A New Evolution
A Real Finger Joint Arthroplasty

Elogenics™ Finger Prosthesis
Surgical Technique
Surgical Technique
Elogenics
Finger Prosthesis

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Contents

Foreword 4

Indications, Contraindications 5

Biomechanical Concept 5

Description of the Implants 6

Overview of the Instruments 7

Preoperative Planning 8

Surgical Technique 9

Incision and Access 9
Determination of the Head Size 9
Resection of the Metacarpal Head 10
Preparation of the Medullary Cavity for the Basis 10
Opening the Medullary Cavity for the Caput 11
Preparation of the Medullary Cavity for the Caput 12
Checking and Determination of the Joint Tension through the Resection Plane 12
Insertion and Setting of the Elogenics Basis Component 13
Insertion and Setting of the Elogenics Caput Component 13
Handling of the Soft Tissues 14
X-Ray Control 14

Postoperative Treatment 15

Case Studies 16

Ordering Information 17

Implants 17
Instruments 18
Elogenics™ Finger Prosthesis
Uncemented MCP Total Finger Joint Prosthesis

**Foreword**

The artificial replacement of the finger metacarpophalangeal joints is of central importance for complex hand function. As a rule, not only are the joint structures destroyed, but also the soft tissues are already almost completely contracted in a defective position. It is no wonder then, that a functional reconstruction fails, especially in the case of so-called place holders.

The completely new approach of the use of an uncoupled endoprosthesis in the finger joint, at the right point in time, normalizes the central functioning of the finger’s metacarpophalangeal joint.

Of special importance here is that the joint can perform a rolling/gliding movement following the insertion of the endoprosthesis, as in the case of a knee joint.

The contours of the *Elogenics* finger prosthesis feature a design that approximates normal anatomy allowing biomechanical restoration of the joint. The soft tissues surrounding the joints are respected.

Deviations and defective positions are reconstructed in the context of the prosthesis implantation in such a way that the requirement of proper soft tissue tension and the alignment paramount to the extensor and flexor tendons are normalized. Only once these requirements are met can the atrophied muscles be subjected to adequate training. Since the components of the endoprosthesis are not coupled, the conducted forces are not transferred to the bone implant bed to too strong an extent.

The titanium lamellar anchoring ensures the fixation of the implants in the hollow bones of the metacarpals and phalanges. In the presence of bone defects, an additional spongiosa plastic in the intramedullary space is also recommended, so that the anchoring lamellas are secured by surrounding vital bones. The medium-term results show an ingrowing of the implants and a secure bone stability in the hand.

The surgical technique demands an understanding of biomechanics on the part of the surgeon and requires only a limited number of instruments. The surgical technique is consciously designed in such a way that the essential features are mastered within a relatively short learning curve. It is important, however, that the main features are mastered and regularly kept in mind.

Success with the *Elogenics* finger metacarpophalangeal joint prosthesis demands very consistent preoperative planning. In addition, regular clinical checkups must be planned ahead of time.

It is preferable to practice and learn the surgical techniques at the authorized clinics or in the surgical course that is regularly offered.

Frank-Wolfgang Hagena
Hans Christoph Meuli
**Indications**
- Arthrosis
  - idiopathic
  - polyarticular
  - post-traumatic
- Rheumatoid arthritis
- Hemochromatosis

**Contraindications**
- Bacterial infections
- Extreme defective positions
- Irreparable ligamentous apparatus
- Heavy manual labor by the patient
- Lack of motivation on the part of the patient

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**Biomechanical Concept**

*Elogenics’s* uncemented finger joint prosthesis was developed as a joint surface replacement for the metacarpophalangeal joints II through V. It consists of a head component and a base component.

The prosthesis is designed as an uncoupled ball and socket joint. The form and size of the head correspond largely to the resected head of the metacarpal bone. A dorsal flattening makes it possible to position the extensor tendons in an anatomically correct position. The collateral ligaments are fed through concave milled slots. A palmar joint surface extension increases flexion ability.

The base of the prosthesis possesses a concave joint mouse that requires only a minimal handling of the proximal phalanx base. The implant is sunk into the natural milled joint surface. The capsular ligamentous apparatus is maintained. Because of the symmetrical form of the implant in the axial direction, checking rotation during the implantation is not necessary.

The anchoring is prevented from rotating by a decussate four-lamellar structure in the intramedullary space. The simple dilatation of the lamella maintains the bony substance in the metacarpal and phalangeal shaft. In the case of bony substance defects osseous stability and healing around the components are improved through additional spongiosa plastic.

The maintenance or surgical reconstruction of the soft tissue balance enables early functional postoperative therapy, supported by a hand or occupational therapist. Dynamic or static splinting complements the postoperative therapy.
Description of the Implants

The *Elogenics* uncemented finger joint prosthesis consists of a caput component and a basis component and is designed to function as an uncoupled ball and socket joint.

