



Fat from contused adipose tissue may cause yellow discoloration of clothes in blunt trauma victims



D. Geisenberger^{a,*}, F. Wuest^b, L. Bielefeld^a, M. Große Perdekamp^a, R. Pircher^a, S. Pollak^a, A. Thierauf-Emberger^a, L.M. Huppertz^a

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

^b Faculty of Biology, University of Freiburg, Freiburg, Germany

ARTICLE INFO

Article history:

Received 22 July 2014

Accepted 10 October 2014

Available online 18 October 2014

Keywords:

Body fat

Adipose tissue

Blunt trauma

Fatty acids

Discoloration of textiles

ABSTRACT

In some fatalities from intense blunt trauma, the victims' clothes show strikingly yellow discoloration being in topographic correspondence with lacerated skin and crush damage to the underlying fatty tissue. This phenomenon is especially pronounced in light-colored textiles such as underwear made of cotton and in the absence of concomitant blood-staining. The constellation of findings seems to indicate that the fabric has been soaked with liquid body fat deriving from the contused adipose tissue. To check this hypothesis, textiles suspected to be contaminated with fat were investigated in 6 relevant cases. GC–MS-analysis proved the presence of 11 fatty acids. The fatty acid composition was similar to that of human adipose tissue with a high proportion of oleic acid (18:1). In total, the morphological and chemical findings demonstrated that the yellow discoloration of the victims' clothes was caused by fat from traumatized adipose tissue.

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1. Introduction

The ability to think in terms of criminalistics has always been crucial for the medico-legal expert, since forensic medicine deals with the application of medical knowledge in the administration of justice [1,2]. Forensic autopsies fundamentally differ from autopsies performed by clinical pathologists [3,4] in that the investigation includes the inspection of the scene and the assessment of (biological) traces [5]. Therefore, the recognition and interpretation of trace material constitute an integral part of practical work aiming at the reconstruction of events. In this context, it has been repeatedly stressed that the forensic autopsy must not be confined to the “naked corpse” [6] as the decedent's clothes may be a major source of evidence.

The German guideline on forensic autopsy emphasizes the importance of investigating the clothing right at the beginning [7]. This requirement applies to all manners of death, i.e. homicides, suicides, accidents and fatalities from natural causes. Pedestrians killed in a car crash may serve as an example: Their garments are often stained with dust from the surface of the impacting vehicle,

oily dirt from the car's underbody, the imprint of a tire tread and traces of abraded or peeled off paint. Textiles can also be covered with adherent glass splinters, particles from the road surface or plant material from the shoulder. Last but not least, clothes are often soaked in fluids (e.g. water, blood, urine, petrol, engine oil and coolant).

To the best of our knowledge, the pertinent literature does not mention body fat as a possible cause of textile staining in trauma victims. Several cases in point induced us to investigate this phenomenon more closely by analyzing the chemical composition of such fatty contaminations.

2. Material

2.1. Case 1

A 64-year-old male committed suicide and died from poly-trauma with consecutive exsanguination after being hit by a rail vehicle from behind. Post-mortem lividity was sparse. The heart and aorta were ruptured. Both lower legs were severed. In the left axillary region, two linear tears ran toward the back of the body (Fig. 1). The skin between these two lesions was avulsed and the underlying fatty tissue was crushed. The left arm of the victim's short-sleeved, white cotton undershirt showed intense yellow discoloration (Fig. 2).

* Corresponding author at: Institute of Forensic Medicine, Freiburg University Medical Centre, Albertstrasse 9, 79104 Freiburg, Germany. Tel.: +49 761 203 6831; fax: +49 761 203 6858.

E-mail address: dorothee.geisenberger@uniklinik-freiburg.de (D. Geisenberger).



Fig. 1. (Belonging to case 1): Two linear lacerations in the left axillary and adjacent thoracic region with contused subcutis.



Fig. 2. (Belonging to case 1): Cotton undershirt stained with yellow fatty fluid in the area of the left sleeve.

2.2. Case 2

A 69-year-old woman suffered a fatal polytrauma in a traffic accident as a pedestrian by being run over by a truck. Layerwise dissection of the soft tissues revealed an extensive décollement on the entire back of the trunk. The heart was severed from the great vessels and the aorta was ruptured. Below the left buttock, a 13-cm-long, deeply penetrating wound was located. A textile sample showing yellow discoloration was taken from the back of the victim's white, long cotton underpants. A tear in the textile material corresponded to the impalement injury. Subcutaneous tissue from the gluteal region was used as a reference sample.

2.3. Case 3

A 51-year-old woman committed suicide by jumping into the railway track bed. The collision with a rail vehicle caused decapitation and transection of the upper part of the body with traumatic exposure of the thoracic and abdominal cavity accompanied by exenteration of thoracic and cervical organs. In the transitional zone between the thoracic and the abdominal region, the skin showed clean-cut circumferential severance. A textile sample was taken from the down-quilted waistcoat, which revealed yellow discoloration on the inside. Subcutaneous tissue from the preaxillary region served as reference sample.

2.4. Case 4

A 21-year-old woman suffered a fatal craniocerebral trauma with decerebration in a traffic accident as a cyclist. She was run

over by a truck in the region of the buttocks. The front of the right thigh showed an open décollement. Postmortem lividity was sparse. A textile sample was taken from the victim's beige cotton shorts partly discolored yellow. Subcutaneous tissue from the thigh region served as a reference sample.

2.5. Case 5

A 48-year-old woman committed suicide on railway tracks. She was run over by a rail vehicle, which caused decapitation, rupture of the heart and aorta as well as amputation of the upper (Fig. 3) and lower extremities. Postmortem lividity was sparse. The superior thoracic aperture was exposed and the skin showed extensive avulsion with lacerations in the chest region. A textile sample was taken from a sleeve of the victim's white cotton T-shirt, which was discolored yellow (Fig. 4). Subcutaneous tissue from the abdominal region was used as a reference sample.

2.6. Case 6

A 76-year-old female was killed in a collision with a passenger car. Death was caused by thoracic and abdominal trauma with pelvic fractures and ruptures of the left lung, the liver, the spleen and the right kidney. A subtotal traumatic amputation of the left upper arm was accompanied by extensive skin defects and severance of the left jugular vein. A textile sample was taken from the left side of the victim's cotton undershirt, which was discolored yellow. Fatty tissue from the preaxillary region was used as a reference sample.

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