# C Circulation and haemorrhage control

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All patients require adequate intravenous (IV) access with at least two large-bore IV cannulae. Equipment and expertise for insertion of central or intraosseous venous access should be - - - available where peripheral access is not easily obtainable. Blood should be taken for cross-match and laboratory assessment, - including haemoglobin and venous lactate. An assessment of the haemodynamic status should be made to identify shocked patients: the skin may be cool and sweaty , the pulse rate raised to over 100 per minute and the blood pressure low . A pelvic ed binder should be applied to all haemodynamically unstable patients following blunt trauma and not removed until after a pelvic fracture has been excluded. Hypotensive trauma patients are treated as hypovolaemic until proven otherwise. The priority is simultaneous fluid resuscitation and identifica - tion of the source of the haemorrhage. Permissive hypotension, massive transfusion protocols and tranexamic acid The initial aim of resuscitation is to maintain the blood supply to the vital organs: the brain, heart and kidneys. For a short time, this can be achieved with a target systolic blood pressure of 70–90 /uni00A0 mmHg, although a higher pressure of >90 /uni00A0 mmHg should be the target if a head injury is suspected. Small boluses of IV fluids (e.g. 250 /uni00A0 mL of O negative blood, or normal saline if blood is not immediately available) should be administered to achieve this target, which should result in a palpable radial pulse. Excessive IV crystalloid or colloid solutions should be

# Figure 27.1 Unrestrained driver with severe craniofacial injury (cour

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pathy and increase the risk of adult respiratory distress syndrome. However, the key to this approach of permissive hypotension is that it is time limited. The primary sour haemorrhage must be identified and controlled as soon as possible. Severely injured hypovolaemic patients should be resusci tated with blood and blood products, not crystalloid/colloid fluids. These must be warmed. All hospitals managing severe trauma should have a massive transfusion protocol that aims to

provide blood and blood products in a ratio of 1 packed red cells /uni00A0 : /uni00A0 1 fresh-frozen plasma /uni00A0 : /uni00A0 1 platelets. Tranexamic acid Tranexamic acid is an antifibrinolytic drug that reduces the risk of mortality from bleeding in both blunt and penetrating trauma. One gram is given intravenously over 10 minutes, followed by a further 1-g dose over 8 hours. Tranexamic acid should be given to all trauma patients suspected to have significant haemorrhage, including those with a systolic blood pressure of <110 /uni00A0 mmHg or a pulse of over 110 per minute. It needs to be administered as early as possible and ideally within the first hour from injury; the first dose should not be administered more than 3 hours from injury . In the UK it is normally given by paramedics in the prehospital environment. Summary box 27.2 Severe hypovolaemia /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF Identification and management of haemorrhage The sites of major haemorrhage in trauma patients are the chest, abdomen, pelvis and long bones, and external haem orrhage ( Figure 27.2 ). Blunt trauma patients frequently have multiple sources of haemorrhage. Clinical examination and investigations should aim to rapidly confirm or exclude signifi cant bleeding from eac h of these sites. Computed tomography (CT) from the head to pelvis with IV contrast, the so-called ‘whole-body CT’ (WBCT), is the gold standard investigation in patients with signs or symptoms of multiple injury or deranged physiology , but note that WBCT should not be perf ormed on the basis of the mechanism of injury alone (see Further reading ). There is no role for scanning selective body systems in the severely injured trauma patient. Wherever possible, WBCT should be performed as soon as possible during the patient’s resuscitation. A provisional ‘hot report’ can be issued to the trauma team. A more detailed definitive report should be available within 30–60 minutes. Traditionally , chest and pelvis radiographs have been ce of obtained early in the assessment of patients with polytrauma but these investigations are increasing ly omitted in favour of obtaining a rapid CT scan, as described above. Most trauma - centres now have rapid access to CT scanners located within, or immediately adjacent to, the resuscitation area. This has allowed haemodynamically unstable patients to have a WBCT with resuscitation by the trauma team continuing simultane - ously during CT . Identifying which patients are too haemo - dynamically unstable to scan safely is a di ffi cult decision for the trauma team leader and will be influenced by local factors and facilities. Some patients will be so haemodynamically unstable on arrival that they need immediate surgical control of their haemorrhage before a CT scan. T he most likely sources are abdominal or pelvic bleeding . An immediate chest radio - graph will exclude catastrophic intrathoracic haemorrhage. An immediate pelvic radiograph is essential but should not delay transfer to the operating theatre. A focused abdominal sonography for trauma (FAST) scan (if immediately available) may also be useful in this scenario to locate the major source of haemorrhage. All patients undergoing immediate laparotomy in the operating theatre should have a pelvic binder applied and not removed. A correctly positioned pelvic binder at the level of the greater trochanters does not obstruct trauma lap - arotomy . These patients will invariably require a WBCT scan after surgical control of haemorrhage has been achieved. Summary box 27.3 Whole-body CT (WBCT) /uni25CF /uni25CF /uni25CF /uni25CF - -

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IV contrast is the gold standard investigation of the severely injured adult blunt trauma patient There is no role for selective scanning of body systems in these patients WBCT scan is a time-critical investigation and should be obtained as early as possible in resuscitation of the severely injured patient Any patient undergoing immediate trauma laparotomy after blunt trauma without a WBCT scan should have a pelvic binder applied and not removed until a pelvic fracture is excluded. Such patients should have an immediate pelvic radiograph either in the emergency department or as they arrive in the operating theatre

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