The Universal TPLO Plate

Though there are many different ways to apply the Universal TPLO Plate, we have incorporated its design background information with helpful step-by-step hints to provide you further insight. This is not to replace your previous TPLO surgery training, but rather to complement what you already know so that you may take full advantage of its design potential.

Improving a Proven Design

The Universal TPLO plate was initially created to overcome some of the weaknesses of the original Slocum plate. Don’t misunderstand this statement! We strongly advocate that the Slocum enterprise did one of the most valuable contributions to the field of small animal surgery by creating the TPLO procedure; However, surgeons and clinic owners demanded a more elegant design solution.

The Slocum plate, among many others, have a reverse configuration for the left and right leg which significantly impacts the economy of the procedure. Myself, who routinely preformed 5-12 TPLO procedures / week for many years, often encountered numerous consecutive dogs with the same affected leg resulting in a 20-30 plate inventory stock of one size for each leg. That’s 40-60 3.5mm TPLO plates (not including 2.7mm) sitting on the shelf. The Universal TPLO plate cuts that inventory expense in half by utilizing a symmetric geometry that maintains exceptional forward and downward compression recommended for primary bone healing.

Note that the simultaneously born multipurpose plate by Biomedtrix recognized the need for a symmetric design, but the Y-shaped holes are not angled correctly to support downward and forward compression. From here the Universal Plate has grown to offer several more advanced design improvements.

Refined Dimensioning

The specific shaping of the Universal Plate is the most innovative aspect of its design. A unique compact head geometry arms the surgeon with the versatility needed for rare and challenging cases. The head must allow placement at the most caudal and proximal position often right against the jig pin. The need for this functionality is especially important when the proximal bone segment is relatively small yet still experiences substantial stresses. This situation is commonly seen in English Bull Dogs where the bone is small yet heavy bodyweight demands a 3.5mm system. The Universal TPLO Plate solves this issue by accommodating placement very close to the jig pin. The cranial end of the plate also becomes parallel to the bone on the proximal segment just behind the osteotomy resulting in the smallest plate footprint possible with the largest distance between the 3 proximal screws. A small footprint allows use in many types of cases and an optimal distance between screw holes creates structural stability by utilizing as much bone as possible.

Next, a limited contact interface is utilized to improve periosteal circulation and work with other geometric design choices to optimize a very important property. Contourability.
The Universal Plate has a highly calibrated shape that allows an incredibly smooth and easy contour making it possible to consistently achieve the right shape for each patient. Proper plate contouring greatly complements your surgery’s design and can be crucial to maintain 3D rotation angles as well as correct any limb angulation issue. Pre-contoured plates are disadvantaged not only because the left and right symmetric formula falls apart, but also because there are almost no two identical surgeries regardless of how many you do. Effective plate contouring is not limited by the experience of the surgeon as much as it is by the physical difficulty of bending oversized plates with hand-held or table-top benders to a patient-specific contour.

Accounting for geometric design, surface treatment, and material properties the Universal Plate achieves an optimal balance of strength and contourability. After being used in thousands of TPLO procedures, there are still zero reports of plate failure.

**Advanced Material Selection & Processing**

_The material properties and manufacturing of the Universal Plate comprise the last two factors of its engineering functionality._ VID was one of the first companies to use 100% pure vacuum melted 316 LVM stainless steel across our product line. This provides superior inert behavior in the physiological environment through an optimized homogeneous microstructure. Additionally, every VID product complies to the highest national and international material quality standards:

- a. ISO 5832-1: Composition D
- b. BS 7252/1: Composition D
- c. ASTM FI 38-97
- d. DIN 17443 W.-Nr. I.4441

We go a step further by applying an aerospace grade micro-beaded surface treatment that has become the leading alloy surface treatment in the human orthopedic field. The impact velocity of the beads creates a plastically deformed case layer that applies a residual compressive load, improving cyclic fatigue strength and overall mechanical integrity. Research has shown that a matte finish also promotes the recolonization of tissue cells to the alloy before bacteria has a chance to colonize which in turn improves overall bio-compatibility. Furthermore, a matte surface increases visibility in the O.R. by reducing glare.

The process also imparts some level of natural elasticity which we believe to be beneficial due its spring loading on the fibula which keeps the lateral edge of the osteotomy site open. We also believe that the bone, as a composite tissue itself, is not a completely rigid object and matching some flexibility with the implant complements the symbiosis between the healing bone and metallic implant while at the same time improving dynamic strength.

To improve quality control we also added a company logo, manufacturing batch number and manufacturing origin to every plate.
How to Apply the Universal TPLO Plate

We recommend that the Universal TPLO Plate be slightly under contoured before placement much like the normal AO recommendations for applying any plate over a fracture. Effectiveness is dramatically improved when compressing the far cortex while inserting screws. We recommend the following screw insertion order and technique for most TPLO cases.

