

Examination

Examination

An initial general examination, including vital signs and general assessment, should be conducted. Is this an isolated injury or do you need to start right at the beginning, considering the Achilles, the Greek hero, was the son of Peleus and Thetis. When he was a child, his mother dipped him in the Styx, one of the rivers of the Underworld so that he should be invulnerable in battle. The heel by which she held him did not get wet, and was, therefore, not protected. Achilles died from a wound in the heel received at the siege of Troy. Individual extremity only begins once you are sure the patient is stable and life- and limb-threatening conditions have been excluded. It is crucial to undertake a thorough top-to-toe evaluation in the secondary survey. Often the minor extremity injuries - are missed (Figure 32.1) and can cause significant long-term problems (Table 32.1). A top-to-toe evaluation is achieved by a systematic approach (see Chapter 35 and Apley's system of orthopaedics and fractures [Further reading]) to the injured extremity: look; feel; move (active and passive); special tests; special investigations. Ensure you examine the joint above and the joint below the site of injury. Consider the events and mechanism of injury and examine the areas that could possibly be affected. For example, a patient who falls from a height may fracture the calcaneus, which is an obvious diagnosis with a very swollen hindfoot and extremely tender heel. The concomitant lumbar spine fracture may not become evident until a few days later when the distracting pain in the heel starts to subside. Look It is important to look at the whole limb, back and front, noting any localised swelling, bruising and any obvious deformity. A shortened externally rotated leg in an older patient suggests a fracture of the proximal femur. A slightly flexed, adducted internally rotated leg might suggest a posterior dislocation of the hip. Any break in the skin or abrasion needs to be noted and the treating orthopaedic surgeon informed, even if you do not think it communicates with the fracture. A graze over the knee in a closed tibial fracture may preclude intramedullary nailing until the wound has healed over, or perhaps an alternative treatment may have to be considered. Ideally a photograph (with appropriate consent) should be taken to document the injury and obviate the need for repeated manipulation of the dressings (see Open fractures).

(a) (b) Figure 32.1 (a) Missed
dislocation of the
metatarsophalangeal joint of the

little toe, picked up at 8 weeks. (b) Initial trauma computed tomography angiogram. In retrospect, on close inspection the dislocation is visible on the angiogram; do not be distracted by the obvious femoral shaft fracture. TABLE 32.1 Extremity injuries that are notorious for being missed. Posterior dislocation of the shoulder Lateral condylar mass fracture of the distal humerus Perilunate dislocation Scaphoid fracture Tarsometatarsal fracture dislocation Compartment syndrome Vascular injury with

knee dislocation Talar neck fracture Slipped upper femoral epiphysis Achilles tendon rupture

ing. A compartment syndrome may still be present even when a limb does not appear to be very swollen (see Compartment syndrome), but if it is grossly swollen, note, document and pass on the information. Look for pre-existing scars; a scar at the back of the elbow or over the cubital tunnel might signify an anterior transposition of the ulnar nerve. Scars might signify previous metalwork that remains in situ or has been removed in the past. Feel Start gently examining the limb away from the zone of obvious injury , gaining the patient's trust and gathering as much information as possible beforehand, and without causing the patient pain or discomfort. Feel for bony tenderness and note the degree of swelling and tenseness of the compartments should be noted that it is not possible to exclude a compartment syndrome based on how tense the limb feels. The deep posterior compartment of the lower leg cannot be felt when palpating the skin. The characteristic crepitus of subcutaneous air can be felt in the setting of open fractures, air-jet injuries and around the chest in the presence of a pneumothorax. The examiner should feel for pulses and assess capillary return (see Neurovascular examination) as well as feeling for temperature changes. Move Movement as part of the examination should once again be approached carefully and without causing the patient pain and discomfort. Two types of movement can be assessed: 1 active – active movement is movement initiated and maintained by the patient; 2 passive – passive movement is when the examiner moves the limb. Special tests There are often special tests to detect injury in precise anatomical locations and many are described elsewhere in the book; for example, looking for a ruptured Achilles tendon by placing the patient prone with the foot over the edge of the bed and squeezing the calf; plantarflexion of the foot and ankle then suggests the Achilles tendon is intact. The examiner should be aware of gravity simulating active movements. For example, a leg lying flat, fully extended on the couch does not mean the extensor mechanism of the knee is intact. In all knee injuries make sure the patient can actively straight leg raise and get their leg off the couch. Similar pitfalls exist in the upper limb with gravity straightening the elbow . In order to assess triceps function and elbow extension, ensure that the patient can actively extend against resistance from the examiner or against gravity . Beware of trick movements. Patients with a complete rupture of the quadriceps can still walk with the leg locked in full to slight hyperextension by using the iliotibial band. Patients with complete rupture of the Achilles tendon can still actively plantar flex the foot and ankle using the long toe flexors. This is an important part of extremity examination and summary terms such as 'neurovascularly intact' are best avoided. It is preferable to clearly document the examination performed and its findings, along with a conclusion about the function of the particular neurological or vascular anatomy - tested. On occasion you may not be able to examine all movements because of injury or casts. It is important to examine and document findings before and after any manipulation or cast application to ensure no change. A radial nerve palsy in association with a humeral shaft fracture that occurs at the time of injury may be treated expectantly . If, however, radial nerve function is lost after

