

TTA-Rapid Protocol

The dog is placed in a dorsal recumbency with the affected limb suspended from a stand. Make sure that the dog's paws are not fixed too tightly, since the affected limb will be put against the table later in the surgery. Preferably, the joint is investigated to assess the menisci and cranial cruciate ligament remnants. Remedial action is taken as necessary. TTA-Rapid is performed through a medial skin incision.

1. Pre-operative planning

- a. Calculating the advancement can be done in a different ways (classic TTA template (Kyon); common tangent technique (Denner); 2.07 x Tibial plateau length (Inauen); MMP Procedure (Ness); ...). However, none of these techniques are perfect. A critical mind is advised when applying those measurements.
- b. Use of the template:
 - i. Where possible, calibrate the radiograph on the screen to real size.
 - ii. Place the template over the radiograph and choose the appropriate cage width.
 - iii. Adjust the template position until the cage sits about 3mm below the proximal cortex on its caudal edge. Now measure the thickness of the cranial tibial cortex in the region of the Maquet hole. Note this value; you will need it during surgery.

2. Joint surgery

- a. If performing a lateral arthrotomy, leave about the last centimeter of the joint capsule closest to the tibia open. This allows enough slack to later perform the advancement.

3. TTA-Rapid protocol

a. Using the drill guide:

The drill guide is a L-shaped device developed to facilitate the correct position of the Maquet hole. The vertical arm of the guide contains numbers that correspond with the size of the cage. The horizontal arm of the guide is a scale in millimeters.

i. Drilling the Maquet hole:

1. Working from the medial aspect of the limb, A 1.25mm K-wire is inserted behind the patellar ligament in the region of the distal infra-patellar bursa (see image). This pin indicates the position of the proximal extent of the cage relative to the bone.

2. The drill guide is dropped over the pin using one of the numbered holes in the vertical arm, corresponding with the size of the cage measured during pre-operative planning.
3. A peg is placed into one of the holes in the horizontal arm of the drill guide, selecting the number of millimeters measured during pre-operative planning.
4. Press the drill guide against the medial aspect of the tibia with protruding peg forced up against the cranial side of the tibia. Hold it in that position. Correct use of the drill guide will place the Maquet hole just caudal to the cranial cortex of the tibia. (As a guide: In a large dog the cortex is approximately 5mm thick and in a small dog approximately 3mm.)
5. The direction of drilling should be approximately parallel to the axis of stifle rotation to avoid medial or lateral displacement of the tibial tuberosity during advancement.
6. The drill guide is now in the optimal position and a 2 or 3 mm hole, depending on the size of the dog, can be drilled.
REMARK: the Maquet hole in the TTA Rapid drill guide is designed for a 3mm drill bit. If you should choose to use a 2mm drill bit, a standard 2mm drill guide should be inserted in the hole of the TTA Rapid drill guide, to maintain optimal positioning.
7. The drill guide and the positioning wire can now be removed.

b. Using the saw guide:

The saw guide has been developed to ensure a sufficiently large cranial fragment is created for screw placement. The saw guide consists of 2 pieces. The saw guide itself is a long, slotted rod with a 2.5mm hole at the top. The second piece is an anchoring device which comes with either 2 or 3 mm diameter pegs, depending on the diameter used for the Maquet hole. The cranial side of this peg is also slotted, to allow the saw blade to reach the Maquet hole.

i. Sawing the crista tibiae:

1. A 2.5mm pin is placed through the joint capsule at the intersection of the femoral condyle and the tibial plateau. On the lateral side, the pin should start at the level of "Gerdy's Tubercle". This pin is used as the proximal fixation of the saw guide.
2. The appropriate size anchoring device from the saw guide is placed into the Maquet hole. Make sure the slot in the device is facing proximally.
3. The hole of the saw guide is slid over the 2.5mm pin and the body is placed on top of the anchoring device.
4. Use the saw guide to create the osteotomy. Optionally, a blade can be used to open the fascia/periosteum prior to the osteotomy. If necessary the osteotomy may be completed with a hand saw.

c. Opening the osteotomy:

