Title CSOP External Haemorrhage Control

Version No: 4.1 Effective date: 15/11/2022

APPROVALS

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Next Review Date:	November 2024		

HISTORY

Effective Date	Version No.	Summary of Amendment
November 2012	2.0	Removal of CELOX granules instructions
22/01/2016	3.0	Addition of Skin Stapler, minor changes to non-catastrophic haemorrhage paragraph
March 2018	3.1	Review and minor amendments made
March 2020	4.0	Review. Re-write of the usage of tourniquets. Added in additional equipment carried. Updated CELOX gauze application. Formatting changes.
July 2022	4.1	Review and minor amendments made. Removal of annexes. Altered location of stapler to surgical kit.

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REFERENCES

1. Information on the Olaes Modular Bandage https://www.prometheusmedical.co.uk/equipment/haemorrhage-control/olaes-modular-bandage
2. Information on the Blast Bandage https://www.prometheusmedical.co.uk/equipment/haemorrhage-control/blast-bandage
3. Manufacturer instructions on Skin Stapler https://www.medtronic.com/covidien/en-us/support/products/surgical-stapling/appose-single-use-skin-stapler.html
4. Information on the CAT and its application http://combattourniquet.com/wp-content/uploads/2012/06/RAW-23110-INSTR-CAT-US-CRI.pdf
5. Position Statement on the application of Tourniquets; Faculty of Pre-hospital Care (2017) https://fphc.rcsed.ac.uk/media/2398/position-statement-on-the-application-of-tourniquets-july-2017.pdf
6. Celox Gauze instructions http://www.celoxmedical.com/wp-content/uploads/How-to-use-Gauze.pdf
7. Welch M *et al.*; Systematic review of haemostatic agents; BMJ Mil Health; 2020;166(3):194-200. https://pubmed.ncbi.nlm.nih.gov/30711924/
8. CELOX use by UK military https://www.celoxmedical.com/uk-mod-selects-celox-rapid/

1. PURPOSE

This CSOP provides guidance on the assessment and management of non-catastrophic external haemorrhage, as well as the use of tourniquets and haemostatic agents for the arrest of catastrophic external haemorrhage.

2. ANNEXES

Document Reference Number	Document Title
None	

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3. DEFINITIONS/ACRONYMS

Acronym/Abbreviations	Description
<C>ABC	Catastrophic Haemorrhage, Airway, Breathing, Circulation
C-A-T	Combat Application Tourniquet

4. MANAGEMENT OF HAEMORRHAGE

The principle of **<C>ABC** should be followed. Catastrophic external haemorrhage ('bleeding to death') should be controlled prior to the management of airway or breathing. In a pre-hospital team approach, haemorrhage control can normally take place simultaneously with A and B management.

Non-catastrophic external haemorrhage should be identified and managed in the primary survey in the assessment of 'Circulation'.

Patients with penetrating trauma should be fully examined front and back to avoid missing bleeding sites. The junctional areas should not be overlooked. Blunt trauma patients with a significant mechanism of injury should not be fully log-rolled to assess the back (unless there is an important reason) as this movement may dislodge internal clots and provoke haemorrhage.

4.1 NON-CATASTROPHIC EXTERNAL HAEMORRHAGE

The majority of external haemorrhage can be controlled by basic measures. These include:

- All wounds: well localised direct pressure over a bleeding point with a gauze swab, plus elevation, the pressure should preferably be finger-tip pressure. Pressure takes predominance over elevation. Emergency Dressings (Olaes Modular bandage) are available to assist with haemorrhage control within the equipment carried by TAAS in the primary bags. The dressings have elasticated wrap to maintain pressure on a wound and have a pressure bar built in for application of additional pressure.[1]

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- Large wounds: packing the cavity with sterile gauze followed by direct pressure with a gauze swab as possible. Also contained within the primary bags of TAAS equipment are Blast Bandages which are useful for large pattern wounds but can also be used for wrapping amputations. The Blast Bandage has a 50x50cm treatment area of non-adherent dressing and a built-in elasticated bandage for easy application to wounds.[2]

- Open fractures: reduction, traction and splintage, e.g. application of femoral traction splint or pelvic splint

- Scalp wounds: temporary mattress sutures with 1-0 silk or for flap wounds eversion of the skin edges to obstruct scalp vessels. Skin staplers are available in the surgical kit bag and can be considered for these wounds as an alternative. Advantages include speed of application and reduced risk of needle stick injury.