application of a cast or brace, the nerve should be explored. Most peripheral nerves have a motor and sensory component; document both sensibility and motor function. . It Laceration or rupture of major vessels may result in life- and limb-threatening injury and should be dealt with as an emergency (see ATLS principles discussed in Chapter 27). Complete laceration or occlusion of a major vessel is obvious and seldom missed. In contrast, occult vessel injuries must be considered and actively excluded. In 30% of knee dislocations (tibiofemoral dislocation) a vascular injury will occur (Figure 32.2). The presence of palpable pulses does not exclude a significant vascular injury and an intimal flap may develop, progress and thrombose over time. Repeated evaluation is necessary , before and after any intervention, for example a manipulation or cast application. In injuries commonly associated with vascular injury , such as knee dislocations, occult injury should be actively excluded with an angiogram. If an angiogram is not performed, repeated thorough vascular evaluation of the limb should be undertaken - for the first 24-48 hours. Open fractures also demand attention to the neurological and vascular status of the limb. In the more severe injuries, there may be both neurological and vascular injury requiring immediate surgical attention through rapid spanning of the limb, creation of an arterial shunt to provide urgent inflow - and subsequent vascular grafting. Once flow has been restored, usually at the same or another surgical sitting, the fracture can then be stabilised definitively with appropriate soft-tissue cover. Performing the arterial shunt before temporary stability has been achieved can compromise the later arterial reconstruction as length, rotation and alignment would not have been restored, thereby pulling on the graft. Open fractures require multiple specialty input. Examination

An initial general examination, including vital signs and general assessment, should be conducted. Is this an isolated injury or do you need to start right at the beginning, considering the Achilles , the Greek hero, was the son of Peleus and Thetis. When he was a child, his mother dipped him in the Styx, one of the rivers of the Underworld so that he should be invulnerable in battle. The heel by which she held him did not get wet, and was, therefore, not protected. Achilles died from a wound in the heel received at the siege of Troy . individual extremity only begins once you are sure the patient is stable and life- and limb-threatening conditions have been excluded. It is crucial to undertake a thorough top-to-toe evaluation in the secondary survey . Often the minor extremity injuries - are missed (Figure 32.1) and can cause significant long-term problems (Table 32.1). A top-to-toe evaluation is achieved by a systematic approach (see Chapter 35 and Apley's system of orthopaedics and fractures [Further reading]) to the injured extremity: /uni25CF look; /uni25CF feel; /uni25CF move (active and passive); /uni25CF special tests; /uni25CF special investigations. /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF Ensure you examine the joint above and the joint below the site of injury . Consider the events and mechanism of injury and examine the areas that could possibly be affected. For example, a patient who falls from a height may fracture the calcaneus, which is an obvious diagnosis with a very swollen hindfoot and extremely tender heel. The concomitant lumbar spine fracture may not become evident until a few days later when the distracting pain in the heel starts to subside. Look It is important to look at the whole limb, back and front, noting any localised swelling, bruising and any obvious deformity . A shortened externally rotated leg in an older patient suggests a fracture of the proximal femur. A slightly flexed, adducted internally rotated leg might suggest a posterior dislocation of the hip. Any break in the skin or abrasion needs to be noted and the treating orthopaedic surgeon informed, even if you do not think it communicates with the fracture. A graze over the knee in a closed tibial fracture may preclude intramedullary nail - ing until the wound has

healed over, or perhaps an alternative treatment may have to be considered. Ideally a photograph (with appropriate consent) should be taken to document the injury and obviate the need for repeated manipulation of the dressings (see Open fractures).