- i. Depending on the required cage size, different osteotomy spreaders can be used to spread and hold open the osteotomy. Provided this is done carefully and slowly, allowing the bone time to adjust, the hinge is unlikely to fail. This being the most critical point of the surgery, the spreaders should be used with great caution!
- ii. Start with the 3mm spreader held sideways (thinnest part) located at the most proximal part of the osteotomy and gently turn it to spread open the osteotomy. Always turn the spacer downwards to minimise the forces on the fragment. A second spacer/spreader held sideways in the distal region of the osteotomy can be used to maintain the displacement.
CAUTION: DO NOT USE THIS 2ND SPREADER TO INCREASE THE DISPLACEMENT, AS THIS WILL CAUSE BREAKING OF THE CORTEX!!!
Repeat these steps until the required displacement is reached.
The proximal end of the colour coded sheet metal guides can be inserted into the osteotomy and is useful to check the level of advancement of the tibial tuberosity.
- iii. The depth of the osteotomy is measured with a drill depth gauge at the proximal extent of the osteotomy. This measurement is rounded up to select the correct cage length.

d. Fixating the cage:

- i. The ears of the cage need to be bent using the bending stick. Ears on the caudal side (tibia) should point slightly upwards, while the ears on the cranial side (crista tibiae) should be tilted slightly downwards. Slight under-bending of the caudal ears and slight over-bending of the cranial ears will help compress the osteotomy against the cage.
- ii. Elevate the periosteum from the bone in the region where the cage will be fixed.
- iii. Insert the cage into the osteotomy. Use bone forceps to make sure the ears of the cage are in close contact with the bone.
- iv. Once the cage is in place, check if the height of the cage is correct. This can be done by palpating the proximal tibia with the tip of a small mosquito clamp. You should feel about 3mm of bone above the top of the cage. More bone means a more distal placement of the cage and thus subsequently a more cranial displacement of the tibial tuberosity.
- v. Large bone forceps can be used to give extra compression on the cage. This step is not essential if the distal cortex is still intact, but will result in a better bone contact with the cage.
- vi. 2.4mm screws are inserted into the cage. Start with the most cranial, most proximal screw.
The orientation of the screws should be medio-proximal to latero-distal (similar as the orientation of the fork in a standard TTA).
The second screw is the caudo-proximal screw. The orientation of this screw

is cranio-medio-proximal to caudo-latero-distal (“Away from the joint, away from the osteotomy site”).

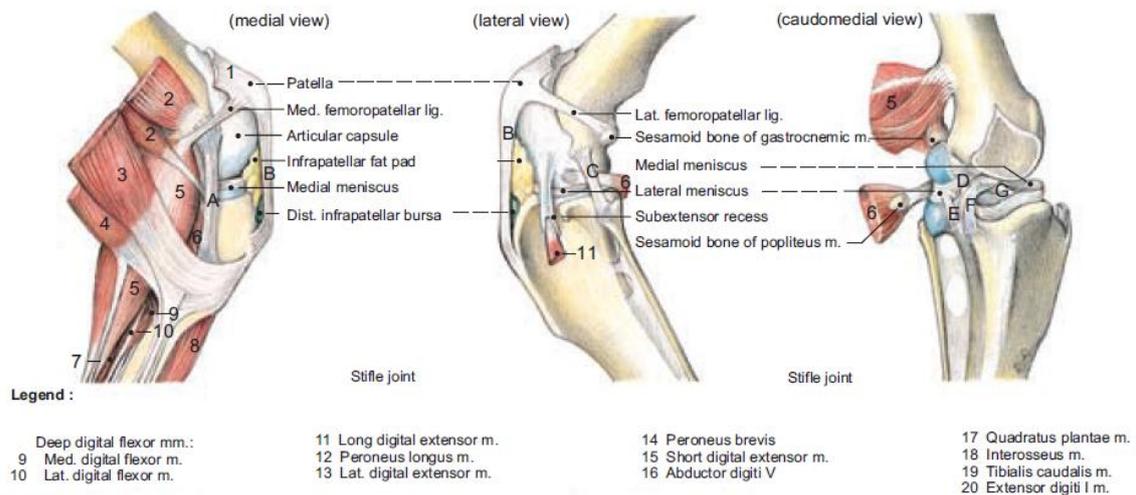
The rest of the screws are placed in the same fashion starting with the most proximal screws.

Once all screws are inserted, remove the bone forceps and re-tighten all screws.

- vii. Insertion of Hydroxy-Apatite paste inside and underneath the cage will accelerate healing of the osteotomy. Close the fascia where possible.
- viii. Close the wound in a routine fashion.

e. Aftercare:

- i. Casting/bandaging is generally not required.
- ii. A light dressing can be applied for 3 to 5 days.
- iii. With HA paste, clinical union can generally be anticipated within 6 weeks.



from: Anatomy of the dog. Klaus-Dieter Budras; Patrick H. McCarthy; Wolfgang Fricke; Renate Richter. © 2007, Schlütersche Verlagsgesellschaft mbH & Co. KG, Hans-Böckler-Allee 7, 30173 Hannover, p87.