

Case Study

A 13-year-old girl was brought to the hospital by the police and her mother for examination. According to the girl's report, her older girlfriend's intoxicated boyfriend had attempted to rape her 7 h earlier. The incident had taken place at the home of the girlfriend as the victim came out of the shower wearing only a towel. Although the girl had resisted to the best of her ability, her assailant was the stronger party. The man had gripped her by the throat with his left hand, unfastened his trousers with his right, and forced himself between the victim's legs. After being forced to the ground, the girl screamed loudly, prompting her assailant to cover her mouth with his right hand. At that moment, the girlfriend returned home, upon which the assailant abruptly desisted in his attempts.

The young girl, who was very slight of build, showed patches of skin reddening on the neck and a small crescent-shaped skin laceration on the left side. Individual conjunctival petechiae were visible. Two small contusions could be seen on the mid-third of the inner side of the thigh, as well as two further small contusions on the spinous processes of two vertebral bodies of the lower thoracic spine, respectively. The contusions were bluish in color and well demarcated.

Clinical forensic medicine is the application of medical knowledge for the assessment of injuries in living persons for the purposes of administering justice.

The forensic examination of living individuals, although a comparatively neglected field of forensic medicine in some countries, is gaining in relevance. Affected subjects are often—but not exclusively—examined by order of the relevant authorities for the purposes of making and interpreting findings in the context of a specific diagnostic task:

- Examination of victims and suspected perpetrators (victim and defendant examinations) in the case of offenses involving bodily injury and attempted homicide, e.g., cases of survived strangulation.
- Abuse, sexual abuse, and neglect of children.
- Victims of violence in the home (domestic violence) or in the workplace, e.g., violence against physicians and nursing personnel.
- Violence against elderly (forensic gerontology) and care-dependent individuals.
- Victims and suspects/defendants in sexual offense cases. Since strong resistance is often used in the case of trauma to the neck, it is desirable from a forensic medical perspective to examine a suspect/defendant where possible in order to reconstruct the facts of an offense more accurately where necessary.
- Examinations for the purposes of forensic age diagnosis.

- Traffic accident victims, whether as pedestrians, drivers, or passengers, etc. (including appraisals for civil proceedings to obtain damages or compensation, such as in cases of whiplash injury).
- Cases of self-harm, e.g., to simulate a criminal offense.
- Self-mutilation, e.g., for the purposes of committing insurance fraud.
- Assessment and interpretation of forensic psychiatric findings (see Chap. 18).
- Evaluation of an individual's fitness to understand a police caution, undergo questioning, be held in custody, stand trial, serve a custodial sentence, travel, or undergo deportation, e.g., in the context of asylum procedures.
- Assessment of findings in torture victims (see Chap. 26).

Although injury patterns can vary greatly, they need to be consistent with an alleged offense. It is sometimes possible to make inferences about a particular form of trauma on the basis of marks on the skin, such as finger marks following blows from the flat of a hand (Fig. 17.1) or cigarette/cigar burns (Fig. 17.2).

In this context, it is important to distinguish between various forms of trauma; of particular importance here is the differentiation between injuries caused by blows and injuries caused by falls. The localization of an injury often aids in its interpretation (Table 17.1).

Not infrequently, a forensic medical appraisal is initially only supported by a pattern of injury; ultimately, however, any appraisal should be formed on the basis of all available information: reported history, injury pattern seen on



Fig. 17.1 Finger marks following a blow from the flat of a hand



Fig. 17.2 Circular cigarette burn in a case of domestic violence

Table 17.1 Interpreting injuries according to their localization

Injury localization (selection)	Interpretation ^a
Head (above the hat line)	Likely a blow (with the exception of falls downstairs)
Head (below the hat line)	Typical of falls: frontal protuberance, eyebrows, tip of the nose, tip of the chin (with the exception of a blow to the face)
Monocle hematoma	Usually a blow (rarely: blood that has descended following a fall on the eyebrow; orbital roof fracture with monocle hematoma after a fall on the back of the head)
Contusions on the upper arm (inner and outer), possible also bilaterally symmetrical	Hand marks
Contusions on the extensor side of the lower arms	Self-defense injury
Back of the hand	Passive self-defense injury
Palms of the hand	Injury incurred while trying to support oneself during a fall; active self-defense against sharp trauma
Contusions over the hip bones	Generally caused by impact trauma
Outside of the elbow	Typical of a fall
Extensor side of the knee	Typical of a fall
Back, buttocks	Typical of corporal punishment
Oral mucosa	Likely a blow but possibly also a fall
Over the spinous processes of vertebral bodies	Abutment injury due to anterior pressure (victim lying with their back on a hard floor)
Orbital fracture	Blow (blow-out fracture)
Horizontal ligature marks	Ligature strangulation
Ligature marks slanting upwards	Hanging
Parallel contusions	Injury due to blows
Extensive skin reddening on the neck and small superficial skin lacerations	Manual strangulation (one or two hands)
Small patches of skin reddening on the neck	Manual strangulation (DD “hickey”/“love bite”)
Incision wounds to the flexor side of the wrist	Self-inflicted: (attempted) suicide
Bullet entry wound to the hard/soft palate	Generally suicide
Contusions to the inner side of the upper thigh	Self-defense injury in (attempted) rape (Fig. 17.3)
Often multiple, parallel scars on the flexor side of the forearms	Self-inflicted (borderline syndrome?)

