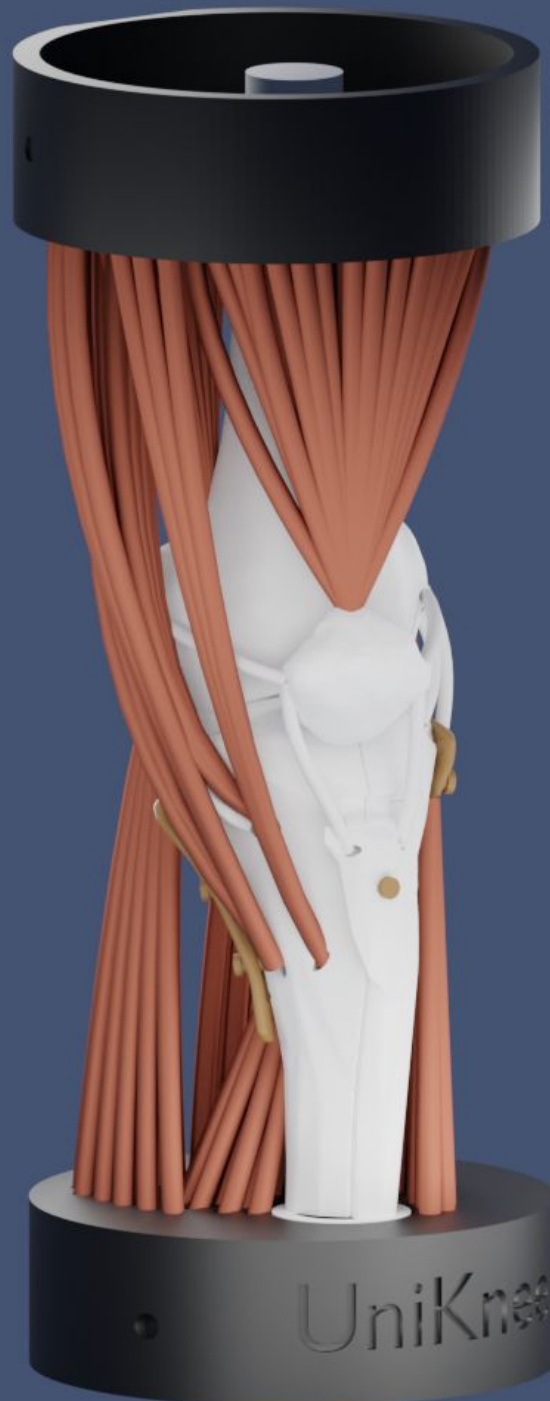


UniKnee

One model to rule them all.

Assembly Guide



The UniKnee simulator is a modular, low-cost 3D-printed knee model designed to teach the main traumatic injuries of the knee, including tibial plateau fractures and ligament injuries. It is ideal for orthopedic trainees to understand anatomy, surgical approaches, and biomechanical concepts.

The soft tissues are represented using standard long balloons available in most stores or online, offering a simple and realistic way to simulate muscles and ligaments.

This manual will guide you step by step through the assembly process.

Several assembly methods are possible; the simplest and most effective is described here: the balloon passes through an insertion hole (its nozzle acts as a stopper), folds over a white ligament balloon (tendon), and is threaded back through another hole to secure it.

Assembly takes around 2 hours and is faster with two people.



Adhesive tape can be used to secure multiple balloons under the base if needed.

Required material

All components 3D-printed in PLA
(2 walls, 15% infill)

Balloon types:

- Red balloons = muscles
- White balloons = ligaments and tendons

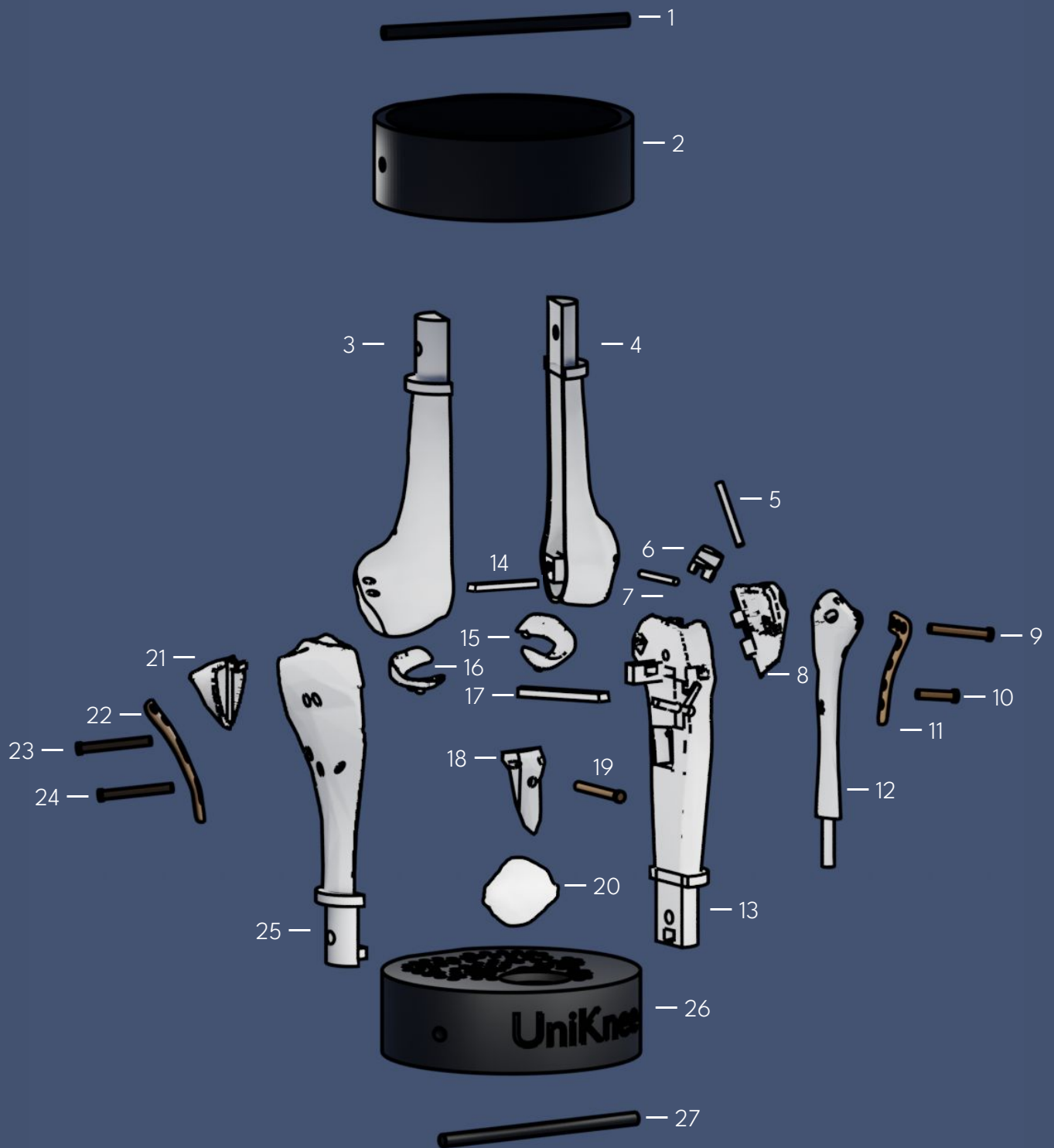
Required Tools:

- Unfolded paperclip (used as a threading needle for balloons)
- No glue or screwdriver required; all components are designed to snap together.
- Adhesive tape can also be used to secure the diaphyses if tension is too high.

