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Forensic Medical Assessment of Facial Scars

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Summary
The examination of skin scars has been and remains one of the most common types of forensic medical research, characterized by a high degree of subjectivity. Since skin scars are very persistent formations, it is they that most often become the object of forensic medical research in cases of late referral of victims for examination (examination).
Key words:scar, formation mechanism, ultrasound examination, digital photo drawing.

INTRODUCTION

Examination of skin scars was and remains one of the most common types of forensic medical research, characterized by a high degree of subjectivity. Since skin scars are very stable formations, it is they that most often become the object of forensic medical research in cases of late referral of victims for examination (examination) [1,3]. In the absence of medical documents or defective registration of such, scars reliably indicate the presence of former bodily injuries, allow you to roughly judge their age, the mechanism of education, parameters of traumatic tools, the number of traumatic effects [6,7,9].

Khalikov (2006) argues that for a sufficient degree of accuracy of expert judgment, a combination of at least two objective methods of quantitative registration of damage is required. If the opinion of a practical expert is confirmed by the numerical characteristics of specific quantities, the shade of subjectivity that arises when assessing the damage "by eye" is removed from the examination, guided by "book data", adjusted for the value of the expert's personal experience[1].

Later I.M. Serebrennikov continued to develop the topic, assessed the possibilities of diagnosis and assessment of keloid and hypertrophic scars (1981), described skin scars after electrical injury (1989). In 1981 and 1992, he published review articles analyzing all the available literature on the problem of studying skin scars from 1962 to 1992. From that moment on, no systematic work on this issue was carried out by judicial medics, and the publications were sporadic, although the high frequency of accidents with numerous human casualties and a sufficient number of local military conflicts in the territory of the post-Soviet space, in Europe and the Middle East region, by no means indicate a decrease in the relevance of the issue [8].

Surgeons, dermatologists and cosmetologists dealt with this problem in much more detail. O.S. Ozerskaya (2004) points out: “The problem of various types of skin scars is at the intersection of dermatology, cosmetology and surgery ... skin scars, especially on exposed parts of the body, also have social significance ... such a cosmetic defect leads to a different kind psycho-neurological disorders " [1,2,5,7,8].

Aim of the research. Development of an algorithm for forensic medical diagnostics of the prescription of damage formation based on the morphological properties of skin scars on the face using the latest technologies.

MATERIALS AND METHODS

The research analyzed the results of a forensic medical examination of 25 cases with observations of skin scars on the face. For comparative analysis, were taken 16 scars of different age and mechanism of formation on the body.
Forensic examination analysis of digital photography, ultrasound examination (size, density, echogenicity) of skin scars on the body.

RESULTS

In the course of the analysis, the main statistical regularities of the occurrence of such studies, the completeness of the description of the scar, the nature of the designation of colors and shades, the correspondence of conclusions (conclusions) to the circumstances of the case, data of medical documents and data of a forensic medical examination were evaluated.
The main issues and tasks solved in the course of forensic medical examination of scars. The questions that arise before a forensic expert in the study of scars are very diverse.
First of all, the investigating authorities may need to establish the mechanism of formation and the duration of the damage that left a scar after its healing. For the legal qualification of an act by the nature of the scar, the severity of the harm caused to health is determined, the percentage of disability due to the previous injury is established, the efflorescence of the scars is assessed (if they are localized in open areas of the body). In a number of cases, by the nature, localization and interposition of scars "it is possible to analyze the correspondence of the versions of trauma proposed by the investigation to objective data (situational examinations). identification of traces of former injections of drug users.

Healing of bruised and lacerated-bruised wounds that have not undergone primary surgical treatment ends with the formation of scars with uneven edges and surface. The scars are dense, protrude over the surrounding skin, and are inactive. To a certain extent, they can reflect the size and shape of the wounds. When healing wounds with suppuration, the scars do not retain features that make it possible to determine the nature of the wound and, accordingly, make a conclusion about the traumatic instrument.
After thermal injury, scars remain only at the site of burns and frostbite of 3 and 4 degrees, less often 2 degrees. The more severe the degree of burn and frostbite, the rougher the scars with tissue deformation. Scars of irregular shape, lumpy, pigmented edges, tighten the tissue. When burns are localized on the neck with their transition to the chest and upper limbs, or in other similar places, scars can take on a webbed, fan-shaped form. In the area of the joints, scars can lead to contractures.

