FAQ's

MBD Medical, LLC

Contents

Q. What allows the plate to self-contour and why is this important?

- Unlike most competitors' plates that have uniform rigidity (cross-section) over their entire length, the MBD plate is designed with a rigid central section that becomes increasingly more flexible moving toward either end of the plate. This rigid central section of the plate spans the fracture and bears the high stresses found at the fracture line. Moving medially and laterally away from the fracture line, the stresses on the plate (and screws) decrease. The MBD plate takes advantage of these biomechanics as the plate becomes increasingly more flexible and lower profile toward the ends allowing it to bend and twist under screw compression. The result is an implant that self-contours to the clavicle simply by inserting the bone screws. This eliminates the need for intraoperative contouring of the plate, a tedious and time consuming step that is often required even on purported "anatomically correct" pre-contoured plates.
- As an analogy consider the wing of a commercial airplane. Setting aside aerodynamic considerations, the wing is tapered from the fuselage to the tip because this is structurally more efficient. The wing is subject to the greatest stresses nearest to the fuselage and this corresponds to the greatest wing cross-section. The decrease in stresses as you move toward the wing tip allows the wing to taper to save weight. With the MBD plate, the decrease in stresses moving outward on the plate allows tapering and increasing flexibility to promote self-contouring.

Q. If the plate is flexible enough to self-contour, how can it be strong enough to effect bone healing?

- The central section of the MBD Plate is rigid and provides the necessary strength across the fracture site. This rigid central section remains essentially straight and can approximate short segments of the clavicle shaft while bearing the greatest biomechanical stresses exerted upon the fixation construct. The self-contouring effect occurs in the sections of the plate lateral to the central plate section where stresses progressively decrease and the plate can be made more flexible.

Q. Why does the MBD system utilize non-locking screws rather than locking screws?

- Non-locking screws compress a plate to the bone and the MBD system uses the compressive force of the bone screws in conjunction with the variable rigidity of the plate to bend and twist an initially straight plate to conform to the complex

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curvature of the clavicle. In contrast, locking screws torsionally lock to the plate and maintain whatever gap exists between plate and bone when the screw contacts the plate. In clinical scenarios where there is minimal soft tissue coverage such as the clavicle, it is important to create a low installed plate profile to minimize the risk of postoperative soft tissue irritation. This would be impossible if the MBD system were a locking plate/screw construct.

- In his excellent chapter on Clavicle Fractures in *Rockwood and Green's Fractures in Adults,* Michael McKee [1] notes that locking plates are not routinely necessary for the fixation of clavicle fractures and that he really has no experience with them. Dr. McKee is a recognized authority on the subject of clavicle repair.
- In biomechanical testing of locked and non-locked plates on cadaveric clavicles, Little et al.[2] found that whether or not the fixation device was locking did not have a significant bearing upon the performance.
- Locking plates have a longer history of use in humerus fractures and studies have shown that there is no obvious benefit from using locking plates instead of non-locking constructs. O'Toole et al.[3] performed biomechanical testing on synthetic and cadaveric clavicles and found that locking screws offered no obvious biomechanical benefits. Similarly Berkes et al.[4] found no statistically significant differences in clinical outcomes between groups of patients treated with either locking or non-locking plates.

Q. What intraoperative efficiencies can be realized using the MBD Clavicle System?

- Fragment screws can be utilized to fixate small fragments resulting in minimal interference with subsequent plate placement.
- Simply pick the plate length that is appropriate for the fracture. Plates universally fit right and left clavicles and conform to both the superior and anterior aspects minimizing plate inventory and simplifying plate selection.
- Plates can be placed on the superior or anterior aspect of the clavicle, or they may be used in an anterosuperior fashion.
- No intraoperative bending is required to achieve a low profile construct that tapers down at the ends to minimize soft tissue irritation. There is no need to take a plate out part way through the procedure in order to fine tune the fit.

Q. What are the major intraoperative differences to be aware of when using the MBD system compared to a competitive locked screw system?