Tips and Safety Notes

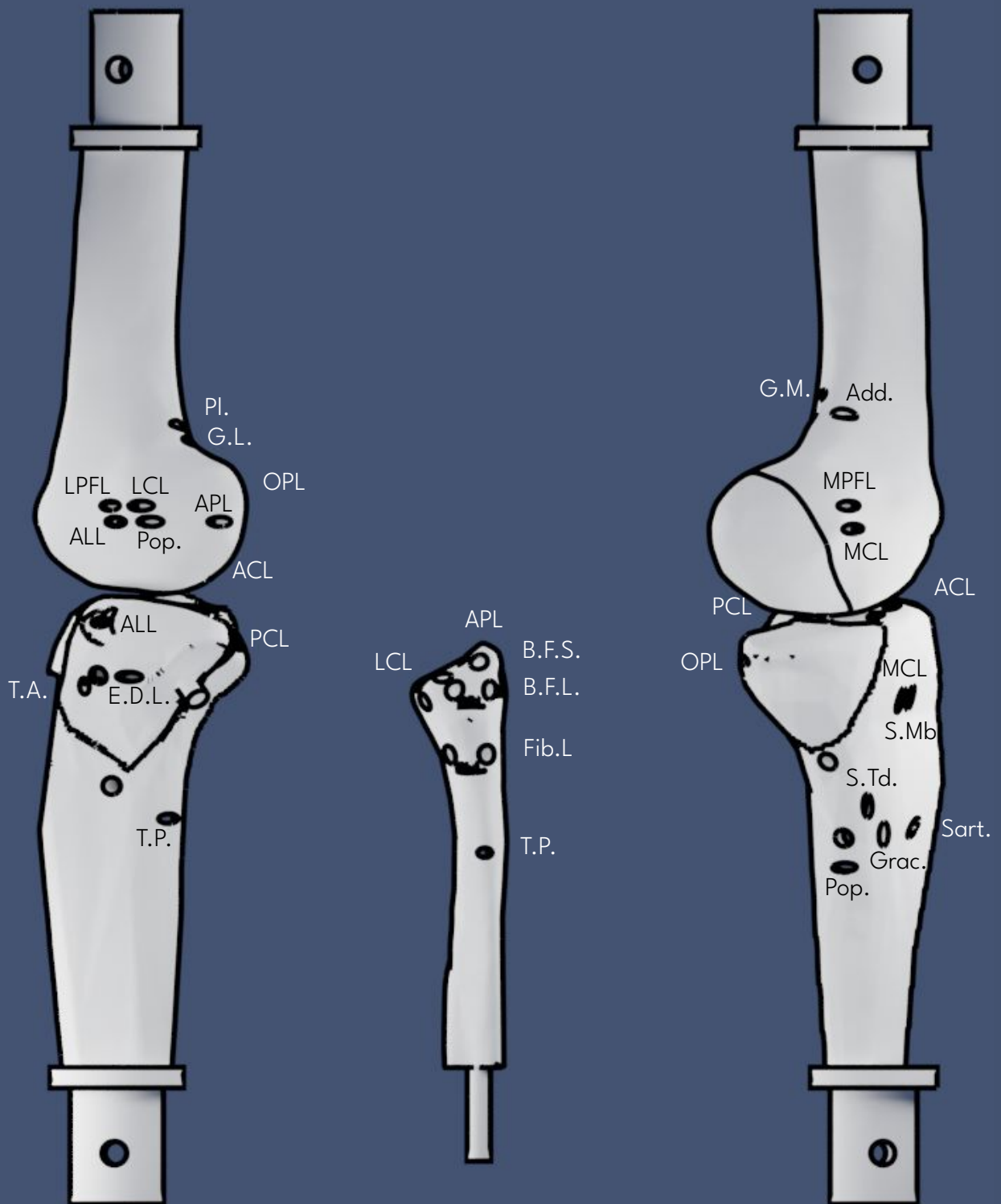
- Do not apply excessive force on the parts. The components are designed to be durable, but excessive force may damage the plastic.
- Balloon tension must be sufficient to create realistic resistance, but not too tight to avoid damage.
- Balloons under tension may snap. Protect your eyes and keep hands clear during adjustment.

Exploded view



- | | | |
|---------------------------------|--------------------------------|------------------------------------|
| 1. Base (upper rod) | 10. Lateral plate distal screw | 19. TT screw |
| 2. Base (upper part) | 11. Lateral plate | 20. Patella |
| 3. Femur (medial part) | 12. Fibula | 21. Tibia (posteromedial fragment) |
| 4. Femur (lateral part) | 13. Tibia (central part) | 22. Medial plate |
| 5. Tibia (lateral hinge) | 14. Femur (locking rod) | 23. Medial plate proximal screw |
| 6. Tibia (depression) | 15. Lateral meniscus | 24. Medial plate distal screw |
| 7. Tibia (depression hinge) | 16. Medial meniscus | 25. Tibia (medial part) |
| 8. Tibia (lateral fragment) | 17. Tibia (locking rod) | 26. Base (lower part) |
| 9. Lateral plate proximal screw | 18. Tibial tuberosity (TT) | 27. Base (lower rod) |