The use of tourniquets or haemostatic agents for non-catastrophic external haemorrhage should only be considered when all other methods have failed and the patient is still exsanguinating.

Foreign bodies, e.g. glass or knife in a wound prevent the application of direct pressure. Foreign bodies should not be removed from any wound and should be stabilised to prevent movement during transport. Circumferential packing is normally sufficient. In the event that this is inadequate for a limb wound, proximal control by a tourniquet may be considered.

SKIN STAPLES

For lacerations (in particular head and scalp) which are causing haemorrhage uncontrollable with direct pressure and dressings, skin staples may be considered. The skin stapler is available from the surgical kit bag(Covidien ULC skin stapler).[3] Forceps may assist their application and local anaesthetic could be considered if overall benefit is supported. The staples must only be applied to the superficial dermis, i.e. not to deep structures.

- Not to be used on ears or directly around eyes.

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- Relative contra-indications include paediatrics and heavily contaminated wounds.
- The number and position of clips should be recorded and handed over to the hospital teams.

4.2 CATASTROPHIC EXTERNAL HAEMORRHAGE

Any catastrophic bleeding should be immediately addressed on arrival at the patients' side. Limb wounds should initially be managed with direct pressure and limb elevation +/- haemostatic agents and only if these measures fail, the application of a tourniquet. Head, neck, torso and proximal limb wounds should be managed with the use of haemostatic agents. Blind clamping of vessels must not be undertaken in the Pre-Hospital environment.

All patients with catastrophic external haemorrhage should be triaged to a major trauma centre.

TOURNIQUETS

The tourniquet in use by TAAS is the CAT[4] which has been in use within the UK military for over 15 years. Tourniquet use has been reintroduced into civilian practice and has been heavily influenced by recent military experiences. In a civilian setting, catastrophic external haemorrhage from a limb is rare and most bleeds can be controlled with direct pressure. Tourniquets should be used as a last resort after other stepped measures have failed, with the exception of complete traumatic amputations where a tourniquet should always be applied.

There is no 'safe' period of time for tourniquet use and therefore a robust risk-benefit analysis must occur. In a shocked patient, the ischaemic time of a limb will be less than two hours. Ischaemia can result in permanent nerve injury, muscle injury, vascular injury, or skin necrosis with loss of a limb. Nerve injury can also result from direct compression by the tourniquet. A reperfusion injury often occurs when the tourniquet is released in hospital.

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Indications for a tourniquet

- The benefits of preventing death from hypovolaemic shock are greater than the risk of limb damage or loss from ischaemia caused by tourniquet use.

AND ANY OF THE FOLLOWING

- Life-threatening limb haemorrhage which has failed to be controlled by other means.
- Complete traumatic amputations proximal to the wrist or ankle joints.
- Point of significant haemorrhage from limb is not peripherally accessible due to entrapment (therefore cannot apply direct pressure on bleeding point)
- Prior to amputation of a limb in a trapped patient.

Directions for use of a tourniquet

- The tourniquet should be applied over exposed skin to avoid slipping
- Place the tourniquet as distally as possible above the wound (this includes over the lower leg and forearm in order to preserve the maximum amount of salvageable tissue)
- The tourniquet must be applied tight enough to arrest haemorrhage, if it is ineffective, the tourniquet should be tightened or repositioned.
- The application of a second tourniquet, proximal to the first, may be required if there is ongoing uncontrolled haemorrhage.

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Notes on tourniquet use

The following guidance has been adapted from the Faculty of Pre-hospital Care consensus statement on tourniquet use.[5]

- The presence or absence of a distal pulse is not a marker of effectiveness.

