

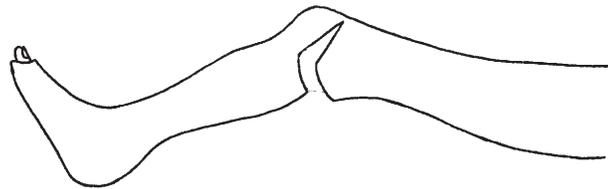
# Plaster-Wedging Technique:

## An Appropriate, Safe, Quick, & Economical Method To Stretch Soft Tissue Contractures Of The Knee

### **PLASTER-WEDGING TECHNIQUE**

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An Appropriate, Safe, Quick and Economical Method to  
Stretch Soft Tissue Contractures of The Knee



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### **General Information.**

In the field of physical rehabilitation of children and young adults with disabilities, we often come across the problem of contractures in the soft tissues of the hip, knee and ankle joint, resulting in subsequent inability to walk normally.

Examples include: children with Poliomyelitis, Cerebral Palsy, Post-septic arthritis or Osteomyelitis in the hip or knee.

The approach in rehabilitation is to cure the active disease where possible, and to straighten the legs so as to get the child up and walking with orthopaedic appliances (for those who have enough potential to walk i.e. strength in their upper body and waist).

### **There are several methods to straighten the knee:**

- ✓ Passive stretching exercises,
- ✓ Surgery to release tendons and other soft tissues
- ✓ Apply Plaster of Paris and Wedge until the knee is straight

These techniques are normally applied in combination and complement each other.

### **Definition:**

Wedging is a technique whereby the therapist cuts the serial plasters in a specific way, controls and corrects the deformity progressively and re-enforces the plaster again.

### **Why wedging:**

- ✓ It is a quick and easy method.
- ✓ It consumes very little plaster of paris (p.o.p).
- ✓ It enables the therapist to monitor the improvement immediately.
- ✓ Movements in one or two planes can be done separate or in combination with each other.
- ✓ If done correctly (see below), wedging avoids joint subluxation.

When applying the plaster wedging technique, it is important to respect the anatomy and biomechanics of the knee and ankle joint.

**Some important features are:**

1. While extending the knee, the tibia should shift anteriorly. If the tibia does not shift anteriorly during extension, there will be posterior subluxation and gapping of the knee.
2. The (moving) center of rotation for flexion and extension in the knee is located at the level of the mid femoral condyles; not in the joint line. In all joints (except TM\* joint) the center of rotation is located in the convex bone. The fact that the center of rotation is located proximal from the tibia is one of the reasons that the tibia shifts anteriorly during extension.
3. During extension of the knee the center of rotation moves from posterior to anterior.
4. The patella is only in contact with the femur. It does not articulate with the tibia. During extension of the knee the patella slides from distal to proximal in the sulcus patellae.

The actual knee joint is always distal from the patella.

\* TM = Temporo-mandibular joint

In the past, therapists and orthopaedic officers have used different techniques to wedge an “above knee p.o.p.” in order to straighten the knee, but for some of these techniques there are clear disadvantages and risks of complications. (See “Other techniques and their disadvantages”, below).

**The following wedging technique has been developed to avoid these complications.**

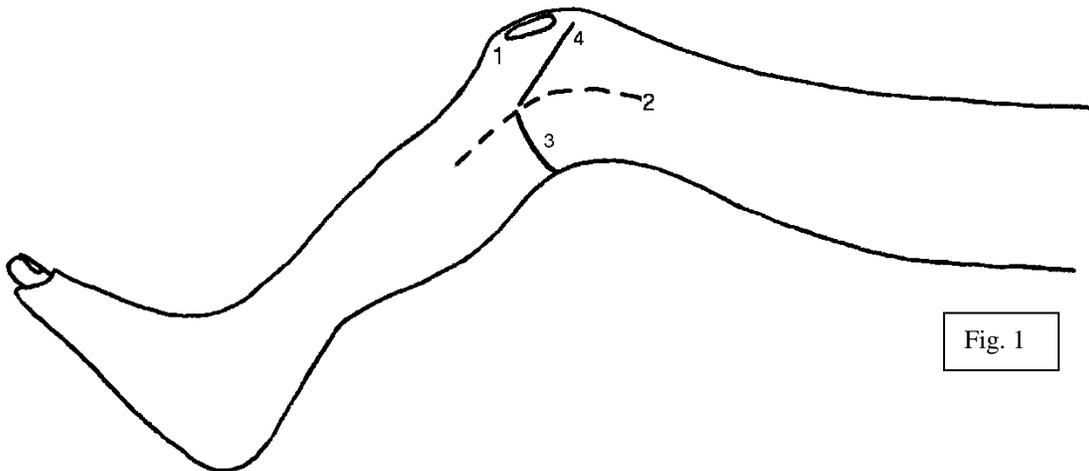
**Important:** often the knee/ankle contracture is due to shortening of the gastrocnemius which passes the ankle and the knee joint. Therefore, when applying the initial long-leg cast, **first apply a below-knee cast** with maximum dorsiflexion of the ankle, while keeping the knee in flexion! When after a few minutes this b/k cast has set, the cast should be extended above the knee while **gently** extending the knee. Do not force the knee to extension!

