

BIOMECHANICAL COMPARISON OF DIFFERENT CERCLAGE SYSTEMS

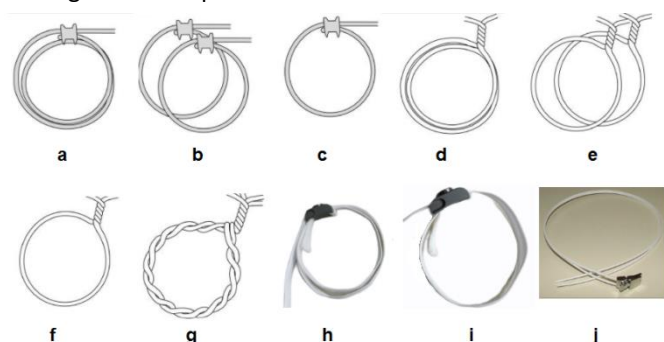
Ortolog Research & Development Team

Purpose

Cerclage using is gaining attention again due to the increasing number of periprosthetic fractures. Different wiring techniques made of metal have been suggested before and used over time. Therefore, the results of existing cerclage techniques published in the study of Lenz et. al¹, 2013 will be compared with new polymer cerclage band technologies.

Material and Method

In Lenz et al. Study, seven different cerclage cable and wire configurations were fixed to encircle the two halves of a shaft mounted on a test apparatus. Sinusoidal cyclic loading was applied with continuously increasing force (0.1N/cycle) starting from 50 N peak load.



Ortholox[®] UHMWPE Cerclage Band samples were mounted on **two complementary semi-circular parts**, according to the technique, in the form of single wraps, double wraps and 3 single wraps, mimicking the osteotomized femoral bone. A cycle, increasing from 50N to 500N with a speed of 40 N/s was applied for 50 cycles until the rupture would occur. If there was no rupture, the load was given until it breaks.²

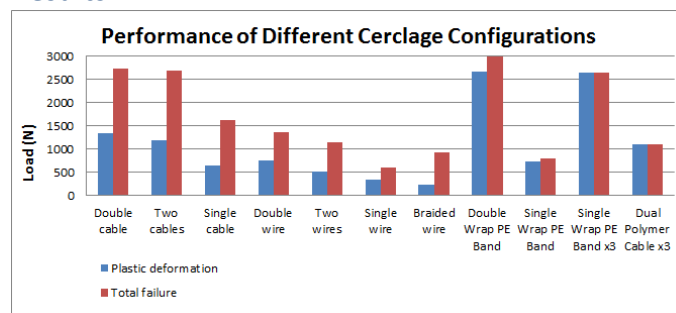


Resim 1. Mechanisms used for tested samples - Double loop wire, Dual Polymer Cable x3, Ortholox[®] UHMWPE Double Wrap, Ortholox[®] UHMWPE Single Wrap x3 systems mounted on test mechanisms

3 Dual Polymer cables, which were wrapped on the midline osteotomized bone model according to the technique, were distracted laterally at a rate of 10 mm/min until it reached the yield strength according to the method given in the literature [Cohen & Griffin 2002].³

The load leading to the beginning of plastic deformation and the load at total failure were measured.

Results



Ortholox[®] UHMWPE Cerclage Band System, shows the best performance in all configurations with double wrap(h) and 3x single wrap(i) configuration. It has been observed that these two configuration performs better than metal multifilament cables (a, b, c) in the plastic deformity stage; and they perform better than or similar to multifilament cables in the rupture stage.

Ortholox[®] UHMWPE Cerclage Band System single wrap has performed better than all other metal cerclage wires (d, e, f, g).

When the results of Ortholox[®] UHMWPE Cerclage Band System single band single wrap was compared with another new technology, Dual Polymer Cable(j), Ortholox[®] UHMWPE single wrap band results have been shown to be promising and single band shows performance of 2/3 rate of 3 polymer cables.

On the other hand Lenz et al. found the use of braided metal wires(g) mechanically not recommended.

When all the results are compared, Ortholox[®] UHMWPE Cerclage Band System offers a safe alternative to metal multifilament cable, dual Polymer cable and steel wire when used as double wrap or multiple single wraps.

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References:

1. Lenz et al, *Biomechanical performance of different cable and wire cerclage configuration*, Int Orthop. 2013 Jan; 37(1): 125–130
2. Ortolog Medikal Biomechanical Test results, Aya Validasyon
3. Kinamed *Biomechanical Comparison of Three Sternotomy Closure Techniques: Static Lateral Distraction*, STS 2016