Wedge ostectomy

Two types of ostectomy exist: the wedge and the step. The wedge ostectomy is the most frequently reported but is losing popularity among surgeons. The ostectomy site can’t be compressed as much as the step ostectomy. This technique also shortens the leg of the animal.

To determine the size and the location of the wedge to be removed, bisecting lines are drawn in the center of the metacarpal bone and in between the digits (Fig1). The angle created at the junction of the line is the angle of the right-angled triangle (wedge) to be removed from the bone. To facilitate the surgery, an aluminum template of the wedge is created and sterilized for surgery. For a varus deformity, the shortest side of the triangle will be positioned on the lateral cortex of the bone and for a valgus deformity it will be positioned on the medial cortex. A dorsal skin incision is performed over the lateral digital extensor (varus deformity) or the common digital extensor (valgus deformity) from the top of MCIII/MCIV to the metacarpo-phalangeal joint. Then the lateral digital extensor or the common digital extensor is incised longitudinally. The periosteum is incised from top to bottom and is elevated 360 degree at the site of the ostectomy. The wedge is removed with an oscillating saw using the aluminum template as a guide. The soft tissues are protected with a malleable retractor. The bone wedge is removed and the fragments created are realigned.

Figure 1: Bissecting lines drawn on a varus deformity of the distal fused MCIII and IV

Ideally, the fragments are repaired with a dynamic compression plate. It can be the only mean of fixation when the ostectomy site is on the diaphysis. When the ostectomy site is close to the growth plate, the animal will need a full limb cast since only a limited number of screws will
be placed in the distal or proximal fragment. The leg can also be immobilized with a hanging limb pin cast. However, this construct is by far not as stable as a plate. It could be difficult to keep the fragments aligned when the casting material is applied. To help keep the fragments aligned, a pin can be placed in the distal fragment.

The postoperative treatments are similar than the step ostectomy.

**Step ostectomy**

Step ostectomy in the sagittal plane and step osteotomy in the frontal plane (not discussed in this presentation) are now the preferred techniques to correct angular limb deformity in older animals. The main advantage of these techniques is that it allows compression of the fragment with lag screws. It also avoids shortening of the leg. However, these techniques are technically more challenging than the traditional wedge ostectomy.

The step ostectomy is performed in the sagittal plane of the bone. A right angle triangle of bone is removed from the dorsal and palmar/plantar cortices. To determine the proper angle of the triangle, the longitudinal bisecting lines are drawn on the dorso/palmar radiograph. The lines are drawn in the middle of the fused MCIII and MCIV and in between the digits (Fig1). The location of where the bisecting lines cross is called the pivot point. It determines the location of the right-angled triangle to be removed and its angle. If the growth problem is secondary to a pathology involving the physis, the lines should cross close to the growth plate. The longitudinal leg of the triangle starting at the pivot point measures 4 cm. The right angle of the triangle is located proximally on the longitudinal line. Then the bisecting lines complete the triangle. It is recommended to prepare an aluminum template of the triangle prior to the surgery.

A dorsal skin incision is performed over the lateral digital extensor (valgus deformity) or the common digital extensor (varus deformity) from top to bottom of MCIII/MCIV. Distally, the skin incision is curved laterally (valgus deformity) or medially (varus deformity). Then the lateral digital extensor or the common digital extensor is incised longitudinally. Distally, the incision through the tendon will be continued through the lateral branch of the lateral digital extensor or the medial branch of the common digital extensor. The periosteum is incised from top to bottom and is elevated 360 degree at the site of the ostectomy, which is usually one centimeter above the growth plate. Distally, the periosteum is tightly adhered to the physis. Care must be taken in this area to not penetrate the palmar pouch of the metacarlo-phalengeal joint during the elevation. A 3.2 mm hole is drilled at the pivot point through both cortices. Another hole is drilled 4cm proximally. Because the metacarpus separates distally, the holes will be made through MCIV for a varus deformity and through MCIII for a valgus, as close as possible to the center of the bone. Using an oscillating saw, a line between the 2 holes is cut. A malleable retractor is used to protect the soft tissue on the palmar aspect of the leg. The template is positioned on the bone and the hypotenuse of the triangle is cut. Then, the proximal and distal cuts are made transversely to the bone in the lateral cortex and the medial cortex respectively for a varus deformity. The cut will be in the opposite cortex for a valgus deformity.

The bony triangles are removed and the fragments are reunited (Fig2). In horses, the fragments are usually secured with a plate with the screws over the longitudinal cut placed in lag fashion. The plate is placed on the medial side for a varus deformity and on the lateral side for a valgus deformity. In cattle, plating is not always done due to economic reasons. Since cattle tolerate cast immobilization better than horses, a combination of lag screws (Fig 3) and full limb cast (regular cast or hanging limb pin cast) can be appropriate at a lesser expense. If a hanging limb pin cast is used, ¼ inch or 3/16 inch positive profile centrally threaded Steimann’s pin are used in the distal radius.
Fig 2: Dorsal and palmar wedge removed from the fused MCIII and IV

The incision is closed in three layers. First, the extensor tendon is sutured back together in a simple continuous pattern with 2.0 absorbable monofilament. Then, the subcutaneous is closed with a simple continuous with 3.0 absorbable multifilament. Finally, the skin is closed with an interrupted pattern with non-absorbable monofilament. If a plate was used and a full limb cast was applied, the cast is removed 3 to 4 weeks after the surgery. If a hanging limb pin cast was used, the cast and the pins are removed 3 to 4 weeks after the surgery. Then, another cast is applied for another 3 to 4 weeks. Post-operative antibiotics are administered for 5 days and an NSAID is administered for the first few days only.

Fig 3: Ostectomy site repaired with 2 lag screws. A hanging limb pin cast with 2 pins in the distal radius have been used to increased stability for the first weeks after surgery.