



Medical Implications

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OFFICIAL



MEDICAL IMPLICATIONS

Introduction

This section of the manual has been subject to an extensive review by members of the Independent Medical Sciences Advisory Panel (IMSAP). IMSAP is sponsored by the Home Office and is under the Chairmanship of Professor James M Ryan MCh FRCS DMCC Hon FCEM.

IMSAP has made their collective recommendations based on current medical research, best practice and expert opinion after observing comprehensive practical demonstrations of the tactical options and techniques described in this manual.

Whilst these opinions may be challenged by others within the medical profession ACPO are confident that IMSAP advice is robust and can be fully supported where necessary.

This module considers the potential liability for the officer as well as the Police Service, and attempts to eliminate unnecessary injury to both the subject and the officer by broadening knowledge.

It is accepted that a caveat exists, whereby an officer may use a technique that is not contained within the pages of this manual. In such cases a post examination by medical practitioners may be sought, or the outcomes are similar to those techniques already present.

Only the techniques that have been reviewed will be taught to officers. Any 'tool kit' submitted will be presented for medical review prior to appearing in this manual.



NOTE

Reading this section of the manual does not make you a medical expert but hopefully broadens your knowledge in relation to injuries and medical conditions, which may assist in the appropriate tactical option being chosen by you at that particular moment in time.

It may also assist in explaining why other options were not used and assist in providing appropriate after care or first aid to those involved.

i INFO POINT

Officers should be aware that body weapons and target areas need not be technically referred to.



Acute Behavioural Disorder

Just as abnormal brain function can be associated with stupor or loss of consciousness, it can also cause confusion or agitation.

The causes of agitation include:

- Acute brain inflammation (infection of the brain such as meningitis)
- Limited oxygen supply to the brain (such as acute pneumonia or heart attack)
- Metabolic problems (diabetes can cause high OR low blood sugars. Both can cause severe changes in personality and behaviour - from sleepiness to agitation - and can be lethal if untreated)
- General illness (severe sepsis can cause confusion)
- **Psychiatric illness (the 'manic' phase of manic depression or acute psychotic illnesses like schizophrenia)**
- **Acute intoxication with a broad range of drugs, or withdrawal from them**
- **Acute brain injury (such as a 'stroke' or blow to the head)**

The degree of agitation may vary but the causes listed **in bold** in the panel below left are more commonly associated with severe agitation. This is sometimes known as 'excited delirium' or 'agitated delirium'.

But agitation is agitation. Even in hospital, it can be very hard to tell one cause from another. Indeed, patients with a serious illness have died when 'left to sleep off the booze'. In these circumstances a number of causes can co-exist. Therefore the alcoholic is at greater risk.

Reasons for restraining an agitated person

An officer may have to restrain an agitated person for several reasons:

- Because the subject is a danger to themselves
- Because the subject is a danger to others
- Because the subject is committing, or is thought to have committed a crime.

However, restraint carries risks:

- The cause of the agitation may in itself be fatal if ignored.
- Restraint itself may endanger life, especially if undiagnosed medical conditions are present, for example 'Sickle Cell Disease'.
- The medical conditions causing the agitation may put the patient at greater risk when restrained.
- The main acute risks of restraint relate to associated difficulties in breathing.

What is acute behavioural disorder?

This is when a subject exhibits violent behaviour in a bizarre and manic way rather than just being simply violent.

Acute behavioural disorder is a rare form of severe mania, sometimes considered part of the spectrum of manic-depressive psychosis and chronic schizophrenia. However many of the signs indicating acute behavioural disorder are common to anyone behaving violently.

Why is a subject in an acute behavioural disorder state of particular concern?

Subjects suffering from acute behavioural disorder can die suddenly during, or shortly after, a strenuous struggle - whilst at hospital or in custody.

Dealing with a case of acute behavioural disorder

It is important to recognise the difference between acute behavioural disorder and a violent outburst.

+ SAFETY POINT

Death can occur:

BEFORE a struggle

DURING a struggle or

DURING restraint AFTER a struggle.

Death is most likely to occur in two ways:

1. The state of acute behavioural disorder causes the subject to have a cardiac arrest
2. The physical exertion leading to oxygen deprivation due to the activities prior to and possibly during restraint make an individual become more at risk from positional asphyxia.



The Causes and Identification of Acute Behavioral Disorder

Acute behavioural disorder can be caused by:

- Psychiatric illness
- Drugs, of which cocaine is the most common cause
- Alcohol
- A combination of drugs, alcohol and psychiatric illness.

Identifying a case of acute behavioural disorder

Symptoms:

- Bizarre and/or aggressive behaviour
- Impaired thinking

- Disorientation
- Hallucinations
- Acute onset of paranoia
- Panic
- Shouting
- Violence towards others
- Unexpected physical strength
- Apparent ineffectiveness of incapacitant sprays
- Significantly diminished sense of pain
- Sweating, fever, heat intolerance
- Sudden tranquillity after frenzied activity or vice versa
- Hot to the touch.

How do you control a subject experiencing ABD?

This will always be very difficult. Officers will probably have to place the subject face down on the ground in order to handcuff them safely. The risk of positional asphyxia affecting a subject who is in a brain agitated state is far greater than for a normal violent subject.

They may continue to struggle beyond their point of exhaustion and it will be very difficult to prevent this regardless of whether or not they are handcuffed.

Once they are handcuffed do not hold them face down. They should be moved onto their side or into a sitting, kneeling or standing position as soon as it is safe to do so. They may continue to kick out. However officers must get them off their stomach in some way or other as soon as they can.

Once a subject is controlled what should be done then?

They may continue to be extremely violent in spite of the use of handcuffs, sprays or batons. Such bizarre, exhaustive and persistent violent resistance is a classic indication of a severe brain agitation case. The officer must monitor them carefully, treating them as a medical emergency as they could collapse and die at any time.

The individual must be examined at hospital, even if they suddenly calm down before the officer arrives at the scene. If the officer thinks they are dealing with an individual with brain agitation then it must be deemed as a medical emergency at hospital. There is no harm done if they turn out to be fine.

They can collapse very suddenly and attempts to resuscitate them usually fail. The likelihood of police officers and staff encountering individuals suffering from brain agitation is rare but real.

Danger!

Certain restraint positions of individuals exhibiting signs of severe brain agitation increase the risk of death.

Restraining an individual in a prone, stomach down position is particularly hazardous. This is increased if the individual's hands are handcuffed behind their back.

It should be remembered that obesity, alcohol and drugs increase the hazard still further by restricting the diaphragm and lung function.

Actions to reduce the risk of death

to a restrained subject exhibiting acute behavioural disorder:

- Get the subject onto their side, into a kneeling or seated position as soon as possible
- Never transport in a prone position if at all possible
- Pay close attention to the life signs of the subject and monitor closely, especially if the subject should suddenly become very passive.



SAFETY POINT

Any subject exhibiting symptoms of acute behavioural disorder should be treated as a Medical Emergency and should be medically examined immediately at a hospital regardless of any subsequent behaviour or apparent recovery.

Examination at a police station may not be appropriate.

Positional Asphyxia

Breathing and the problem of restraint

The role of the lungs is to:

- **Get oxygen into the body**

This keeps the organs working normally and the blood (and thus skin and lips) pink. Lack of oxygen stops organs functioning properly, including the brain.

Low oxygen levels can thus make patients bemused, confused, sleepy or agitated. Everyone is different. If very short of oxygen, they may be

blue (this can be hard to see in the dark) and the patient may look blue-ish in the cold anyway. So low oxygen levels are easy to miss.

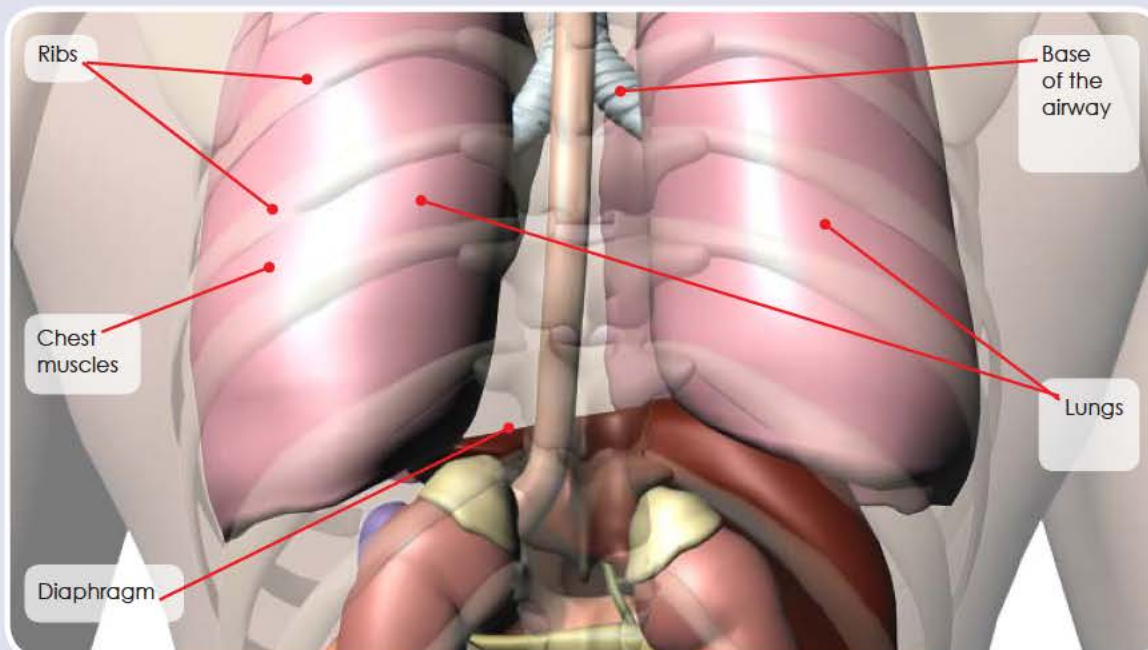
- **Get rid of (acid) carbon dioxide**

Try holding your breath for 2 minutes. The sense of agitation you feel is due to rising carbon dioxide levels.

To perform these two roles, air is drawn into the lungs and forced out again.

This happens because the chest works like a giant set of bellows.

Key Components of the Breathing Mechanism



The key components of these bellows are:

Ribs	Broken ribs can cause pain and make breathing hard. A 'rack' of broken ribs may 'float free' and make breathing harder.	Lungs	There is a tiny space between the ribs and the lungs. A punctured lung (for instance, after a kicking or stabbing) can cause air to leak from the lungs, fill this space up and collapse or compress the lungs.
Chest muscles	The chest muscles which include those between the ribs, and the muscles of the shoulders and back, if one is breathing hard.	Airway	A normal airway runs from the mouth and jaw, to the voicebox and main windpipe to the lungs.
Diaphragm	Put your hands on the top of your tummy and sniff. The tummy moves out. This is because it is pushed down by a sheet of flat muscle called the diaphragm.		

Restraint

Restraint can thus cause problems with breathing; the shoulders may be held, the belly pressed (someone sits on it/ kneels on it, or the subject lies flat) and the airway may become narrowed (the head forced or flopped right forward can cause this, but so too can having the head flopped back or pressing on the neck).

There are always risks; lying face down can compress the belly, but lying flat on the back risks inhaling vomit if they throw up.

All of these can prevent oxygen getting into the body, or carbon dioxide getting out.

Especially vulnerable are those:
 (i) already having to breathe hard to get oxygen in and carbon dioxide out due to severe exertion
 (ii) with a medical condition causing low oxygen levels already (e.g.

pneumonia) or acid blood (for instance, some cases of kidney failure or high blood sugar due to diabetes).

Restraint may thus cause even lower oxygen levels (or higher carbon dioxide levels); the patient gets more and more agitated, and needs more and more restraint. In the end, the carbon dioxide levels rise so high (and/or oxygen levels so low) that the patient becomes quieter and struggles less.

This can be a point very close to death.

What is positional asphyxia?

In simple terms an individual can stop breathing because of the position they have been held in. Positional asphyxia is likely to occur when a subject is in a position that interferes with inhalation and/or exhalation and cannot escape from that position.



Guidelines for Avoiding Positional Asphyxia

When is it likely to occur?

- When an individual is prone causing their stomach to press up to the ribs
- When an individual is sat (possibly in a vehicle) and their head drops between their knees compressing their chest and abdomen
- When the individual's head falls forward restricting their windpipe.

This can occur rapidly and post mortems have failed to identify any other anatomical or toxicological findings sufficient to explain the death.

Risk factors

The following are risk factors that have been shown to contribute to positional asphyxia:

- Individual's body position results in partial or complete airway constriction
- Alcohol or drug intoxication (the major risk factor)
- Inability to escape position
- The subject is prone
- Obesity (particularly subjects with what is commonly known as large 'beer bellies')
- Restraints
- Stress
- Exhaustion, following strenuous muscular activity (such as fighting or running away).
- Injury
- Medical conditions.

“ This can occur rapidly and post mortems have failed to identify any other anatomical or toxicological findings sufficient to explain the death. ”

Signs and symptoms

Officers should pay close attention when they recognise the following symptoms, taking immediate action to remedy them, and treat as a medical emergency:

- Body position restricted to prone, face down
- Cyanosis (lips/nail beds/gums are discoloured blue due to lack of oxygen)
- Gurgling or gasping sounds
- Behaviour changes - an active prisoner suddenly becomes passive or a loud violent prisoner becomes quiet/tranquil
- Panic
- Subject tells the officer that they cannot breathe.