1. The first screw should be the one most proximal to the osteotomy and should be tightened to cause a partial immersion of the screw head into the dynamic compression screw hole in the proximal (compressive) position.

2. The second screw should be in the lowest most distal position. The drill bit should be either centered or distal in the round plate hole with the plate head in tension with the first screw placed. This screw should be fully inserted and slightly tightened.

3. The third screw should be the remaining round screw hole (second from the most distal hole). The drill bit should be placed in the center of the hole and fully inserted. The two most distal screws now can be fully tightened going back and forth between those two screws. You will notice that the under contoured plate will start pulling down on the bone.

4. The most distal dynamic compression screw hole should be the fourth screw inserted. Under most circumstances the drill bit should be centered at the proximal end of the screw hole. In this case we are not utilizing the dynamic compression functionality of the hole. The screw can be fully inserted and tightened. (In unique circumstances when a large gap needs to be closed at the medial aspect of the tibia, this DC screw hole would be second and inserted at the distal end to cause a shift of up to 2mm)

5. Due to the plate tightening from inserting screws 2, 3 and 4 - the first screw now is slightly more proud. At this time we can further, but still just slightly, tighten screw 1 until it makes contact with the plate while still keeping it in the proximal end of the dynamic compression hole.

6. The fifth screw should be the most proximal screw hole closest to the cranial part of the plate. The drill bit should be against the proximal and caudal edge of the screw hole to maximize the compressive effect. Screw 5 can be fully inserted and tightened in conjunction with the number 1 screw. Going back and forth will bring excellent downward and forward compression of the proximal bone segment.

7. The last screw should be inserted in the remaining proximal and caudal screw hole by centering the screw driver near the distal end of the hole. This will facilitate no compression, but will also not distract the previously achieved downward and forward compression.
Placing the Derotational Pin

A slight modification on the original Slocum procedure is recommended. The concept of leaving the derotational pin in place instead of removing it has been tested and found to be beneficial.

1. **Sizing:** Choose a pin appropriate to the size of the patient. Typically pins vary from 0.035” below 12 lbs, 0.045” below 35 lbs, 0.062 in below 120 lbs, 5/64 in over 120 lbs in diameter would work most of the time. The danger of an undersized derotational pin is the likelihood of rock-back under rotation occurring before plate placement is complete. This under rotation is only proven in cases where the derotational pin was left in place and is now visibly bent. This error is under estimated and not visible if the pin is removed at the end of the surgery before postoperative radiographs can be taken. Under rotation can significantly affect surgical outcome.

2. **Positioning:** Place the pin in an exact position where the most proximal and pointing edge of the tibial crest is, parallel with the tibial plateau, aiming just under the jig pin in place and slightly towards the medial aspect ending the pin in the caudal cortex with no significant over protrusion. The starting position of the pin is very important and often underestimated. The point described above is the division point between the functional part vs. the nonfunctional part of the tibial crest. When pins are removed after surgery the pin hole that’s left behind creates a weakness in the tibial crest and serves as a stress riser and point of preferential fracture nucleation. If the pin remains at the designated point, even in the event of a crest fracture, the nonfunctional portion of the crest will break off resulting in a nonevent complication. Leaving the pin in place reduces the stress of the pin hole making crest fractures of the area very unlikely.

3. **Aiming:** Aiming the pin just below the jig pin ensures that it will not enter the joint and can be left in safely. Aiming medially ensures that the pin will not exit on the lateral concave portion of the tibial crest before re-entering the proximal tibia. Using a second reference pin can help ensure that the pin is terminated at the level of the caudal cortex avoiding soft tissue irritation. We recommend monitoring the pin placement for overheating to make sure that the bone is not burned. Cool the pin with saline solution and/or wait for heat distribution during insertion. It’s also beneficial to apply a cranio-caudal pressure on the two segments by holding onto the jig and the rotating pin or by placing bone reduction forceps in cranio-caudal direction. This hold will reduce the risk of the proximal segment from sliding caudally due to the introduced pin. Note that these pin placement instructions are not much different than the original Slocum model, but offer added stability with permanent structural pins.

4. After the Universal TPLO Plate application is complete bend the protruding cranial portion of the derotational pin laterally just like in the case of an MPL repair and cut it short.
Our initial testing of hundreds of TPLO cases suggests that a properly selected and placed pin improves stability of the fixation compared to cases where the pin was removed. More importantly, TPLO surgeries that utilize a permanent derotational pin show identical stability seen in more expensive locking plate configurations.

Complications related to leaving the pin in are generally related to poor pin selection, poor pin placement (such as an over extended pin), or excessive heat generation at the crest during pin placement.

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