



Use of Lever Action Plate for Optimizing Distal Radius Fracture Reduction and Internal Fixation

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Background

Following decades of casting and external fixation device treatment methods, volar plating has become the standard approach for distal radius fracture fixation over for the past three decades. Stable internal fixation and more anatomic reductions have allowed earlier therapy leading to faster functional recovery and more optimal results than in years past.

Despite this advance, a complication rate of ~15% has been reported with traditional volar plating.^[1] Complications include tendon irascibility, malunion, arthritis, nerve injury, infection, and tendon rupture.^[2] There are several features of volar plating which factor into this complication statistic: plate material, type of fracture, volar tilt restoration, and many more. These components, if improved upon, have the potential to improve outcomes while also decreasing the complication rate.

With multiple distal radius plates available on the market, it is tempting to assume they all have similar capabilities and will produce similar outcomes. If one were to review the above complication-reducing factors of distal radius fractures through the lens of plate capabilities, only one system can dial in the appropriate volar tilt even after the plate is applied - The McGinley Orthopedics' Lever Action Plate System.

Released in January 2021, the Lever Action Plate System has revolutionized the distal radius fracture surgical treatment industry due to its unique configuration and its keynote beam assistance technology. Able to be anatomically fitted to the watershed line, the Lever Action Plate System is a novel design which can restore volar tilt and articular congruity with innovative precision, never before available to surgeons who have been utilizing standard distal radius plating systems.

Although the restoration of volar tilt is possible without the use of the proprietary beams, beam insertion allows the surgeon, with the turn of a screw, to elevate and reduce the fracture with extreme accuracy even after initial reduction and screw placement. The surgeon can precisely dial in the desired amount of volar tilt application and verify the accurate reduction under fluoroscopy, thereby creating a structurally sound fixation. This is especially valuable in complicated cases where the implantation of a standard plating system would be unsuccessful in fully reducing the fracture or restoring volar tilt.

Methods

This pioneering technology was put to the test on our first 11 patients recently. An overview of injury x-rays coupled with final radiographic results are presented, with early clinical results summarized. Specific indications for particular use of the Lever Blade assembly will be reviewed and broad treatment recommendations made in order to allow the surgeon to provide more optimal fixation in the more challenging clinical scenarios.



Surgical Technique

The patient is placed in the supine position and in cases with severe articular comminution, a traction tower for possible wrist arthroscopy is secured to the surgical table on the ipsilateral side of the injured wrist. The author (AB) prefers to use a regional block, coupled with IV sedation for tourniquet discomfort.

Once anesthetized, we hold the wrist in supination and a non-sterile tourniquet is applied to the upper arm, along with a strap to provide counter-traction. The upper extremity is prepped, draped and then exsanguinated with an Eschmarch and the tourniquet is inflated to 250 mmHg. As a part of our surgical protocol, endoscopic carpal tunnel release using the single portal technique (Microaire, carpal tunnel release system, Charlottesville, VA) is performed at this time if displacement of the metaphyseal fragment is not severe.¹ However, if the displacement and deformity are severe, the carpal tunnel is released once the fracture is reduced, to facilitate placement of the scope in the canal. The extended flexor carpi radialis approach was used in all 12 patients for open reduction and volar plate fixation.² The initial reduction is performed and the McGinley Lever Action Plate (McGinley Orthopedics, Casper, WY) is applied with one compression screw in the center portion of the sliding hole followed by a compression, or locking, screw in the metaphyseal portion to maintain the reduction that is initially achieved by the assistant applying longitudinal traction and varying degrees of wrist flexion depending on the degree of dorsal displacement or tilt. This initial reduction will often determine where the Lever Blade is necessary to achieve or even improve restoration of volar tilt.

