

WATER JETTING ASSOCIATION INJURY FIRST AID ALGORITHM ©



WATER JETTING INJURY FIRST AID AT SCENE

- **SAFE APPROACH** and call for **HELP ALWAYS**.
 - **C-ABC approach** as per ATLS @ guidelines.
- Direct pressure to bleeding wounds. Where TRAUMA KIT(s) are available on site, the application of pressure using a haemostatic agent (such as Quickclot® or Celox®) and a trauma bandage and/or tourniquet. Otherwise, application of pressure over the bleeding site and elevation of the injured limb where possible.
- Pack any severed body parts in a sterile cloth or clean plastic bag and chill if possible.
- Note the time of the injury, nature of the material in the jet and environment e.g. sewer, drains.
- If clinical circumstance allow and there is clean water available, wound irrigation should be done.
- Monitor vital signs if possible.
- Keep warm, nil by mouth and reassure casualty.
- **Arrange TRANSFER/EVACUATION of the patient to a hospital /medical facility nearby urgent in the first instance.** Instiate evacuation planning at point of injury in advance in remote areas such as decks, large footprint chemical refineries, industrial sites, manufacturing sites or oil platforms. An air ambulance is likely to be needed. Need for a TRAUMA/VASCULAR SURGEON assessment to be organised post haste.

Clinical stable and/or isolated limb wounds

CASUALTY (A&E) or EMERGENCY DEPARTMENT (ED)

This is initially a CONTAMINATED injury which requires an EMERGENCY SURGERY to be performed - until clinically proven otherwise.

Trauma team

- Handover: MIST (mechanism, injuries, signs and symptoms and treatment received).
- Primary assessment as per ATLS @ guidelines (ideally by surgeon).
- If patient is in shock, all traumatic causes must be considered and treated.

Medical history

- Time of the incident.
- Details of the contaminant. Check for paints or solvents and EXCLUDE general intoxication.
- Past medical history.
- Any allergies.
- Date of last Tetanus injection.

Examination

- General examination.
- Examination of the injured limb: site (note the size and site of the entry wound). Check for local swelling, erythema and skin colour change. Assess the range of movement and tendons function (strength grade) and neurological weakness and numbness. Watch for compartmental syndrome. Wounds MUST NOT be surgically explored in ED.

Investigations

- **Imaging:** If patient haemodynamically unstable: EFAST/ portable pelvic X-ray and chest X-ray can be considered. If patient is haemodynamically stable: a CT-scan can be considered. ALWAYS, obtain X-rays of the injured area to check for presence of subcutaneous air, foreign bodies or fractures, preferably obtain an urgent CT-Angiogram scan.
- **Laboratory:** basal blood cultures, cross match, full blood count (FBC), arterial blood gas (ABG), urea and electrolytes (U&E's; BUN), liver function tests (LFT), direct (conjugated) bilirubin, hepatitis screening A, B and C, clotting (including fibrinogen and calcium levels) especially IF it is a haemorrhagic trauma, biochemistry, basal procalcitonine, C-reactive protein and creatinine kinase (CK).

General management

- In isolated limb wounds, steroids IF irritant material (petroleum based products) and continue for a minimum of 24 hours or up to 7 days (depend of the case). Hydrocortisone 200 mg/IV/Stat, followed by 50 mg/6h/IV or prednisolone 0.5 mg/kg/OD. Currently, it is not advised on only water injuries.
- Pain control: e.g. morphine boluses 2.5-5mg PRN or Ketamine 50-100 mg (as required) IV and a antiemetic such ondansetron 4-8 mg/6h/IV or cyclizine 50 mg/8h/IV.
- Preoperative CT-ANGIOGRAM is advisable IF possible. Distal pulse does not exclude arterial injury in these circumstances.
- The patient should be taken to theatre for exploration of the injured limb.

Antimicrobials

- Tetanus status If uncertain : vaccinate !!

