
Major Orthopaedic Trauma

In the primary assessment, an analysis of the trauma and a quick evaluation of the patient condition are included, advisably by the ATLS concept (Advanced Trauma Life Support) through the combination A-B-C-D-E. To secure vital life supporting functions, the A-B-C is the main priority, i.e. Airway (always secure a free airway first, this is the most urgent, and cervical spine control), Breathing (control of spontaneous breathing ability) and Circulation (control of pulse, heart activity and signs of circulatory shock with deteriorated cardiovascular function and consequent oxygen deficit). D and E represent a primary survey regarding Disability (reaction on speech/stimulation/pain) and Exposure (whole body examination) as well as Environment, respectively, in the following chronological order: Chest, Abdomen, Pelvis, Head (including neurology) and Skeleton. The vital functions are thus secured (with attention paid to the cervical spine) and neurological screening completed; after that the chest has the highest priority, followed by the head. People exposed to a major trauma have, on average, two to three body parts/organ systems injured.

Injuries of the Pelvis

Diagnosis. Palpation and compression with respect to tenderness, hematoma (per rectum!), dislocations, sliding, also in vertical direction (since the most dangerous fractures have vertical instability/laxity) and from behind against the sacroiliac joint. The fracture is stable if the pelvis ring is broken entirely or partly in only one place, but unstable if broken at least at two sites that leads to a sliding displacement/translation between the two pelvis halves. Nerve injuries are not uncommon with unstable pelvis fractures.

Treatment. For unstable pelvis fracture, shock treatment is started; arrange as stable a fixation as possible with, e.g. girdle, coil banding or a vacuum mattress, and observe for possible injury to the large vessels (general circulatory

compromise, large hematomas that can be of 2–3 litres size). Decision about urgent surgery with external fixation of the pelvis with anterior frame. Radiological mapping regarding skeleton and possible bleeding source (angiography). Also angiographic treatment with coiling could be indicated in selected cases.

Spine Injuries

Diagnosis. Most often indirect trauma with distortion and possibly rotation with compression of vertebral bodies that, with heavier violence, can disrupt and be pushed into the spinal canal. Fractures of vertebral arches incur a risk of instability and distraction injury to the spine marrow. Complete or incomplete transsectional lesions occur in spinal cord injuries, i.e. nerve function loss below the level of injury, above C4 paralysis of the breathing, at the C4–Th1 level tetraplegia and below this level paraplegia.

Injuries where the spinal cord is involved are, luckily enough, a relatively small portion of the spinal injuries.

The cervical spine and the thoracolumbar transitional zone are more often affected by injuries than the other parts. Observe the risk of cervical spine injuries after severe trauma to the head – often there are injuries to both head and neck! Injuries in the cervical spine and upper thorax can lead to loss of breathing function. Injuries to the cervical spine are common for severely injured patients; take caution when lifting, moving and examining. Avoid forward bending of the cervical spine! Observe and palpate the spine for dislocations, malformations, hematomas and tenderness at the spinous processes. Careful motion can provoke pain and crepitations. Check the ability to move the arms and the legs and the sensibility.

Treatment. Stabilise with stiff cervical collar and support, before and after the use of this, with, e.g. a towel roll in the cervical lordosis and cushions on both sides, alternatively use vacuum mattress. ATLS recommends manual stabilisation when removing the neck collar in case of intubation and clinical examination. Secure free airway, especially for patients with depressed consciousness. With signs of neurological deficits, high-dose corticosteroids can be given, but according to a different school of thought, steroids should not be administered. For unstable or dislocated injuries in the cervical spine, halo traction should be used (this can be done in local anaesthesia) with 12 kg of traction initially.

Shock treatment in circulatory compromise with primarily fluids and secondarily inotropes and vasopressors. Translation of a vertebra >3 mm and wedge angulation $>11^\circ$ indicates an unstable fracture, just as a combined anterior and posterior column injury does. Facet joint (sub)dislocation also suggests instability, even if the fracture cannot be visualised (ligamentous injury). Undisplaced stable fractures can be treated with a soft collar for 2–4 weeks, and if there is any doubt about the stability, the patient should be called back after 10 days for

renewed X-ray with flexion-extension images. Open (penetrating) injuries should promptly receive antibiotics and be operated on, preferably at a neurosurgical unit.

Extremity Injuries

Diagnosis. Systematic inspection of the extremities regarding presence of major bleeding, wounds or soft tissue injury and visible dislocation. Palpation on joints and diaphyses, cautious examination of movement to reveal pain reaction, tenderness, swelling and crepitations. Evaluate distal status with registration of vascular and nerve function distally from the injury (circulation, sensibility and motility). Observe signs of acute compartment syndrome like progressing pain, more firm muscle tissue in consistency (can become stiff like a board), weakness or inability to use the affected muscles and pain on passive stretch.

Treatment. Irrigate contaminated injuries with isotone saline fluid, stop bleeding with compression bandage. Cover injuries with sterile cloths. When needed, make preliminary gross morphological reduction to eliminate major fracture dislocations and joint dislocations, which, close to the time of injury (within 10–30 min), can be done even without anaesthesia or muscle relaxants. Always reduce by simultaneous traction in longitudinal axial direction, preferably together with a co-worker, who maintains resistance on the other side of the injury. Use slow and careful movements. First, neutralise gross angular dislocation and then gross rotational malposition. Keep the traction until the fixation/immobilisation is established. Give antibiotics early in case of open injuries with contamination or devitalized tissue. After traumatic amputation, there is as a rule astonishingly small or no bleeding (spasm of the arteries and fall of blood pressure), but risk of new arterial bleeding by shock treatment or movement of the patient. Disrupted and amputated body parts should be transported as sterile as possible, e.g. wrapped by compress in a sterile glove and/or in isotone saline solution in cold pack/ice bag. High priority for surgery when fractures with vascular or nerve injuries in spite of gross reduction, as well as open fractures. If circular plaster of cast is established primarily, it should always be cut up. Cast bandages should principally involve the joints on both sides of the fracture.

Emergency Orthopedics

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