**Spring element implementation**

The force-strain relationship of each spring element is described by the following nonlinear piecewise function:

where *ε* is the ligament strain, *εL* is a reference value of strain assumed to be 0.03 and *k* is the stiffness parameter, expressed as force per unit strain, of each different spring element. The spring strain *ε* is defined as:

where *l* is the actual element length and *l0* is the no load length (i.e., slack length). Moreover, to avoid high frequency vibrations during simulations, a parallel damper with a damping coefficient of 0.5 Ns/mm was added to each spring element.

**Table S2. Characteristic parameters of the spring elements.**

|  |  |  |
| --- | --- | --- |
| Element | k (N) | lo (mm) |
| l-MCL | 48000 | 102.0 |
| l-LCL | 48000 | 105.9 |
| l-MR | 10000 | 106.9 |
| l-LR | 10000 | 107.2 |
| s-MCL | 24000 | 51.4 |
| s-LCL | 24000 | 50.0 |
| s-MR | 1000 | 53.0 |
| s-LR | 1000 | 42.4 |