

## Patients and Methods

The study was a retrospective review of 405 patients with tattoo complications collected consecutively in the “Tattoo Clinic” between 2008 and 2015. The flowchart of the study is shown in Figure 1. The main goal of this study was to suggest a new clinical classification of tattoo complications.

### *The “Tattoo Clinic”*

The “Tattoo Clinic” is a public clinic under the health system. Patients with tattoo regret cannot be treated. The clinic has a broad intake of patients and accepts all patients referred. The majority of patients have permanent tattoos; however, henna, cosmetic, and traumatic tattoos were also included to obtain knowledge. Patients with tattoo complications were referred by practising dermatologists, other specialties, or from general practitioners.

### *Patients*

In total, 405 patients with 493 tattoo complications were consecutively enrolled and examined. All patients were examined by a dermatology specialist (J. Serup) with complete patient history, detailed clinical examination, and biopsies (clinically indicated). All patient data were collected from patient records and analysed (M. Sepehri and K. Hutton Carlsen).

### *Clinical Diagnostic System*

Following the principles of the internationally approved diagnostic classification system of the World Health Organisation (WHO), we applied a differentiated diagnostic approach with primary (level A) and secondary levels (level B) of clinical diagnoses (see Fig. 2). Clinical diagnoses of tattoo complications were categorised into 1 main diagnosis (level A) representing the main problem or main findings. If relevant, 1 or more secondary diagnoses (level B) representing subgroups, associated manifestations or problems, events, or special disease mechanisms were defined.

“Tattoo complications” were, in our material, defined as more serious adverse reactions or events after tattooing which manifest as objective abnormalities or pathologies associated with clinical and subjective symptoms of a severity considered disease or disablement. The sufferers, in general, requested medical advice and treatment. In contrast, persons with “tattoo complaints” only had mild subjective or objective

abnormal experiences or observations acquired along with and caused by the tattoo. Persons with complaints, in general, do not seek medical advice or treatment, and therefore this group has not influenced our material, albeit tattoo complaints are far more common in the tattooed population than genuine medical complications.

## **Diagnostic Groups**

Multiple diagnose groups of levels A and B were seen in the clinic and structured in the following 5 headlines: infections, inflammation (non-infectious), psycho-social, miscellaneous, and technique and treatment hazards, which covers the broad spectrum of tattoo complications (see Fig. 2). This structure is maintained throughout the article.

### *Infections*

Tattoo-provoked illnesses with local or systemic reactions, as exemplified by bacterial and viral infections, were diagnosed using commonly accepted diagnostic criteria and terms. We did not take routine skin surface swabs, and we did not take biopsies for culture of bacteria. Skin surface swabs were taken sporadically as the skin surface flora might not represent the causative microorganism behind an invasive infection.

We defined the 3 following groups: local infections were limited to the tattooed skin, regional infections affected the surrounding skin and body region (e.g. erysipelas), and systemic infections could be acute (and manifested as sepsis) or protracted (and manifested as hepatitis).

### *Inflammatory Reactions (Non-Infectious)*

Allergic tattoo reactions appear after a latency of primary sensitisation lasting weeks, months, or years, are full blown and chronic once established, and are mostly refractory to topical corticoid treatments. Cross-reactivity in an older tattoo in another anatomical site, if present, affirms a definite diagnosis of allergy. Allergy patch testing using tattoo ink products, tattoo pigments, or disperse textile dyes was *not* used in the diagnostic evaluation, since they have previously been proven unsuccessful for this purpose.

Non-allergic reactions are chronic inflammatory reactions of tattoos not fulfilling the criteria of allergy described above.

Urticaria reactions may be light or not light induced, and may be localised or generalised.

#### *Psycho-Social Complications*

Complications were differentiated in the 2 groups: “Exits” (gang members in a rehabilitation programme) or “Non-Exits”.

#### *Miscellaneous Reactions*

These include a broad spectrum of local, regional, systemic, and other complications.

#### *Technique and Treatment Hazards*

These are hazards caused by tattooing or any treatment.

### **Histology**

Punch biopsy for routine histology was obtained in patients when clinically indicated. The biopsies were evaluated as a routine procedure by the hospital’s Department of Pathology.