We then obtain fluoroscopic postero-anterior and lateral wrist views to evaluate fracture/joint reduction and implant positioning. At this point, the blade can be inserted after the bony channel is created using special sized k-wires followed by the sharp curved awl-osteotome. The restoration of volar tilt is done under direct lateral imaging using the special reduction device that will then be substituted with a smooth support peg that has proximal threads to engage the plate to varying degrees. However, in cases where the initial reduction is achieved with traction and initial screw placement, the lever blade is deemed not necessary. If there was significant articular comminution or the wrist sustained a high energy injury, a systematic careful arthroscopic inspection of the radiocarpal joint including the articular surface of the distal radius and the intraarticular structures was performed, in order to judge the reduction observed by fluoroscopy and not to miss any ligamentous lesion. A small probe was used to palpate the joint surface in search for articular gaps and/or step-offs and to test the integrity of the carpal ligaments and the TFCC. Any adjustments to reduction and subchondral screw fixation is done at this time.

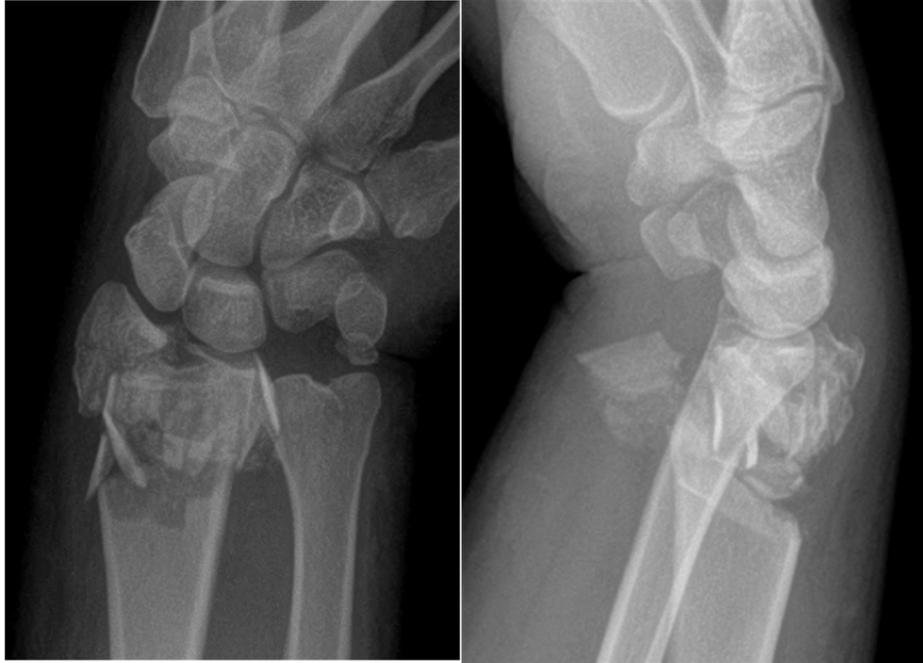
Prior to wound closure, in supine position, the endoscopic carpal tunnel release is performed. The skin is closed using absorbable 4-0 Vicryl Rapide sutures and a well-padded volar plaster splint is applied. The tourniquet is then released, and patient brought into recovery room with strict elevation of the hand/wrist above the heart.



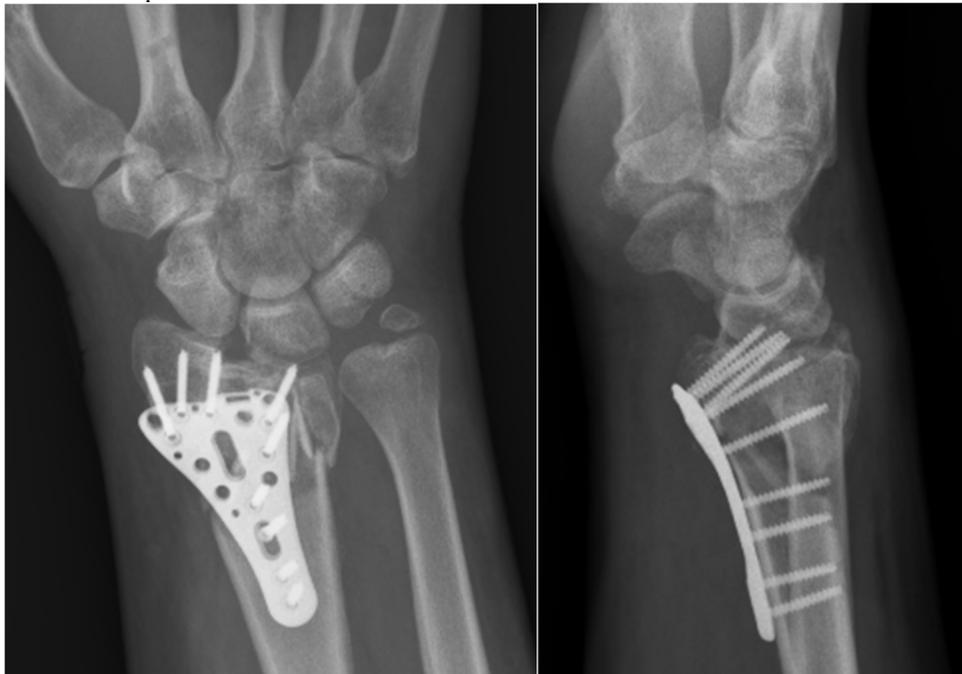
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AA Pre Op