### **How to wedge the knee:**

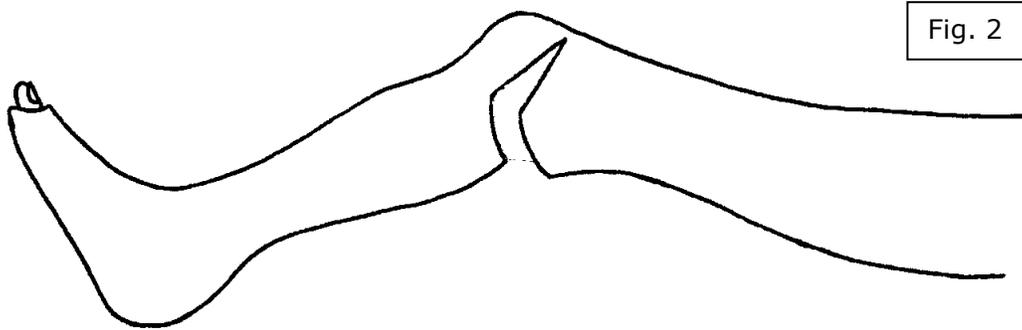
The initial long-leg cast can be wedged after 5-10 days

First draw lines where to cut the p.o.p. See fig. 1

1. Mark where the patella is.
2. On the medial and lateral side of the plaster, draw a line marking the mid-line of the plaster (dividing the plaster in an anterior and posterior half).
3. About 1 inch distal from the apex of the patella, draw a half circle around the posterior half of the plaster, connecting the first two markings. This line represents the actual joint space.
4. Position two fingers (1 ½ - 2 inch apart) just proximal from the patella and mark each with a dot on the plaster. Connect these two dots on both the medial and lateral side with the half circle.
5. Cut the plaster while following the line. Leave the p.o.p just proximal from the patella intact. NOTE THAT THIS INTACT SPOT NOW REPRESENTS THE CENTER OF ROTATION. IT IS PROXIMAL AND ANTERIOR TO THE TIBIA.



6. Gently straighten the knee/plaster. See fig. 2  
NOTE THAT IT IS NOW CLEARLY VISIBLE THAT THE TIBIA SHIFTS ANTERIORLY. THE PATELLA ALSO HAS ROOM TO MOVE UP.  
Fill the gap with cotton wool (sometimes a cork).
7. Close/fix with one or two rolls of p.o.p.



### **Follow-up wedging:**

After 5 – 10 days the plaster can be wedged again:

Make a superficial straight or diagonal cut over the plaster at the spot where the last rolls of plaster were applied. Peel of this "repair p.o.p.". The initial drawings for the wedging are now visible again. Straighten the knee/plaster while using the same incisions as the first time. Add cotton wool. Close again with one or two rolls of p.o.p.

### **NEVER WEDGE A PLASTER MORE OFTEN THAN TWO TIMES.**

The force to straighten the knee will only have effect when there is a three-point-fixation. These points are: the heel, the proximal-posterior part of the thigh and the anterior part of the knee (where the center of rotation in the plaster is). To avoid pressure sores especially at the knee, the complete plaster should be changed after two wedgings and one starts again with step 1 (above).

### **Control external and internal rotation:**

When the knee is still in considerable flexion (around 70 –90°), the external- and internal rotation can be influenced.