^aNote: Any interpretation should encompass the whole pattern of injury; in some cases, an alternative explanation or unusual sequence of events may account for injuries

examination, laboratory findings, and possibly also radiological findings.

Important: Having as much information as possible to support injury assessment, as well as a familiarity with other findings to be included in the overall picture, is of critical importance to any forensic medical appraisal.

Human bite wounds are occasionally seen and must not be associated with sexual offenses (Fig. 17.4; see Figs. 9.14 and 9.15).

Petechiae in the sclerae, conjunctivae, and oral mucosa or extensive hemorrhage beneath the conjunctivae (Fig. 17.5) suggest compression

trauma to the neck (ligature or manual strangulation, as well as atypical hanging possibly involving tearing of the ligature).

The average resuscitation time for individual organs following interrupted oxygen supply to the organism is crucial for prognosis; however, these are subject to considerable variation depending on the age and temperature of the organism. The following times are given as a guideline:

- Brain: approx. (3) 5–8 min (followed by irreversible damage)
- Heart: approx. 15–30 min
- Liver: approx. 30 min

Fig. 17.3 Wounds in a case of (attempted) rape

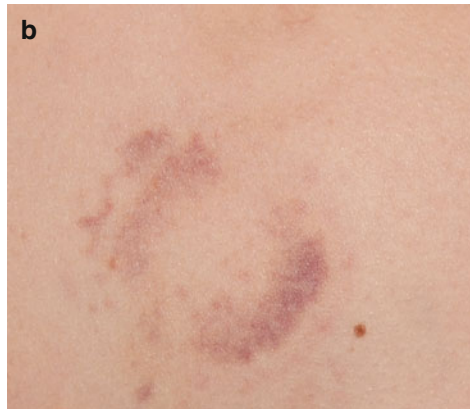


Fig. 17.4 (a, b) A young woman with multiple bite wounds of characteristic shape in a case of domestic violence

Fig. 17.5 Extensive hemorrhage beneath the conjunctivae in a case of survived manual strangulation

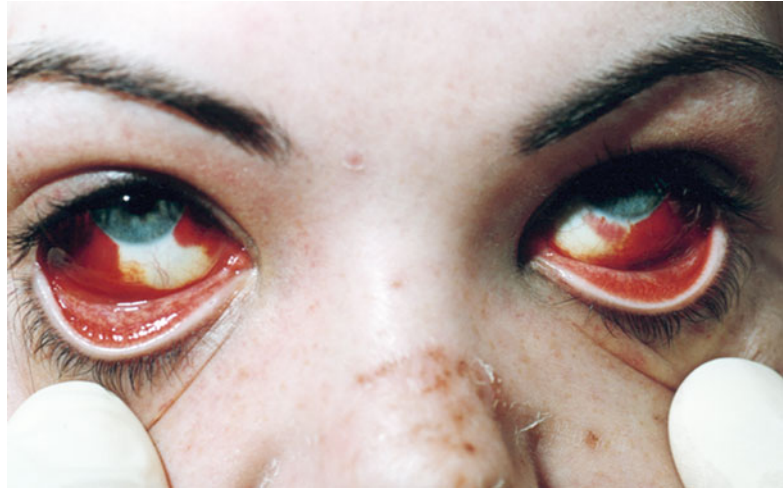


Table 17.2 Findings on the hemodynamic and neurological effects of neck compression

Hemodynamic effects	Neurological effects
Congestion above the level of compression?	Loss of consciousness?
Facial cyanosis?	“Blacking out?”
Petechiae?	Memory gaps?
Hemorrhage under the skin of the neck?	Involuntary defecation and urination?
Swelling of the laryngeal mucosa causing luminal narrowing?	Impaired vision?
Pain on swallowing (dysphagia)?	
Changes in voice pitch (dysphonia)?	

- Lungs: approx. 60 min
- Kidneys: approx. 90–120 min
- Muscles: approx. 2–8 h

Any forensic medical appraisal also needs to address the question of injury severity. Particularly in the case of compression trauma to the neck, information on duration, intensity, and lethality is sought. To this end, signs of the hemodynamic and neurological effects of neck compression need to be established (Table 17.2).

In addition to signs of the hemodynamic and neurological effects of neck compression, attention should be paid to other injuries in the appraisal of injury severity or when making conclusions on the lethality of neck compression. Under the case law rulings of Germany’s highest

criminal court, laryngeal cartilage fracture, prolonged respiratory distress, as well as overall duration and intensity are relevant to the question of lethality. Injuries and symptoms permit inferences to be made about duration and intensity, as do the approximate time periods to loss of consciousness:

- (a) Complete interruption of arterial blood supply to the brain: Loss of consciousness within a few seconds (6–10 s), e.g., typical hanging.
- (b) In experiments, loss of consciousness for up to 100 s caused by interrupting blood supply left no residual damage.
- (c) Isolated occlusion of the airways, on the other hand, may be withstood for somewhat longer before loss of consciousness, while blood circulation is maintained, e.g., gagging causes airway displacement by displacing the tongue to the posterior pharynx.

The severity of injuries and symptoms tends to be greater in victims having suffered a loss of consciousness (Table 17.3).