Transporting an individual

- The condition of the individual must be checked and monitored prior to, during and at the conclusion of the journey.
- The individual must not be transported in a prone, face down position.
- Note: In some cases, transport in a face down position may be unavoidable. In this situation constant supervision/monitoring is of paramount importance.

Reception in a custody office and/or hospital

- Inform the custody officer or medical staff of the nature and circumstances surrounding police involvement
- The officer should inform the custody officer or medical staff of any restraint options or equipment options used during arrest as well as the method of transporting the individual.

Custody officer

The custody officer should:

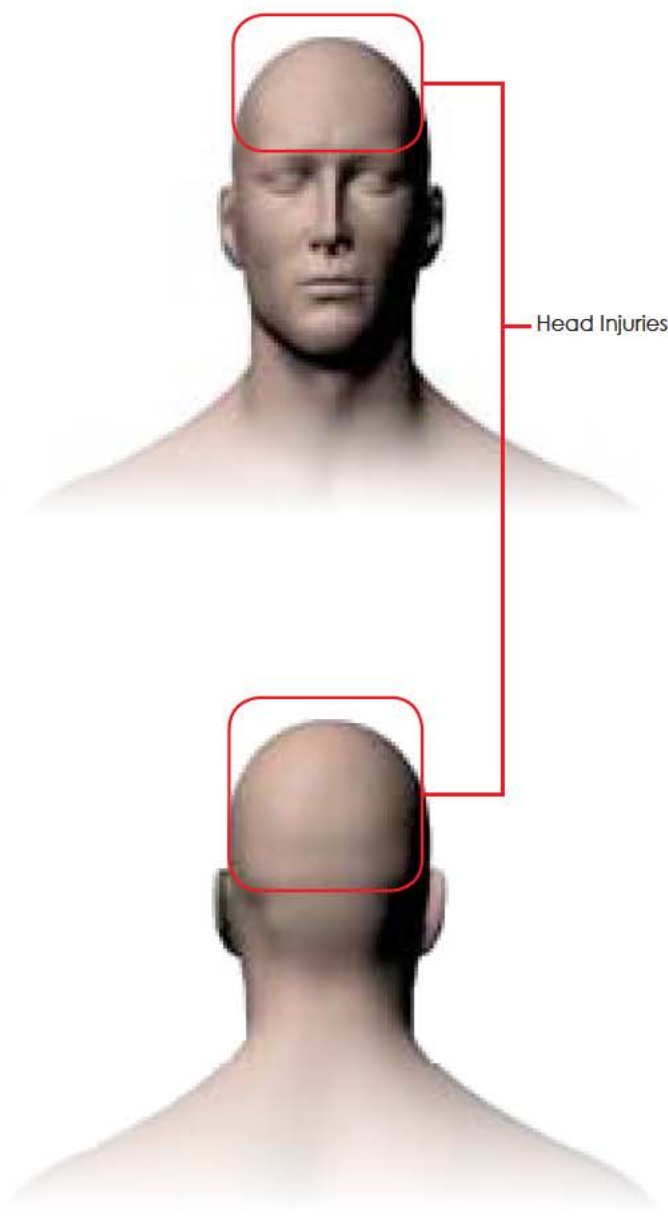
- Note the condition of the subject
- Consider the likelihood of alcohol/drug abuse
- Observe any signs of toxicity
- In the case of an emergency, arrange transport to hospital, if they are in any doubt that the individual may be suffering from positional asphyxia
- Complete documentation of everything witnessed.

Head Injuries

Many of the techniques used may result in trauma to the head. This may result from direct blows to the head from body weapons or the use of Personal Protective Equipment (PPE). Further, head injury may result from striking the head on a hard surface during an uncontrolled fall. The resulting injuries may be classified as follows:

Diffuse injury – Concussion and Diffuse Axonal Injury (DAI)

The brain is soft in consistency and is loosely anchored within the bony box of the skull. A blow to the head may cause acceleration/ deceleration of the soft brain



inside the bony skull box resulting in bruising (contusion) or, more seriously, stretching or tearing of nerve tracts within the brain causing diffuse axonal injury (DAI). The outcome is an alteration in conscious level or complete loss of consciousness.

An alteration in conscious level, including complete loss of consciousness is the hallmark of significant brain injury and warrants urgent medical attention.

Focal impact injury

Typically occurs when the head strikes a protruding object or following a blow using PPE.

There may be a laceration to the scalp with possibility of underlying fracture. There may be significant bleeding from torn blood vessels in the scalp and alteration in conscious level. These injuries are associated with a high risk of epilepsy and brain infection. Urgent medical attention is necessary.

Swelling around or in the brain

This may or may not be associated with skull fracture. In a fit, healthy subject significant force is required. However in subjects with a history of chronic substance abuse bleeding may occur with minimal force.

Again the cardinal feature is an alteration in conscious level, which may be transient but then recur (this is called the lucid interval).

Look also for any reduction in the use of arms or legs or variation in the size of the pupils. Particular care must be exercised in subjects who have been drinking or where substance abuse is suspected.

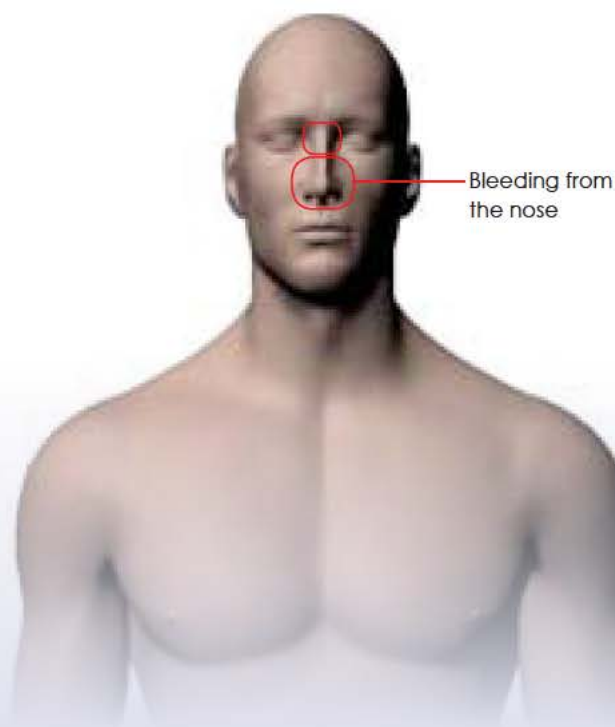
Do not assume a change in conscious level is due to alcohol or drugs. The slightest suspicion of injury demands urgent medical attention.

Facial Injuries

There are two potential issues following blows to the face using body weapons or work equipment. These are significant bleeding and facial swelling.

Bleeding from a facial injury can be very difficult to control due to the regions rich blood supply. Bleeding from the nose can be particularly troublesome.

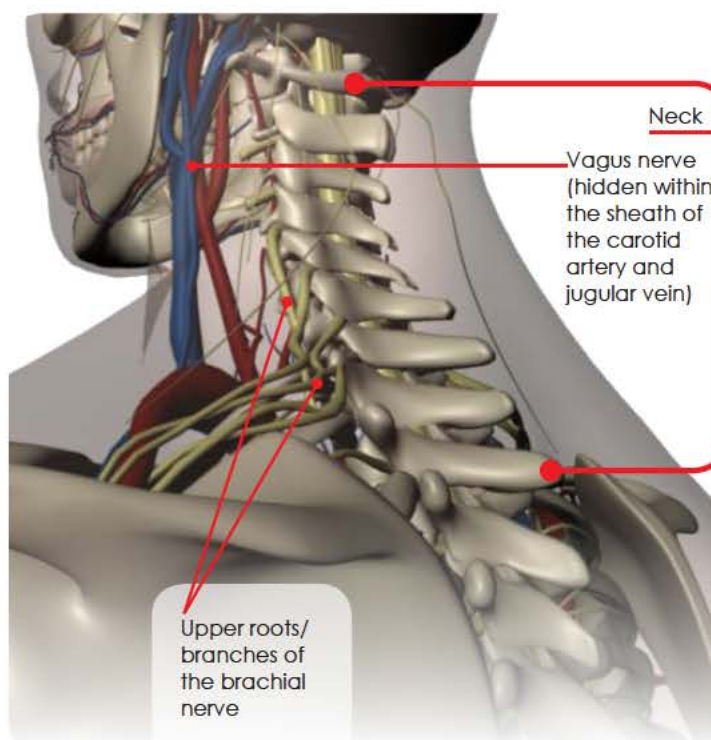
Seek expert medical help as a matter of urgency. The face has a dramatic tendency to swell following injury. Swelling around the eyes or in the mouth may obstruct the airway. Urgent medical evaluation is needed.



Spine and Spinal Cord Injuries

As with head injury many of the techniques described may result in injury to the bony spine with or without involvement of the spinal cord. Particular care must be exercised in dealing with subjects with an alteration in conscious level. Even in a fully conscious patient spinal injury cannot be excluded. The neck is particularly prone to injury.

Forceful neck movement in any direction following a fall or blow to the head or neck may result in serious injury. If neck injury is suspected because of a complaint of neck pain or loss of limb function or because of the injury mechanism, the subject should be managed lying on their back with the head in the neutral position and manual immobilisation technique applied (see next page). During immobilisation it is vital that the subject's airway remain open. Hypoxia or loss of oxygen to the brain will result in worsening of the injury. If injury to the airway is suspected get urgent medical help.



practical techniques...

START overleaf

SPECIFIC IMPLICATIONS

Handcuffs and Other Restraining Devices

Handcuffs

Every officer is likely to handcuff a subject sometime in their career, and some officers may

use handcuffs several times during a duty period. With each handcuffing event there is potential for injury.

Officers should consider that a subject might already have an injury prior to interaction with them. Individuals may have cuts, bruising, swelling, reddening of wrists, fractures and trapped nerves as a result of being handcuffed.

Carpal tunnel syndrome (handcuff neuropathy)

This condition can result from pressure on the median nerve where it passes into the hand via a gap (the carpal tunnel) under a ligament at the front of the wrist. The median nerve carries sensory messages from the thumb and some fingers, and also motor stimuli to the muscles in the hand. Damage to the nerve can cause sensory disturbances, particularly numbness, tingling, loss of flexion and weakness.

In terms of subjects who have suffered nerve damage to one or both wrists, this often results from one or both bracelets of the handcuffs being cinched down on a subject's wrists too tightly, or the

handcuffs being tightened by the subject or by a third party when the officer has failed to double lock them. This may also occur if the handcuffed individual tries to escape by wriggling their arms and wrists whilst they are handcuffed. Many medical findings show that the median nerve within the carpal tunnel is vulnerable to indirect injury from a variety of causes.

It is also known that handcuffs can block blood flow from the hand if they are left on a subject for an extended period of time which can cause the contents of the carpal tunnel to swell, which can in turn give rise to chronic nerve pain.

Injuries to the median, ulna and radial nerves can occur from direct compression by the handcuffs. Single or multiple nerves can be affected. The injury in most cases is bruising to nerves.

Always, where practicable, check for tightness and double lock the handcuffs.

Intoxicated people are most at risk as their ability to feel pain is lessened.

Nerve damage can cause:

- Sensory disturbances e.g. numbness, tingling
- Pain
- Loss of flexion in fingers
- Weakness



GO TO:
MODULE 08
HANDCUFFING

Damage can be temporary or permanent and can last, in some cases for up to 6 weeks.

Although the focus so far has been related to potential damage to the inside of a subject's wrist, officers could also fracture the wrist. If handcuffs are inadvertently double locked prior to attempting application they may fracture a wrist, lacerate the skin and do other trauma type damage. It may also occur when compliance is used. Bone breakage is rare from handcuffs.

Vulnerable areas:

- The ulna styloid process is more likely of the two to break, but it tends to heal easily.
- Styloid process radial
- Scaphoid fracture

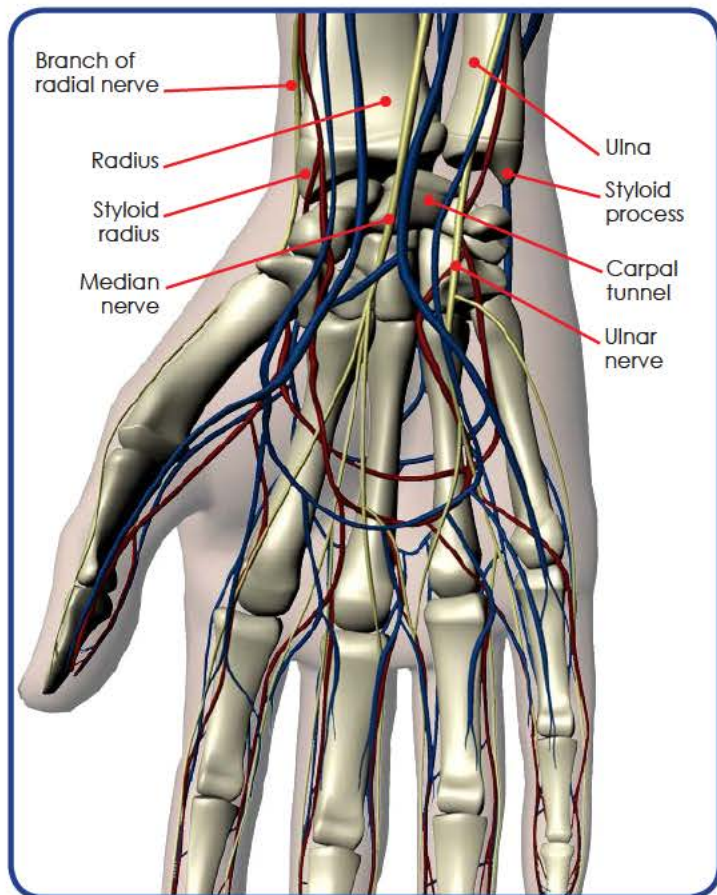
Soft tissues injuries

When handcuffs are correctly placed on a subject who offers little resistance the cuffs will still leave marks on the wrists.

