Le traitement des fractures du corps du scaphoïde carpien avec agrafe à mémoires de forme. Étude rétrospective d’une technique peu diffusée.
The **Shape memory staple** consists of a biocompatible nickel-titanium alloy (**NITINOL**) with thermoplastic properties, which makes the fixation deformable when subjected to thermal stimuli.

**Biomechanical Properties of Nitinol Staples.** McKnight RR\(^1\), Lee SK\(^2\), Gaston RG\(^3\). *J Hand Surg Am.* 2019 Jun;44(6):520

**Fracture Fixation Using Shape-Memory (Ninitol) Staples.** Wu JC\(^1\), Mills A\(^2\), Grant KD\(^2\), Wiater PJ\(^2\). *Orthop Clin North Am.* 2019 Jul;50(3):367-374

**Biomechanical evaluation of shape-memory alloy staples for internal fixation-an in vitro study.** Hoon QJ\(^1\), Pelletier MH\(^1\), Christou C\(^3\), Johnson KA\(^2\), Walsh WR\(^1\). *J Exp Orthop.* 2016 Dec;3(1):19

This tool is capable of guaranteeing inter-fragmentary fracture hold and compression, producing a claw-like effect, which lasts an indeterminate amount of time.
The **Shape memory staple** consists of a biocompatible nickel-titanium alloy (**NITINOL**) with thermoplastic properties, which makes the fixation deformable when subjected to thermal stimuli.

This tool is capable of guaranteeing inter-fragmentary fracture hold and compression, producing a claw-like effect, which lasts an indeterminate amount of time.
surgical approach

Anatomical preparation
A. Bagliet
surgical approach
surgical approach
Wrist preservation in plaster cast or splint from 15 to 28 days.
90 days delayed union

60 days after surgery
Delayed union

30 days after surgery

60 days after surgery
60 days after surgery
This technique was used on more than 600 patients in 22 years.

In the last five years a retrospective study has been conducted on 131 cases to achieve enough data to support the usage of this technique.

Analyzing the proper reduction and healing with subjective, objective and radiographic parameters on a large sample of patients, our aim was to confirm the usefulness of this surgical procedure in terms of technical ease, stability and low complicate.
OUTCOMES in 131 consecutive patients

Type B (1,2,5) according to Herbert

- B1: 31 cases (oblique)
- B2: 85 cases (trasversal)
- B3: no indication (proximal pole)
- B4: not included in the study (fracture-dislocations)
- B5: 15 cases (comminuted)

Primary fractures: 93
Delayed unions: 38
Outcomes on 131 scaphoid staples

<table>
<thead>
<tr>
<th>Consolidation</th>
<th>No. of Cases</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary fracture</td>
<td>93</td>
<td>100%</td>
</tr>
<tr>
<td>Delayed union</td>
<td>36</td>
<td>94.7%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pain</th>
<th>No. of Cases</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absent</td>
<td>103</td>
<td>78.6%</td>
</tr>
<tr>
<td>Modest or occasional</td>
<td>23</td>
<td>17.5%</td>
</tr>
<tr>
<td>Bereable</td>
<td>5</td>
<td>3.8%</td>
</tr>
<tr>
<td>Severe</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

- **R.O.M.:** average wrist flexion-extension 112°

- **Grip Strength:** comparable to contralateral wrist 98(74.8%), slightly inferior 29(22.1%), significant loss 4(3.1%).
Outcomes on 131 scaphoid staples

<table>
<thead>
<tr>
<th>Complications</th>
<th>No. of Cases</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonunions</td>
<td>2</td>
<td>1.5%</td>
</tr>
<tr>
<td>Superficial Infection</td>
<td>5</td>
<td>3.8%</td>
</tr>
<tr>
<td>Deep Infection</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Hardware removal</td>
<td>5</td>
<td>3.8%</td>
</tr>
</tbody>
</table>
• Overall 94.7% union rate; 100% in acute fractures, 94.4% for delayed unions

• Direct visualization of the fracture outbreak

• Absence of joint conflicts and damages

• Prolonged compression of the fracture

• Great simplicity of execution

• Low X-rays exposition

• Minimal incidence of failures / complications

• Capsulo-ligamentous section to be restored
The authors report a study on unstable fractures of the scaphoid waist (type B1, B2, B5, according to Herbert classification), treated with shape memory staple on a large sample of patients, with the aim to confirm the usefulness of this method, the quality of reduction and fixation, the functional results, the time of union and the possible complications.
Results show the reliability and practicality of treatment with shape memory staple.

The surgical procedure has a very high percentage of success on primary fractures and delayed unions.

In the authors' opinion, it should be considered as an excellent alternative to screw fixation for treatment of the scaphoid waist fractures.
Grazie