Lethality and Severity of Strangulation. Injuries are considered to be lethal if death would be imminent without (medical) intervention, e.g., a victim bleeding to death in the absence of surgery or a blood transfusion. The injuries inflicted by the perpetrator may (not “must”) cause death without the perpetrator being able to influence the further outcome in any way (the further course is ineluctably predetermined)—this is assumed in the case of neck compression where an acute onset of neurological symptoms

Table 17.3 Congestive petechiae and symptoms in 82 survivors of manual or ligature strangulation

	Victims who remained conscious ($n=42$) (%)	Victims who lost consciousness ($n=32$) (%)
Congestive facial petechiae	55	78
Urination	7	31
Defecation	0	16
Amnesia	0	25
Dyspnea (difficulty in breathing)	29	13
Dysphagia	71	78
Dysphonia	5	6

From Strauch et al. (1990)

is seen, e.g., loss of consciousness, memory gaps, as well as involuntary defecation and urination. Affirming the actual lethality of neck compression from a medical perspective in the presence of facial and conjunctival petechiae but in the absence of neurological symptoms is controversial and certainly requires careful pathophysiological consideration. Thus, from a medical point of view, lethality can be affirmed when, following trauma-related injury or damage, death would have been imminent in the absence of external intervention or when the further course of injury had reached a stage where the perpetrator no longer had any influence on whether the victim survived or not (an inevitable course following a chain of events caused by the perpetrator): in particular, irreversible damage to brain tissue with increasing brain edema due to damage to the central nervous system as a result of oxygen deprivation (CNS; diffuse axonal injury, DAI). Although at this point death and survival (with or without complications) are both possible outcomes, the perpetrator is no longer able to influence the outcome, since his/her actions have progressed too far.

Classifying Severity in Strangulation Survivors. Attempts have been made to classify the severity of trauma; the following classification has been proposed for strangulation (from Plattner et al. 2005):

“Severe” form: Only lethal if petechial hemorrhage is present, with or without loss of consciousness

“Moderate” form: Injury to the soft tissue of the neck or larynx, sore throat, dysphagia, hoarseness, and hemorrhage beneath the skin

“Mild” form: Only superficial skin findings

A more recently proposed classification assumes lethality if at least one of the following three criteria is fulfilled (from Parzeller et al. 2008):

- Venous congestion above the level of strangulation and detection of facial petechiae (including conjunctivae and mucosa), which cannot be explained in any other manner
- Loss of consciousness, either supported by witness evidence or credibly self-reported, at the time of neck trauma, which cannot be explained in any other manner
- Evidence of severe injury to the upper neck and pharyngeal soft tissue or the upper respiratory tract capable of causing secondary obstruction or decreased cerebral perfusion/hypoxia

The literature gives the following times to the onset of loss of consciousness, inability to act, and irreversible cardiac arrest:

- (a) Loss of consciousness and inability to act due to complete compression of the large vessels in the neck: 6–14 s (Rossen et al. 1943; Denk and Misliwetz 1988).
- (b) Ligature strangulation times of up to 100 s have been survived without complication (Rossen et al. 1943).
- (c) Petechiae appear after between 20 s and several minutes (Maxeiner 2001).
- (d) Irreversible loss of brain function after 3 min and more (Henßge 1990).
- (e) Ultimate cardiac arrest after 5–18 min (Rossen et al. 1943).

Data on the speed at which petechiae appear vary from 20 s to approximately 3 min. At low

pressures (35 mmHg), petechiae appear after 15 min, whereas at higher pressures (90 mmHg) they appear after around 3 min (Prokop und Göhler 1976). Petechiae could be produced after around 3 min in experiments on human skin with suction cups. However, an abrupt rise in pressure has been reported to cause petechiae in significantly shorter times; moreover, particularly in the case of homicide, additional pressure increases in the chest area due to strong respiratory movements serve as a compounding factor. Thus, data on precise time courses between neck compression, loss of consciousness, and death should be disregarded, since sequences of events relating to crimes are often complex and the pathophysiological processes subject to great variation.

Therefore, the duration of asphyxia can vary considerably depending on its cause. Shorter times are given for uninterrupted suppression of blood supply and blood flow to and from the brain (as in typical hanging) with total arterial and venous compression. Somewhat longer times are seen in partial suppression of oxygen supply and/or blood flow to and from the brain (atypical hanging, ligature strangulation). Longer times are given when oxygen supply to the lungs is obstructed but brain perfusion maintained, as in manual strangulation or other forms of respiratory obstruction (e.g., suffocation with a soft cover, gagging) without compression of the blood vessels of the neck.

The time to the onset of damage and unavoidable death in the case of total suppression of blood flow to the brain (typical hanging, uninterrupted massive ligature, or manual strangulation) is generally in the low single-digit minute range (at room temperature). The time to the onset of damage and unavoidable death in the case of interrupted oxygen supply but maintained blood supply is likely to be somewhere between the upper single-digit minute range and 10 min or slightly more (a “flushing effect” prevents acidosis).

Thus, in cases where victims of violent trauma survive, it is important from a forensic medical perspective to answer the following questions:

- What type of trauma has taken place? Particularly in the case of neck trauma: hanging or manual/ligature strangulation?