AA Post Op





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CV Pre Op



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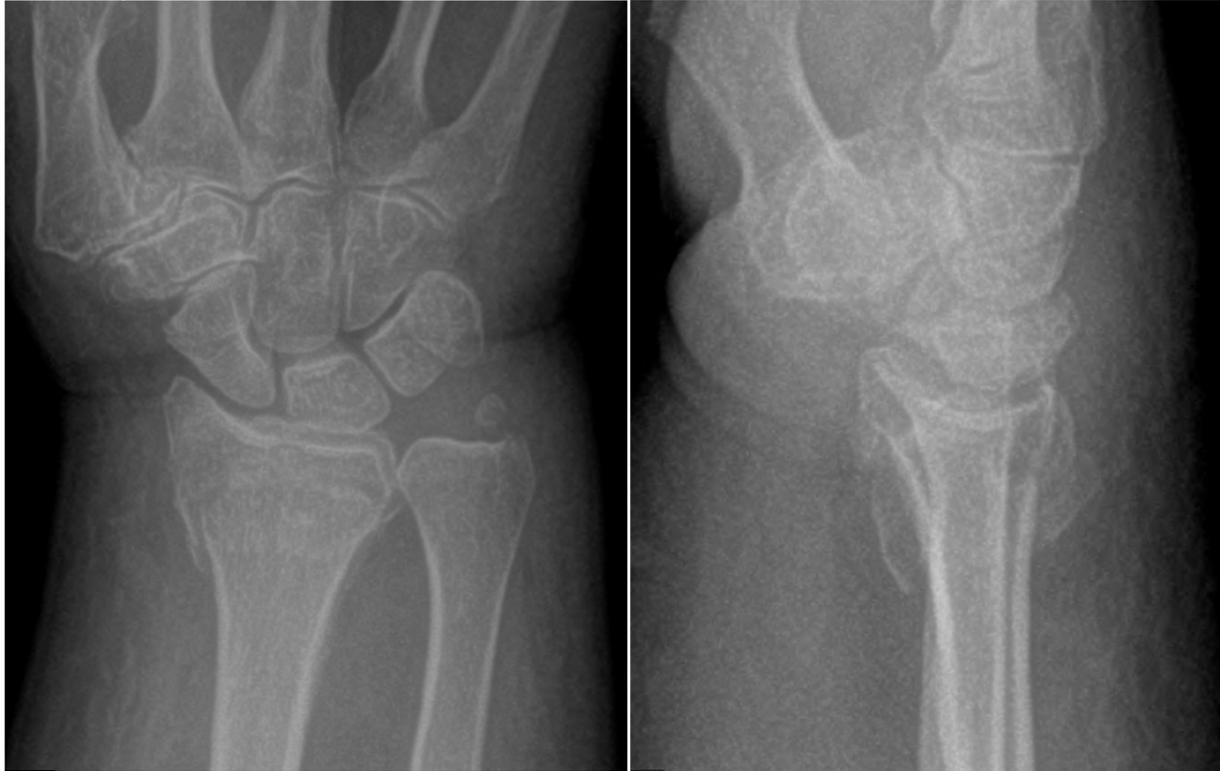