Movement of the subject's wrist within the handcuff or the **handcuff being too tight** may produce:

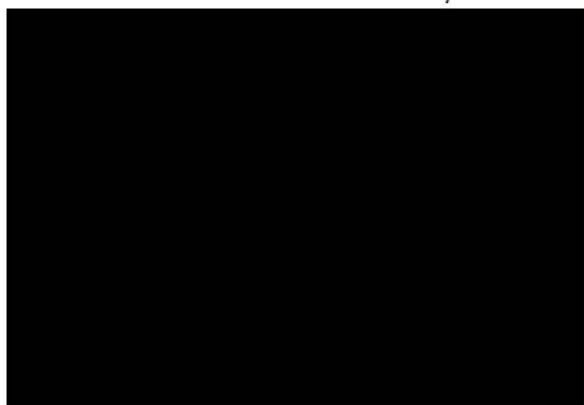
- Erythema (reddening of the skin)
- Abrasions
- Bruising - usually to the outside and inside of the wrist
- Small lined cuts (radius and ulna borders)
- Swelling of the hand.

These injuries sometimes extend a few centimetres away from the wrist indicating movement between cuff and wrist.



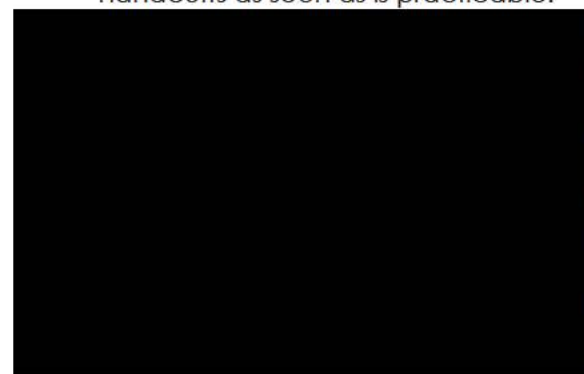
When handcuffs are used they must be double locked unless it is clearly not possible to do so. When the double locking mechanism is not used, care should be taken to ensure the handcuffs do not progressively tighten. Checks should be made to ensure that no unnecessary injury is caused.

Any use of handcuffs needs to be recorded detailing the grounds for their use and the facts brought to the attention of the custody officer.



Plasti-cuffs / Boot lace cuffs

These can cause injuries as above. They can tighten further as there is no method of double locking. Therefore direct compression injuries to the wrist area can be apparent. It is also important that care be taken when cuffs are cut off (if they do not have locks). Ideally individuals should be placed in metal handcuffs as soon as is practicable.



Trifold cuffs

This device is an effective restraint. The cuff-parts are very narrow and have no quick release device or key requiring the cuffs to be cut off with scissors or similar equipment. As with all cuffs there is a risk of over tightening. The normal recommendation of being able

to insert 2 fingers between cuff and wrist is required. A further recommendation is that the device should be improved by including either a key or quick release mechanism. The device should also be seen as a temporary expedient prior to application of normal handcuffs.

Summary of potential injury checks

Check for pre-existing injury

Check for early signs of undue compression; tingling and numbness in fingers

Check for early signs of undue vascular compression; swelling or discolouration

Check for undue bone compression; severe pain over radial or ulnar styloids

Emergency Response Belt (ERB)[®]

This refers to the application of the device and carrying a subject with the device in situ.

The author fully understands the indications for use of the device and supports its use subject to a number of caveats.

Caveats

The author, while understanding the need for tight application, is concerned that prolonged application presents a number of risks:

Vascular compromise

Prolonged or over tight application may cause vascular problems to the upper or lower limbs. A tourniquet like effect is possible resulting in distal limb ischaemia.

A further risk is the development of a distal limb compartment syndrome.



Neuropraxia

The distal component of the lower limb restraint exerts considerable pressure to the latter aspect of the legs just below the knee.

This has the potential to press on an important nerve – the lateral popliteal – resulting in temporary or permanent damage to leg muscles resulting in a foot drop.

Joint dislocation

Over extension of the arms when applying the upper component of the restraint may result in shoulder dislocation.

Skin pressure effects

The necessary tightness of application results in the knees being tightly compressed and could result in pressure necrosis of the skin overlying the medial (inside) aspects of the knees where bone is protected only by a relatively thin layer of skin.

Chest compression

Tight compression of the chest raises the potential for positional asphyxia,

Safe usage of ERB

All of the concerns outlined can be addressed by observing a set of simple recommendations:

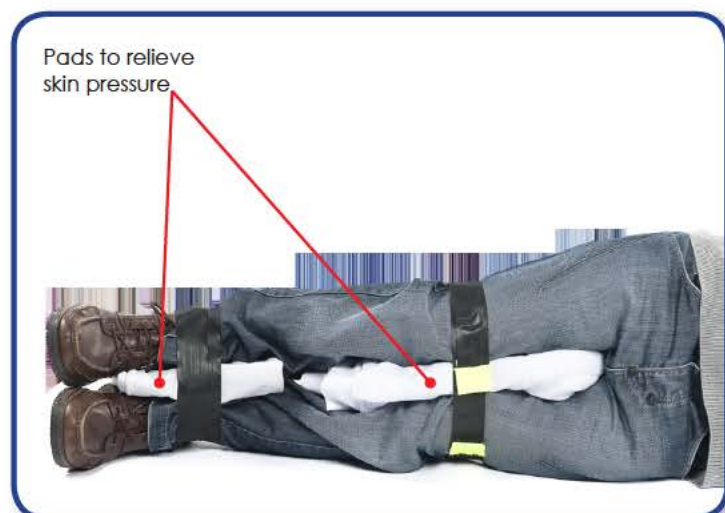
- Officers should ensure against over tightening by checking that 2 fingers can be easily be inserted between the straps and the underlying limb.
- Regular checks should be made to identify worrying symptoms such as increasing pain, altered sensation or loss of feeling distally.
- Great care should be observed to ensure that limbs are not constrained in abnormal positions.
- Particular care should be taken in assessing breathing difficulty and chest movement. Signs of breathing difficulty should prompt immediate loosening of the restraining straps. This will require training.
- The device should be seen as a temporary measure and removed as soon as other measures can be instituted – ideally within 30 minutes.

Opinion

Subject to the above recommendations the device is considered fit for purpose and is an appropriate item of equipment for officers.

particularly in subjects who struggle violently, with existing lung disease or when under the influence of alcohol or drugs.

Picture below shows clothing between the bony parts of the knees and ankles

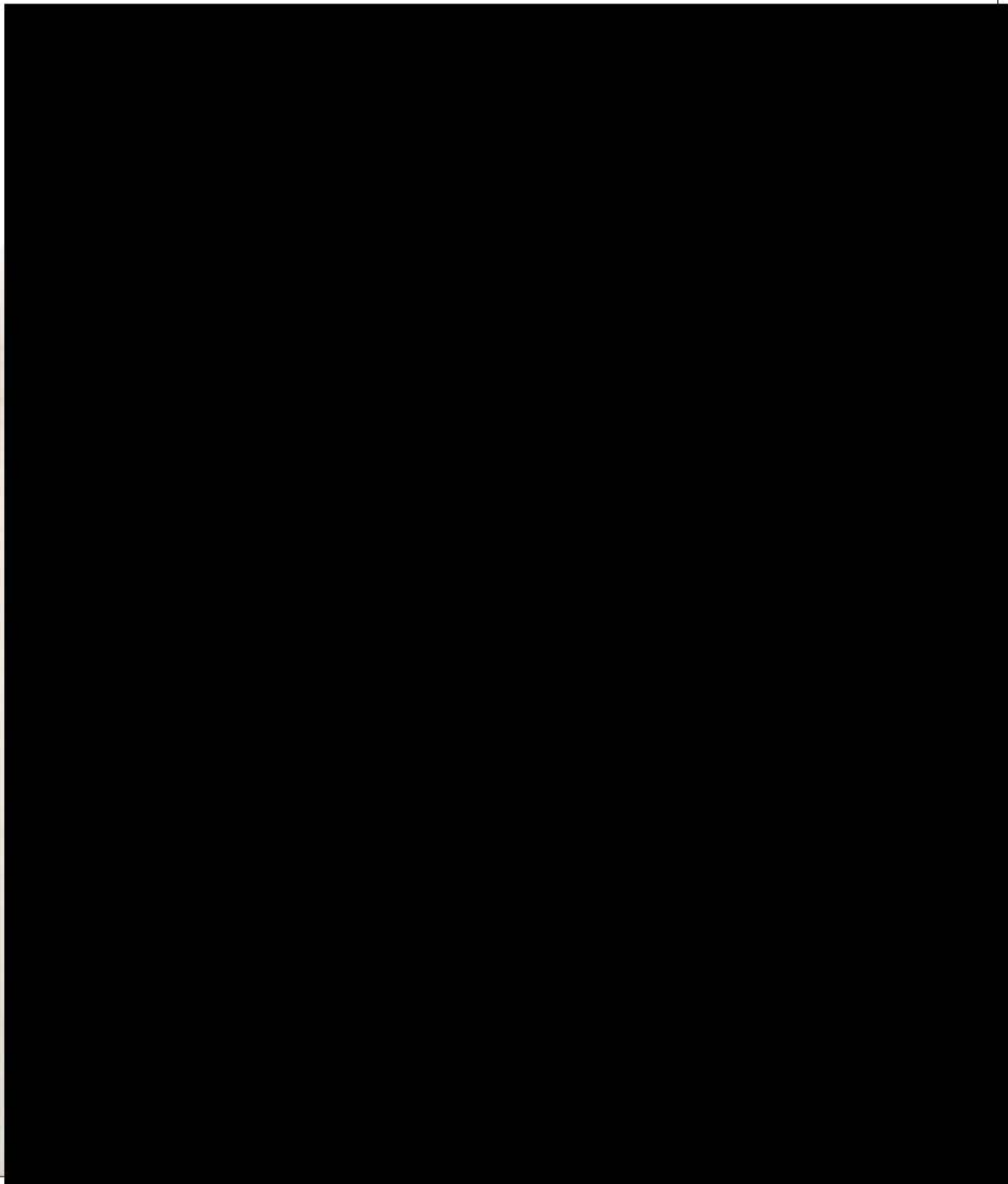


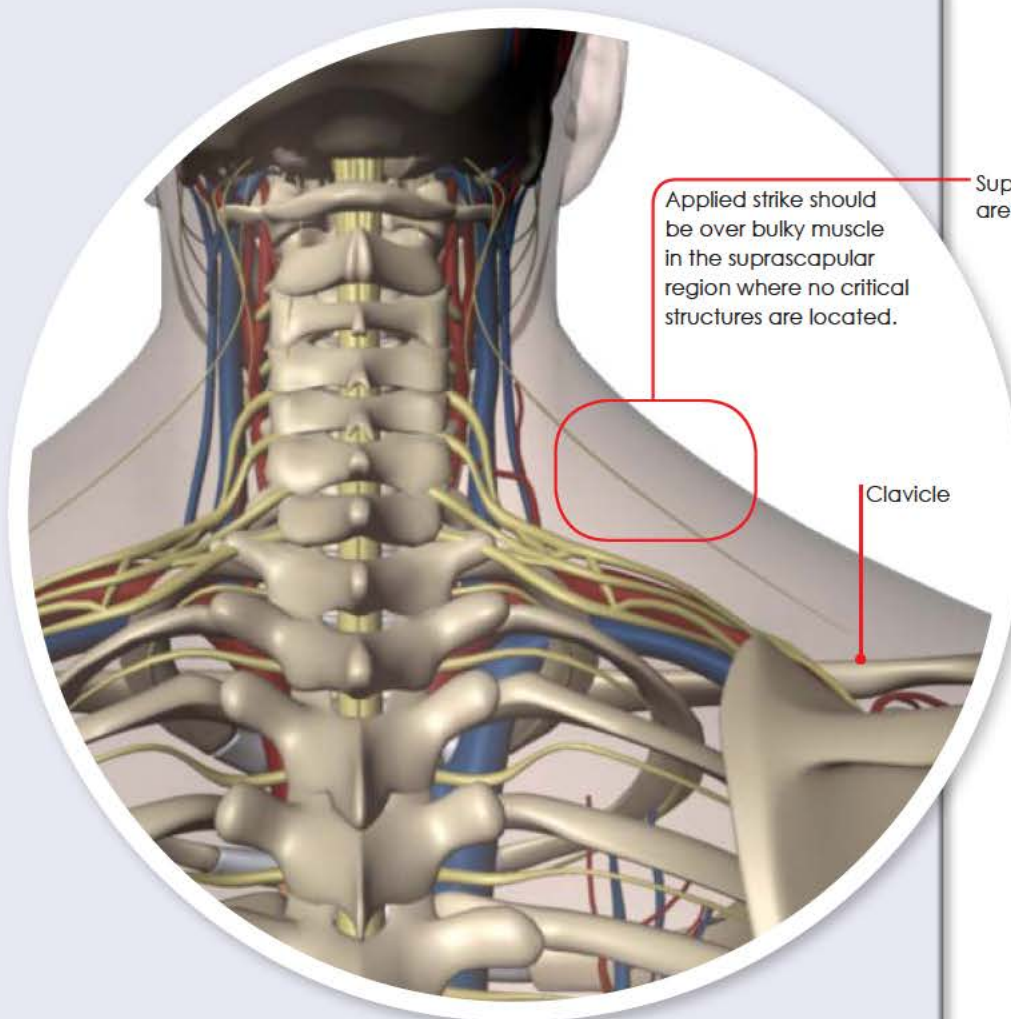
SPECIFIC IMPLICATIONS

Use of Nerve Points

Suprascapular nerve point

Strikes may be applied by body weapons or work equipment.





