TTA Rapid with Patellar Luxation

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.

01 Pre-operative planning

a. **Calculating the advancement** can be done in different ways (classic TTA template (Kyon); common tangent technique (Dennler); 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**:
   1. Where possible, calibrate the radiograph on the screen to real size.
   2. Place the template over the radiograph and choose the appropriate cage width.
   3. 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 black dot. Note this value; you will need it during surgery.

\[ XX / YY / Z \]

\[ XX = \text{Size of Implant from Template} \]
\[ YY = \text{Implant deep (you find out, after the saw cut)} \]
\[ Z = \text{thickness of the cranial tibial cortex in the region of the Maquet hole} \]

02 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.

03 TTA-RAPID protocol:

a. **Using the saw guide**

The saw guide is an L-shaped device developed to facilitate the correct position of the osteotomy. It has been developed to ensure a sufficiently large cranial fragment is created for screw placement. The vertical arm of the guide has 2.5mm holes placed at strategic points, over a 1mm wide slot. The numbers beside the holes correspond with the size of the cage. This will prevent making a too distal osteotomy. The horizontal arm of the guide is a scale in millimeters. This will prevent making a too caudal osteotomy.
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 slightly in front of the level of “Gerdy’s Tubercle”. This pin is used as the proximal fixation of the saw guide.

2. The 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 preoperative 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 preoperative planning.

4. Press the saw 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 saw guide will place the osteotomy 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.) **DO NOT PRESS THE HORIZONTAL ARM AGAINST THE BONE, AS THIS WILL CAUSE AN OBLIQUE OSTEOTOMY!**

5. Use the saw guide to create the osteotomy. Optionally, a blade can be used to open the fascia/periostium prior to the osteotomy.
b. Opening the osteotomy

1. 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!

2. 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 minimize 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.

3. 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.
c. Fixating the cage

1. 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.

2. Elevate the periostium from the bone in the region where the cage will be fixed.

3. Insert the cage into the osteotomy. Use bone forceps to make sure the ears of the cage are in close contact with the bone.

4. 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.

5. 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.

6. 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.

7. Insertion of Hydroxy-Apatite paste inside and underneath the cage will accelerate healing of the osteotomy. Close the fascia where possible.

8. Close the wound in a routine fashion.
TTA and Patella luxation (TTTA)

Dr. Hugo Schmökel

When a dog suffers from a cranial cruciate ligament rupture with a simultaneous patellar luxation, this can be addressed with a modified TTA Rapid procedure. Prior to the TTA Rapid surgery itself, it should be determined if the dog would benefit from a trochleoplasty. If so, this should be performed before the actual TTA Rapid procedure (1).

The osteotomy used for the TTA Rapid procedure can also be used to achieve a medial or lateral tibial tuberosity transposition (TTT), depending on the kind of patellar luxation. The further described procedure focuses on a lateralization of the crest, needed for the correction of a medial patellar luxation after performing the osteotomy, the appropriate cage is inserted into the osteotomy and all of the caudal screws are inserted in the tibia (Figure 1).

Take care to choose a cage that has a bigger medio-lateral length than measured after the osteotomy, as both cortices of the transposed crest need to be supported! Usually, the longest cage is advised. Consecutively, the tibial crest is slightly advanced, so that it can be moved laterally (Fig 2 and 3).

Be very careful performing this and restrict the advancement to the absolute minimum to avoid crest avulsion. Ideally, the advancement is given above the cage. Once the desired position is reached, a bone holding forceps (or a small Kirschner wire) can be used as described above to keep the position, until a corresponding washer is placed between the crista tibiae and the ears of the cage (Figure 4).

If the transposition is sufficient to prevent dislocation of the patella, the remaining screws are inserted and the operation finished as described (Figure 5 and 6). In case of a lateral luxation, the tibial crest is shifted medially in a similar manner after fixating the cranial part of the cage in the tibial crest.

Samov Y, Verhoeven G, Bosmans T, Van der Vekens E, de Bakker E, Verleyen P, et al. TTA Rapid: Description of the Technique and Short Term Clinical Trial Results of the First 50 Cases. Vet Surg. 2014:n/a-n/a.