GENOS MC
Internal Finger Distractor
Introduction

Callus distraction has traditionally been performed with small external fixators in cases of phalangeal amputation or malformation. This often led to troubles such as intra-distraction angle deviation or bone flexion caused by scar formation after removing the fixator. Our newly developed internal finger distractor reliably prevents such problems.

The internal finger distractor can be compared to an osteosynthesis plate with an external activator. The body of the distractor is fixed in place with four or eight osteosynthesis screws, depending on the model used. Two different distractors are available, enabling metacarpal bone lengthening by either 23 mm or 30 mm at a maximum. One complete turn of the hexagonal patient screwdriver used for activation is equivalent to a distraction length of 0.25 mm. As activation must be carried out twice a day by the patient, a total daily distraction of 0.5 mm can be achieved. The whole process should be monitored by regular X-ray checks. Physiotherapy during the distraction period is recommended because this can help to prevent an adduction contracture with consequential angle deviation.

Once the desired length has been achieved, the activator can be removed under local anesthesia. The distractor body is left in place as a stabilizing plate until the new bone has ossified completely. As the resulting fixation is functionally equivalent to a stable osteosynthesis, unrestricted use of the distracted phalange is guaranteed.

Clinical experience has shown that the internal finger distractor is an excellent alternative for finger reconstruction in cases of phalangeal amputation or malformation.
Indications

- Reconstruction of the thumb or the metacarpal bones I-IV after amputation or for correction of malformations

Contraindications for the internal finger distractor include:

- Cases of in-adequate bone volume for safe fixation of the distractor
- Open and infected wounds
- Patients with immunodeficiencies

The contraindications for the implant system include:

- Apparent infections
- Hypersensitivity to foreign bodies
- Suspected sensitivity to the implant materials
- Circulatory problems, systemic diseases and metabolic disorders
- Insufficient or inadequate bone tissue
- Secondary diseases such as degenerative processes that may adversely affect the healing process
- Regions exposed to inadequately high forces or excessive weight loads
- Patients unwilling or unable to follow instructions during the postoperative phase due to their mental, neurologic or physical condition
- Osteoporosis or osteomalacia or other severe structural bone damage that prevents the stable fixation of implant components
- Bone tumors located in the implant base region
- Apparent drug or alcohol abuse
With the patient lying on the back and the upper arm exsanguinated, interdigital web deepening is carried out first, preferably in the first interdigital web. To insert the internal finger distractor, a longitudinal dorsal incision is made over the metacarpal bone. The extensor tendon is exposed and then either split longitudinally or displaced. Thereafter, the periosteum is dissected and the osteotomy localized under X-ray monitoring, preferably in the distal third of the metacarpal. The osteotomy point is marked and the internal finger distractor applied.

The screw holes are now filled according to the standard osteosynthesis techniques, preferably with 2.0-mm screws. Before implanting the distractor, it is important to open it approx. 2 mm in order to keep the screws at a sufficient distance from the osteotomy surfaces. Following fixation of the distractor, the primary distraction length can be easily set via the external activator with the hexagonal patient screwdriver. A distraction length of 3 mm is recommended to begin with. Thereafter, the extensor tendon is closed and the skin stitched up. Initially, the internal finger distractor will project into the proximal soft tissues of the metacarpal base. This can cause tension and irritation in the dorsal skin surface. However, these symptoms will abate during the distraction phase.

The distraction is started after a postoperative latency phase of 3–5 days. We recommend a daily distraction length of 0.5 mm. This is achieved by two full clockwise turns of the activator carried out at different times of the day. One turn is equivalent to a distraction length of 0.25 mm. During the distraction phase, proper progress is continuously monitored by medical checks paying particular attention to the tensile forces acting on the patient’s soft tissues and to sufficient callus formation (to be monitored by X-rays). If necessary, the distraction speed must be correspondingly adjusted.

Please note that excessive soft-tissue tension can lead to elastic deformation of the distractor. This should be monitored by regular X-ray examinations of the distraction progress. If the distraction process is carried on in spite of distractor deformation, this can have adverse consequences such as overload fracture of the device, screw fracture or screw tear-out.

To cut off the activator after completion of the distraction, the KLS Martin “EasyCut” plate cutter (22-523-25) can be used for example. However, it is important to prevent any lever action on the remaining distractor in this process. In cases where distraction is carried out to the maximum length possible, it is therefore necessary to turn the distractor backwards by half a rotation after distraction, thus preventing a potential torsion impact and consequential distractor damage and/or patient injury when proceeding to cut off the activator.
Postoperative treatment

After achieving the desired length, the activator can be removed with a wire cutter. At the same time, the interdigital web can be deepened to reach a better gripping position.

Physical therapy is already useful in the distraction phase in order to prevent an adduction contracture.

To ensure proper bone consolidation, it is recommended to leave the internal finger distractor in place for approx. 1 year after distraction before removing the implant.

