Investigations

Investigations

- The mainstay of extremity trauma investigation remains radi - ography of the a ff ected limb to see if there is a bony injury . However, this is not the sole investigation available. - Haematological investigations Simple haematological investigations are seldom useful in the evaluation of a single limb injury . In the polytrauma patient a full blood count, serum biochemistry , clotting factor and creatinine kinase may be useful. A blood gas, including pH, base excess and lactate, can be useful to show the severity of the injury and the response to resuscitation. Ultrasound Ultrasound is very useful to define soft-tissue injuries. Fractures of the bones can be visualised on ultrasound but generally it is reserved for the soft tissues. One limitation of ultrasound is the variability depending on the experience of the sonographer. Radiography Radiographs are the mainstay in the initial evaluation of suspected extremity trauma. The rule of 2s should be remembered: planes to avoid missing a fracture out of plane on the first radiograph view . For shoulder injuries ensure at least an anteroposterior and axillary or modified axillary view (Figure 32.3). /uni25CF 2 joints – radiographs are required of the joint above and the joint below the fracture. /uni25CF 2 occasions – sometimes the fracture may not be initially visible; a second series of radiographs should be under - taken after 10–14 days if suspicion of bony injury persists. The classic injury here is a scaphoid fracture. If initial scaphoid views are normal, consider repeating them 10– 14 days later if pain and tenderness in the anatomical snu ff box (Figure 32.4) persist. /uni25CF 2 sides – in paediatric injuries it can be useful to consider a radiograph from the opposite and uninjured side if doubt exists. With improved access to atlases of normal variants this is less important. Computed axial tomography Computed axial tomography (CT) is very good for character - ising the bony anatomy of injuries, allowing for multiplanar reconstruction of injury anatomy and providing other three-dimensional information. It is very useful f or periarticu - lar injuries, where the exact characterisation of the bony injury is essential. A CT with contrast creating a CT angiogram provides very useful information regarding the vascularity and its association with the fracture. T he CT angiogram also gives an indication to plastic reconstruction surgeons of reconstruc - tive options for limb trauma. Surface volume rendering is a useful addition allowing for easier visualisation of the injury (Figure 32.1b). CT angiogra - phy (Figure 32.2b) may be added, providing informa tion on the vascular anatomy . One disadvantage of CT is the dose of radiation involved. Magnetic resonance imaging Magnetic resonance imaging (MRI) provides three- dimensional information without the radiation involved in CT . It provides useful information, particularly about the soft tissues. MRI can provide information on the blood supply to the bone; for example, avascular necrosis of the proximal pole of the scaphoid. One disadvantage of MRI is the time taken to acquire the image; patients su ff ering from claustrophobia find the experience traumatic. It is essential to ensure patient safety and consideration should be

given to potential risks of MRI that may apply , for example with certain implanted devices and metallic foreign bodies, e.g. in the eye (see MHRA guidance in Further reading). MRI angiography can also be performed, providing infor - mation about the vascular anatomy . Nuclear medicine scans Technetium-99 nuclear medicine scans register osteoblastic activity and may be used to demonstrate occult fractures; for example, an undisplaced scaphoid fracture.

(b) Figure 32.2 (a) Initial anterior tibiofemoral dislocation. (b) Postreduc tion computed tomography angiogram showing complete blockage of the popliteal artery with reconstitution distally from a collateral blood supply.

Harald Tscherne , b. 1933, Austrian trauma surgeon, Director of the Trauma Department, Medical Graduate School, Hannover, Germany . Ramon Balgoa Gustilo , surgeon, Hennepin County Medical Center, Minneapolis, MN, USA. John T Anderson , surgeon, Hennepin Medical Center, Minneapolis, MA, USA. 10 4 2 5 3 1 9 11 8 6 7 12 Summary box 32.1 History, examination and investigations /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF

(b) (c) Figure 32.3 Radiographic series of the same patient demonstrating the value of two views in two planes and the true

value of the axil lary view in shoulder trauma. (a) Anteroposterior radiograph of the shoulder, initially reported as normal. (b) Lateral scapula radiograph, initially reported as normal; humeral head slightly posteriorly directed. (c) Axillary view – true value of the axillary view shown with obvious posterior dislocation of the glenohumeral joint. Figure 32.4 Surface anatomy of the anatomical snuffbox: 1, cephalic vein (blue); 2, radial nerve (yellow); 3, radial artery (red); 4, lower end of radius; 5,

scaphoid; 6, trapezium; 7, /f_i rst metacarpal; 8, proximal phalanx; 9, distal phalanx; 10, extensor pollicis longus; 11, extensor pollicis brevis; 12, abductor pollicis longus. (Reproduced with permis

sion from Lumley JSP , Craven JL, Abrahams PH, Tunstall RG. Bailey & Love’s essential clinical anatomy . Boca Raton, FL: CRC Press, 2019.) Follow a systematic approach History requires suf /f_i cient detail of injury History can be organised in the AMPLE format Examination follows look, feel, move, special tests approach Investigations will include radiographs with the rule of ‘2s’ observed Selective use of special investigations can help diagnosis