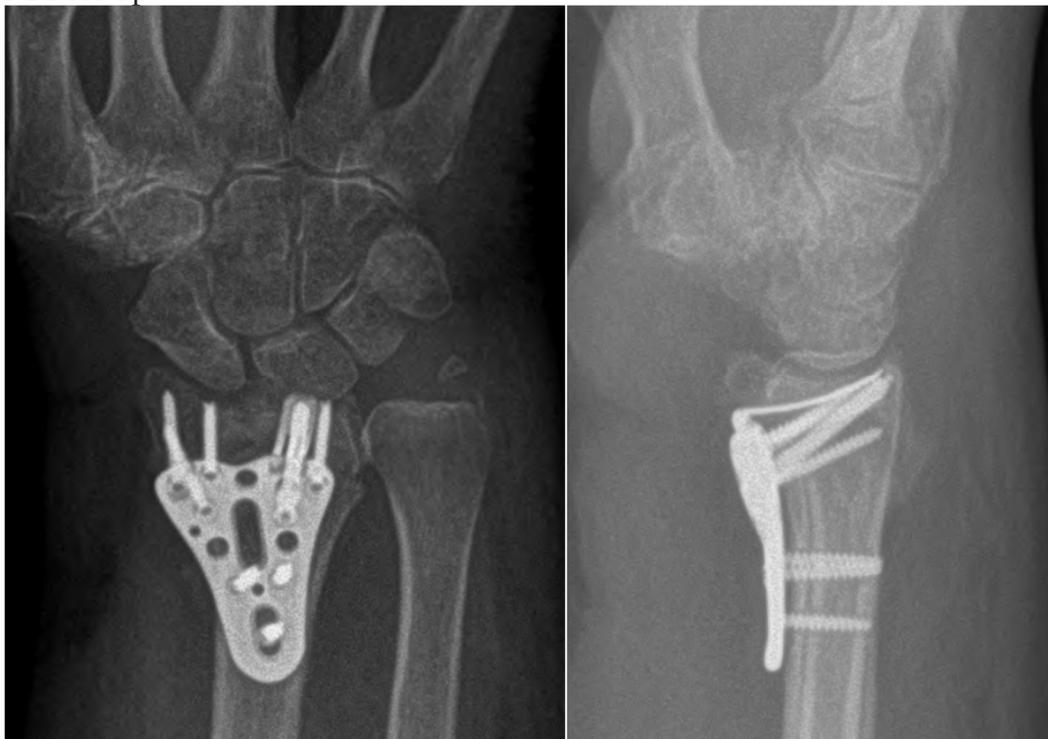
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Results

The pre-op (injury) films and post-op x-rays on the 11 initial cases by one surgeon (AB) are shown. No operative complications occurred as there were no tendon/nerve injuries and no post-operative infections, sympathetic mediated pain syndromes, or failure of hardware. All 11 patients healed the fracture while maintaining the reduction obtained at the time of surgery. Six of the 11 cases (55%) utilized the Lever Blade technology option and maintained intra-articular reduction. This includes several cases where anatomic reduction was impossible due to such severe comminution and/or articular bone loss. It should be noted that many patients required use of the lever blade technology, even when it was initially felt that satisfactory reduction was initially achieved with plate application. The addition of the reducing blade allowed restoration of more anatomic volar tilt even when initial application of the simple construct was thought to suffice.

In 3 of the 11 cases, arthroscopic assisted reduction was performed which was deemed helpful to the final outcome (AA, JV and JC). The carpal tunnel was released endoscopically in all eleven cases.

Cases where the lever blade was not necessary, or useful, included moderately displaced extra-articular fractures with adequate bone quality (GG, LL and OO). Additionally, the blade was not necessary in the case of an articular volar Barton's type fracture (CV) where the plate itself reduced the articular step off and the locking screws sufficed in maintaining reduction. In another case, the lever blade was useful to assist in gaining reduction but needed to be removed when it was noted to be possibly intra-articular due to such severe bone loss in the lunate fossa (AA). This latter case was a high energy motorcycle injury where initial treatment in another state consisted of external fixator application.

Conclusion

The presented case series demonstrates that a large percentage of significantly displaced distal radius fractures, intra and extra-articular, will benefit from additional use of the lever action blade for fracture reduction/stabilization.