Literature

R. Rösslein
First experience with a distraction apparatus prototype for phalange lengthening
European Journal for Pediatric Surgery 3, 1993, 231-235

H.-J. von Pollack
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R. Hierner; K. Wilhelm; B. Brehl
Kallusdistraktion zur Verlängerung von Mittelhand- und Fingerstümpfen bei angeborenen Handfehlbildungen

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Plastic and Reconstructive Surgery;1996;6

J. Maegawa; H. Ogino; M. Saijo
A simple distraction device for finger lengthening
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Osseodistraction after traumatic amputation of the little finger in a young musician
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Metacarpal and phalangeal lengthening by callus distraction
Journal of Hand Surgery; 26B; 1; 13-16;2001

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Die Kallusdistraktion des ersten Mittelhandknochens zur Daumenrekonstruktion nach traumatischer Amputation
Unfallchirurg; 103; 1073-1078; 2000

C. Harpf; R. Zimmermann; M. Ninkovic
Die mikrochirurgische Daumenrekonstruktion mittels partieller Großzehentransplantation

Fig.5: Postoperative X-ray check
Storage modules
Implants and screws

GENOS MC internal finger distraction set
26-700-00

55-901-01
Tray for implants, only

55-901-02
Tray for instruments, only

Implants

GENOS MC internal finger distractor
26-702-15
Distraction length 15 mm

26-702-20
Distraction length 20 mm

26-702-25
Distraction length 25 mm

26-702-30
Distraction length 30 mm

Centre Drive®
(self-retaining)

Ti

Screws

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25-650-03
Screw length measuring clip, red

Ti

90-200-52
X-ray template
### Instruments

#### Set List

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<th>Description</th>
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<td>Depth gauge</td>
<td>1.5 mm, 14 cm/5 1/2”</td>
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<tr>
<td>25-402-99</td>
<td>Handle for drill bits</td>
<td>10 cm/4”</td>
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<td>25-441-16</td>
<td>Plate holding instrument</td>
<td>16 cm/6 1/4”</td>
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<td>26-141-15</td>
<td>Drill bit</td>
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<td>26-141-20</td>
<td>Drill bit</td>
<td>Ø 2.0 mm</td>
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<td>26-153-16</td>
<td>Drill bit</td>
<td>Ø 1.5 mm, 70 x 35 mm dental</td>
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<td>26-153-20</td>
<td>Drill bit</td>
<td>Ø 2.0 mm, 70 x 35 mm dental</td>
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<td>25-435-30</td>
<td>Plate holding forceps</td>
<td>18 cm/7 1/4”</td>
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<td>26-750-25</td>
<td>Patient screwdriver</td>
<td>Ø 1.5 mm, 70 x 35 mm dental</td>
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**ATTENTION:** Single use only!

### Implants

#### Set List

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<td>Internal finger distraction</td>
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- **Implants**
  - 25-662-06 - 20 Set includes 5 CD screws, Ø 2.0 mm in each length
  - 26-702-30 GENOS MC finger distractor, 30 mm
  - 26-704-23 GENOS MC finger distractor, 23 mm

- **Instruments**
  - 25-402-99 Centre Drive® handle for screwdriver
  - 25-434-98 Centre Drive® screwdriver device, 2.0 mm
  - 26-145-02 Depth gauge, 2.0/2.3 mm
  - 26-150-00 Handle with dental coupling
  - 26-153-16 Drill bit, 1.5 x 70 x 35 mm dental
  - 26-153-20 Drill bit, 2.0 x 70 x 35 mm dental
  - 25-650-03 Screw length measuring clip, 2.0 mm, red
  - 26-750-25 Patient screwdriver, straight, 0.25 mm

- **Storage**
  - 55-901-01 Tray for implants, compl.
  - 55-901-02 Tray for instruments, compl.
What does “distraction” mean?

Distraction osteogenesis is a technique for lengthening or reconstructing bones that utilizes the self-healing forces of the human body. In this process, new bone tissue (so-called callus) starts forming between two separate bone pieces as they are slowly pulled apart.

To pull the two bone sections apart, a small distraction apparatus is employed, which is fitted to the metacarpal bone and needs to be activated twice by you on a daily basis.

Distraction involves different phases:

- **Distraction phase:** The time period during which distraction takes place at a rate of approx. 0.5 mm per day (= two clockwise turns daily).
- **Consolidation phase:** The time period required for the bone to heal and ossify. This phase is completed when the distractor is removed.
- **Latency phase:** The time interval between the surgical intervention and the start of the distraction process (3–5 days postoperatively).

What is finger distraction used for

The finger lengthening achieved by distraction enables the patient to use his/her hand in a normal way again (holding, grasping).

Internal finger distraction is a reconstructive measure used for the treatment of traumatic injuries or the correction of malformations.

How long will the distraction process take?

This naturally varies from patient to patient. Usually the entire distraction process – from insertion to removal of the device – can be completed within a period of 12 months. After the distractor has been implanted, the distraction process can be started. The distractor is activated twice a day, performing one full turn of the screwdriver in each case (= 0.5-mm distraction per day), until the desired bone length has been achieved.

**ATTENTION:**

If the maximum distraction length is intended, it is essential to rotate the activator backwards by half a turn once the distraction has been completed. This ensures a safety margin.

Distraction is then followed by consolidation. This phase extends over approx. 3–12 months. During this period, the distractor is left in place in order to stabilize the new (but still soft) bone before the device is finally removed. Once bone consolidation is complete, the distractor is removed.

**Please always follow your doctor’s instructions specifically tailored to the individual case!**

What are the advantages of internal finger distraction?

Compared with traditional bone lengthening techniques, internal finger distraction offers a number of advantages:

- No danger of infection caused by external nails
- No external devices causing inconvenience
- No bone graft required

Who can benefit from internal finger distraction?

Patients of all age groups with a grasping problem due to a shortened thumb or finger.

Distraction failure cannot be ruled out for the following patient groups:

- Diabetics
- Patients with osteoporosis
- Patients with immunodeficiencies
- Patients having undergone radiation treatment

What needs to be observed during the therapy?

- Be sure to comply fully with your doctor’s instructions.
- The daily distraction length may not exceed a maximum of 0.5 mm (corresponding to two complete 360° turns, one performed in the morning and one in the evening).
Please turn screwdriver in the direction indicated by the arrow! GENOS MC – 2 x 0.25 mm/turn