(a) (b) Figure 32.1 (a) Missed dislocation of the metatarsophalangeal joint of the little toe, picked up at 8 weeks. (b) Initial trauma computed tomography angiogram. In retrospect, on close inspection the dislocation is visible on the angiogram; do not be distracted by the obvious femoral shaft fracture. TABLE 32.1 Extremity injuries that are notorious for being missed. Posterior dislocation of the shoulder Lateral condylar mass

fracture of the distal humerus
Perilunate dislocation Scaphoid
fracture Tarsometatarsal fracture
dislocation Compartment
syndrome Vascular injury with
knee dislocation Talar neck
fracture Slipped upper femoral
epiphysis Achilles tendon rupture

ing. A compartment syndrome may still be present even when a limb does not appear to be very swollen (see Compartment syndrome), but if it is grossly swollen, note, document and pass on the information. Look for pre-existing scars; a scar at the back of the elbow or over the cubital tunnel might signify an anterior transposition of the ulnar nerve. Scars might signify previous metalwork that remains in situ or has been removed in the past. Feel Start gently examining the limb away from the zone of obvious injury , gaining the patient's trust and gathering as much information as possible beforehand, and without causing the patient pain or discomfort. Feel for bony tenderness and note the degree of swelling and tenseness of the compartments should be noted that it is not possible to exclude a compartment syndrome based on how tense the limb feels. The deep posterior compartment of the lower leg cannot be felt when palpating the skin. The characteristic crepitus of subcutaneous air can be felt in the setting of open fractures, air-jet injuries and around the chest in the presence of a pneumothorax. The examiner should feel for pulses and assess capillary return (see Neurovascular examination) as well as feeling for temperature changes. Move Movement as part of the examination should once again be approached carefully and without causing the patient pain and discomfort. Two types of movement can be assessed: 1 active – active movement is movement initiated and maintained by the patient; 2 passive – passive movement is when the examiner moves the limb. Special tests There are often special tests to detect injury in precise anatomical locations and many are described elsewhere in the book; for example, looking for a ruptured Achilles tendon by placing the patient prone with the foot over the edge of the bed and squeezing the calf; plantarflexion of the foot and ankle then suggests the Achilles tendon is intact. The examiner should be aware of gravity simulating active movements. For example, a leg lying flat, fully extended on the couch does not mean the extensor mechanism of the knee is

intact. In all knee injuries make sure the patient can actively straight leg raise and get their leg off the couch. Similar pitfalls exist in the upper limb with gravity straightening the elbow. In order to assess triceps function and elbow extension, ensure that the patient can actively extend against resistance from the examiner or against gravity. Beware of trick movements. Patients with a complete rupture of the quadriceps can still walk with the leg locked in full to slight hyperextension by using the iliotibial band. Patients with complete rupture of the Achilles tendon can still actively plantar flex the foot and ankle using the long toe flexors. This is an important part of extremity examination and summary terms such as 'neurovascularly intact' are best avoided. It is preferable to clearly document the examination performed and its findings, along with a conclusion about the function of the particular neurological or vascular anatomy - tested. On occasion you may not be able to examine all movements because of injury or casts. It is important to examine and document findings before and after any manipulation or cast application to ensure no change. A radial nerve palsy in association with a humeral shaft fracture that occurs at the time of injury may be treated expectantly. If, however, radial nerve function is lost after application of a cast or brace, the nerve should be explored. Most peripheral nerves have a motor and sensory component; document both sensibility and motor function. Laceration or rupture of major vessels may result in life- and limb-threatening injury and should be dealt with as an emergency (see ATLS principles discussed in Chapter 27). Complete laceration or occlusion of a major vessel is obvious and seldom missed. In contrast, occult vessel injuries must be considered and actively excluded. In 30% of knee dislocations (tibiofemoral dislocation) a vascular injury will occur (Figure 32.2). The presence of palpable pulses does not exclude a significant vascular injury and an intimal flap may develop, progress and thrombose over time. Repeated evaluation is necessary, before and after any intervention, for example a manipulation or cast application. In injuries commonly associated with vascular injury, such as knee dislocations, occult injury should be actively excluded with an angiogram. If an angiogram is not performed, repeated thorough vascular evaluation of the limb should be undertaken - for the first 24-48 hours. Open fractures also demand attention to the neurological and vascular status of the limb. In the more severe injuries, there may be both neurological and vascular injury requiring immediate surgical attention through rapid spanning of the limb, creation of an arterial shunt to provide urgent inflow - and subsequent vascular grafting. Once flow has been restored, usually at the same or another surgical sitting, the fracture can then be stabilised definitively with appropriate soft-tissue cover. Performing the arterial shunt before temporary stability has been achieved can compromise the later arterial reconstruction as length, rotation and alignment would not have been restored, thereby pulling on the graft. Open fractures require multiple specialty input. Examination