Insertions



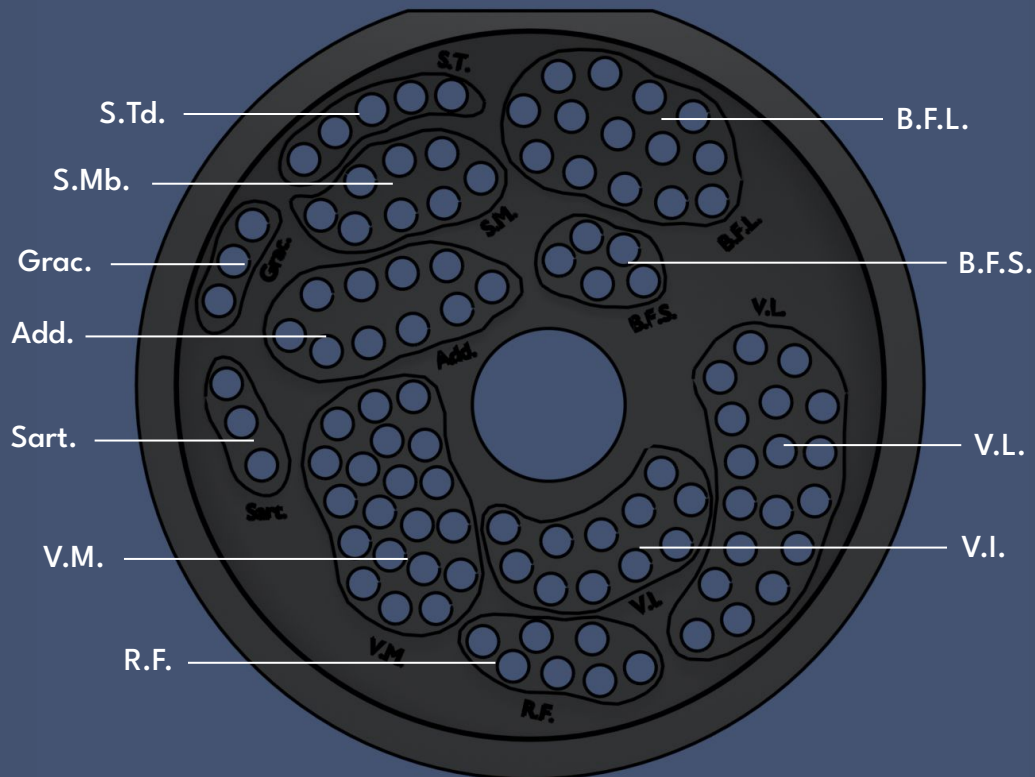
ACL : Anterior cruciate ligament
 Add. : Adductor
 ALL : Anterolateral ligament
 APL : Arcuate popliteal ligament
 B.F.L. : Biceps femoris long head
 B.F.S. : Biceps femoris short head
 E.D.L. : Extensor digitorum longus
 Fib.L : Fibularis longus
 G.L. : Gastrocnemius lateral head
 G.M. : Gastrocnemius medial head

Grac. : Gracilis
 LCL : Lateral collateral ligament
 LPFL : Lateral patellofemoral ligament
 MCL : Medial collateral ligament
 MPFL : Medial patellofemoral ligament
 OPL : Oblique popliteal ligament
 PCL : Posterior cruciate ligament
 Pl. : Plantaris
 Pop. : Popliteus

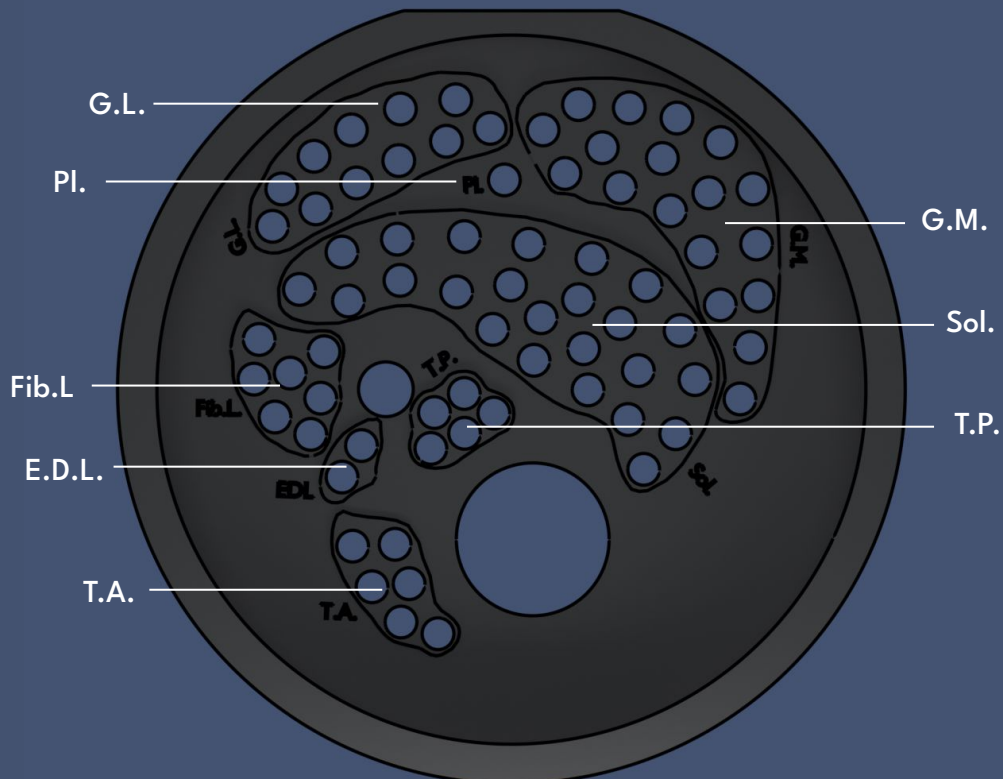
S.Mb. : Semimembranosus
 S.Td. : Semitendinosus
 Sart. : Sartorius
 T.A. : Tibialis anterior
 T.P. : Tibialis posterior