Investigations

- The mainstay of extremity trauma investigation remains radi - ography of the a ff ected limb to see if there is a bony injury . However, this is not the sole investigation available. - Haematological investigations Simple haematological investigations are seldom useful in the evaluation of a single limb injury . In the polytrauma patient a full blood count, serum biochemistry , clotting factor and creatinine kinase may be useful. A blood gas, including pH, base excess and lactate, can be useful to show the severity of the injury and the response to resuscitation. Ultrasound Ultrasound is very useful to define soft-tissue injuries. Fractures of the bones can be visualised on ultrasound but generally it is reserved for the soft tissues. One limitation of ultrasound is the variability depending on the experience of the sonographer. Radiography Radiographs are the mainstay in the initial evaluation of suspected extremity trauma. The rule of 2s should be remembered: planes to avoid missing a fracture out of plane on the first radiograph view . For shoulder injuries ensure at least an anteroposterior and axillary or modified axillary view (Figure 32.3). /uni25CF 2 joints – radiographs are required of the joint above and the joint below the fracture. /uni25CF 2 occasions – sometimes the fracture may not be initially visible; a second series of radiographs should be under - taken after 10–14 days if suspicion of bony injury persists. The classic injury here is a scaphoid fracture. If initial scaphoid views are normal, consider repeating them 10– 14 days later if pain and tenderness in the anatomical snu ff box (Figure 32.4) persist. /uni25CF 2 sides – in paediatric injuries it can

be useful to consider a radiograph from the opposite and uninjured side if doubt exists. With improved access to atlases of normal variants this is less important. Computed axial tomography Computed axial tomography (CT) is very good for character - ising the bony anatomy of injuries, allowing for multiplanar reconstruction of injury anatomy and providing other three-dimensional information. It is very useful f or periarticu - lar injuries, where the exact characterisation of the bony injury is essential. A CT with contrast creating a CT angiogram provides very useful information regarding the vascularity and its association with the fracture. T he CT angiogram also gives an indication to plastic reconstruction surgeons of reconstruc - tive options for limb trauma. Surface volume rendering is a useful addition allowing for easier visualisation of the injury (Figure 32.1b). CT angiogra - phy (Figure 32.2b) may be added, providing informa tion on the vascular anatomy . One disadvantage of CT is the dose of radiation involved. Magnetic resonance imaging Magnetic resonance imaging (MRI) provides three- dimensional information without the radiation involved in CT . It provides useful information, particularly about the soft tissues. MRI can provide information on the blood supply to the bone; for example, avascular necrosis of the proximal pole of the scaphoid. One disadvantage of MRI is the time taken to acquire the image; patients su ff ering from claustrophobia find the experience traumatic. It is essential to ensure patient safety and consideration should be given to potential risks of MRI that may apply , for example with certain implanted devices and metallic foreign bodies, e.g. in the eye (see MHRA guidance in Further reading). MRI angiography can also be performed, providing infor - mation about the vascular anatomy . Nuclear medicine scans Technetium-99 nuclear medicine scans register osteoblastic activity and may be used to demonstrate occult fractures; for example, an undisplaced scaphoid fracture.

(b) Figure 32.2 (a) Initial anterior tibiofemoral dislocation. (b) Postreduc tion computed tomography angiogram showing complete blockage of the popliteal artery with reconstitution distally from a collateral blood supply.

Harald Tscherne , b. 1933, Austrian trauma surgeon, Director of the Trauma Department, Medical Graduate School, Hannover, Germany . Ramon Balgoa Gustilo , surgeon, Hennepin County Medical Center, Minneapolis, MN, USA. John T Anderson , surgeon, Hennepin Medical Center, Minneapolis, MA, USA. 10 4 2 5 3 1 9 11 8 6 7 12 Summary box 32.1 History, examination and investigations /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF

(b) (c) Figure 32.3 Radiographic series of the same patient demonstrating the value of two views in two planes and the true value of the axil lary view in shoulder trauma. (a) Anteroposterior radiograph of the shoulder, initially reported as normal. (b) Lateral scapula radiograph, initially reported as normal; humeral head slightly posteriorly directed. (c) Axillary view – true value of the axillary view shown with obvious posterior

dislocation of the glenohumeral joint. Figure 32.4 Surface anatomy of the anatomical snuffbox: 1, cephalic vein (blue); 2, radial nerve (yellow); 3, radial artery (red); 4, lower end of radius; 5, scaphoid; 6, trapezium; 7, /f_i rst metacarpal; 8, proximal phalanx; 9, distal phalanx; 10, extensor pollicis longus; 11, extensor pollicis brevis; 12, abductor pollicis longus. (Reproduced with permis

sion from Lumley JSP , Craven JL, Abrahams PH, Tunstall RG. Bailey & Love’s essential clinical anatomy . Boca Raton, FL: CRC Press, 2019.) Follow a systematic approach History requires suf /f_i cient detail of injury History can be organised in the AMPLE format Examination follows look, feel, move, special tests approach Investigations will include radiographs with the rule of ‘2s’ observed Selective use of special investigations can help diagnosis

Investigations

- The mainstay of extremity trauma investigation remains radi - ography of the a ff ected limb to see if there is a bony injury . However, this is not the sole investigation available. -

