LA LIGAMENTOPLASTIE SELON F. BRUNELLI COMME TRAITEMENT POUR LA RHIZOARTHROSE : RÉSULTATS CLINIQUES ET SUIVI À NEUF ANS.

F. BRUNELLI LIGAMENTOPLASTY AS TREATMENT IN RHIZARTHRHOSES: NINE YEARS FOLLOW UP.

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Arthrosis at the thumb “root”

- 10% of all arthrosis are located at the trapezio-metacarpal joint.

- Rhizarthrosis can not be exclusively considered as a pathology of the first metacarpal bone and trapezium.

- Involving the “root” (rhiza) of the thumb, it compromises the entire dynamics of the thumb chain, causing a severe disability due to the progressive lost of the opposition of the thumb (pinching).
Rhizarthrosis: surgical treatments

1. Arthrodesis (Muller 1949)
2. Simple trapeziectomy (Gervis 1949)
3. Trapeziectomy with silicon implant (Swanson 1969)
4. Trapeziectomy with tendin interposition (Froimson 1970)
5. Cuneiform osteotomy (Wilson 1973)
6. Cemented and non-cemented arthroprothesis. (Caffinière 1979)
7. Spacers (pyrocarbon, lactic acid, others) (Szaley 2009, Tiihonen 2012)
8. Biological arthroplasty
   - Trapeziectomy + FCR on APL arthroplasty (Weilby 1979)
   - Trapeziectomy + FCR arthroplasty and tendon interposition (Eaton-Litter 1979)
   - Trapeziectomy + APL arthroplasty between the base of the first and second metacarpals (Thompson 1986)
   - Trapeziectomy + APL on FCR arthroplasty (Ceruso 1988)
Most of the ligamentoplasty found in literature can be surgically challenging:

- anchorage of the suspensory ligament around some of the wrist tendons (as the FCR)
  - passing through a transosseous tunnel (mostly of the first metacarpal)

Those techniques can lead to complications due to surgical mistakes or secondary inflammatory disorders as inflammatory tendinopathy or tendon ruptures.

**The F. Brunelli ligamentoplasty** is a variation of the arthroplasty that uses an emitendon of the abductor pollicis longus.

The technique relies on the anchorage of the volar band of the tendon to the first intermetacarpal ligament, in order to obtain a suspension arthroplasty without any suture on other tendons nor any transosseous tunnel.
The presence of a **distal enthesis with a thenar and a metacarpal insertion**, allows to use the volar band of the APL tendon to make a hammock that pivot at the base of the thenar eminence and around the first intermetacarpal dorsal ligament, in order to support the first metacarpal.

The development of an organized hematoma in the free space of trapeziectomy, and the **fibrotic tissue** which follow, will ensure the suspension over time.
Surgical technique

Once isolated the neurovascular bundle, we perform an «L» capsulotomy
Surgical technique

A complete trapeziectomy is performed with a rongeur and small chisels.
Surgical technique

With two incisions we identify the volar band of the APL tendon
Surgical technique

The most volar part of the APL tendon is prepared, sectioned at the myotendinous junction and removed from the DeQuervain canal.
Surgical technique

The tendinous band is then passed under the 1° metacarpal deeply to the other tendons.
**Surgical technique**

The volar band passes around the dorsal intermetacarpal ligament, placed in between 1st and 2° metacarpal.
Surgical technique

The tendon is then tensioned and sutured to itself and to the articular capsule.

This tenoplasty form a hammock able to maintain the 1° metacarpal in suspension.

The hematoma and the consequent fibrosis ensure the joint stability.
To protect the arthroplasty, a cast or a thermoplastic splint is used during the first month.

Starting from the third post-operative week, rehabilitation exercises are prescribed.
Eaton and Littler classification of trapeziometacarpal arthritis.

For this study we have selected patient with an idiopathic, painful and disabling rhizoarthrosis at radiological stage II or III of Eaton-Littler.

The stage has been radiographically identified presenting sclerosis, with a narrowing of the joint, and osteophytes smaller than 2mm (stage II) or bigger than 2mm (stage III).

We escluded patients with a stage I rhizoarthrosis, characterized by initial arthrosis without cartilage degeneration, and with a stage IV, characterized by a scaphotrapezio-trapezoid arthritis.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Slight joint space widening (due to effusion)</td>
</tr>
<tr>
<td>II</td>
<td>Slight narrowing of joint with sclerosis and small osteophytes &lt; 2 mm</td>
</tr>
<tr>
<td>III</td>
<td>Marked narrowing of joint with osteophytes &gt; 2 mm</td>
</tr>
<tr>
<td>IV</td>
<td>Pantrapezial arthritis with involvement of scaphotrapezial joint</td>
</tr>
</tbody>
</table>
Over 200 patients have been treated and followed since y.2007. Among those, 67 have been checked for one year after surgery, and then reevaluated with follow-up going up to nine years.