Insertions

Upper base



Lower base



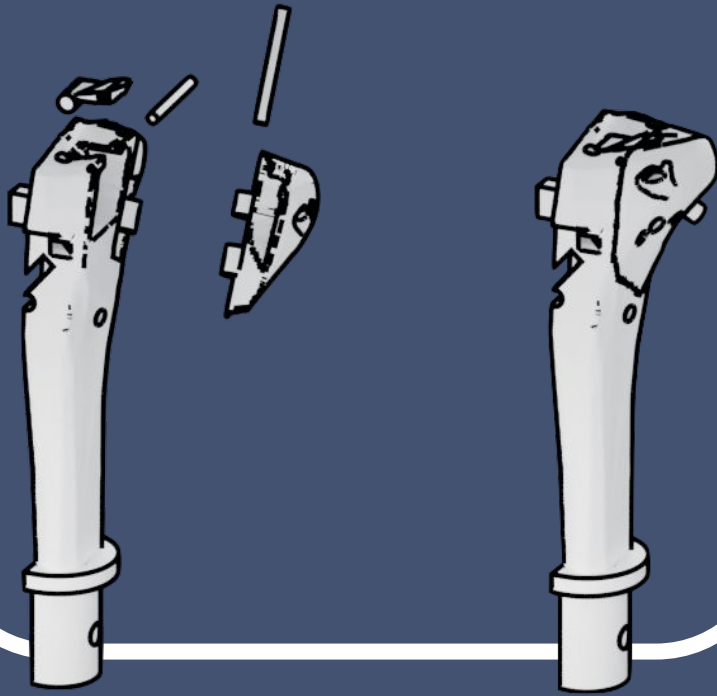
Add. : Adductor magnus
 B.F.L. : Biceps femoris long head
 B.F.S. : Biceps femoris short head
 E.D.L. : Extensor digitorum longus
 Fib.L : Fibularis longus
 G.L. : Gastrocnemius lateral head
 G.M. : Gastrocnemius medial head

Grac. : Gracilis
 Pl. : Plantaris
 R.F. : Rectus femoris
 S.Mb. : Semimembranosus
 S.Td. : Semitendinosus
 Sart. : Sartorius
 Sol. : Soleus

T.A. : Tibialis anterior
 T.P. : Tibialis posterior
 V.I. : Vastus intermedius
 V.L. : Vastus lateralis
 V.M. : Vastus medialis

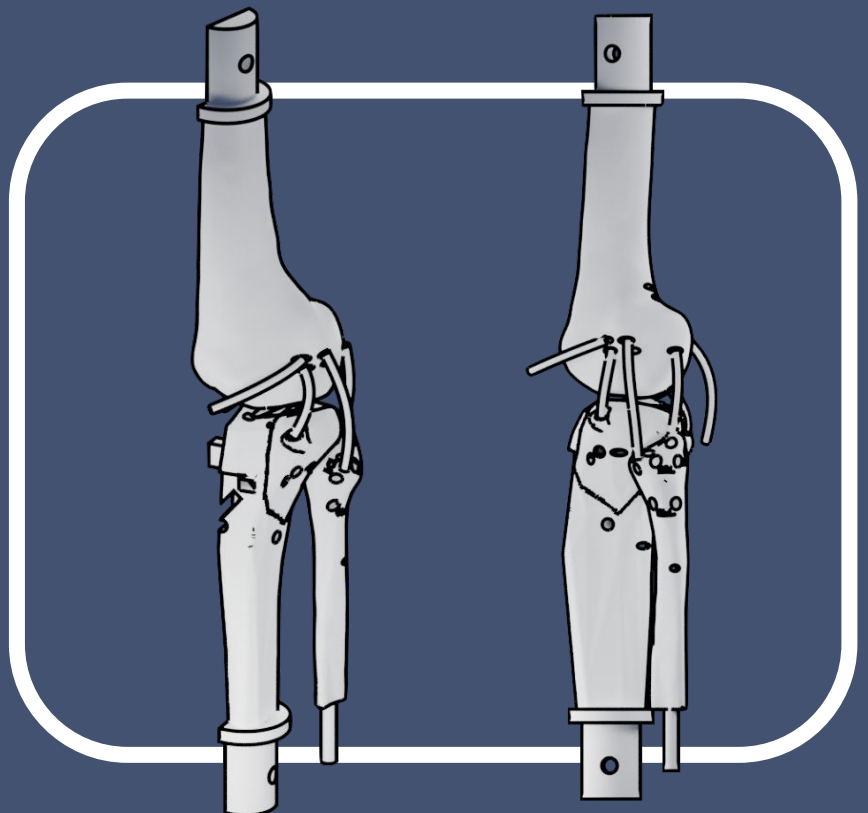
1. Lateral Hinge

Place the lateral hinge parts to simulate the split and depression fracture of the lateral tibial plateau. Insert the two metal rods to lock the hinges in position.