- Which injuries can be identified as resulting from the effects of trauma?
- Can self-inflicted injury be ruled out?
- Can the intensity of injuries and trauma be measured in terms of degree from a medical point of view?
- Can it be assumed from a medical point of view that acute lethal trauma has taken place? If so, on what criteria is this statement based and how can the lethality of the trauma be established?
- Is it possible to draw any conclusions about the duration of trauma?
- Is it possible to draw any conclusions about the victim’s ability to act, or their actual actions, during the incident?
- In addition to the principle injury, were any further injuries incurred during the course of the incident, such as facial contusions, active and passive self-defense wounds (on the flexor side of the forearms or palms of the hand), hand marks (contusions on the upper arm), lacerations at the corners of the mouth, small injuries to the lips and oral mucosa (due to the mouth being held shut to prevent the victim from screaming), tooth marks (due to a blow to the lips), possibly also contusions/injuries and findings consistent with an attempted sexual offense?

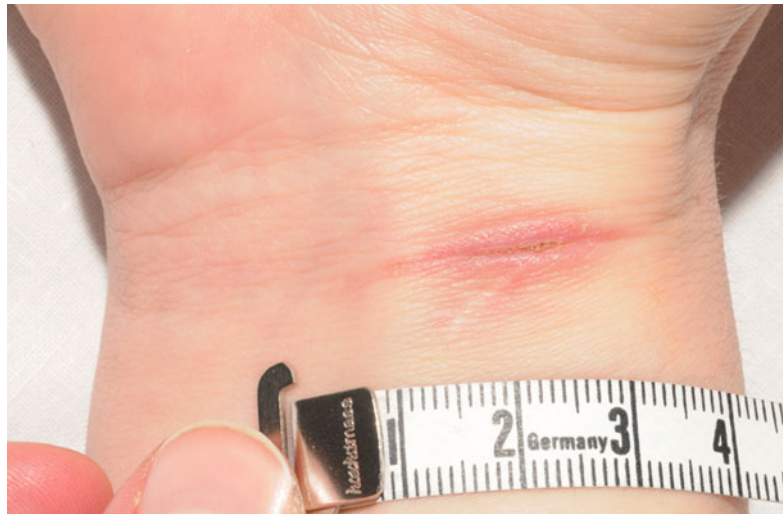
17.1 Self-Inflicted Injuries in Suicides and Attempted Suicides

Mention should be made here of tentative, or hesitation, wounds—the frequently encountered scars running either laterally or longitudinally across the flexor side of the wrist—which are occasionally fresh incision wounds made in the context of an acute suicide or an attempted suicide (Fig. 17.6). Tentative wounds of this kind are also seen in the form of deeper incision wounds to the neck with suicidal intent, in which case they are largely superficial (epidermis and subepidermal dermis), straight parallel incision wounds, which rarely go as deep as the subcutaneous fatty tissue. In some cases, the victim fails to make deeper incisions and the incision wounds heal (Fig. 17.7).

Fig. 17.6 Self-injurious behavior involving tentative wounds made to the flexor side of the wrist



Fig. 17.7 A single older tentative wound made in the context of a non-genuine attempt at suicide with overtones of an “appeal for help”



Although tentative wounds on the flexor side of the wrists can generally be attributed to (attempted) suicide, injury patterns that are inconsistent with an alleged course of events are sometimes seen, thereby necessitating a differentiation between self-inflicted injuries and injuries inflicted by others.

17.2 Self-Harm and Self-Mutilation

The Anglo-American literature reports the prevalence of self-injurious behavior at 0.6–0.8 % of the population; according to statistics, there is a

marked prevalence in the 15- to 35-year-old age group; moreover, women are between two and five times more frequently affected.

Some cases of self-injurious and self-mutilating behavior prompt the relevant authorities to seek clarification on the causes or circumstances behind the injuries. Although self-harm is not in itself a criminal offense, a lack of further information may arouse the suspicion of a simulated criminal offense. Where an individual is suspected of having committed an offense that was in fact simulated by another, not only may the wrong person be suspected but an instance of libel may be considered. If a third person is used for the purposes of self-harm or self-mutilation,

this may represent an offense against common decency, which can also be a criminal offense. In practice, self-harm should also be considered in the context of simulating a self-defense situation or with the intention of incriminating another person, such as a law enforcement officer following an arrest. There are also cases where the perpetrator self-inflicts injury in order to simulate a robbery, whereas he in fact stole the goods himself. Occasionally, fatal accidents, such as traffic accidents, are simulated in order to ensure that a life-insurance payout will provide financial security for surviving dependents. Self-mutilation is also seen in the context of making a claim against an accident insurance or in order to evade military service, e.g., a “million-dollar wound” or “blightly wound.”

Self-harm (synonyms: self-injury, self-injurious behavior, self-inflicted injuries) describes direct, self-inflicted injury, usually of a nonserious nature. Injury is not inflicted with the intention of causing a life-threatening situation.

Self-mutilation describes deliberate, self-inflicted, substantial loss of peripheral body parts.

Although injuries incurred in the course of suicide or attempted suicide could also be seen as self-harm or, in some cases, self-mutilation, they are excluded in this context. The following causes form the basis of self-injurious behavior:

- Self-injury to simulate a criminal offense
- Psychiatric disorders
 - Psychoses
 - Neuroses
 - Borderline personality disorder
 - Compulsive self-injurious behavior
- As a “test of courage”
- For sexual reasons
- For the purposes of committing insurance fraud, e.g., amputating a finger and claiming for accidental injury while working in the garden
- Munchausen syndrome
- For religious or political reasons, e.g., self-immolation or hunger strike
- Self-harm while in custody
- Self-mutilation to evade compulsory military service

- Self-harm in asylum seekers to prevent deportation
- To follow fashion, e.g., tattoos, piercings, and other forms of body modification

In cases such as the above, a forensic physical examination and expert correlation with an alleged incident or event are usually able to contribute significantly to establishing the veracity of victims’ claims.