Anatomical structures

Applied Anatomy:

The important anatomical structures in this region are the neck bones medially and the clavicle in front. However, a correctly applied strike should be over bulky muscle in the suprascapular region where no critical structures are located. Accuracy is important because of important adjacent structures.

Strikes applied to near the neck may result in a variety of neck injuries from sprain to fractures or even injury to the spinal cord with disastrous consequences.

A strike too far to the front could injure or even fracture the collar bone or clavicle.

Outcomes:

Probable:

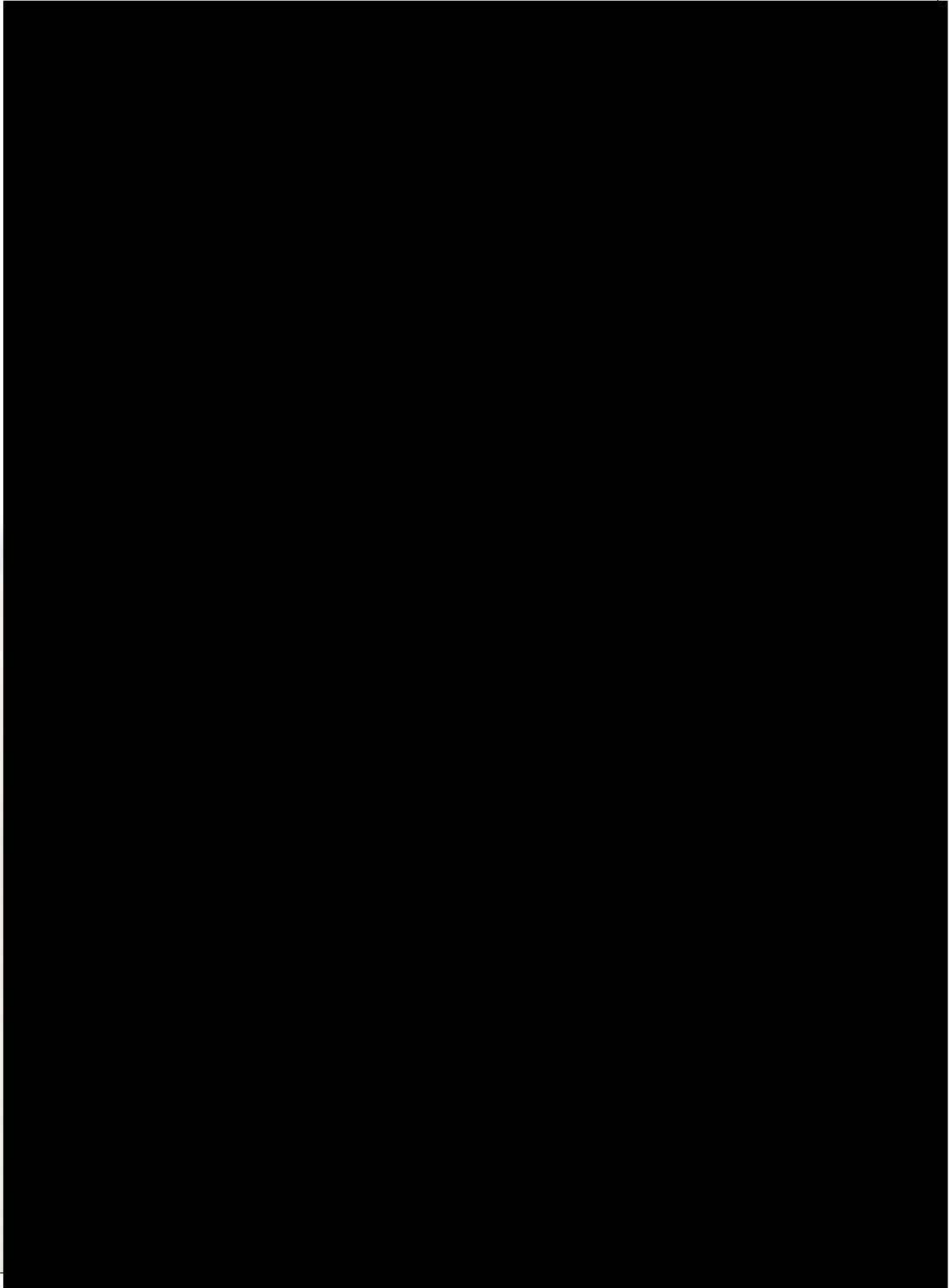
Transient pain and discomfort.

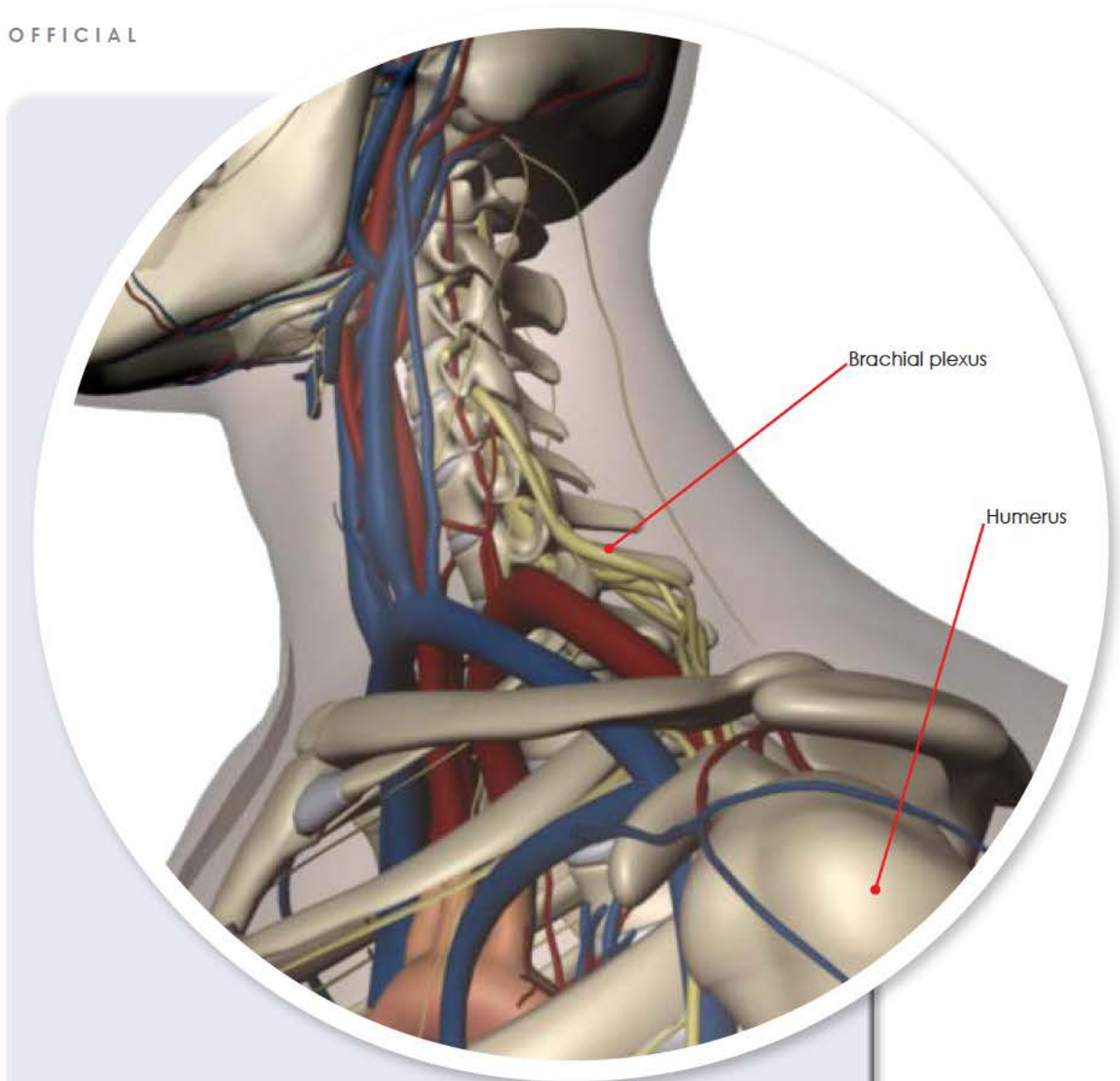
Possible/Less Likely:

If the strike is accurate no untoward problems should occur.

Anterior shoulder motor nerve pressure point

Previously called brachial plexus tie-in.





Anatomical structures

Applied Anatomy:

At this point a motor nerve derived from the brachial plexus is superficially situated lending itself to the application of point pressure. The only structure of consequence here is a fibrous band encircling the neck of the humerus (upper arm bone) called the rotator cuff. Injury to this cuff makes rotating the shoulder and raising the arm very painful.

Outcomes:

Probable:

Temporary short lived pain and discomfort localised to the pressure point.

Possible/Less Likely:

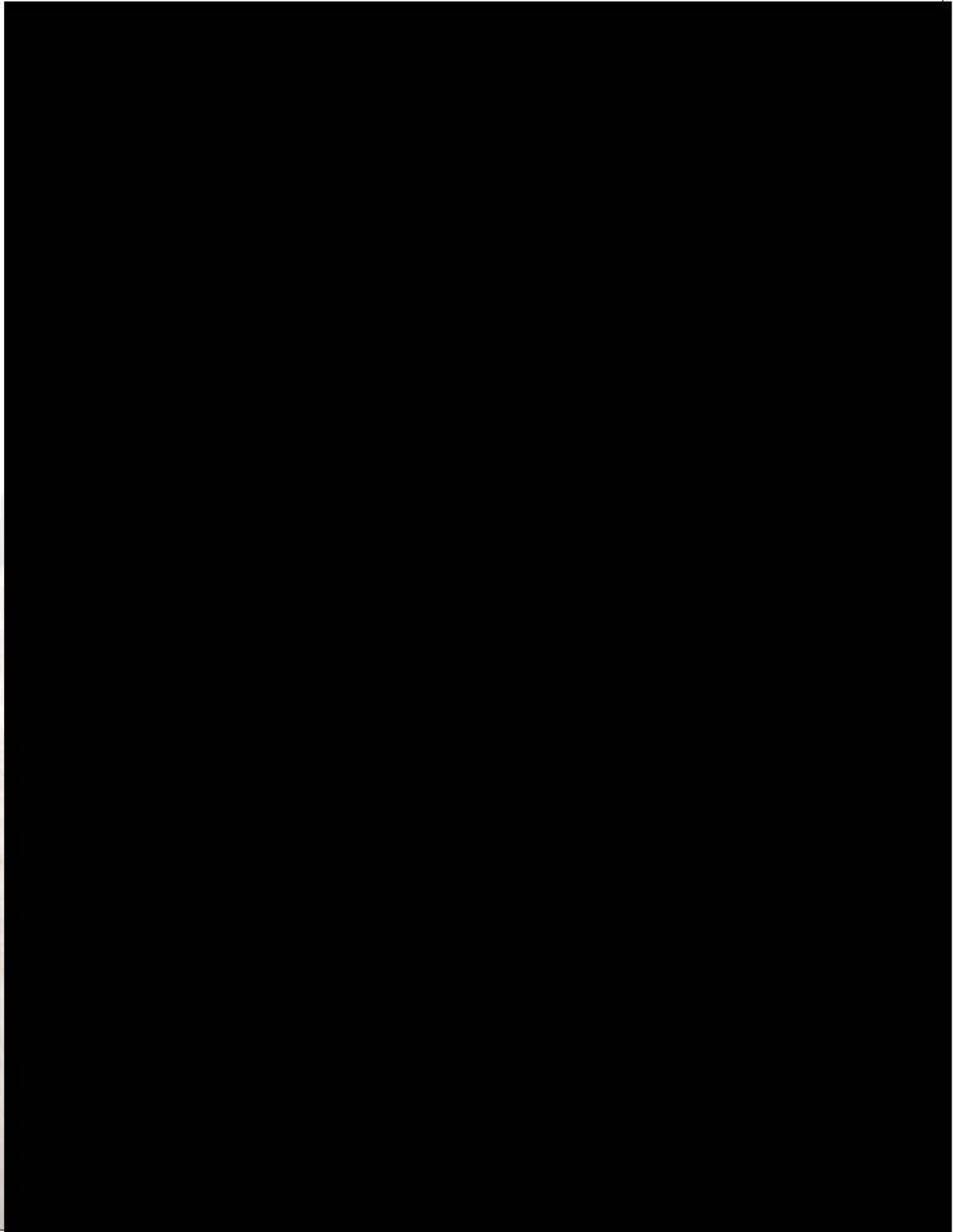
Bruising and/or mild swelling. Rotator cuff syndrome is a possible outcome.