2. Ligaments

Attach all lateral ligaments between tibia, femur, and fibula. At the same time, thread all muscle balloons outward so they remain accessible before closing the bones.



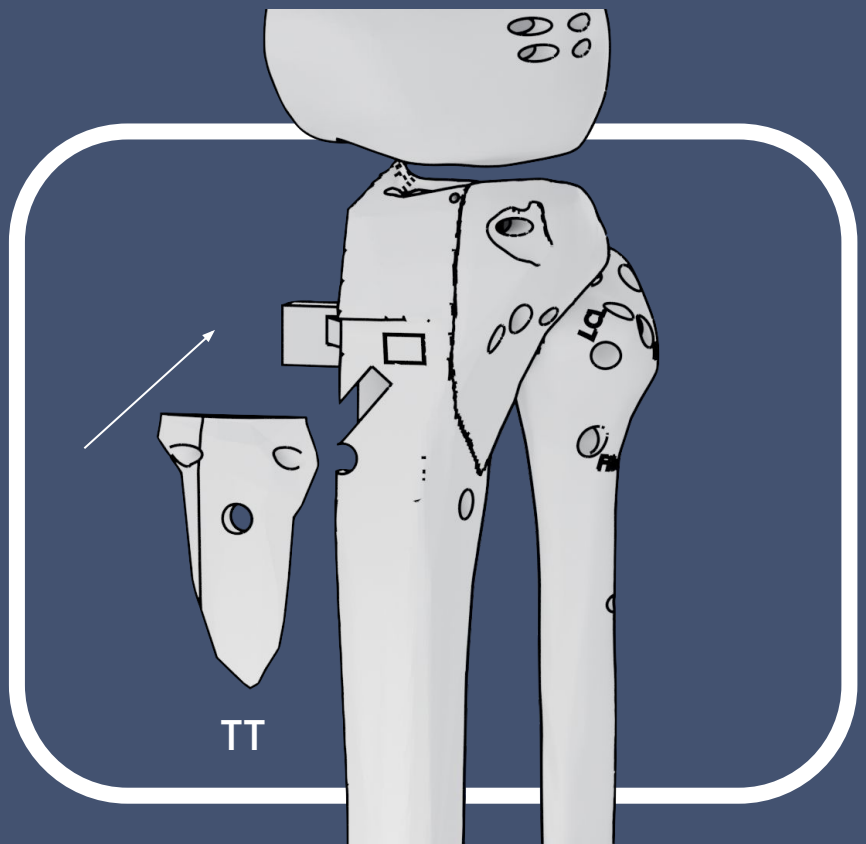
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Lateral

3. TT, Medial Side

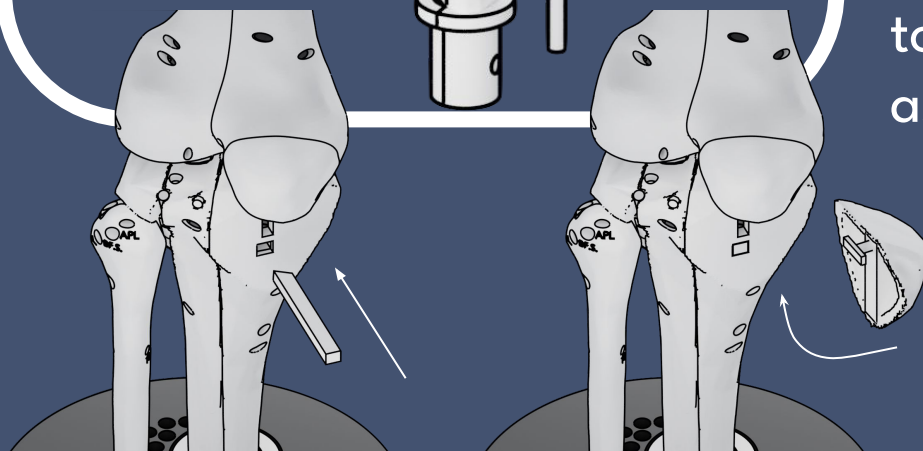
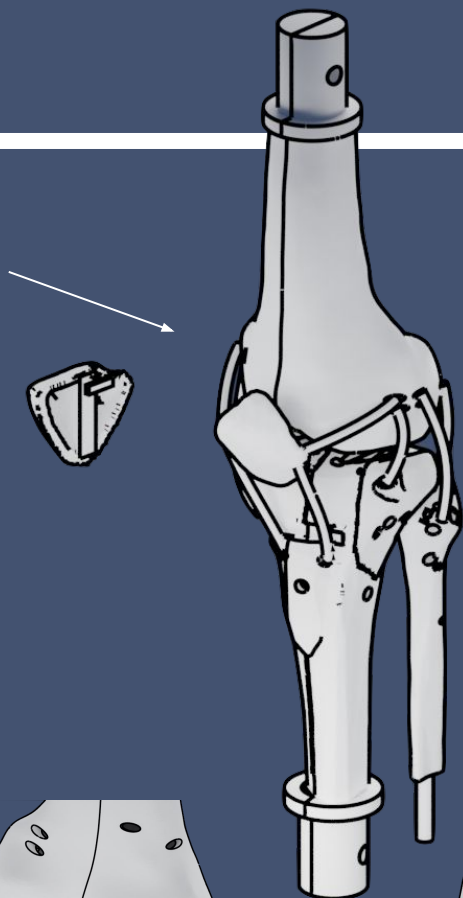
Slide the tibial tuberosity into its slot.