17.2.1 Differentiating Between Self-Inflicted Injury and Injury Inflicted by Others in the Case of Alleged Assault

In order to assess injuries following an alleged but otherwise unverified assault, physical findings of injury need to be consistent with the findings made by the investigating authorities (see Table 17.4, Fig. 17.8).

A somewhat “fantastical” account of an assault is often given in the case of self-inflicted injuries. The presence of superficial, mostly parallel cuts or scratches to the skin on areas of the body that are easy for the victim to reach, e.g., forearms (Fig. 17.9a, b) or the anterior upper body (Fig. 17.9c), is striking.

17.2.2 Self-Harm and Psychiatric Disorders

Self-harm is primarily seen in borderline patients, less frequently in other histrionic, dissocial, or paranoid personality disorders. The injuries encountered can usually be explained by checking the psychiatric diagnosis of the underlying disease. Patients with psychoses and neuroses are capable of inflicting severe or even life-threatening injury on themselves and causing significant blood loss. Cases of self-immolation—otherwise occasionally seen in the context of political or religious protest to highlight a particular plight—are also seen in psychiatric patients. Psychiatric disorders may lead to suicide or attempted suicide involving self-inflicted injury; however, here again, an assault is occasionally reported as the alleged cause of injury.

Table 17.4 A comparison of the characteristics of self-inflicted injury and injury inflicted by others

Characteristic	Injured inflicted by others	Self-inflicted injury
Type of sharp injury	Usually stab wounds, some cuts, occasional amputations	Predominantly cuts, as well as scratches and transitional forms
Distribution	Irregular distribution over the body	In groups, largely parallel, occasionally in rows, symmetrical distribution
Localization	All body regions, without sparing of sensitive areas	Chest, pubic region, and unclothed areas are more often affected (arms, chest, abdomen); sensitive areas (nipples and lips) and functional areas (eyes, ears) are spared; the back and inaccessible areas are unaffected; emphasis on the contralateral side to the dominant hand
Type of individual injuries	Generally short, irregular, and distinctly curved in shape	Often long, constant, mildly curved, and uniform in shape
Intensity of individual injuries	Highly variable; often deep	Almost always constant; always superficial; uniform injury depth even on non-flat areas of the body
Number of individual injuries	Rarely multiple	Remarkable frequency of multiple injuries; signs of previous self-harm possible
Overall injury severity	Generally (very) severe	Consistently mild
Concomitant injuries	Generally multiple concomitant injuries of varying type	Occasional concomitant injuries of varying type (self-inflicted)
Clothing	Involved in the injury; bears multiple signs of physical conflict	Generally not involved; occasional signs of physical conflict (self-produced)
Self-defense wounds	Often typical, deep incisions on the flexor side of the fingers, palm of the hand, and forearms	No self-defense wounds or untypical, consistently superficial incisions on fingers, hands, and forearms

From König et al. (1987), Pollak et al. (1987)

Borderline Personality Disorder. A compulsive urge to self-harm as a means of releasing inner tension is seen predominantly in young women (aged around 15–35 years), who take care to conceal their self-inflicted injuries. The frequency of scratches in upper- and forearm skin is often remarkable in borderline personality disorder patients (usually females, but occasionally also males). On physical examination, straight, mostly fine scars in either a parallel or an intersecting formation can be seen.

Munchausen Syndrome. This patient group simulates disease symptoms, self-harms, exacerbates existing symptoms, and/or delays healing of existing wounds by deliberately introducing foreign substances into the wound. These patients show an abnormal willingness to undergo diagnostic and therapeutic measures, seek contact with physicians and nursing personnel, gain superficial medical knowledge over time, and frequently demonstrate a worsening of symptoms immediately prior to discharge from hospital.

The desire for a renewed stay in hospital can become obsessive, while at the same time these patients demonstrate a certain indifference to the course of their disease and show little interest in making a recovery. Symptoms may be contradictory; moreover, these patients often discharge themselves from hospital and switch physicians and hospitals regularly.

The number of unreported cases of Munchausen syndrome is estimated to be high. In addition to up to 80 % of patients being female, individuals in the medical profession appear to be more commonly affected.

17.2.3 Self-Harm in Custody

Detention facility inmates, both with and without psychiatric disorders, show a tendency to self-harm. Some form of “incarceration shock” on initial incarceration may represent a trigger for self-injurious behavior. In some cases, fellow cell