An initial general examination, including vital signs and general assessment, should be conducted. Is this an isolated injury or do you need to start right at the beginning, considering the Achilles, the Greek hero, was the son of Peleus and Thetis. When he was a child, his mother dipped him in the Styx, one of the rivers of the Underworld so that he should be invulnerable in battle. The heel by which she held him did not get wet, and was, therefore, not protected. Achilles died from a wound in the heel received at the siege of Troy. Individual extremity only begins once you are sure the patient is stable and life- and limb-threatening conditions have been excluded. It is crucial to undertake a thorough top-to-toe evaluation in the secondary survey. Often the minor extremity injuries - are missed (Figure 32.1) and can cause significant long-term problems (Table 32.1). A top-to-toe evaluation is achieved by a systematic approach (see Chapter 35 and Apley's system of

orthopaedics and fractures [Further reading]) to the injured extremity: /uni25CF look; /uni25CF feel; /uni25CF move (active and passive); /uni25CF special tests; /uni25CF special investigations. /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF Ensure you examine the joint above and the joint below the site of injury . Consider the events and mechanism of injury and examine the areas that could possibly be affected. For example, a patient who falls from a height may fracture the calcaneus, which is an obvious diagnosis with a very swollen hindfoot and extremely tender heel. The concomitant lumbar spine fracture may not become evident until a few days later when the distracting pain in the heel starts to subside. Look It is important to look at the whole limb, back and front, noting any localised swelling, bruising and any obvious deformity . A shortened externally rotated leg in an older patient suggests a fracture of the proximal femur. A slightly flexed, adducted internally rotated leg might suggest a posterior dislocation of the hip. Any break in the skin or abrasion needs to be noted and the treating orthopaedic surgeon informed, even if you do not think it communicates with the fracture. A graze over the knee in a closed tibial fracture may preclude intramedullary nailing until the wound has healed over, or perhaps an alternative treatment may have to be considered. Ideally a photograph (with appropriate consent) should be taken to document the injury and obviate the need for repeated manipulation of the dressings (see Open fractures).

(a) (b) Figure 32.1 (a) Missed dislocation of the metatarsophalangeal joint of the little toe, picked up at 8 weeks. (b) Initial trauma computed tomography angiogram. In retrospect, on close inspection the dislocation is visible on the angiogram; do not be distracted by the obvious

femoral shaft fracture. TABLE 32.1
Extremity injuries that are
notorious for being missed.
Posterior dislocation of the
shoulder Lateral condylar mass
fracture of the distal humerus
Perilunate dislocation Scaphoid
fracture Tarsometatarsal fracture
dislocation Compartment
syndrome Vascular injury with
knee dislocation Talar neck
fracture Slipped upper femoral
epiphysis Achilles tendon rupture