- a) When the tibia is in extreme external rotation (as often in polio), the center of rotation on the plaster should be positioned proximal and **medial** to the patella.
- b) When the tibia is in extreme internal rotation, the center of rotation on the plaster should be positioned proximal and **lateral** to the patella.

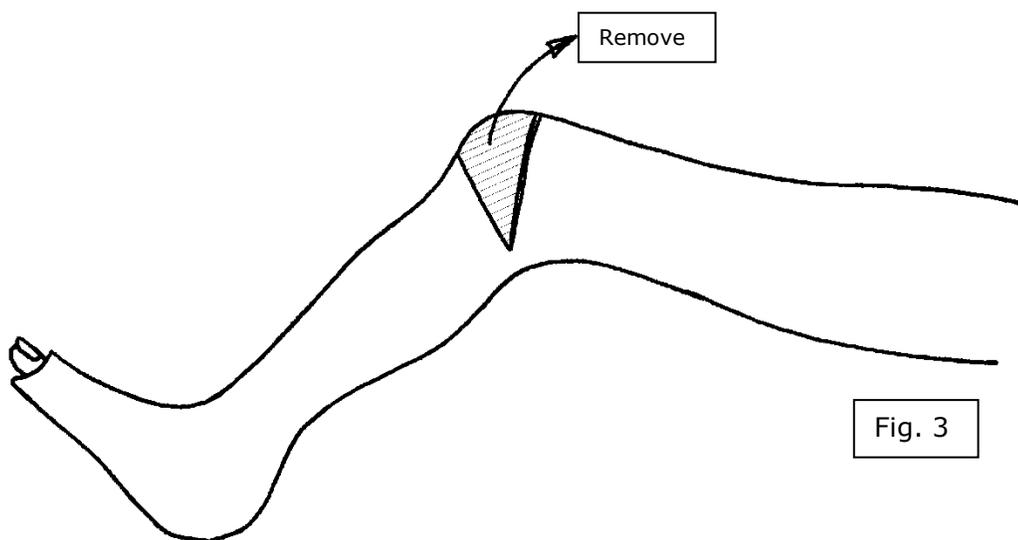
IT IS NOT ADVISABLE TO APPLY WEDGING TECHNIQUES ON PLASTERS FOR THE ANKLE JOINT IN ORDER TO INCREASE THE DORSIFLEXION. THE RISK OF PRESSURE SORES IS TOO BIG.

### **OTHER WEDGING TECHNIQUES AND THEIR DISADVANTAGES.**

#### **DON'T USE THE BELOW 4 TECHNIQUES**

**I. Take out an anterior wedge.** See Fig. 3

This will leave the posterior part of the plaster intact, which will represent the center of rotation. It will prevent the tibia to slide anteriorly and will cause subluxation and posterior gapping of the knee. Most importantly, it will cause compression on the articular cartilage, resulting in flattening of the femoral condyles and subsequent arthritis of the knee.



**II. Straight posterior incision, leaving anterior part of p.o.p intact.** See Fig. 4

This will also prevent the tibia from sliding anteriorly, because the plaster is still intact at the anterior side. The tibia then subluxes posteriorly and there is posterior gapping of the knee.