Scars at the site of electrical burns are thin, smooth, usually whitish with uneven edges, dense

to the touch, mobile.
In cases of gunshot wounds, additional questions arise about the nature of the wound (input, output), the distance of the shot, and possibly the nature of the charge.
After gunshot wounds, scars remain, the appearance of which depends on the type of damage and the distance of the shot. At the site of the entrance fire and arrow wound, inflicted by a shot at close range and not subjected to surgical treatment, the scars have an oval, radiant, star-shaped or irregular shape, as a rule, moderately retracted and inactive.
The dimensions may be larger than the scar at the site of the final gunshot wound, especially when fired at close range. Traces of penetrated powders are noted around, sometimes scar tissue impregnated with soot. After a fire and arrow wound from a shot from a long distance, the scar is rounded, not large, as a rule, smaller than the scar at the site of the exit wound, where the scar has an irregular, funnel-shaped retracted shape.
Radiographically, in the deep layers of scars in soft rays, foreign inclusions, metallization can be detected.

In cases of explosive injury, gross defects and crushing of tissue are characteristic, followed by gross scarring. The comminuted lesions leave scars of irregular shapes, and foreign bodies can be detected in their projection radiographically.
The duration of scar formation is established by comparing the data of medical documentation and the properties of the scar, which change as it matures. During the formation of a scar during the healing of an uncomplicated sutured surgical wound, surgeons distinguish the following stages:
1. Epithelialization of the skin wound (7-10 days). It is characterized by the development and completion of postoperative inflammation. Granulation tissue forms between the wound walls, epithelialization begins with close contact of the edges of the skin wound. Clinically, after removing the stitches, the edges of the wound can disperse under the influence of even a slight force. There is no scar as such yet.
2. Formation of a fragile scar (10-30 days). Maturation of granulation tissue and active development of fibrillogenesis with the formation of a fragile scar. Clinically, the scar is relatively easily stretchable and well visible.
3. Formation of a strong scar (30-90 days). Increase in the number of fibers in the scar tissue and their orientation in accordance with the dominant direction of the load. Decrease in the number of cells and blood vessels. Clinically, the skin scar becomes stronger and less visible. In unfavorable conditions, the scar begins to hypertrophy or undergo keloidosis.
4. Final restructuring of the scar (90 days -1 year). There is a slow restructuring of the scar with an increase in the longitudinal orientation of the fibers, the scar tissue contains a minimum number of cellular elements and single small vessels. The scarring of the skin gradually reaches its maximum strength and becomes even less visible. In unfavorable conditions, a hypertrophic or keloid scar is finally formed.

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Table 1.
Approximate data on the external properties of scars of various ages (with normal scar formation)

Scar age	Scar properties		
	Color and shades	**Density**	**Other signs**
Up to 1 month	Pinkish, later reddish, with a bluish tinge	Soft	Flat, delicate, crusty
1 - 2 month	Reddish, with various shades of purple, usually dark purple	Dense	Convex, small, mobile
2-3 month	Reddish. Cyanosis gradually decreases	Tight all over	Convex, hyper-trophic character
3-6 month	The cyanosis disappears. Pink begins to dominate	Gradually soften expected	Convex, sometimes retracted, or at the level of the surrounding skin
From 6 months to 1-1.5 years	Pale pink. Various shades of brown appear. Later whitish, with some areas of brown	Slightly dense or soft. The density of the scar tissue is not the same	The surface is uneven or smooth, shiny, located at or below the level of the skin
Over 1 year	More often whitish (white), less often brown	Soft, tight strands or tight throughout	Thin, atrophic, shiny,sometimes convex

The study of skin scars in ultraviolet rays is based on the fact that different tissues fluoresce differently in ultraviolet rays.

When exposed to filtered ultraviolet rays, the connective tissue acts as a luminous screen, on which accumulations of pigment are visible in the form of shadows, which weaken, "quench" the fluorescence. Shades to a certain extent depend on the thickness of the stratum corneum of the epidermis: a thick layer gives a yellowish, thinner - whitish-blue fluorescence (1-table). According to the data of the 1st table, fresh scars, several months old and having a reddish color with a bluish tint under normal illumination, give a weak dark-violet fluorescence in ultraviolet rays. Scars, which are pale pink under normal light, give a faint pale violet fluorescence in ultraviolet rays. Scars are brown, pigmented, and appear as dark areas in ultraviolet rays. Old, white scars glow with a faint blue-and-white color. The general background of the skin appears dark greenish.

CONCLUSION

A digital photograph made using a scale and a color standard makes it possible to assess the age and mechanism of formation of a normotrophic skin scar in expert practice.
This method allows you to fix the echographic picture of the scar and save in digital format

the echogenicity values obtained at the time of the study for its subsequent forensic medical assessment.

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