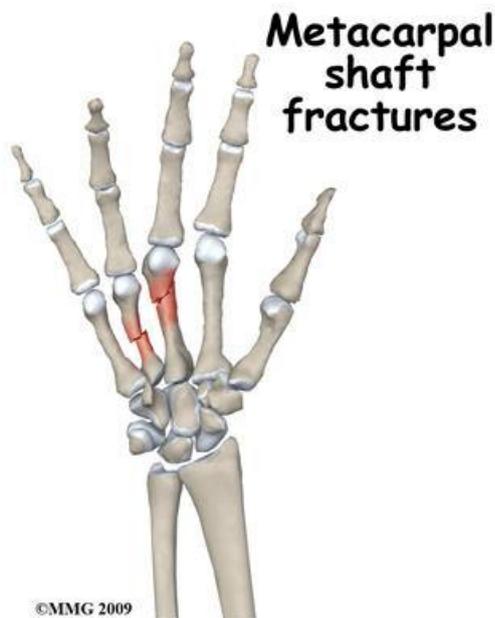


METACARPAL FRACTURES



Definition

Metacarpal fractures account for about 30-40% of all hand fractures and are most common in adolescents and young adults. The mechanism of injury in the majority of cases is related to sport, trauma such as car accidents, as well as punching with a clenched fist.

Healing of a fracture

Immediately following a fracture, bleeding occurs around the fracture site. The blood clot forms in the fracture gap and may persist for days. This is the first step in fracture union. With the bleeding come cells that are responsible for destroying dead tissue. Within 7 days after the fracture, new blood vessels develop between and around the fracture and thus, cells reach the fracture site which begin to lay down collagen (type of protein) to strengthen the bond between the bone fragments. Eventually, bone cells from the margins of the bone fragments begin to migrate over the fracture gap. This is called a bony callus and remains weak and unable to support weight bearing. After about 4-6 weeks after the fracture, the fracture and bony callus have healed significantly and gained adequate strength. At this stage, the bone begins to remodel. This means that bone will form in areas submitted to tension (weight bearing or muscle attachments) and will be absorbed in areas that are not submitted to tension. Thus, over time, the callus remodels itself until the size and shape of the bone closely resembles that of the bone before the fracture. This process may take up to a few year, but generally occurs more quickly in children.

Factors that affect the healing of a fracture

It is important to note that certain factors may affect the quality or speed of fracture healing. Adequate nutrition during this process is important. Adequate daily intake of vitamin C ensures the best speed of fracture healing while vitamin D will ensure the formation of a strong bony callus. Calcium intake also ensures good quality bone formation.

If possible, smoking should be avoided, during this process. Smoking causes the blood vessels to contract and thus less blood to flow to the area. This delays the healing of the fracture. It is also important to note that taking anti-inflammatory medications during this process can affect fracture healing negatively.

Symptoms and possible associated complications

Metacarpals are associated with swelling, bruising, pain and tenderness over the fracture site. Frequently, associated tightness to the ligaments surrounding the bone and joint results in joint stiffness and an inability to make a tight fist.

Metacarpal fractures are also often associated with angulation (twisting) of the affected finger, due to the pull of the small muscles in the hand which attach to the metacarpals. Healing of an angulated fracture may cause a crossing over of the fingers or “scissoring” when making a fist. It may also lead to a weakened grip strength in the hand.

In addition to this, impaction (compression) of the fracture and subsequent shortening of the bone can disrupt the balance of the muscles and tendons within the hand, leading to an inability to completely straighten the affected finger.

Surgical options

Some minor and undisplaced fractures may be conservatively treated through splinting (immobilisation) and gentle movement. Fractures that are displaced, angulated, fragmented or impacted will generally be corrected surgically through ORIF (Open Reduction Internal Fixation) involving plates, screws or K wires.

Therapy

Hand therapy following a metacarpal fracture will first address the pain and swelling associated with the injury. It is important to manage the swelling because, if left untreated, swelling leads to scar tissue formation and stiffness.

If the fracture is at the base of the metacarpal, a splint may be made to immobilise and stabilise the wrist to allow adequate healing of the fracture. However, more often, when the fracture is in the shaft or top of the metacarpal, or extends into the joint space, the hand will be splinted with the knuckles bent to 90°, leaving the wrist free. This is called the safe position. This position relieves pressure off the joint, thus allowing good quality fracture healing, as well as maintaining stretch in the supporting ligaments to prevent future stiffness.

Splinting in metacarpal fractures is continued for 4-6 weeks and is done in conjunction with a graded exercise program. The exercise program maintains joint flexibility as well as active movement and muscle strength in all of the joints.

After adequate healing of the fracture has occurred, therapy will focus on regaining muscle strength in the hand. With a good quality of fracture healing and good performance in therapy, it is possible to regain full movement and muscle strength in the affected finger