Forensic Science International 224 (2013) 33–36

Contents lists available at SciVerse ScienceDirect

Forensic Science International

journal homepage: www.elsevier.com/locate/forsciint

Modification of hematoma findings in the breast region

Rebecca Pircher *, Stefan Pollak, Annette Thierauf, Markus Große Perdekamp, Ulrike Schmidt

Institute of Forensic Medicine, Freiburg University Medical Centre, Freiburg, Germany

ARTICLE INFO

Article history:
Received 14 March 2012
Received in revised form 8 August 2012
Accepted 23 August 2012
Available online 12 December 2012

Keywords:
Areola
Nipple
Hematoma
Blunt injury

ABSTRACT

Subcutaneous bruises caused by blunt injury are common findings in medicolegal case work. If the hematoma involves the anterior thoracic wall, bruises are mostly absent in the region of the nipples and the surrounding areola. A similar phenomenon has already been described for hypostatic skin hemorrhages. A possible explanation for both phenomena is the special tissue texture in the nipple–areola complex. Based on four cases from the forensic autopsy material and two cases from clinical forensic examinations, the macromorphological findings and the histological correlates are presented.

1. Introduction

Cutaneous and subcutaneous hematomas are common findings in medicolegal case work [1]. Nevertheless, the assessment of these seemingly trivial consequences of blunt traumatization may be a real challenge. The questions to be answered include the causative mechanism (e.g. fall or blow), the shape and character of any object used, the age of the injury and the manner of infliction (accident, physical abuse/bodily harm, homicide) [2].

The medical evaluation of hematomas is essentially based on the external appearance (localization, number, distribution, size, shape, patterning, color, concomitant excoriations, etc.). However, hematomas may be influenced by numerous external and internal factors, which make their interpretation difficult (e.g. time-dependent increase in size, gravitational shift, concomitant coagulopathy, pressure by clothing or dressing material) [3,4].

The loose or tight texture of the tissue in the respective region is another factor promoting or limiting the formation and spreading of blood extravasates. This effect has already been shown for postmortem (hypostatic) skin hemorrhages, which are absent within the nipple and its areola [5]. To the best of our knowledge, it has not been investigated up to now whether a similar phenomenon can be observed in hematomas after vital trauma to the anterior thoracic wall.

2. Materials and methods

The Freiburg forensic autopsy material and cases from clinical forensic medicine examined between 2003 and 2011 have been evaluated in order to find subcutaneous bruises within the anterior thoracic wall. Out of 4162 autopsy cases, four photographically documented hematomas have been found in the mammary region. Moreover, the retrospective evaluation comprised 1047 clinical forensic cases including two cases of subcutaneous bruises in the breast region which had also been documented by photographs.

The interval between traumatization and death ranged from one day to twelve days. Furthermore, one case of post-mortem lividity concerning the anterior trunk is also reported to compare the findings of postmortem (hypostatic) skin hemorrhages with those of the present study. The six cases of our study material including age and cause of death are indicated in Table 1.

Before autopsy (cases 3–6), pictures of the anterior thoracic wall were taken to document the macromorphological correlates of blunt injury in the region of the nipples and the areola. To examine the distribution of extravasates in the different anatomical structures and layers within the areola, the affected tissue was incised at right angles to the skin surface. Excised tissue was fixed in formalin and routinely embedded in paraffin. The tissue was cut into serial sections of 3–5 μm. The sections were stained using hematoxylin and eosin and Mallory's method. The localization of hemoglobin in the skin sections was examined by staining them with Alizarin Red S [6].

3. Results

In all cases presented, the anterior trunk showed subcutaneous hematomas of different age and size. Because of the different ages of the hematomas, their color ranged from bluish-purple to yellow. In the region of the nipples and the areola mammae, bruises were absent or at most of minor intensity. In some cases, there was even a halo-like bright ring around the areola (Figs. 1 and 3). This phenomenon has already been photographically documented (but not described) by Smock [7] when dealing with the recognition of pattern injuries in domestic violence victims. In the present study this finding was seen in both sexes.

* Corresponding author at: Institute of Forensic Medicine, Freiburg University Medical Centre, Albertstrasse 9, 79104 Freiburg, Germany. Tel.: +49 761 203 6804; fax: +49 761 203 6858.
E-mail addresses: rebecca.pircher@uniklinik-freiburg.de, rebeccapircher@aol.com (R. Pircher).

0379-0738/$ – see front matter © 2012 Elsevier Ireland Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.forsciint.2012.08.046

Table 1
Investigated study material.