ing. A compartment syndrome may still be present even when a limb does not appear to be very swollen (see Compartment syndrome), but if it is grossly swollen, note, document and pass on the information. Look for pre-existing scars; a scar at the back of the elbow or over the cubital tunnel might signify an anterior transposition of the ulnar nerve. Scars might signify previous metalwork that remains in situ or has been removed in the past. Feel Start gently examining the limb away from the zone of obvious injury , gaining the patient's trust and gathering as much information as possible beforehand, and without causing the patient pain or discomfort. Feel for bony tenderness and note the degree of swelling and tenseness of the compartments should be noted that it is not possible to exclude a compartment syndrome based on how tense the limb feels. The deep

posterior compartment of the lower leg cannot be felt when palpating the skin. The characteristic crepitus of subcutaneous air can be felt in the setting of open fractures, air-jet injuries and around the chest in the presence of a pneumothorax. The examiner should feel for pulses and assess capillary return (see Neurovascular examination) as well as feeling for temperature changes.

Move Movement as part of the examination should once again be approached carefully and without causing the patient pain and discomfort. Two types of movement can be assessed: 1 active – active movement is movement initiated and maintained by the patient; 2 passive – passive movement is when the examiner moves the limb.

Special tests There are often special tests to detect injury in precise anatomical locations and many are described elsewhere in the book; for example, looking for a ruptured Achilles tendon by placing the patient prone with the foot over the edge of the bed and squeezing the calf; plantarflexion of the foot and ankle then suggests the Achilles tendon is intact. The examiner should be aware of gravity simulating active movements. For example, a leg lying flat, fully extended on the couch does not mean the extensor mechanism of the knee is intact. In all knee injuries make sure the patient can actively straight leg raise and get their leg off the couch. Similar pitfalls exist in the upper limb with gravity straightening the elbow . In order to assess triceps function and elbow extension, ensure that the patient can actively extend against resistance from the examiner or against gravity . Beware of trick movements. Patients with a complete rupture of the quadriceps can still walk with the leg locked in full to slight hyperextension by using the iliotibial band. Patients with complete rupture of the Achilles tendon can still actively plantar flex the foot and ankle using the long toe flexors. This is an important part of extremity examination and summary terms such as ‘neurovascularly intact’ are best avoided. It is preferable to clearly document the examination performed and its findings, along with a conclusion about the function of the particular neurological or vascular anatomy - tested. On occasion you may not be able to examine all movements because of injury or casts. It is important to examine and document findings before and after any manipulation or cast application to ensure no change. A radial nerve palsy in association with a humeral shaft fracture that occurs at the time of injury may be treated expectantly . If, however, radial nerve function is lost after application of a cast or brace, the nerve should be explored. Most peripheral nerves have a motor and sensory component; document both sensibility and motor function. .

Laceration or rupture of major vessels may result in life- and limb-threatening injury and should be dealt with as an emergency (see ATLS principles discussed in Chapter 27). Complete laceration or occlusion of a major vessel is obvious and seldom missed. In contrast, occult vessel injuries must be considered and actively excluded. In 30% of knee dislocations (tibiofemoral dislocation) a vascular injury will occur (Figure 32.2). The presence of palpable pulses does not exclude a significant vascular injury and an intimal flap may develop, progress and thrombose over time. Repeated evaluation is necessary , before and after any intervention, for example a manipulation or cast application. In injuries commonly associated with vascular injury , such as knee dislocations, occult injury should be actively excluded with an angiogram. If an angiogram is not performed, repeated thorough vascular evaluation of the limb should be undertaken - for the first 24–48 hours. Open fractures also demand attention to the neurological and vascular status of the limb. In the more severe injuries, there may be both neurological and vascular injury requiring immediate surgical attention through rapid spanning of the limb, creation of an arterial shunt to provide urgent inflow - and subsequent vascular grafting. Once flow has been restored, usually at the same or another surgical sitting, the fracture can then be stabilised definitively with appropriate soft-tissue cover.

Performing the arterial shunt before temporary stability has been achieved can compromise the later arterial reconstruction as length, rotation and alignment would not have been restored, thereby pulling on the graft. Open fractures require multiple specialty input.

Revision #1

Created 2025-12-31 15:13:30 UTC by Omar Ayman

Updated 2025-12-31 15:13:30 UTC by Omar Ayman