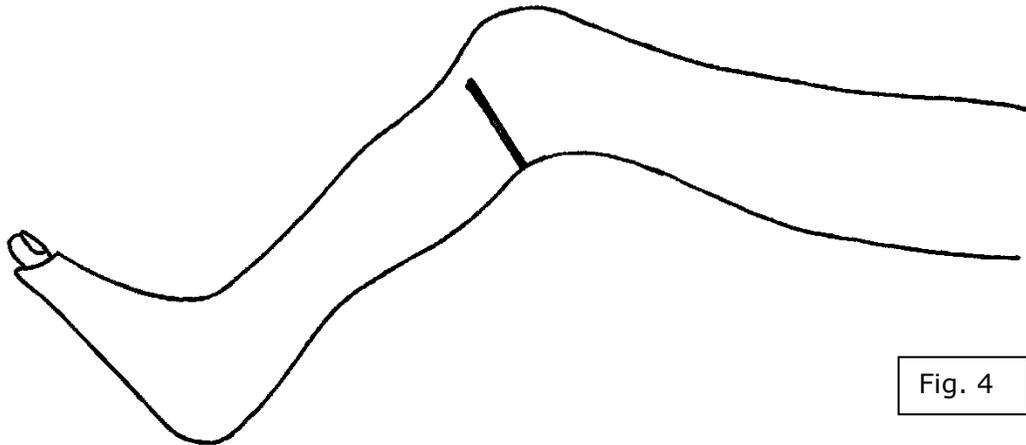


Fig. 4

**III. Straight circular incision, separating a/k and b/k plaster.**

The disadvantage is that the therapist will need to control movements in all directions: the anterior shift of the tibia, rotation, valgus/varus as well as the flexion/extension. There is a risks of pressure sores because of edges of both a/k and b/k plaster. The patella may be obstructed from moving upwards in the a/k portion of the p.o.p. See fig. 5

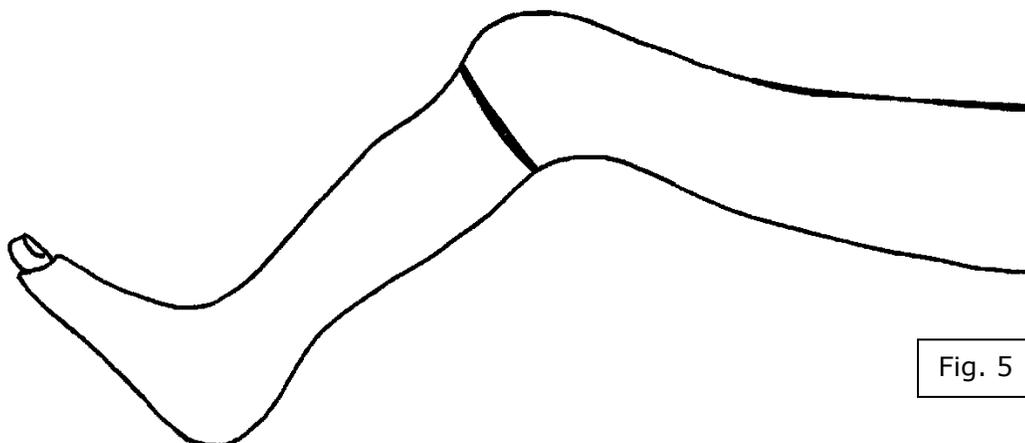
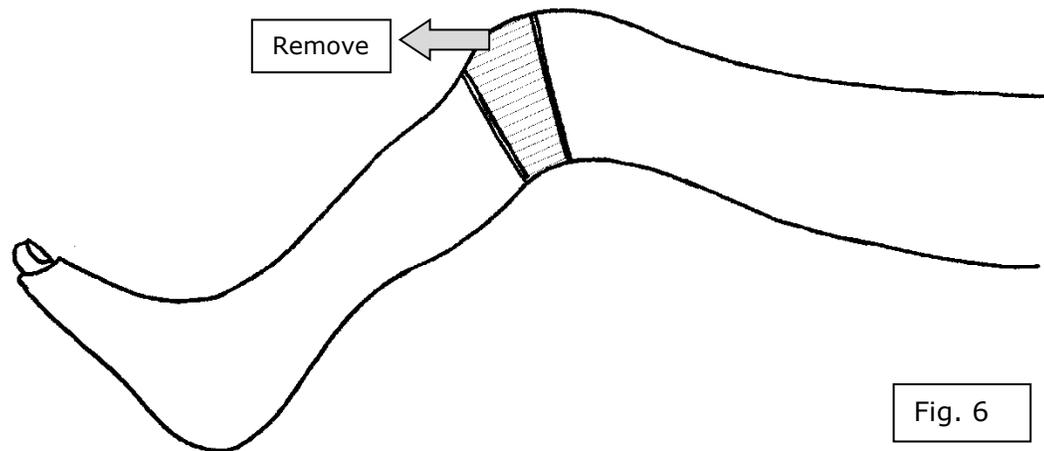


Fig. 5

**IV. Take out a ring of p.o.p at knee joint level.** See Fig. 6

If the ring taken out is wide enough, the tibia can slide anteriorly and the patella can move upwards.

Also here the therapist will need to control movements in all directions: the anterior shift of the tibia, rotation, valgus/varus as well as the flexion/extension and there is again the risks of pressure sores because of the plaster edges of the two parts of the cast (a/k and b/k).



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