



(HOW) DO YOU TREAT FOREARM MAL-UNIONS?

HELP YOUR PATIENTS OUT OF HIBERNATION WITH THE ALASKAN 3-D OSTEOTOMY

Michael G. McNamara, M.D., Avery B. Munoz, B.S.M.E.

HYPOTHESIS

The Alaskan 3-Dimensional (3-D) Osteotomy is a simple, reproducible procedure for effective correction of angulation in two planes, length and rotation deformities of mal-united long bones.

METHODS

Three patients presented post-traumatic forearm mal-unions: one ulnar mal-union, one radial mal-union (Figures 1, 2), and one patient with mal-union of both bones. Each complained of wrist pain, decreased range of motion and unsatisfactory cosmetic appearance.



Figure 1. Radial Mal-Union



Figure 2. Radial Shortening

The Alaskan 3-D Osteotomy was performed on each patient, as follows (Figure 3):

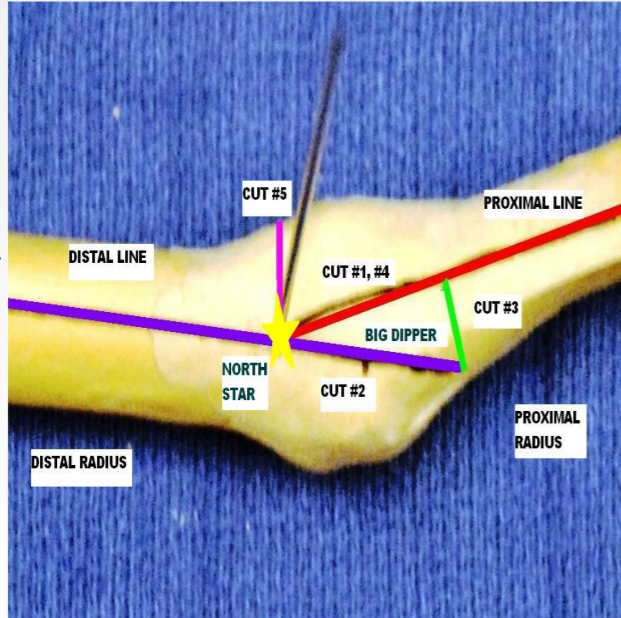
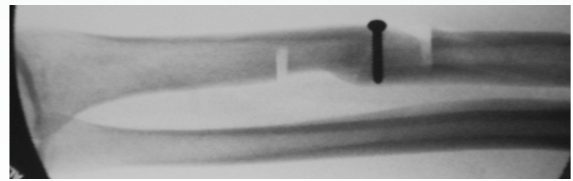


Figure 3. Alaskan 3-D Osteotomy with the North Star (pin guide for cuts at the intersection of proximal and distal axes) and the Big Dipper (removable wedge of bone)

METHODS

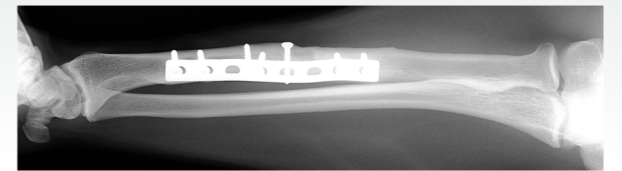
1. Identify the major angle of the deformity and clearly mark the central axis of proximal and distal bone portions (proximal line and distal line).
2. Locate the point of intersection of the proximal and distal lines as the North Star (the central point of the deformity).
3. Three osteotomies create a wedge (the Big Dipper):
 - a. Cut #1 along the proximal (red) line of the Big Dipper
 - b. Cut #2 along the distal (blue) line of the Big Dipper from the North Star to the convex edge of the deformity
 - c. Cut #3 from the convex edge where Cut #2 exits the bone, perpendicular to Cut #1
4. Cut #4 is used when the deformity requires rotation correction. Cut #4 is an angled cut that generates a wedge in the center of the proximal bone portion along Cut #1 and outside of the Big Dipper. A wedge with superficial base corrects clockwise rotation and a wedge with a base deep to bone corrects counter-clockwise rotation, viewed from distal to proximal.
5. Finish with Cut #5, from the concave edge of the deformity to the North Star.
6. Remove the Big Dipper (bone wedge) and reserve for use as autograft.
7. Compress and rotate bone portions to restore proper alignment and good bone contact for healing.
8. Length deformity is corrected using a lamina spreader between proximal and distal cortices. Length congruity at the wrist is determined using fluoroscopy.
9. Prepare and place the Big Dipper as autograft into the wedge defect, then secure with an inter-fragmentary screw. Excess callus (and/or autograft versus allograft) can be used to fill gaps at the osteotomy site (Figure 4).

Figure 4. The Big Dipper Secured with Inter-fragmentary Screw



10. Secure proper alignment of proximal and distal bone portions using a locking screw plate or dynamic compression plate (Figure 5).

Figure 5. Corrected Radial Mal-Union After 4-1/2 Years



SUMMARY

	Preoperative (°)		Arc Gain (°)	**% Recovery	
	Supination	Pronation		Supination	Pronation
Ulnar Malunion	40	60	80	100	100
Radial Malunion	25	20	125	90	100
Both Bones	0	45	45	60	70

Table 1. **Postoperative results compared to the un-injured arm

CONCLUSIONS

The Alaskan 3-D Osteotomy corrects angulation in two planes, rotation and length deformities of long bones. This technique helped patients with mid-shaft long bone mal-unions return to active lifestyles by alleviating joint pain, improving forearm rotation and restoring more normal cosmetic appearance. The simplicity and reproducibility of the procedure are enhanced using precision surgical instrumentation (please see attached handout).

Without the Alaskan 3-D Osteotomy, the LEFT radius mal-union patient could not have enjoyed "7.6 seconds on Prime Rib" (Figure 6).

Figure 6. 7.6 Seconds On Prime Rib