The *Elogenics* basis component is made from the titanium-forged alloy *Protasul®*-100. The articulation surface is hardened by means of the oxygen-diffusion-hardening process *Tribosul™-ODH* and finely polished for articulation. A stable fixation secure from rotation is achieved in the corticalis of the proximal phalanx through the four-finned cross section of the anchoring. The *Elogenics* finger basis component is available in three sizes: S, M and L. The base component possesses a concave joint mouse that requires only a minimal handling of the proximal phalanx basis. The implant is sunk into the natural, milled joint surface.

The anchoring of the *Elogenics* caput component is also made of the titanium-forged alloy. The head of the caput component consists of polyethylene (*Sulene™-PE*) and is securely connected to the anchoring of the caput component. The form and size of the caput component correspond largely to the resected head of the metacarpal bone. The dorsal flattening of the implant makes it possible to position the extensor tendons in an anatomically correct position, allowing the collateral ligaments to be fed through concave milled slots.

A stable fixation secure from rotation, anchored in the corticalis of the metacarpal bone is achieved through the four-finned cross section and the base designed with a rectangular cross section.

The head component can be obtained in four sizes: S, M, M+ and L. Head sizes M and M+ differ in the size and length of the anchoring.

The implants must be combined as follows: Combining different component sizes is not allowed.

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>S</td>
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*Elogenics™ Finger Prosthesis*
Overview of the Instruments

The preparation and implantation of the Elogenics™ finger prosthesis should be carried out in a standardized manner. The special set of instruments have been logically developed and kept to a minimum. The correct use and handling of these special instruments are a requirement for the success of the operation.

The procedure will require this specialist set of instruments together with a “hand tray” and a “mini-saw”.

A special Luer for handling bones, as well as a “mini-Luer” for the synovectomy of the finger joints are contained in the Elogenics standard set of instruments for finger prostheses. Lamella cutters are available in the corresponding sizes for preparing the anchorage to the phalanx and metacarpals.

Elogenics Finger Prosthesis
Preoperative Planning

Three X-ray images are necessary for planning the operation:

1. A/P X-ray image
2. Lateral X-ray image
3. X-ray image with oblique view

Preoperative planning is a prerequisite for a successful finger joint replacement, requiring:

- Examination of the indications and contraindications
- A/P and lateral X-ray images and an X-ray image in the oblique plane.

Oblique images make possible the extensive superimposition-free assessment of an existing subluxation of the finger metacarpophalangeal joint.

The implant size is then planned with the aid of the X-ray template.
Surgical Technique

Incision and Access
The patient is placed in the supine position, with his or her arm on a hand table. The surgery is performed under brachial plexus anesthesia or general anesthesia with pneumatic upper-arm ischemia.

The opening is performed through a dorsal incision, across when operating on MP joints II – V, or lengthwise when operating on only one joint.

The extensor hoods are exposed while protecting the dorsal vascular nerve bundle. A longitudinal opening of the joint is then made radial to the extensor tendons. Following a synovectomy, the metacarpal head is exposed. Two Hohmann levers are used to protect the collateral ligaments.

Determination of the Head Size
The radius of the metacarpal head determined during preoperative planning can be checked using a radius gauge.
Resection of the Metacarpal Head
The metacarpal head is just barely resected with an oscillating saw. When doing so, attention must be given to protecting the collateral ligament insertions as much as possible from injury with two Hohmann levers.

The synovectomy is completed on the palmar side after head resection.

Preparation of the Medullary Cavity for the Basis
To achieve a central opening of the phalangeal base, the awl is inserted in the middle up to the laser marking. The 2.5 mm drill is then used to expand the opened joint surface of the proximal phalanx base opened with the awl. The drill is inserted with careful pressure in the phalangeal axis up to the laser marking. Penetration or fenestration of the phalanx is avoided by making tactile contact with the anterior corticalis.

To prepare the phalangeal base, the reamer basis is used to deepen the joint surface centrally by 3 mm, corresponding to the height of the prosthetic component. The reamer basis are centered in the intramedullary space through a truncate axis. The milling is done in a circular fashion from the center outward while preserving the cortical rim, this ensures that the capsular ligamentous apparatus of the phalanx is not destroyed and the soft tissue balance can be reconstructed. Preparation with the reamer basis always starts at base size S and is increased each time by one size until achieving the planned size.
The basis lamellar cutter is gently driven into the base of the proximal phalanx with light strokes of the hammer. As a basic principle, size S is first driven in up to the laser marking. Depending on the preoperative planning and the anatomical proportions, the intramedullary space is expanded incrementally until the optimal fit for the anchoring is achieved.

For a better orientation in the axial plane, the angled alignment rod mounted on the basis lamellar cutter is used. The slotted hammer is used for driving the lamellar cutter in and out. The position of the lamellar cutter may be checked with an image intensifier.