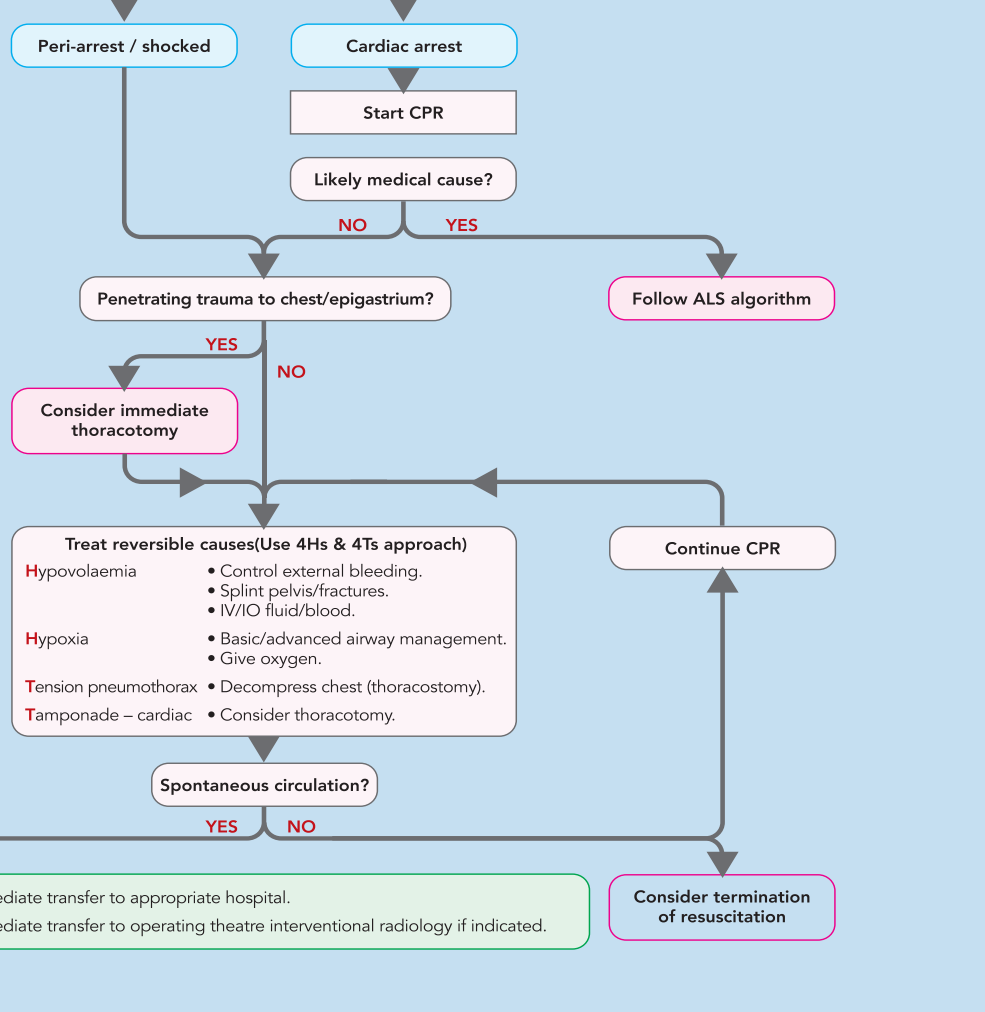
	Antimicrobial prophylaxis	Comments
<small>Avoid if severe penicillin allergy, seek specialist advice*</small>		
Patient presenting for immediate debridement after HPWJ injury <24 h	Co-amoxiclav 1.2 g/IV/TDS Alternative for penicillin allergic patients Cefuroxime* 1.5 g/IV/TDS for 5 days plus Metronidazole 500mg/ IV /TDS for 5 days	Extensive debridement essential, send sample for culture and sensitivity, modify treatment according to culture results. Assess need for MRSA cover in areas with high prevalence. Close monitoring and start antifungal if: • Fungal hyphae are seen in tissue after debridement. • Wound becomes infected/necrotic tissue.
Patient presenting >24 hours after the injury or with established soft tissue infection	Piperacillin-Tazobactam 4.5g/IV/TDS plus Posaconazole 400mg/IV/ OD Alternative for penicillin allergic patients Ciprofloxacin 400mg/ IV/ BD Plus Clindamycin 1.2 g/IV/QDS Plus Posaconazole 400mg/IV/ OD	Extensive debridement essential. Send samples for microscopy, culture and sensitivity. Continue antibiotic treatment until first surgical debridement/washout. Modify treatment according to culture results. Total duration will depend on extent of injuries and intra-operative findings
Patient not responding or developing infection while on first line treatment	Meropenem* 1g/IV/ TDS Plus Vancomycin IV (adjust as required)Plus Posaconazole 400mg BD for 14 days	Extensive debridement essential. Send samples for microscopy, culture and sensitivity. Modify treatment according to culture results.