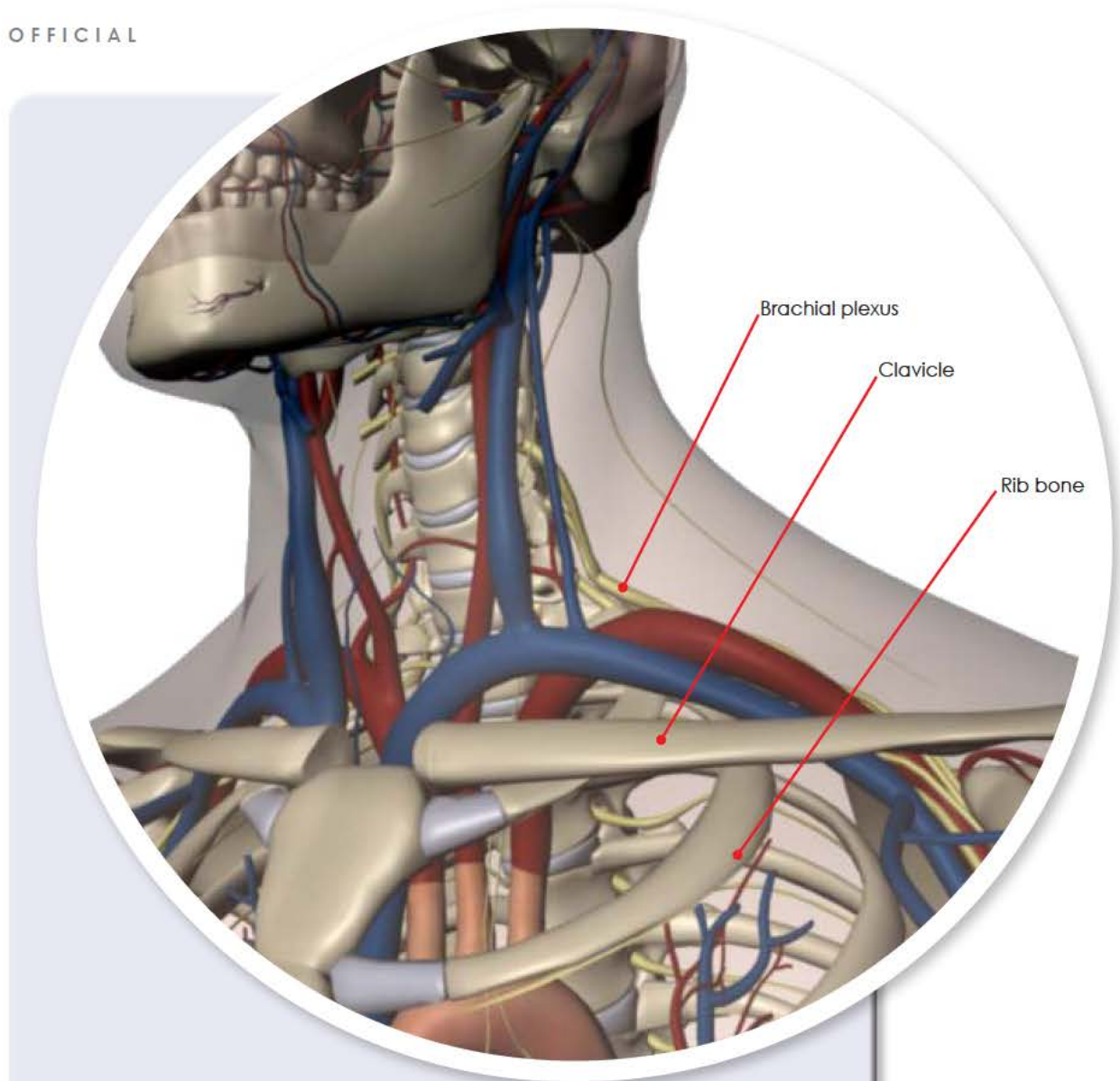
Additional Comments:

Generally a very safe technique. However, some subjects may cite it as a cause of rotator cuff syndrome in litigation. This condition usually settles spontaneously but is a small number of cases it persists and can be quite disabling. It may be difficult to prove or disprove that the cause was application of pressure at this point and may lead to evidence being sought from expert medical witnesses.

Infra clavicular nerve point

Strikes may be applied by body weapons or work equipment.





Anatomical structures

Applied Anatomy:

The important anatomical structures in this region are the clavicle, upper rib bones with the lung underlying. The brachial plexus is situated lateral to the strike point and may be at hazard if the strike is off target.

Outcomes:

Probable:

Transient pain and discomfort for all methods.

Possible/Less Likely:

Bruising and swelling under the skin or involving underlying muscle. Strikes, particularly with

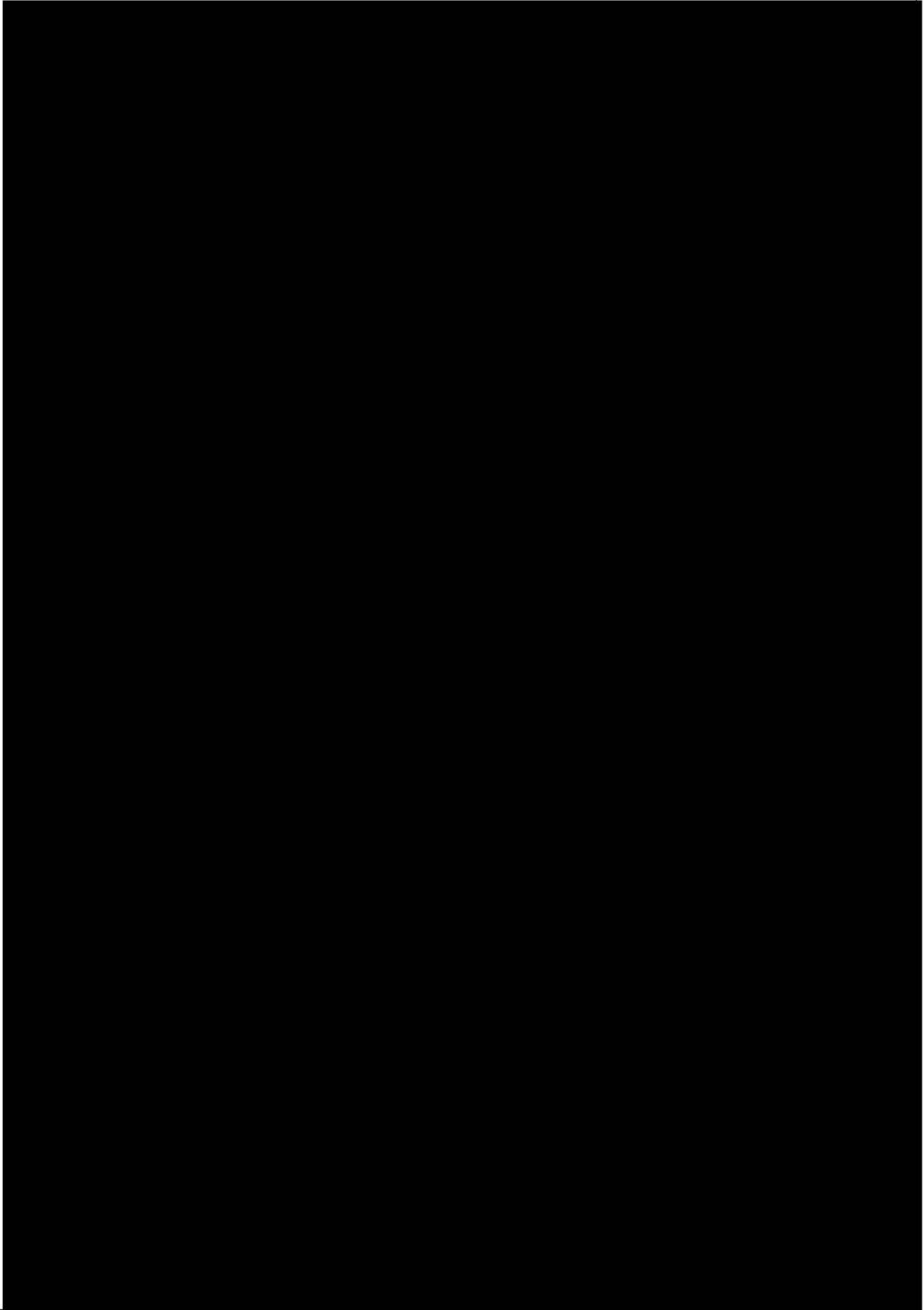
hard objects, have the potential to cause fractures to the clavicle or upper ribs. Inadvertent rib fracture may cause a lung collapse (pneumothorax). Inaccurate strikes may involve the brachial plexus resulting in a varying degree of loss of sensation and/or muscle weakness in the arm.

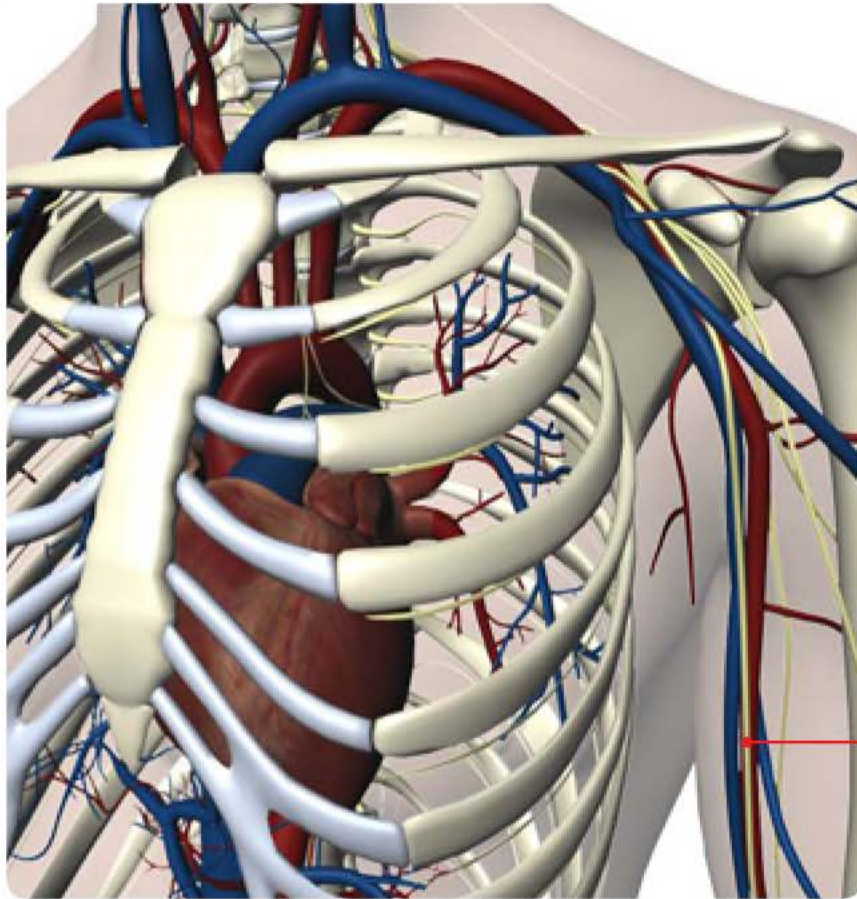
Additional Comments:

In the unlikely event of a collapsed lung officers will notice the subject becoming progressively breathless and complaining of pain on breathing. This is potentially life threatening and immediate skilled medical help is needed.

Biceps nerve area

Strikes may be applied by body weapons or work equipment.





Median
nerve

Anatomical structures

Applied Anatomy:

Strikes here are close to the elbow joint and the important blood vessels and nerves that traverse the front of the joint close to the skin.

the front of the forearm) may result in a varying degree of loss of muscle power and /or loss of sensation in the forearm and hand.

Outcomes:

Probable:

Transient pain and discomfort for all methods.

Additional Comments:

Nerve involvement may be transitory (neuropraxia) or permanent and is more likely when a hard object is used.