Repeat the same process on the medial side: insert ligaments and muscle balloons. Connect the patella.



4. Closing and Posteromedial Fragment

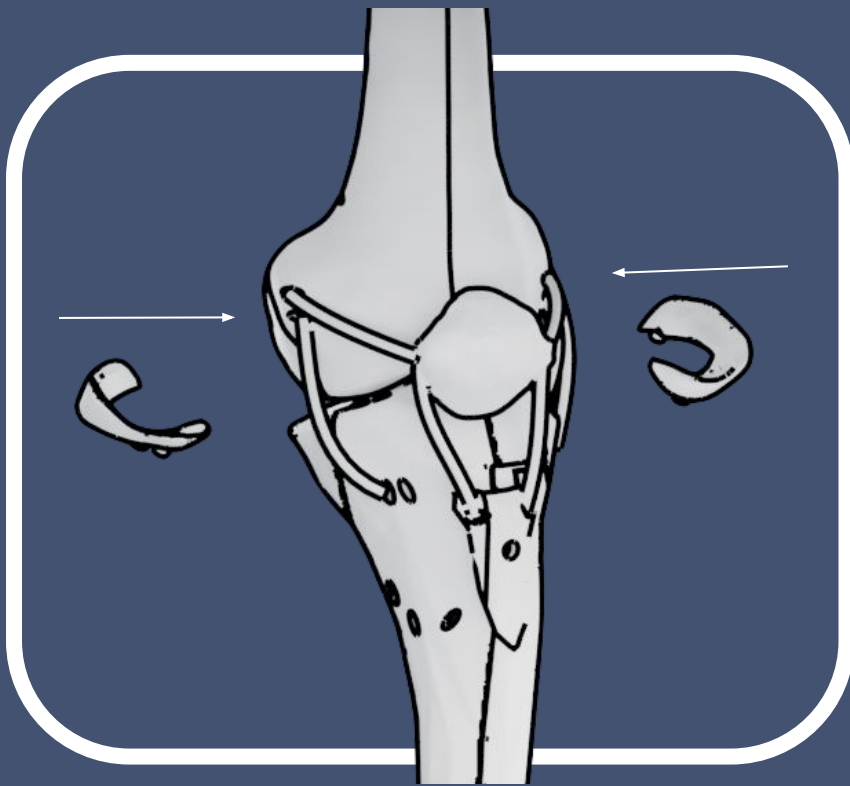
Lock the central and lateral tibial parts together using the rear rod, then close the posteromedial fragment to finalize the bony assembly.



Back view

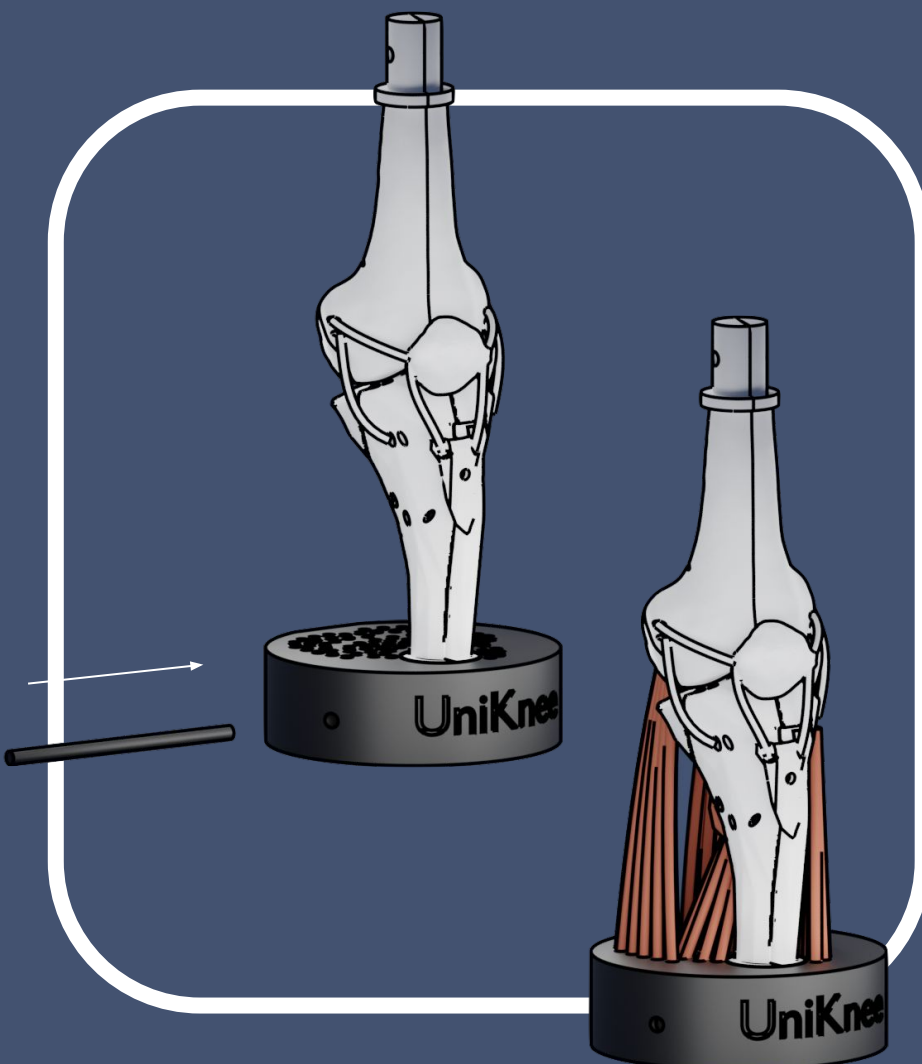
5. Menisci (Optional)