DISCHARGE (Thinking of discharging such a patient? Think twice!!!)

- If discharging from **A&E or ED:**
 - Normal examination at this stage does not exclude serious and potentially limb-threatening complications developing also pain may not be present initially.
 - Keep the patient in observation for at least 24h BEFORE discharge without fail.
 - Watch for early signs of infection, keep in mind the possibility of unusual organisms being present and compartmental syndrome development.
- If discharge from **hospital ward:**
 - Encourage the patient to come back to hospital if presence of loss functionality, pain, fever, swelling or any other symptoms.
 - Makes sure you arrange a follow up by the appropriate specialist.
- PLEASE, encourage the patient to contact The Water Jetting Association via their website: www.waterjetting.org.uk or Tel: +44 (0) 2083 201090 for the most up-to-date treatment development and clinical research findings.

COMPLICATIONS (usually after a week)

- **From surgical wound:**
 - Check results from WOUND SWABS and TISSUE SAMPLES taken and sent previously for microbiological and histological examination. If unusual pathogens or any filamentous fungi detected, please liaise with Infectious Disease expert for advice on management and antimicrobial treatment. Consider urgent surgical review if patient deteriorates. Consider NEW DEBRIDEMENT and DECOMPRESSION and closure by second intention. For high grade injuries already on temporary NPWT (negative pressure wound therapy) there would be a need for a new "wash out" use the earliest possible definitive plastic surgical wound closure.
- **Systemic presentation:**
 - Unusual infections with micro-aerophilic organisms (usually GRAM negative) and fungal. Check for previous cultures. Leptospirosis (Weil's disease) presents as a "flu-like" illness with severe headaches, fever, nausea, and sometimes aseptic meningitis. Classical triade involves "jaundice, renal failure and haemorrhage". Check (IgM) ELISA. Hepatitis A, B, C



THEATRE (Surgical Emergency)

- The initial DEBRIDEMENT and DECOMPRESSION should start as soon as an experienced trauma surgeon is available. WOUND SWABS and TISSUE SAMPLES should be taken and sent for microbiological and histological examination so that the presence of fungal spores can be identified.
- DECOMPRESSION FASCIOTOMY of all compartments must be done if patient is having a compartment syndrome or considered to be at high risk thereof.
- Tissue that is definitely avital will have to be removed, whereas traumatized but potentially surviving tissue areas will be evaluated in a "SECOND-LOOK" 36-48 hours later.
- In cases of contamination (often the case), manual wound IRRIGATION 3-9 L will be useful with additives such polyhexanide, octenidine or superoxidized water.
- NEVER primary close, as this is a contaminated wound. Primary closure ONLY in the case of certain decontamination and overall vitality of the wound. For high grade injuries, a temporary NPWT (negative pressure wound therapy) could be used until the earliest possible definitive plastic surgical wound closure.