- An effective tourniquet will be extremely painful and is likely to require strong intravenous analgesia after stabilisation of vital signs.

- The wound must be frequently reassessed during transfer and any further haemorrhage must not be concealed. In a previously shocked patient with a tourniquet in situ, resuscitation and restoration of the blood pressure may allow bleeding to restart. In this case the tourniquet should be tightened until bleeding is controlled again.

- The time of application must be clearly recorded on both the PRF and the tourniquet itself and handed over to hospital staff.

- For the majority of transit times that TAAS are involved in, the tourniquet should not be removed before arriving at hospital. Periodic loosening and re-tightening of tourniquets has been shown to be detrimental. Removal of a tourniquet should only occur when alternative methods of haemorrhage control are effectively in place or the patient is in theatre where direct surgical control of haemorrhage can be undertaken. In cases of prolonged extrication, consideration may be given after 2 hours to loosen the tourniquet to reassess ongoing bleeding but only if there are sufficient resources to deal with any adverse effects.

- Patients who have had tourniquets loosely applied (so they are in the correct position for tightening in case of haemorrhage in flight) must be removed by the pre-hospital team on arrival to the Emergency Department so there can be no confusion regarding their use.

- Fully amputated limbs should be transported with the patient even if they appear unsalvageable as tissue may be utilised for skin cover and reconstruction of the stump.

- In the past, the advice has been to apply the tourniquet to a single bone only as it was thought to be more effective. However, significant military experience has shown that applying a tourniquet as distally as possible above the wound, even if over two bones, is effective.

HAEMOSTATIC AGENTS

Choice of product

TAAS make use of CELOX gauze haemostatic agent.[6] There is a lack of high-quality clinical evidence to demonstrate superiority of any particular haemostatic agent with most evidence to date being based on swine studies. Of the evidence available, a recent systematic review failed to find a difference in efficacy between three of the most widely used haemostatic agents (CELOX, HemCon and QuickClot) with all three demonstrating they were effective in arrest of haemorrhage.[7] CELOX has been the agent of choice used by the UK military[8] for a number of years now and its usage has now become commonplace within UK civilian practice for both pre-hospital and in-hospital control of haemorrhage. The combination of available evidence and the proven track record of usage within the UK armed forces for over 10 years has led TAAS to select this product for its own usage.

CELOX is a fabric dressing which is coated with CELOX haemostatic granules. It is suitable for larger wounds e.g. an open pelvic fracture, and can be used on limb injuries when direct pressure has failed to control haemorrhage.

Indications for haemostatic agents

The patient has catastrophic life-threatening external haemorrhage which is not controllable by other means (including direct pressure and elevation, wound packing or temporary sutures) and the patient will require emergency surgery for their injuries.

There are no obvious contraindications to use of CELOX gauze. Studies have shown no adverse reactions when used on patients with allergy to shellfish. This product does not produce an exothermic reaction unlike previous haemostatic agents. The product is reported to be effective even in the presence of hypothermia, acidosis or when the patient is taking anticoagulants.

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Directions for use for CELOX Gauze

- Gloves should be worn. Avoid inhaling the product or contact with eyes.
- Tear open the CELOX Gauze packet and locate the end of the gauze.
- Tightly pack the unfolding CELOX gauze directly on to the bleeding site. Pack remaining wound cavity with the CELOX gauze. Excess CELOX gauze can be torn or cut if necessary.
- Apply firm direct pressure for THREE minutes. If bleeding persists, apply direct pressure for an additional three minutes.
- Wrap and tie with an emergency dressing in order to maintain pressure on the wound

INFORMATION FOR THE RECEIVING HOSPITAL

All patients with catastrophic external haemorrhage should be triaged to a major trauma centre.

The use of a haemostatic agent must be clearly given in the hand over and the empty packet handed to hospital staff for information. The patient will require surgical exploration in theatre to gain surgical control of the bleeding and remove any product from the wound.

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