Possible/Less Likely:

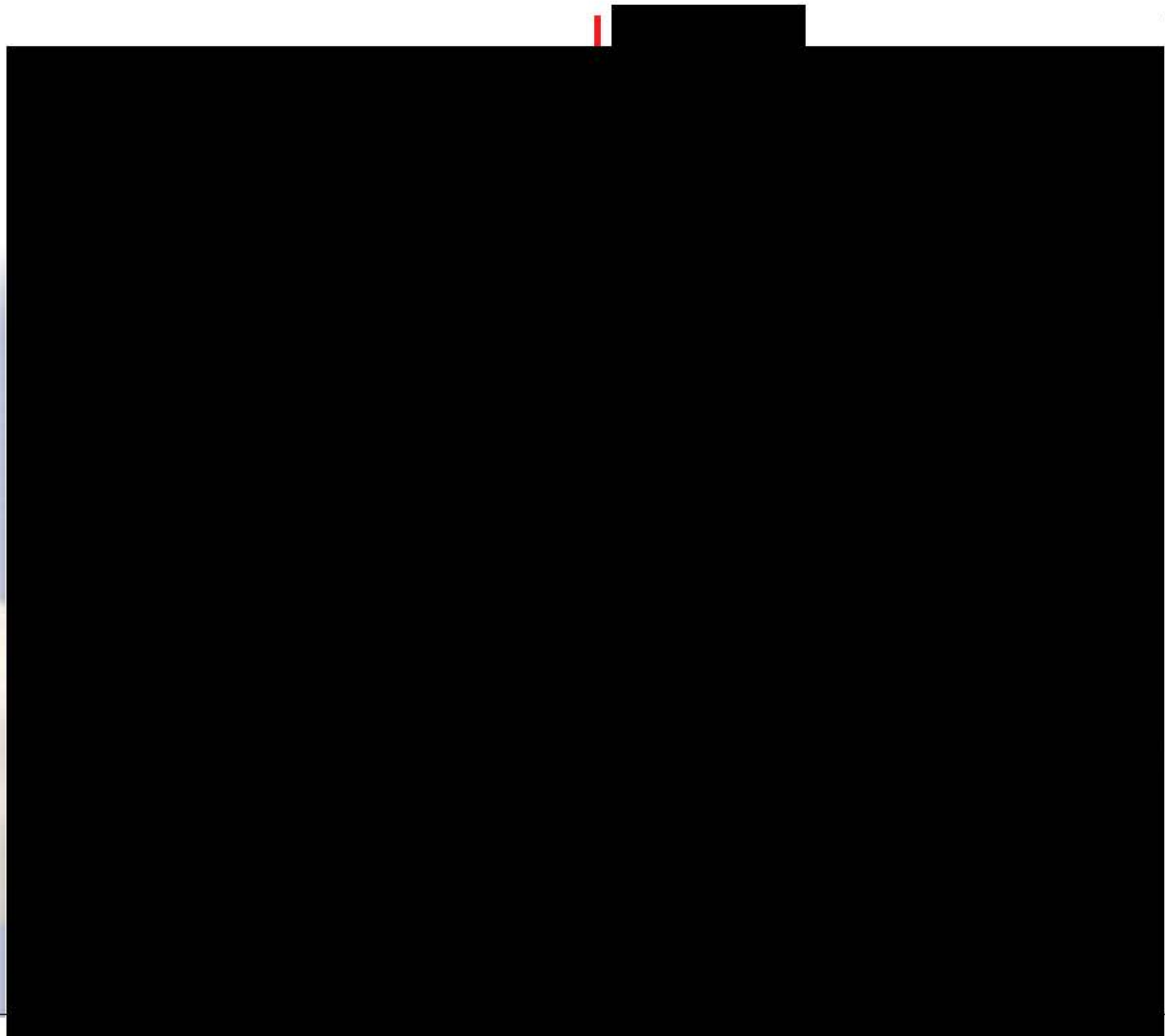
Bruising and swelling under the skin or involving underlying muscle.

Complaint by the subject of indicative nerve injury warrants medical investigation.

A strike in the proximity of the median nerve (supplying sensation and muscle function to

Radial nerve point

Strikes may be applied by body weapons or work equipment.



Anatomical structures

Applied Anatomy:

This is a well-muscled area, where the radial nerve is relatively protected.

Outcomes:

Probable:

Transient pain and discomfort for all methods.

Possible/Less Likely:

Bruising and swelling under the skin or involving underlying muscle. A transitory injury (neuropraxia) to the radial may ensue exemplified by a wrist drop.

A strike with a hard object such as a CS canister could result in fracture of one or both the forearm bones.

Ulnar nerve point

Strikes may be applied by body weapons or work equipment.



Anatomical structures

Applied Anatomy:

In this position the ulnar nerve is more exposed and vulnerable to injury.

Outcomes:

Probable:

Transient pain and discomfort for all methods.

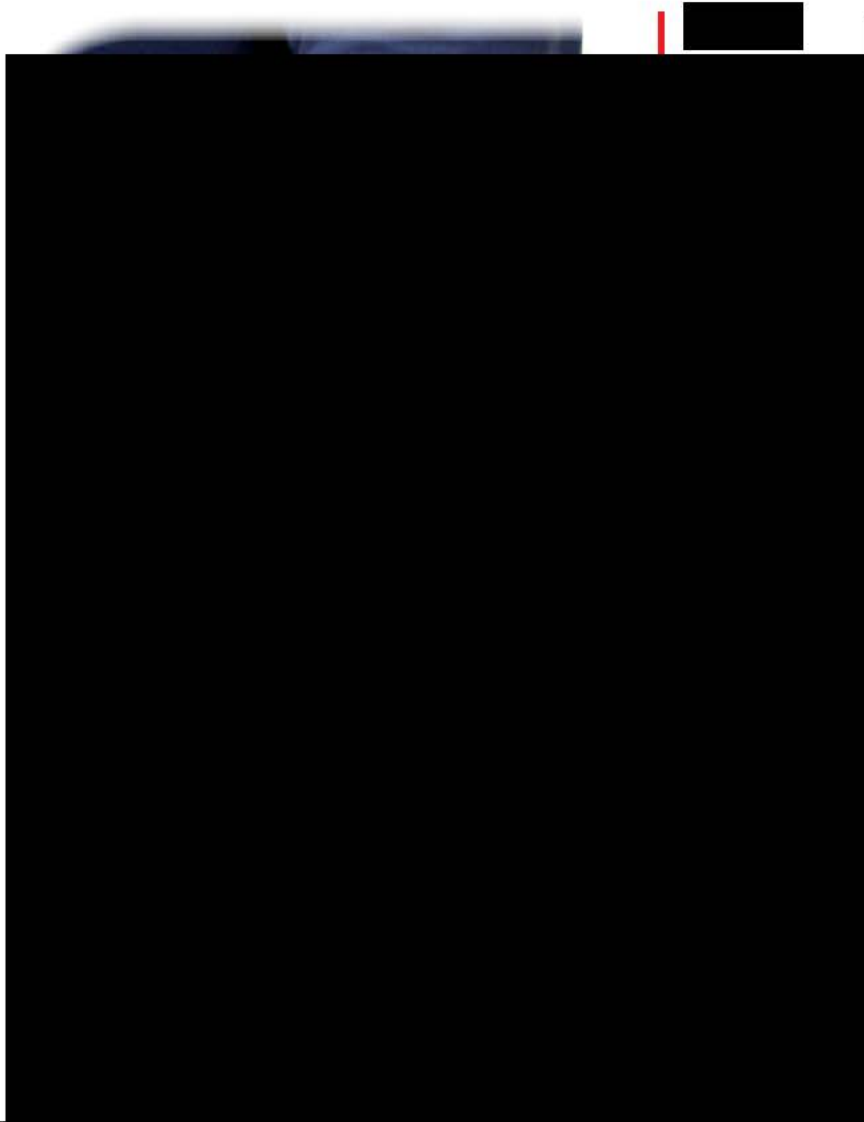
Possible/Less Likely:

Bruising and swelling under the skin or involving underlying muscle. A transitory ulnar nerve neuropraxia is possible.

A strike with a hard object has to potential to cause more severe and permanent nerve injury and also result in fracture of the upper arm bone (humerus). Nerve injury may produce a variable degree of numbness and/or loss of function to the medial (inside) part of the hand.

Median nerve point

Strikes may be applied by body weapons or work equipment.



Anatomical structures

Applied Anatomy:

In this position, the median nerve is relatively deep and well protected.

Outcomes:

Probable:

Transient pain and discomfort for all methods.

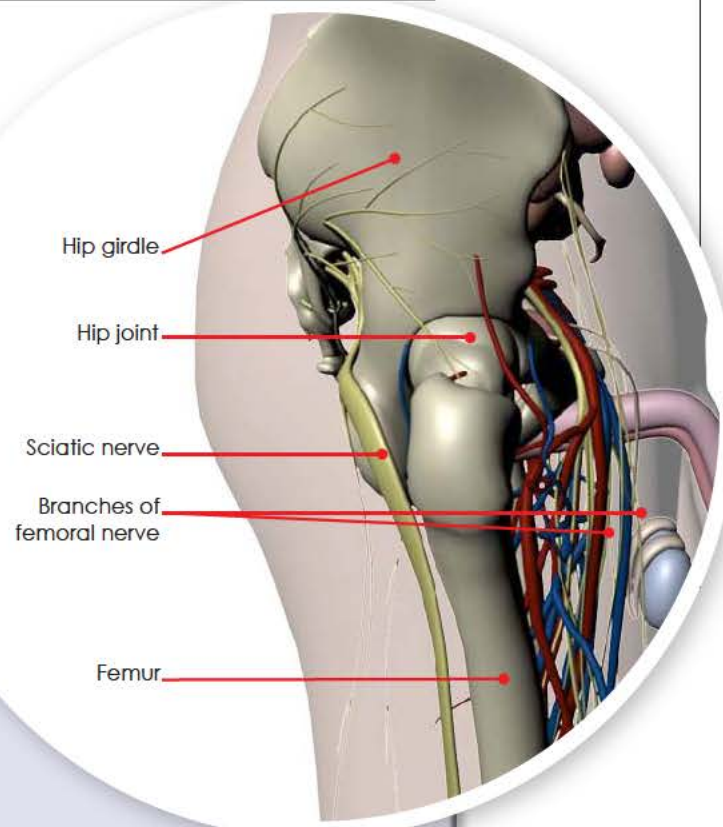
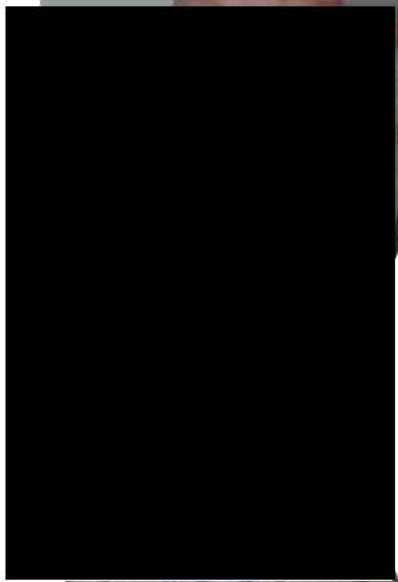
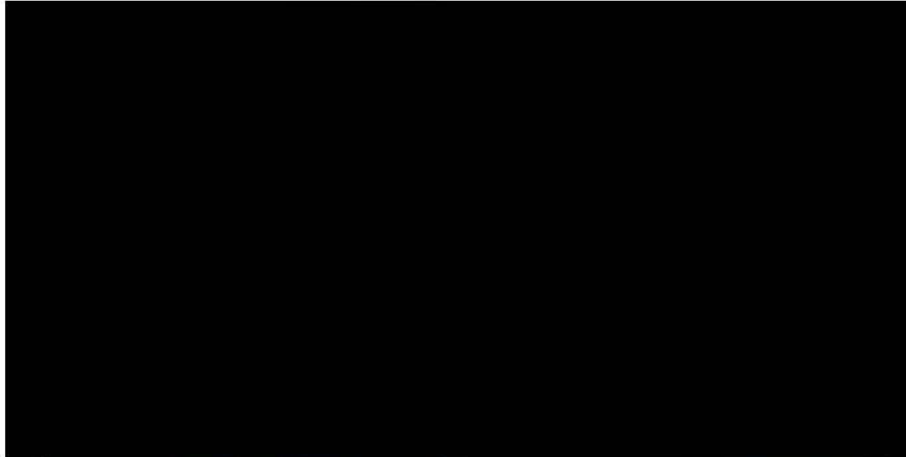
Possible/Less Likely:

Bruising and swelling under the skin or involving underlying muscle. A transitory median nerve neuropraxia is possible.

A strike with a hard object has to potential to cause more severe and permanent nerve injury and also result in fracture of one or both forearm bones. Permanent nerve injury is unlikely.

Lateral branch of the femoral nerve point

This was previously referred to as the common peroneal nerve and is superficial just below the knee. It does not run through the lateral aspect of the thigh.



Anatomical structures

Applied Anatomy:

In this position the median nerve is relatively deep and well protected.

Outcomes:

Probable:

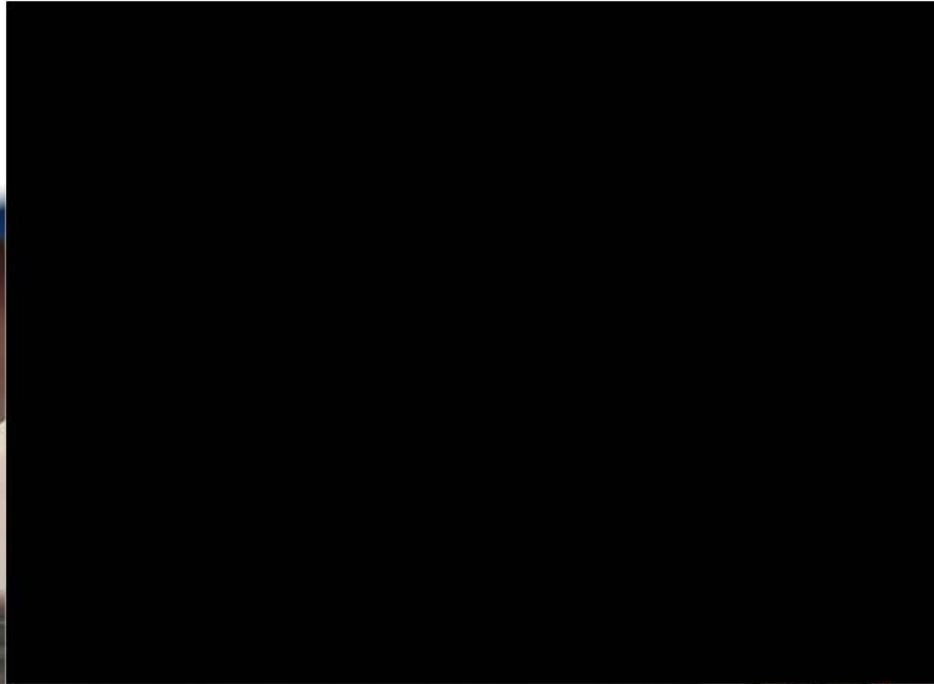
Transient pain and discomfort for all methods.