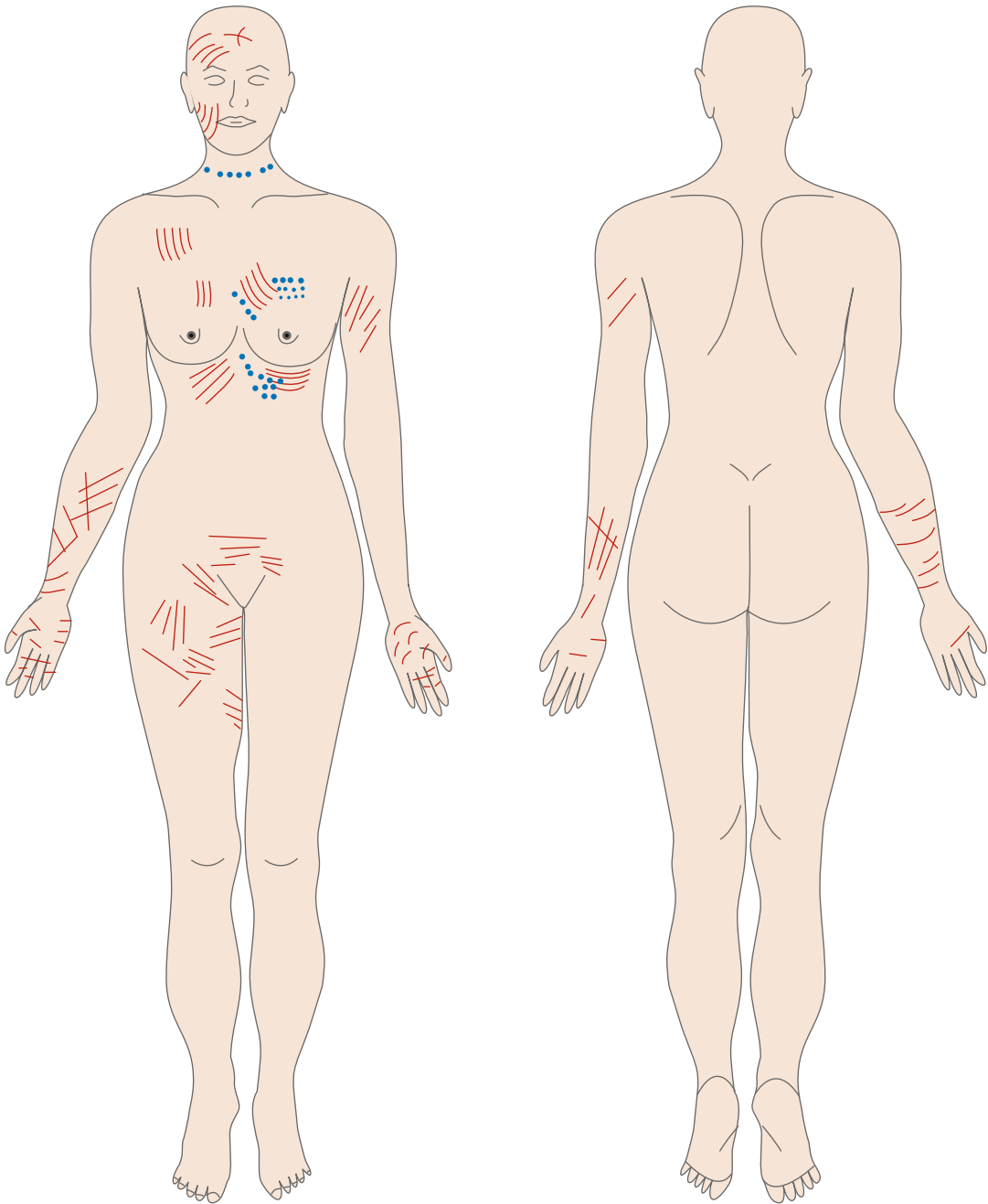


Fig. 17.8 Areas of the body affected in typical self-inflicted injury (From König et al. (1987))

inmates may be a triggering factor for anxiety and self-injurious behavior. In general, specific objectives are pursued through self-harm: increased opportunities for escape, transfer to a hospital, better detention conditions, different cell mates, etc.

Cases of self-harm predominantly involve intoxications and superficial stab wounds or cuts; the ingestion of corrosive substances is sometimes seen when inmates have access to such materials. In addition, foreign bodies may be



Fig. 17.9 (a, b) Self-injurious behavior with parallel superficial scratches on the forearm. (c) Self-inflicted superficial scratches or cuts

swallowed to induce disease symptoms, sometimes leading to life-threatening situations. Small objects found in the cell may be swallowed, including parts of cutlery, batteries, rarely razor blades, and occasionally drugs illicitly obtained in detention facilities. Life-threatening situations

arising from the above, e.g., infections, perforations, and hemorrhages, are generally not intentional—hanging is the prevalent method of suicide in prisons.

17.2.4 Body Modification

The term “body modification” is used to describe varying degrees of physical modification undertaken on the explicit wish of the affected individual. The spectrum ranges from tattoos and relatively harmless piercings to severe injury associated with the risk of infection, such as implanting foreign material subcutaneously. Voluntarily inflicted burns (“branding”) and scars in particular patterns or shapes produced by making incision wounds (“cutting”) are also known. In some cases, the boundary between modifications that represent normal variants of acceptable behavior and unethical self-harm, possibly involving third parties, becomes blurred. Perspectives may be influenced by the cultural background of a particular country, as well as the cultural or social subgroup to which an individual belongs.

17.2.5 Self-Harm and Insurance Fraud

In addition to examining and interpreting injuries in surviving victims—both adult and pediatric—of violent trauma and the associated collection of evidence, clinical forensic medicine deals with assessing mechanisms of injury that give rise to the suspicion of self-harm or self-mutilation for the purposes of making insurance claims. Cases of this kind involve, for instance, amputations of extremities (thumb or finger) that have been either staged or carried out by the accident victim themselves in an alleged accident while performing farming or building activities. In some cases, claims are then filed with several accident insurance institutions. Self-mutilation is sometimes performed for the purposes of insurance fraud, in particular by amputating the distal phalanx of fingers, toes, whole fingers, and more rarely

hands and feet. There are a number of characteristic features of self-mutilation (Table 17.3). Deliberate self-mutilation usually affects one or two fingers, only rarely three or more. Total hand amputations are rare. The fact that genuine accidental finger and hand injuries often occur in the course of everyday life should always be borne in mind.