Insert the menisci by gently prying open the joint space. This step is optional, as primary stability is maintained without them.



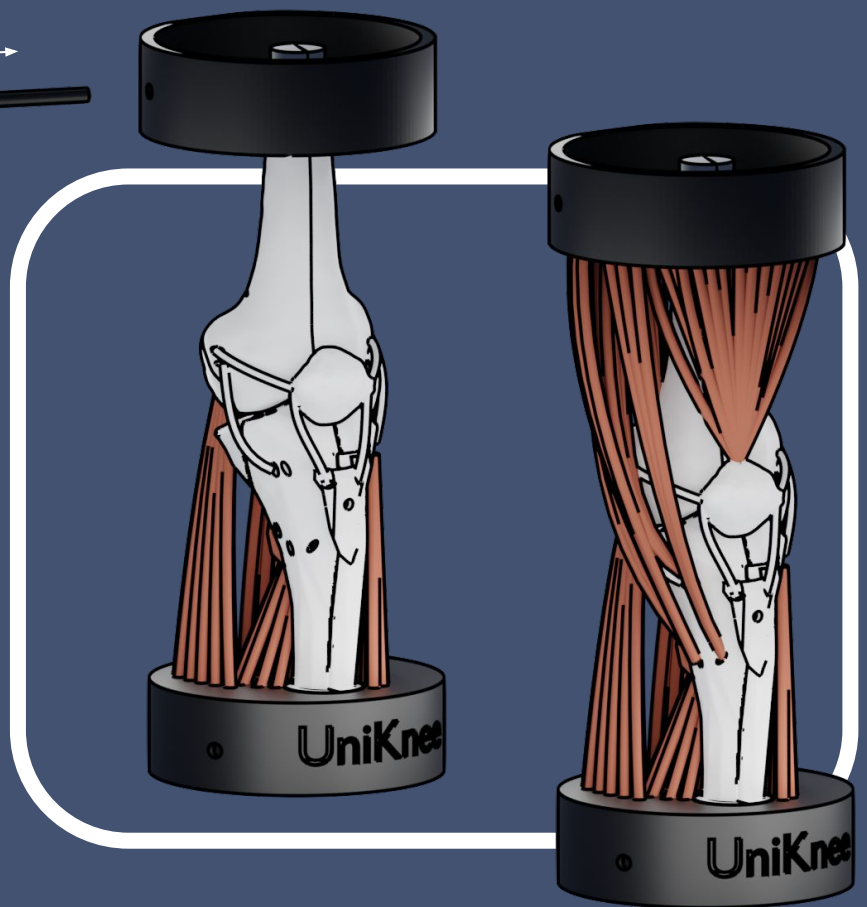
6. Lower Base

Place the assembled bones into the lower base and insert the anti-rotation rod to secure them. Connect all lower muscle balloons from the base to the bones, adjusting tension for stability.



7. Upper base

Attach the upper base and lock it with the second rod. Then connect the upper muscles one by one, starting from the center and moving outward.



8. Fixation Plates and neurovascular bundle (Optional)

Once all balloons are in place, you can optionally add fixation with printed plates and screws over the fracture sites. Neurovascular bundle can also be added, using different colors balloons.



UniKnee