Possible/Less Likely:

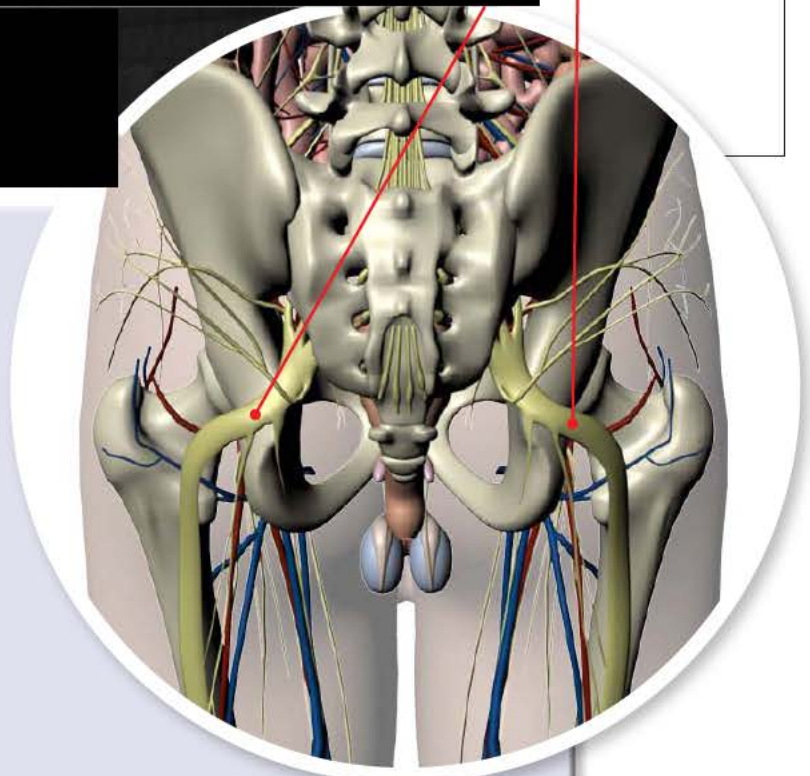
Bruising and swelling under the skin or involving underlying muscle. A transitory femoral nerve neuropraxia is possible. In view of the muscle bulk and the strength of the femur a fracture at this site is unlikely.

Sciatic nerve point

Although this is called the 'sciatic pressure point' this is a historic name, as the sciatic nerve travels from the buttocks down the legs. It would be better termed 'lower back' pressure point.



Sciatic nerve



Anatomical structures

Applied Anatomy:

In this position the sciatic nerve is relatively deep and well protected.

Outcomes:

Probable:

Transient minor pain and discomfort for all methods.

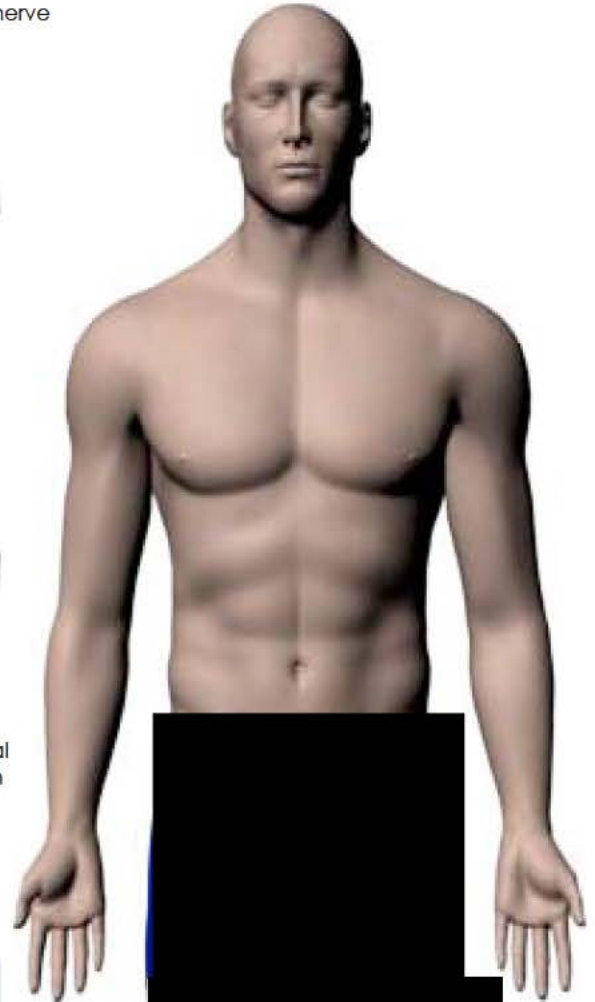
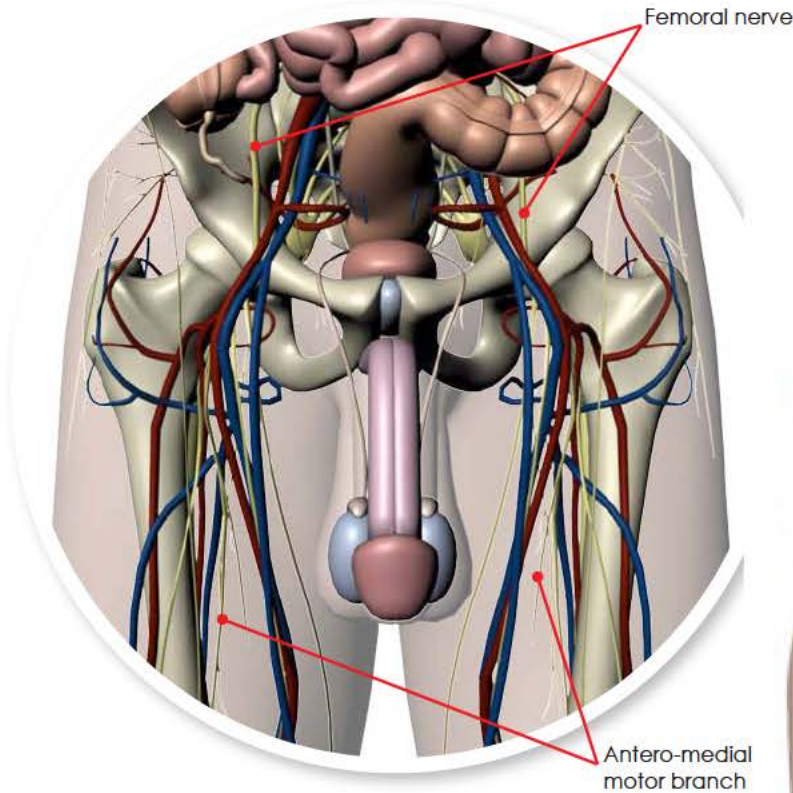
Possible/Less Likely:

Bruising and swelling under the skin or involving underlying

muscle. A transitory sciatic nerve neuropraxia is possible.

Antero-medial motor branch of the femoral nerve

Strikes may be applied by body weapons or work equipment.



Anatomical structures

Applied Anatomy:

In this position the branch of the femoral nerve is relatively deep and well protected.

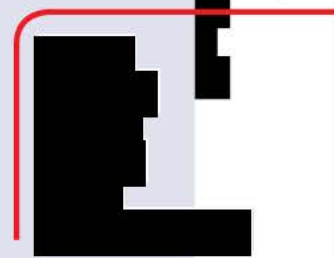
Outcomes:

Probable:

Transient minor pain and discomfort for all methods.

Possible/Less Likely:

Bruising and swelling under the skin or involving underlying muscle.

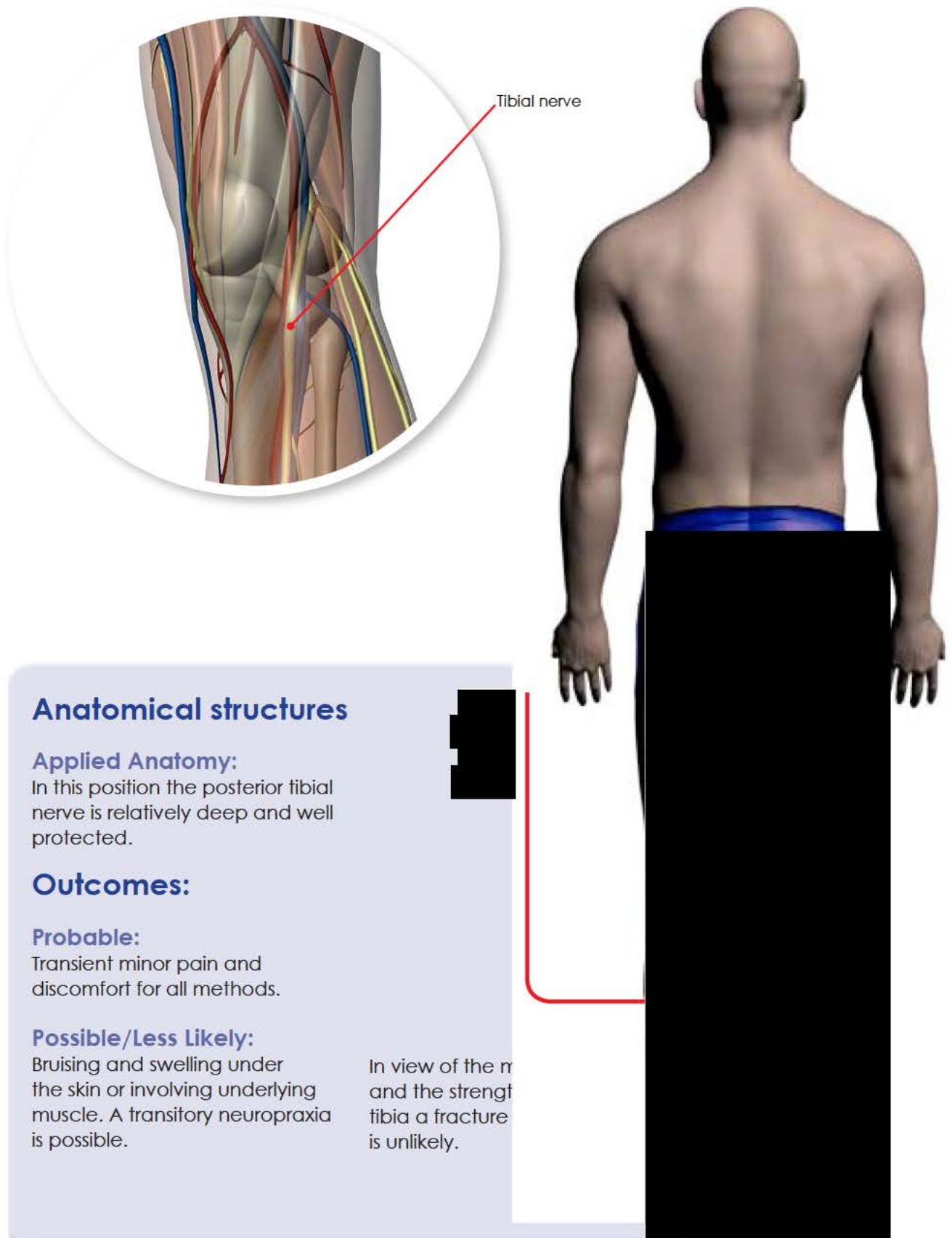


A transitory ne is possible.

In view of the bulk and the s of the femur a fracture at this is unlikely.

Tibial nerve point

Strikes may be applied by body weapons or work equipment.



Anatomical structures

Applied Anatomy:

In this position the posterior tibial nerve is relatively deep and well protected.

Outcomes:

Probable:

Transient minor pain and discomfort for all methods.

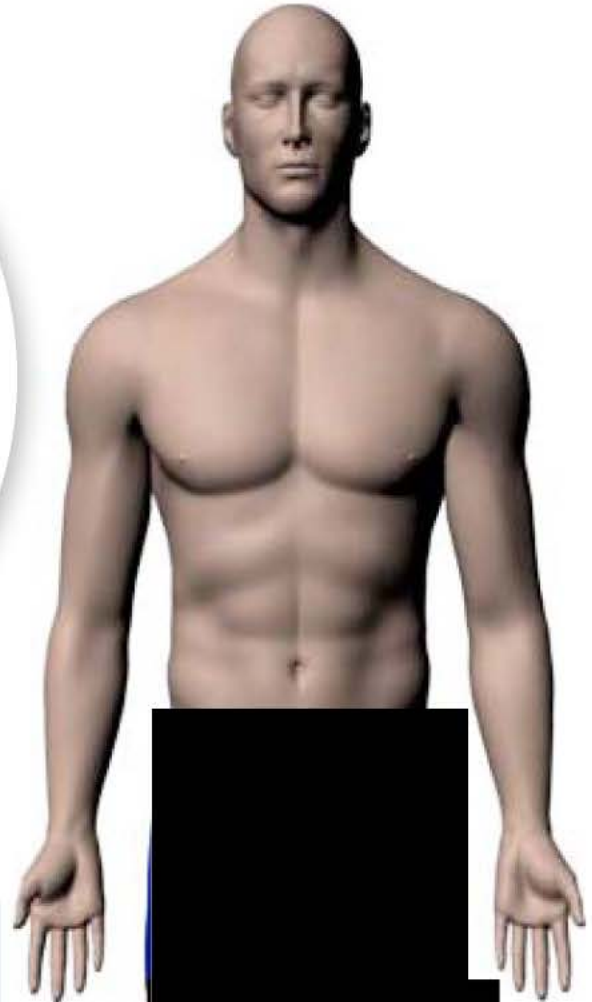
Possible/Less Likely:

Bruising and swelling under the skin or involving underlying muscle. A transitory neuropraxia is possible.