Table 17.3 Characteristics of suspected self-harm using finger injury as an example (from Rastrup (1992))

- Recently acquired insurance policy.
- Disparity between the insurance sum and the economic situation of the insured person.
- Failure to disclose double or multiple insurances.
- A lack of eye witnesses or witnesses are subsequently influenced for the purposes of eliminating conflicting information about the time and circumstances of the “accident.”
- The description of the accident is primitive, emphasis is put on irrelevant details, and a description of the immediate sequelae is omitted.
- Untruthful claims about left- or right-handedness in order to make injury to the other hand more plausible.
- Disposal of amputated digit(s), implements, and evidence.
- Discrepancies between the reported course of events and the objective findings.
- Distinct injury abnormality (total loss of the finger, short finger stump, transverse line of transected edges, finger injury as the sole injury).
- Abnormal concomitants, such as pain relief and hemostasis prior to the accident.
- Abnormal behavior in the insured and their relatives when examined by the insurance physician.
- Immediate enthusiasm for and psychological disinhibition at the mention of proposed insurance settlements.

In some cases, attempts to reconstruct an accident for the purposes of clarifying how an injury was incurred can be helpful, particularly where complicated manual procedures involving machinery are concerned.

The distinction between an accident and self-harm is rarely achieved on the basis of a few abnormal features or types of behavior; generally, a great number of indicators need to be collated and considered jointly. The following require consideration from a forensic medical perspective:

- Type and localization of the injury, e.g., injury above the level of the sole of the foot
- Type and demarcation of injury to soft tissue and bone
- Direction of injury
- The ratio of injured to non-injured areas
- The work procedure
- The implement(s) used
- The workpiece
- Physical conditions, including lighting among others
- Traces of evidence

Once the results of an investigation have been evaluated, it is necessary to establish whether the injury could have been:

- Caused by the implement reported, in the position the implement was reported to be in
- In the reported posture
- Caused to the limb actually injured
- Caused by a physiologically and mechanically plausible mechanism

It must then be determined whether or not the injury is consistent with the sequence of events described by the injured party or witnesses, whether injury could have occurred spontaneously in the course of performing common and familiar activities, or whether it could only be explained if some form of contrived posture was adopted. It is also necessary to establish whether information given about the accident is consistent with the objective findings. For example, accidental amputation of the left thumb or a finger on the left hand (in right-handed individuals) allegedly due to poor aim while using an axe or hatchet is reported relatively frequently. In cases such as these, a poor aim that happens to strike the thumb is only possible if the left hand had been placed hazardously close to the point the axe was intended to strike in the first place. Where this is the case, the direction of amputation deducible from X-ray findings should be consistent with the

alleged initial position, that is to say, for example, from the ulnar side to the radial side and not from the extensor side to the flexor side.

17.3 Fitness to Undergo Questioning, Be Held in Custody, Stand Trial, and Receive a Custodial Sentence

Particularly in the context of judicial proceedings, there are a number of circumstances that require a (forensic) medical assessment of witnesses (victims) and defendants (suspects) to establish their status: from the time of arrest, police caution, and questioning (capacity to understand a caution, fitness to undergo questioning) to detention and trial (fitness to be held in custody, capacity to stand trial, and fitness to serve a custodial sentence).

Fitness to Undergo Questioning. Witnesses (including victims) and defendants should be questioned as soon as possible following an incident. A defendant must be given the opportunity to comment on the charges brought against him/her. Since, following caution, the information or description given by the defendant will be used in subsequent legal proceedings, the defendant must be fit to undergo questioning.

Fitness to undergo questioning is the capacity to understand the meaning of and answer questions posed during a hearing (or questioning) by the investigating authorities (police, public prosecutors) and the court. The defendant possesses sufficient ability to communicate in a contextually ordered manner.

During questioning, the interrogee's capacity to make decisions should not be impaired by disease, intoxication, etc. Impairment to the suspect as a result of prohibited interrogation methods (§ 136a, German code of criminal procedure), such as threats of violence (torture), is not permitted. A suspect is not fit for questioning, for example, when his/her consciousness, ability to reason and make decisions, or memory is severely impaired. Acute severe alcohol, drug, and/or medication intoxication, as well as acute withdrawal symptoms and severe exhaustion or

fatigue, can cause a suspect to be unfit for questioning. Thus, it is quite possible that the procedural admissibility of statements made by suspects under the influence of alcohol or drugs requires subsequent examination. If, following questioning, the suspect remains under suspicion, he may be detained in police custody until arraignment, provided fitness to be detained in custody is proven.

Fitness to Be Detained in Custody. A distinction is made between fitness to be detained in custody and fitness to serve a custodial sentence. An individual may be detained in custody until arraignment or for the purposes of sobering up. Where doubt exists, fitness to be detained in custody needs to be medically checked or established.

Important: Fitness to be detained in custody relates to the question of whether the detention of a person in temporary police custody is medically tenable.