Of these 67 patients, 48 reached surgery with a stage II rhizarthrosis, and 19 with a stage III.

<table>
<thead>
<tr>
<th>67 patient</th>
<th>2007/2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis</td>
<td>Rhizarthrosis st. 2 (48) – st. 3 (19)</td>
</tr>
<tr>
<td>Follow-up</td>
<td>6 -9 years</td>
</tr>
<tr>
<td>Sex:</td>
<td></td>
</tr>
<tr>
<td>- male</td>
<td>51</td>
</tr>
<tr>
<td>- female</td>
<td>16</td>
</tr>
<tr>
<td>Mean n° of month since diagnosis</td>
<td>26</td>
</tr>
<tr>
<td>Mean age</td>
<td>63 (&gt;79, &lt; 42)</td>
</tr>
<tr>
<td>Splint</td>
<td>All</td>
</tr>
<tr>
<td>Physiotherapy (n° of cased)</td>
<td>18</td>
</tr>
</tbody>
</table>
Subjective evaluation:

1) Pain (VAS);
2) Aesthetics;
3) Functionality (DASH);
4) Overall satisfaction (1-10)

Those evaluation have been made before surgery, and then at 3, 6 and 12 months from surgery.

Objective evaluation:

1) ROM (1 to 10 according to Kapandji)
2) Pinching force (in kg)

Those evaluation have been made before surgery, and then at 3, 6 and 12 months from surgery.

Radiographical evaluation:

1) Anteroposterior and lateral Rx - to measure the distance between the scaphoid and the first metacarpal.-
2) Under stress Rx - To evaluate the stability of the thumb we asked the patient to press first and second fingertip against each other in order to form an «O» -

Exams performed before and after surgery, 1 year after surgery and between 6 and 9 years after surgery.
## Subjective Evaluation

### 67 patient 2007/2012

<table>
<thead>
<tr>
<th>Pain (in 67 patients)</th>
<th>Preoperative</th>
<th>3 months</th>
<th>1 year</th>
<th>6-9 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>No pain and restriction</td>
<td>0</td>
<td>27</td>
<td>63</td>
<td>65</td>
</tr>
<tr>
<td>Mild pain with use: some restriction</td>
<td>9</td>
<td>38</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Pain at rest: some restriction</td>
<td>38</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pain at rest: severe restriction</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>DASH score</td>
<td>43.3</td>
<td>25.6</td>
<td>14.2</td>
<td>9.1</td>
</tr>
</tbody>
</table>
Pinch test

- Pre-op mean: 3.7 Kg.
- 1 year post-op mean: 5.6 Kg.
- 6-9 years post-op mean: 6.2 Kg.
Objective evaluation

Abduction/adduction and opposition recovery according to Kapandji

- Pre-op mean: 6.2
- 1 year post-op mean: 7.6
- 6-9 years post-op mean: 8.2
Radiographical evaluation
Evaluation of proximal migration of 1°MC

Distance from tubercle of the scaphoid to the base of 1° metacarpal
Mean distance pre-op with trapezium on-site: 8.6 mm

Eaton-Littler 2 group:
- 6.7 mm after 1 year,
- under stress: 6 mm
- no variation after 6-9 years

Eaton-Littler 3 group (worst results and higher variability):
- 5.2 mm after 1 year,
- Under stress: 3 mm,
- further worsening after 6-9 years (3.2 / 2.8 mm)

This shows a lower reliability of the ligamentoplasty in case of advanced osteophitosis, with a consequent intermetacarpal ligamentous laxity.
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Evaluation of proximal migration of 1°MC

67 patient
2007/2012

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## Complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>3 months</th>
<th>1 year</th>
<th>6-9 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partial lost of suspension</td>
<td>/</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Dysaesthesia</td>
<td>/</td>
<td>16</td>
<td>7</td>
</tr>
<tr>
<td>Pain under stress</td>
<td>11</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Cicatricial hyperesthesia</td>
<td>/</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Algodystrophy</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*NO tendinopathy, NO infection*
Conclusions

- easy to perform
- no secondary tendinitis
- «comfortable» post-op for the patient
- excellent thumb mobility
- good stability and grip strength
- fast loss of pain
- durable correction of the deformity

- main indication: Eaton-Littler stage 2
- less satisfactory results if osteophytosis
This technique is particularly respectful of the anatomy and physiology of the first ray, but in cases of severe subluxation of the 1st metacarpal (Eaton-Littler st.3 / 4) it is instead contraindicated, due to the degeneration of the intermetacarpal ligament.

Learning this procedure can be useful to expand the possibilities of treatment of rhizoarthrosis and to simplify the currently used ligamentoplasty techniques.