaged epidermis.3 The different ways to clean the site of entrance are through active transport to lymph nodes, i.e., by phagocytizing cells, or passively along the lymphatic vessels.4 In addition to observations in humans, a study on mice revealed colored lymph nodes after tattooing with an azo pigment.5,6 This gives us an idea that this pigment originates from the lymph nodes, but there is paucity of literature supporting it except for few which analyzed that human lymph nodes in tattooed individuals were assessed for its contents on carcinogenic polycyclic aromatic hydrocarbons deriving from carbon black particles.7 Altogether there is a strong evidence for both migration and long-term deposition of toxic elements and tattoo pigments as well as for conformational alterations of biomolecules that likely contribute to cutaneous inflammation, swelling of lymph nodes, and other adversities upon tattooing. There are many case studies on inflammation of lymph nodes due to various reasons, but swelling of lymph nodes because of tattooing is rare which was reported to us and hence it is further discussed as a case study.

CASE REPORT

A young lady of 22 years presented to the physiotherapy department with the chief complaint of pain and symmetrical swelling in the neck region for the past 7 days. There was no history of trauma, lifting heavy weight, or unaccustomed physical work or any signs of infection.

On observation, it was noted that tattooing was done in the upper back region starting from lower cervical to midthoracic region few weeks earlier (Fig. 1). On palpation, localized swelling was present on bilateral trapezius region symmetrically on equal distance from spine.

Palpation revealed that the swelling was in the subcutaneous region. It was nodular, oval and soft in feeling, and mobile when palpated with the index finger and thumb. Hence, clinically, involvement of pretrapezius lymph nodes was suspected.

To confirm the clinical findings, the patient was referred for high-resolution ultrasonography (HR-USG) of trapezius region and color Doppler to check the vascularity of the area.

The HR-USG revealed enlarged pretrapezius lymph nodes (Fig. 2). No calcification or necrosis was seen within. No collection was noted in it. The nodes did not show sonographic features of acute inflammation like increased color and power Doppler flow, thereby confirming the diagnosis of reactive lymphadenopathy (Fig. 3).
INVESTIGATIONS

Ultrasonography

Diagnostic ultrasonography with high resolution probe (7MHz) beautifully demonstrated the skin, subcutaneous tissues, muscles, and vessels. Bilaterally oval symmetric enlarged pretrapezius lymph nodes were seen oriented transversely. Measuring $17 \times 12$ mm, they had well-defined margins. No necrosis or calcification was seen in situ. The normal helium was not visualized indicating its replacement by other tissue-tattoo pigments in this particular case.

Color Doppler and Power Doppler

Colour Doppler and power Doppler was done to identify increased vascularity and to visualize the spectrum of this increased vascularity, if any-which are the hallmarks of acute infective/inflammatory lymphadenopathy. However, in this case no increased in vascularity of the nodes was demonstrated. Thereby, confirming them reactive lymph nodes. Follow-up colour Doppler and power Doppler confirmed the reduction in size of the pretrapezius nodes ($6 \times 7$ mm).

DISCUSSION

Lymphadenopathy basically refers to the nodes that are abnormal in size, consistency, or number. Clinically, there are two classifications of lymphadenopathy: “generalized” and “localized.” If lymph nodes are enlarged in two or more noncontiguous areas, it is called “generalized lymphadenopathy,” or if only one area is involved, it is “localized lymphadenopathy.” The reason that a tattoo causes lymphadenopathy in the acute phase is due to local inflammation and probably resolves spontaneously. The

Figs 1A and B: (A) Day 1 labeled image is on the day of performing ultrasound. Patient was prescribed antibiotics and analgesics for 5 days and after 1 week ultrasound was repeated. Day 7 labeled image shows clinical resolution of swelling. These findings were confirmed on HR-USG.

Figs 2A and B: (A) HR-USG showing enlarged lymph nodes in subcutaneous; and (B) color Doppler. Inflammation of lymph nodes in subcutaneous plane over the trapezius muscle showing lack of increased vascularity.
tattoo ink particles may range from 2 to 400 nm and are most commonly 40 nm. They are initially found within large phagosomes in the cytoplasm of keratinocytes, phagocytic cells including fibroblasts, macrophages, and mast cells. Initially, the skin layers appear homogenized, but after 1 month, the basement membrane is reformed and aggregates are present within basal cells. Later, ink particles are found only in dermal fibroblasts surrounded by a network of connective tissue that entraps and immobilizes the cell. The tattoo may appear blurred with time due to ink movement into the deep dermis. Eventually, the tattoo ink appears in the regional lymph nodes.

Tattoo pigments consist of either inorganic colorful biologically inert metals or its oxides, or of polyaromatic compounds (Fig. 4). A broad range of elements in tattooed human tissue are the sensitizers, namely, nickel (Ni), chromium (Cr), manganese (Mn), and cobalt (Co)—as parts of color-giving pigments, swelling of lymph nodes, or element contamination. Besides carbon black, the second most commonly used ingredient of tattoo inks is titanium dioxide (TiO₂), a white pigment usually applied to create certain shades when mixed with colorants. The toxicity of TiO₂ depends on its speciation (crystal structure) which can be either rutile or the more harmful photocatalytically active anatase. The latter can lead to the formation of reactive oxygen species when exposed to sunlight. Delayed healing is thus often associated with white tattoos, along with skin elevation and itching.

Differential diagnosis could be carcinoma changes as it is one of the risks with adenopathy. But, a study says that a lymphadenopathy that lasts for less than 2 weeks has no progressive chance of malignancy, and it was reported that size of the lymph starts reducing within 9 days.

Also, there was no history of recurrent exposure to ultraviolet radiation, tobacco chewing, and alcohol consumption, which are risk factors that hamper the condition.

To the best of our knowledge, this is the first case that scientifically and actually demonstrates the clinical and imaging scenario post-tattoo in the upper back region. The only limitation is that histopathological study was not done. Although the patient was advised, she refused on cosmetic grounds.

This case report emphasizes that not only those who undergo tattooing but also those who perform the procedure and all the concerned health care specialties should be aware of this entity for prompt timely management.

CONCLUSION

Both infectious and noninfectious adverse reactions have been observed among otherwise healthy people after tattooing. Reactive lymphadenopathy is one of the commonest disabling conditions seen after tattooing. There is a need to increase awareness in the youth today regarding increased risks of tattooing when carried out in potential unsterile environments.
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REFERENCES