- Plate selection: For simple fracture patterns (transverse and short oblique fractures), a minimum of three (3) bicortical screws will need to be placed on each side of the fracture. For more complex fractures, a minimum of four (4) bicortical screws on each side of the fracture is recommended.
- It is important to insert the screws nearest the fracture first to maintain proper reduction. The remaining screws are inserted sequentially moving away from the center of the plate (and fracture line) toward each end.
- Angulation of screws: To achieve optimum self-contouring of the plate, insert the drill guide through the plate at an angle that is perpendicular to the bone surface – not the plate surface. Target the centerline of the clavicle.
- Retightening of previously inserted screws: As screws are inserted medially and laterally from the fracture line, the plate begins to self-contour and each subsequent screw will contour the plate to a greater degree. Consequently there is a need to go back and retighten each of the previously inserted screws going back to the fracture line. Before closing, ensure that all screws are fully tightened.

Q. How does one choose the preferred anatomic position (superior, anterior or anterosuperior) for the plate?

- Because the MBD plate self-contours to both the superior and anterior aspects of the clavicle, that decision can be made once reduction is achieved and the clavicle is visualized. The plate is placed in the position that provides the best initial fit and then the bone screws are inserted and the plate self-contours to the clavicle as shown in both the time

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lapse video and Dr. Meade's demonstration video on the website. Having the plate wrap around both the superior and anterior aspects of the clavicle adds to stability as bone screws are inserted from multiple angles.

Q. Why does the MBD plate have a concave underside in the central section of the plate?

- The concave underside of the plate results in a reduced profile when placed on the generally circular cross-section of the clavicle shaft.

Q. Since the MBD plate self-contours, why are bending irons included in the instrument tray?

- Bending irons may be used to partially pre-bend and twist the plate if the surgeon prefers. The self-contouring feature of the plate will resolve any minor inaccuracies as the surgery proceeds.
- In cases of malunion, where an osteotomy is necessary to re-establish proper clavicle length and alignment, the resulting clavicle contour may require use of the bending irons.

Q. Why are there no "emergency" screws in the sets?

- The MBD bone screws feature a hybrid cortical-cancellous thread profile that achieves excellent screw purchase preventing screw strippage when tightened. Additionally most clavicle fracture (plating) patients are generally active with high quality bone, particularly in the midshaft region of the clavicle.

Q. Explain the design advantages of the fragment screw.

- The MBD fragment screw is a small diameter (2.5mm) screw with a threaded head that generates compression and recesses flush within the near cortex of bone. This allows fixation of smaller fragments while still ensuring that the screw head does not protrude and interfere with subsequent plate placement. Fragment screws have a solid shaft for maximum strength.

Q. What is the effective profile of the MBD plate with screws?

- In its midsection the MBD plate is 3mm thick although some reduction in installed profile may result from the concave underside of the plate. At the ends, the MBD plate tapers down to a final thickness of 1.1mm. The MBD bone screws are recessed in the plate slots and holes and are virtually flush with the surface upon full insertion. Radiused plate edges minimize palpability and soft tissue irritation.

Q. Are there any fracture patterns of the clavicle for which the MBD plate might not be the appropriate choice?

- Fractures of the lateral (distal) clavicle, particularly those with displacement, should be carefully evaluated preoperatively. The major challenge of these fractures is ensuring sufficient screw purchase in the distal fragment. This fragment may be of inadequate size to permit fixation with three bicortical screws using an MBD plate. Proper fixation of these fractures may require the use of an "anatomic" plate with a non-linear hole pattern specific to the distal clavicle or through the use of a distal clavicle "hook" plate.

References:

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2. Little KJ, Riches PE, Fazzi UG. Biomechanical analysis of locked and non-locked plate fixation of the clavicle. *Injury.* 2012;43(6):921-5.
3. O'Toole RV, Andersen RC, Vesnovsky O, et al. Are locking screws advantageous with plate fixation of humeral shaft fractures? A biomechanical analysis of synthetic and cadaveric bone. *J Orthop Trauma.* 2008;22(10):709-15.
4. Berkes M, Garriques G, Solic J, et al. Locking and non-locking constructs achieve similar radiographic and clinical outcomes for internal fixation of intra-articular distal humerus fractures. *HSS J.* 2011;7(3):244-50.

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