Case	Days between the origin of hematomas and examination/death	Age	Sex	Cause of death	Cause of blunt injury
1	2	38	f	–	Domestic violence
2	1, 3	21	f	–	Sexual abuse
3	12	91	m	Cardiac insufficiency	Fall at home
4	5	82	f	Respiratory insufficiency	Car accident
5	1	68	m	Blunt thoracic trauma	Car accident
6	12	90	f	Pneumonia	Fall at home

Fig. 1. Case 3: hematoma of the anterior thoracic wall with a halo-like bright ring around the areola. The hematoma is absent within the nipple and the areola.

One of the clinical cases provided another interesting result. In the second examination performed three days after traumatization, the marginal parts already showed a yellowish discoloration which extended to the adjacent areola (Fig. 2b). Two days before, when the victim was seen for the first time, the hematoma clearly had been confined to the skin outside the areola (Fig. 2a).

On the cut surface of the mammillary region, hemorrhages were found only in the deeper layers consisting of adipose tissue but not within the overlying nipple–areolar complex (Fig. 4b). Histological examination revealed that in the corium of the nipple–areolar complex there is a compact network of connective tissue with abundant fibers and smooth muscle cells. Mallory's stain showed that the nipple and the areola were almost free of extravasates (Fig. 4c), whereas the surrounding area was densely infiltrated by blood extravasates located both in the cutis and subcutis (Fig. 4d). Within the areola with its dense network of fibers, only few and less extensive hemorrhages could be seen; they mainly consisted of deformed and partially already disintegrated erythrocytes.

4. Discussion

According to a generally accepted definition, bruises are extravasations of blood within (mostly soft) tissues originating from ruptured vessels as a result of blunt traumatization [8]. In contusions with externally visible skin discolorations, a distinction is made between subcutaneous, intracutaneous and "mixed" bruises depending on the tissue layer(s) affected. If a recently inflicted hematoma is localized in the dermis close to the skin surface, the color impression is "red", whereas a blood extravasation in the deeper subcutis appears "blue", because the blue component of the light is scattered (and thus reflected) more strongly than the red one [4]. Intradermal bruises may exactly reflect the surface configuration of an impacting object mirroring a negative imprint of its profile or the weaving structure of interposed textiles. On the other hand, subcutaneous bruises are usually non-patterned [8,9].

The present study deals only with blood extravasations located in the subcutaneous tissue with its comparatively loose structure composed of movable fatty lobules. In spite of the mostly uncharacteristic configuration of subcutaneous hematomas, there may be bruising of criminalistic significance: for instance, a "tramline" arrangement from blows with a stick or another elongated instrument, roundish fingertip bruises from rigorous gripping, ring-shaped bitemarks or seat belt-related contusions [3].

Apart from configurations reflecting the causative implement, the shape, contours, size and intensity of hematomas can change due to secondary mechanisms [8]:

- Time-dependent expansion of the bruise owing to a progressive percolation of free blood from the ruptured vessel(s) to surrounding tissue areas
- Gravity shifting of the hemorrhage resulting in a downward movement of the hematoma (e.g. from the forehead to the periorbital region)
- Patterning of a primarily uncharacteristic bruise by subsequent local pressure on the contused and discolored body region (e.g. by a tight dressing).

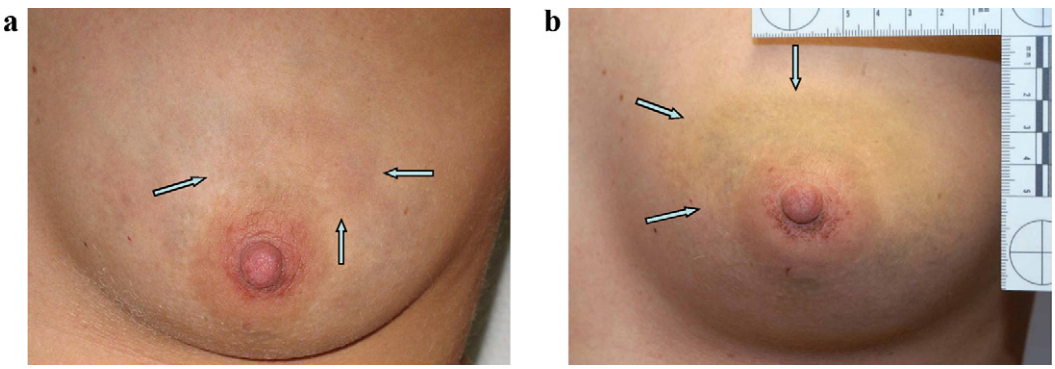

Fig. 2. (a) Case 2: hematoma confined to the skin outside the areola (one day after traumatization). (b) Case 2: bruise with yellowish discoloration extending into the adjacent areola (three days after traumatization).