Crucial here is the fact that a person is (initially) held in temporary custody in areas or cells specified by the police. Restrictions to an individual's fitness to be detained in custody may arise in the case of:

- Acute (psychophysical) disease requiring therapy or surgery
- Medical conditions, such as diabetes mellitus, hypertensive crisis, epileptic seizure, and cardiovascular disease
- Alcohol, drug, or medication intoxication
- Psychiatric disorders such as acute psychosis (claustrophobia, etc.), whereby in such cases, the question of forced detention may need to be examined, depending on the legal situation

If the investigating authorities are of the opinion that grounds for detention are present, the individual held in custody must be brought before a committing magistrate, who then decides whether the individual will be, at least initially, remanded in custody—on the provision that the person is fit to be detained in custody.

Fitness to Serve a Custodial Sentence. Whenever a person is to be placed in custody, such as remand or prison, it is necessary to establish whether this form of long-term detention is

medically tenable. The following represent possible restrictions to fitness to serve a custodial sentence:

- Acute life-threatening disease
- Severe psychiatric disease
- Chronic depleting diseases such as anemia or advanced cancer
- Conditions associated with hunger strike

As with other concepts, there is no legal definition for fitness to serve a custodial sentence. Prison physicians may be called upon to establish whether a person is fit to serve their sentence or an examination may be carried out in a prison hospital.

Important: Unfitness to serve a custodial sentence presupposes an immediate disease-related risk of death, a severe psychological deterioration, or severe and usually chronic health impairment.

An individual detained in remand will only be transferred to a regular prison once their sentence has come into force following trial. Attendance at trial presupposes that the detained individual is able to travel to court and attend court sessions. In general, fitness to travel and attend court sessions can only be impaired on the basis of severe impairments to health, which need to be medically established. The question of whether an individual is fit to stand trial is more commonly raised.

Fitness to Stand Trial. Occasionally, the question of whether a person is fit to stand trial or participate in legal proceedings and conduct his/her defense (legal capacity to sue and be sued) requires clarification. According to the German Federal Constitutional Court (*BVerfG NJW* 1995, 1951), a defendant should have the capacity, both within and outside of court proceedings, to defend his/her interests in a reasoned way, put forward his/her defense in an informed and understandable manner, as well as make and understand procedural declarations.

To ensure that these requirements are fulfilled, it is the task of the medical expert, usually called upon by the court, to provide information on an individual's fitness to stand trial while taking the following points into consideration

- Type of disease?
 - Organic disease?
 - Psychiatric disease?
- Acute or chronic intoxication?
- Withdrawal symptoms?
- Is there a temporary disease-related impairment to an individual's fitness to stand trial?
- Where relevant, is unfitness to stand trial total or partial?
- Can the disease causing total or partial unfitness to stand trial be medically treated with curative therapy? If yes, when can a restoration to fitness to stand trial be expected?
- If the disease cannot be treated curatively, would palliative therapy be able to prognostically guarantee fitness to stand trial until proceedings are completed?
- Could a disease only susceptible to palliative therapy cause unfitness to stand trial in the foreseeable future? If so, within what timescale?
- If a disease can be either curatively or palliatively treated, how much risk is associated with the required therapy as administered according to standard medical practice?

In practice, it should be borne in mind that defendants sometimes deliberately cause their unfitness to stand trial. This may be achieved by abusive ingestion of alcohol, drugs, and medication, a deliberate failure to take advantage of treatment options, deliberately bringing on a psychological emergency, attempting suicide or inflicting some other form of self-harm, and occasionally hunger strike.

17.4 Radiological Diagnosis

Alongside the clinical and physical examination of an injured person, in particular victims of violent crime, radiologically detected findings may also be very helpful. They are often able to make the diagnosis of internal findings in the neck and throat region easier (hemorrhage under the skin, in the soft tissue of the neck and in the salivary glands, as well as fractures). It may be helpful to examine a patient more than once, and at least twice, at intervals of a few days. Radiological

examinations, however, require the victim's consent and possibly an order from the court or authorities.

Radiological diagnosis plays an important role in the collection and documentation of evidence in clinical forensic medicine. In addition to classic X-rays and computed tomography, radiation-free methods such as magnetic resonance imaging and ultrasound are increasingly used in forensic diagnosis.

Since bone fractures, for example, represent sufficient clinical indication for X-ray examinations, existing X-rays can be used for the purposes of forensic assessment. The same is true for CT datasets produced for the clinical diagnosis of injuries (e.g., involvement of body cavities in sharp trauma or complex fractures of the mid-face). These datasets permit the visualization of actual wounds, as well possibly enabling a reconstruction of, for example, puncture wounds to the skin and wound tracks.

Methods associated with radiation exposure are rarely used in patients purely on the basis of forensic indications, given that this would contravene the principles of protection against radiation. By way of exception, a child's skeletal system may be investigated for the purposes of detecting or excluding older, healed bone fractures in the case of suspected child abuse. Forensic age determination in living individuals is only sufficiently conclusive when X-rays of the teeth, medial clavicular epiphysis, or carpal bones are performed; but again, the indication must be made strictly on the basis of diagnostic relevance and according to the basic principles of radiation protection.

Ultrasound can have an important role to play in the estimation of extent of superficial soft tissue hematomas; together with the color of a hematoma, estimations on hematoma age are possible to a limited extent.

External signs of injury may be absent even in the case of genuine injury to the neck. Although clinically reported difficulty in swallowing and hoarseness may be further indications of injury, these symptoms are highly subjective. In such cases, detecting trauma to the neck and throat may be possible by means of soft tissue visualization

using magnetic resonance imaging. These methods and their applications are discussed in greater detail in Chap. 24.

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