In view of the muscle and the strength of the tibia a fracture is unlikely.

Peroneal nerve point

Strikes may be applied by body weapons or work equipment.



Anatomical structures

Applied Anatomy:

In this position, the deep peroneal nerve is relatively less well protected.

Outcomes:

Probable:

Transient minor pain and discomfort for all methods.

Possible/Less Likely:

Bruising and swelling under the skin or involving underlying muscle. A transitory neuropraxia is possible.

A fracture just above or involving the ankle is possible.

SPECIFIC IMPLICATIONS

Irritants



GO TO:
MODULE 09
IRRITANTS



CS Spray

Physiological effect

A burst of CS into the face will usually affect the eyes, the respiratory system and the skin.

The effect may be virtually instantaneous, delayed, or there may be no effect at all. For this reason, officers must not rely on CS as their only option but must be prepared to consider other appropriate response options. CS will equally affect those who

wear spectacles or contact lenses. The extent of these symptoms could depend on the amount of CS, the delivery system and the range it is used at, and may vary between different individuals.

Other common reactions

Due to the potential shock effect of being sprayed with CS, the following common reactions may be also recognised:

- The individual may move their hands to their face, and drop any held items
- **The individual's legs may become weak and they may drop to their knees**
- The individual's upper torso may bend forward
- **The individual may suffer from impaired hearing and may not hear the officer**
- The individual muscles may tense and they may not respond immediately to the officer's instructions.

What happens when a subject is sprayed with CS?

When a subject is exposed to CS, the effects are:

- Pain and discomfort in the eyes, which may cause excessive watering
- **Involuntary spasm of the eyelids, leading to blinking or closure of the eyes**
- Burning sensation
- **Excess salivation**
- Burning and constriction of the chest
- **Sneezing, coughing, retching**
- Stinging or burning sensation on exposed skin.

After-effects

Lasting side effects or lasting effects may or may not occur, dependent upon the subject.

Important

The drawing of irritant spray should not be used as a threat, although a subject may draw an inference as to the next action of the officer. It must be remembered that the mere drawing of the spray may need to be accounted for as a use of force.

Aftercare of a subject controlled by use of CS spray

What aftercare is required?

Once an officer has used the spray, and the individual they used it on is controlled, they should follow these procedures.

- Inform the individual that they have been sprayed with CS.
 - Inform the individual that you are going to help them.
 - Provide reassurance that the effect of the spray is temporary.
 - **Instruct the individual to breathe normally. This will aid recovery and will help prevent hyperventilation (abnormally deep or rapid breathing caused by anxiety).**
 - Remove the individual to an uncontaminated area where they can be exposed to fresh air, if possible.
 - **This will assist the CS particles to blow off the body. Exposure to fresh air will normally result in recovery from significant symptoms in approximately 10-15 minutes.**
 - Advise the individual not to rub their eyes or face as this may worsen their condition. If reactions persist beyond 15 minutes, the use of copious amounts of cool tap water may be used to flush remaining CS from the face.
 - **Attempting to irrigate the eyes at an earlier stage, when they are being forced closed by the effect of the spray, would be futile. Under no circumstances should warm water be used.**
 - The use of so-called CS 'antidote' or 'neutralising agents' have been examined, and in some cases the use of these can prove harmful and they should not be used.
 - **If an individual's reaction to CS is considered by the officer to be adverse, immediate medical assistance should be obtained. It is essential that the subject's breathing be monitored. If the individual is having difficulty resuming normal breathing, the provision**
- of medical assistance must be given precedence over conveying the subject to the police station.
 - Ensure that the control methods used and the position the individual is placed into does not adversely affect their breathing.
 - **Individuals must not be left in or transported in a prone (face down) position. The individual should be carefully monitored throughout the policing process, until the effect of CS has worn off.**
 - This is particularly important in monitoring the recovery of individuals who are obese, or are known to be under the influence of drink and/or drugs. It is also important to pay particular attention to individuals on whom the spray appears to be ineffective and those exhibiting bizarre and/or violent behaviour, or those experiencing breathing difficulties.
 - Inform the control room at an early stage after the use of an incapacitant spray. This will assist the arrangements to be made for medical examination of individuals who have been sprayed.
 - Individuals who have been sprayed should be examined by a police surgeon on arrival at the police station.
 - **If officers suffer contamination, a police surgeon may similarly examine them. It will be a matter for individual force policy whether individuals are routinely examined by the police surgeon, or at the discretion of the custody officer.**
 - The officer should ask the individual if they wear contact lenses, as they may experience greater discomfort. They should be permitted to remove their lenses at the earliest opportunity.
 - **On no account should an officer attempt to remove contact lenses from an individual. During the removal of contact lenses by an individual, officers must ensure**
- that the individual is in a safe location or position to prevent an attack or escape.
 - The individual who is wearing them, or a medical practitioner should only remove contact lenses.
 - **Exposure to incapacitant sprays, in common with other substances, may cause damage to certain types of lenses and individuals who experience problems with their lenses after normal cleaning should consult an optician.**
 - If the individual requests it or if the symptoms persist, additional medical attention should be provided. This may include the recall of a medical practitioner, or the conveyance of the individual to hospital, dependent upon individual force policy.
 - **Close monitoring of the individual throughout the recovery period is of the utmost importance. If the individual is detained in a cell they should be given constant cell supervision, as provided to individuals who have consumed alcohol and/or drugs. If there are any signs of adverse or unusual reactions then medical attention should be provided as soon as possible.**
 - Until a full recovery has been made from the effects of the spray, the individual should be supervised in accordance with the guidelines for subjects under the influence of drinks and drugs.
 - **If reactions persist beyond 15 minutes from the time of spraying, then refer the individual to the medical officer. If the medical officer is likely to be unduly delayed, the provision of other medical assistance should be considered. Do not attempt to irrigate the individual's eyes.**

NOTE: A police surgeon should undertake irrigation of the eyes only, or other specified trained medical personnel.

PAVA

Physiological effect of PAVA

When an individual is exposed to PAVA in most cases the affect will be any, or all, of the three areas:

- eyes
- respiratory system (if inhaled)
- skin.

A spray into the eyes will cause dilation of the capillaries and instant closing of the eyes. Effects can range from severe twitching or spasmodic contraction of the eyelids to involuntary closing of the eyes, an eye shut reflex.

The individual will feel a burning sensation. This is not actual burning however the chemical is causing the body sensors to respond in a similar way. People wearing contact lenses or glasses will be equally affected if the spray contacts the eyes in any way.

If the spray is inhaled it produces immediate respiratory inflammation, which in turn produces uncontrollable coughing as a protective measure and sometimes shortness of breath. The inflammation of mucous membranes produces difficulty in breathing through the nose.

PAVA has been medically tested to its full dose on both healthy and asthmatic subjects with no adverse effects.

The face will feel very hot, as will the inside of the nose and mouth if they have been in contact with the spray.

The individual's lips and eyelids may become slightly swollen. Depending on the individual's complexion, skin colour may range from slight discoloration to bright red. Normal skin colour should return within 30-45 minutes of spraying, however this may vary from person to person.

The effects may be instantaneous or delayed from anything up to 5 minutes.

The extent of these symptoms will depend on the amount of PAVA sprayed, the delivery system and the range it is used at, and may vary between different individuals. Individual's can find the experience of being exposed to PAVA very painful.

Other common reactions

As well as causing the aforementioned effects, the following sympathetic symptoms may also occur, including:

- Hands move to the face
- **Legs become weak - may drop to knees/Involuntary leg tremors**
- Upper body bends forward
- **Whole body shakes**
- Impaired hearing – 'auditory exclusion'
- **Impaired thinking – 'cognitive dissonance'**
- Muscles tense
- **Rocking from foot to foot (balance)**
- Panic attacks due to the pain and all that can go with them such as a belief that they cannot breathe, etc.

This can lead to high stress, anxiety, panic or aggression.

This combined with the experience of being temporarily blind for a longer period of time than they have ever experienced before, can lead to disorientation and a slight feeling of nausea.

Aftercare of a subject controlled by use of PAVA

What aftercare is required?

Immediately after spraying the individual should be advised to allow their eyes to remain closed for as long as necessary, and not to rub their eyes or face as this will only aggravate the effects. The immediate application of water or saline to the affected area increases the burning sensation.

- **Standing the individual facing cool moving air such as from a fan or a breeze is most soothing.**
- Experience has shown that the earlier a individual forces themselves to open their eyes and natural, unimpeded tearing takes place the quicker their recovery.
- **If effective tearing takes place, recovery from the significant symptoms of exposure i.e. eyes opening, should take place within 20 minutes.**
- Trying to open the eyes is very uncomfortable but increases visual recovery rapidly. If discomfort to the eyes and face persists beyond this period ideally cool, running water should be used to flush the remaining spray from the eyes and face.
- **Experience has shown that flushing with water is soothing but this does sometimes prolong the recovery time of the subject. However, as the eyes will recover of their own accord in around 20 - 35 minutes after initial exposure, it may not be possible or necessary to provide irrigation immediately after exposure.**
- Exposed individuals should be allowed to bathe their face and eyes if they so wish. Under no circumstances should warm water be used.
- **The individual's breathing should be monitored. If the individual has difficulty in breathing then medical attention should be sought, and must be given precedence over conveying to the police station.**



- Ensure that the control methods used and the position the individual is placed in does not adversely affect their breathing. Individual's must not be left in or transported in a prone (face down) position.
- **The individual should be carefully monitored throughout the policing process, until the effect of PAVA has worn off. This is particularly important in monitoring the recovery of subjects who are obese, or are know to be under the influence of drink and or drugs. It is important to pay particular attention to subjects on whom the spray appears to be ineffective and those exhibiting bizarre and or violent behaviour, or those experiencing breathing difficulties.**
- Individuals who have been sprayed should be asked if they wear contact lenses. People wearing contact lenses may experience greater discomfort. They should be allowed to remove their lenses at the earliest opportunity.
- **Exposure to PAVA, in common with other substances, may cause damage to certain types of lens and individuals who experience problems with their lenses after normal cleaning should consult an optician.**
- **Only the individual or a medical practitioner should remove contact lenses.**
- PAVA may saturate the subject's hair or clothes, simple washing or showering with copious amounts soap and water will remove all residues.
- **Throughout the treatment it is helpful to reassure the individual that they will recover.**
- Until a full recovery has been made from the effects of the spray, the individual should be supervised in accordance with the guidelines for subjects under the influence of drink and drugs.

There is always a chance that a person could have a hypersensitive reaction to Nonivamide. Although such reactions are extremely rare they include symptoms such as:

- Swelling of the face
- Localized skin reactions - tingling, rashes, pain or blistering.

NOTE: If any of these symptoms occur medical attention should be sought as soon as possible.

Glossary of Terms

Axilla

The armpit.

Brachial plexus

A functionally important group of nerves taking origin from the spinal cord in the neck and then becoming more superficial in the root of the neck and then descending into the axilla and down into the arm.

Carotid sheath

This is a tube in the neck containing major arteries, veins and nerves.

Carpal bones

Two rows of small and functionally important bones at the base of the wrist joining the forearm bones to the hand.

Clavicle

Better known as the collar bone.

Coccyx

The extreme tip of the spinal column.

Dislocation

A limb threatening injury where a joint is completely disrupted.

Distal

Away from the centre.

Haematoma

A collection of blood at an injury site commonly associated with swelling and discolouration (bruise).

Humerus

The upper arm bone.

Hypovolaemia

Loss of circulating volume, typically blood.

Lateral

To the side.

Medial

Towards the midline.

Neuropraxia

A bruising of a nerve causing temporary loss of function.

Peritonitis

A generalised infection of the abdominal cavity typically associated with faecal soiling following trauma or inflammation of bowel with subsequent leakage of bowel contents into the abdominal cavity.

Pneumothorax

A collection of air in the chest cavity causing a partial or complete collapse of the lung.

Proximal

Towards the centre. Opposite of distal.

Plexus

A meshing or conglomeration of structures such as nerves or veins (see brachial plexus).

Rotator cuff

A fibrous and muscular structure wrapping around the upper humerus.

Subluxation

An incomplete dislocation.

Submandibular gland

A saliva producing gland tucked under the jaw bone on either side.

Superficial

Close to the surface.

Transient

Temporary or passing.

Vagus Nerve

An important nerve vulnerable to injury in its passage in the neck. It has important functions controlling heart rate.

Reference Documents

Cross F, Ryan JM. **The Severely Injured Patient**. In: Kirk, ed. *General Surgical Operations*, 5th edition. Chapter 3. Churchill Livingstone - Elsevier:London, 2006.

Greaves I, Ryan JM, Porter K. **Trauma** , Joint Editors. London: Arnold, 1998

Greaves I, Porter K, Ryan JM. **Trauma Care Manual**, Joint Editors. London: Arnold 2000.

Ryan JM, Thomas AJ, Adams S. **Trauma, Surgical and Related Conditions** – Section B. Trauma and Orthopaedics. In: Ryan, Mahoney, Greaves, Bowyer, eds. *Conflict & Catastrophe Medicine – A Practical Guide*. Chp 20, Pp 294-308. Springer-Verlag, 2002.

Russell et al, eds. - **Bailey & Love's Short Practice of Surgery, 23rd Edition**.

Skinner & Whimster, Eds. **Trauma - A Companion to Bailey & Love's Short Practice of Surgery**. London:Arnold

Skinner D, Driscoll P, Earlam R, Eds. **ABC of Major Trauma – 3rd Ed**. London:BMJ Publications, 2000.

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