**Opening the Medullary Cavity for the Caput**

To achieve a central opening of the intramedullary space of the metacarpal bone, the awl is inserted up to the laser marking.

Before impacting the metacarpal caput component, the resected surface is polished so as to anchor the blunt-guided face mill perpendicular to the stem axis.
Preparation of the Medullary Cavity for the Caput

In order to create space for the anchoring lamellas of the caput component, the caput lamellar cutter is driven into the medullary space of the metacarpal bone with gentle strokes of the hammer. As a basic principle, size S is first driven in up to the laser marking. Depending on the preoperative planning and the anatomical proportions, the intramedullary space is expanded incrementally until the optimal fit for the anchoring is achieved.

For a better orientation in the axial direction and rotation of the fins to be inserted, the angled alignment rod, mounted on the lamellar cutter, is used.

Here, care must be taken to avoid penetration of the corticalis. The slot hammer is used for driving the lamellar cutter in and out. The position of the lamellar cutter can be checked with the image intensifier.

Checking and Determination of Joint Tension through the Resection Plane

Trial caput components are available in the respective sizes for checking the resection plane on the metacarpal and for testing the soft-tissue tension. These are positioned in the joint space, with the anchoring kept smaller by about 10% than the implant.

The joint tension can now be checked and determined. If necessary, the face mill must be used for additional resecting.
To keep in mind
With the help of the curved flat chisel, bone from the metacarpal bone is removed, depending on the nose on the implant, so that the prosthesis shoulder of the caput component can then lie fully on the resection surface.

**Insertion and Setting of the Elogenics Basis Component**
The basis component is anchored in the bone with the aid of the basis impacting rod.

To keep in mind
In the case of osseous defects (intra-medullary or in the phalangeal shaft), a spongiosa plastic may be necessary in order to guarantee the circumferential stability of the implant.

**Insertion and Setting of the Elogenics Caput Component**
The caput component of the previously determined size is now inserted into the prepared medulla. In the case of bone destruction, spongiosa plastic can be carried out at this point if necessary.

The caput component is now securely anchored in the bone with the aid of the caput impacting rod until the prosthesis shoulder rests completely on the resection surface. Finally, the joint is reset.
Handling of the Soft Tissues
The collateral ligaments are reinserted or reconstructed. At this stage an “intrinsic release”, if need be combined with a “crossed intrinsic transfer” may be required.

The extensor tendons must be exactly centered. In the case of a tendency to palmar subluxation of the proximal phalanx on the metacarpal, a tenodesis of the extensor tendon according to Zancolli’s technique may be necessary. It is critical that the soft tissue mantle is closed, so that a firm ball joint is ensured.

X-Ray Control
To check the position of the prosthesis part, an X-ray control must be performed.

The joint surfaces must be congruent. If this is not the case, a correction is necessary.
Postoperative Treatment

Following postoperative radiological controls and dynamic testing of movability at the end of the operation, a voluminous, stabilizing bandage is applied.

The first change of bandage is performed on the 1st day postoperatively.

From the 3rd through 5th day, a splint is applied, with inclusion of the wrist, if necessary.

On the 3rd day postoperatively, functionally guided therapy is initiated by an occupational hand therapist.

External stabilization for 6 weeks is recommended, i.e. until sufficient osseointegration is achieved. Beginning at the 3rd week after the wound is healed careful-guided movements should be performed. During the day a dynamic splint should be worn, while a static splint should be worn at night.
Case Studies

Case Study 1
Hand function of a 69-year-old woman suffering from rheumatoid arthritis after the implantation of four Elogenics prostheses in the right hand and two Elogenics prostheses in the left (MP joints II and III). Checkup period for the right: 38 months. Checkup period for the left: 26 months. Additional intervention: Right-wrist arthrodesis.

Case Study 2
Pre- and postoperative X-rays of the right hand in two planes 12 months after the implantation of three Elogenics prostheses in a patient suffering rheumatoid arthritis. Correct implant position with no sign of sintering. Progressive palmar subluxation and joint-space narrowing of the MP II joint as an indication of the unabated activity of the root disease.

Case Study 3
Pre- and postoperative X-rays of the right hand in two planes 20 months after the implantation of one Elogenics prosthesis, MP III joint, for primary arthrosis. Secure osteointegration is observed.

Functional result: Range of movement of the MP joint for extension/flexion 0-0-70°. Overall strength in comparison to the opposite side 85%.
Ordering Information

Implants

*Elogenics™ Finger Prosthesis*

**Elogenics Finger Basis**

*Protasul-100*

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**Elogenics Finger Caput**

*Protasul-100*

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## Instruments

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Also available in Zimmer’s Hand Portfolio:
Meuli MWP III Wrist Prosthesis