Haematological investigations Simple haematological investigations are seldom useful in the evaluation of a single limb injury . In the polytrauma patient a full blood count, serum biochemistry , clotting factor and creatinine kinase may be useful. A blood gas, including pH, base excess and lactate, can be useful to show the severity of the injury and the response to resuscitation. Ultrasound Ultrasound is very useful to define soft-tissue injuries. Fractures of the bones can be visualised on ultrasound but generally it is reserved for the soft tissues. One limitation of ultrasound is the variability depending on the experience of the sonographer. Radiography Radiographs are the mainstay in the initial evaluation of suspected extremity trauma. The rule of 2s should be remembered: planes to avoid missing a fracture out of plane on the first radiograph view . For shoulder injuries ensure at least an anteroposterior and axillary or modified axillary view (Figure 32.3). /uni25CF 2 joints – radiographs are required of the joint above and the joint below the fracture. /uni25CF 2 occasions – sometimes the fracture may not be initially visible; a second series of radiographs should be under - taken after 10–14 days if suspicion of bony injury persists. The classic injury here is a scaphoid fracture. If initial scaphoid views are normal, consider repeating them 10– 14 days later if pain and tenderness in the anatomical snu ff box (Figure 32.4) persist. /uni25CF 2 sides – in paediatric injuries it can be useful to consider a radiograph from the opposite and uninjured side if doubt exists. With improved access to atlases of normal variants this is less important. Computed axial tomography Computed axial tomography (CT) is very good for character - ising the bony anatomy of injuries, allowing for multiplanar reconstruction of injury anatomy and providing other three-dimensional information. It is very useful f or periarticu - lar injuries, where the exact characterisation of the bony injury is essential. A CT with contrast creating a CT angiogram provides very useful information regarding the vascularity and its association with the fracture. T he CT angiogram also gives an indication to plastic reconstruction surgeons of reconstruc - tive options for limb trauma. Surface volume rendering is a useful addition allowing for easier visualisation of the injury (Figure 32.1b). CT angiogra - phy (Figure 32.2b) may be added, providing informa tion on the vascular anatomy . One disadvantage of CT is the dose of radiation involved. Magnetic resonance imaging Magnetic resonance imaging (MRI) provides three- dimensional information without the radiation involved in CT . It provides useful information, particularly about the soft tissues. MRI can provide information on the blood supply to the bone; for example, avascular necrosis of the proximal pole of the scaphoid. One disadvantage of MRI is the time taken to acquire the image; patients su ff ering from claustrophobia find the experience traumatic. It is essential to ensure patient safety and consideration should be given to potential risks of MRI that may apply , for example with certain implanted devices and metallic foreign bodies, e.g. in the eye (see MHRA guidance in Further reading). MRI angiography can also be performed, providing infor - mation about the vascular anatomy . Nuclear medicine scans Technetium-99 nuclear medicine scans register osteoblastic activity and may be used to demonstrate occult fractures; for example, an undisplaced scaphoid fracture.

(b) Figure 32.2 (a) Initial anterior tibiofemoral dislocation. (b) Postreduc tion computed tomography angiogram showing complete blockage of the popliteal artery with reconstitution distally from a collateral blood supply.

Harald Tscherne , b. 1933, Austrian trauma surgeon, Director of the Trauma Department, Medical Graduate School, Hannover, Germany . Ramon Balgoa Gustilo , surgeon, Hennepin County Medical Center, Minneapolis, MN, USA. John T Anderson , surgeon, Hennepin Medical Center, Minneapolis, MA, USA. 10 4 2 5 3 1 9 11 8 6 7 12 Summary box 32.1 History, examination and investigations /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF

(b) (c) Figure 32.3 Radiographic series of the same patient demonstrating the value of two views in two planes and the true value of the axil lary view in shoulder trauma. (a)

Anteroposterior radiograph of the shoulder, initially reported as normal. (b) Lateral scapula radiograph, initially reported as normal; humeral head slightly posteriorly directed. (c) Axillary view – true value of the axillary view shown with obvious posterior dislocation of the glenohumeral joint. Figure 32.4 Surface anatomy of the anatomical snuffbox: 1, cephalic vein (blue); 2, radial nerve (yellow); 3, radial artery (red); 4, lower end of radius; 5, scaphoid; 6, trapezium; 7, /f_i rst metacarpal; 8, proximal phalanx;

9, distal phalanx; 10, extensor pollicis longus; 11, extensor pollicis brevis; 12, abductor pollicis longus. (Reproduced with permis

sion from Lumley JSP , Craven JL, Abrahams PH, Tunstall RG. Bailey & Love’s essential clinical anatomy . Boca Raton, FL: CRC Press, 2019.) Follow a systematic approach History requires suf /f_i cient detail of injury History can be organised in the AMPLE format Examination follows look, feel, move, special tests approach Investigations will include radiographs with the rule of ‘2s’ observed Selective use of special investigations can help diagnosis

---

Revision #1
Created 2025-12-31 15:13:34 UTC by Omar Ayman
Updated 2025-12-31 15:13:34 UTC by Omar Ayman