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TRANSFORMATION OF RADIAL STRESS TO AXIAL STRESS THROUGH MORSELIZED BONE GRAFT FOR INTERBODY APPLICATIONS

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NAME OF EVENT: 21st Annual Scientific Conference of the Canadian Spine Society

DATE: Feb 3,10,15,17,24, 2021 **LOCATION:** Virtual Conference ON Canada

Please enter all abstract numbers you are presenting

ABSTRACT NUMBER(S): 103

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ACKNOWLEDGEMENT: Tim Lasswell, MASc

I acknowledge that this information is accurate. I understand that this information will be publically available.

SIGNATURE: ____________________ **DATE:** 1/21/2021

OVERVIEW OF WOLFF'S LAW

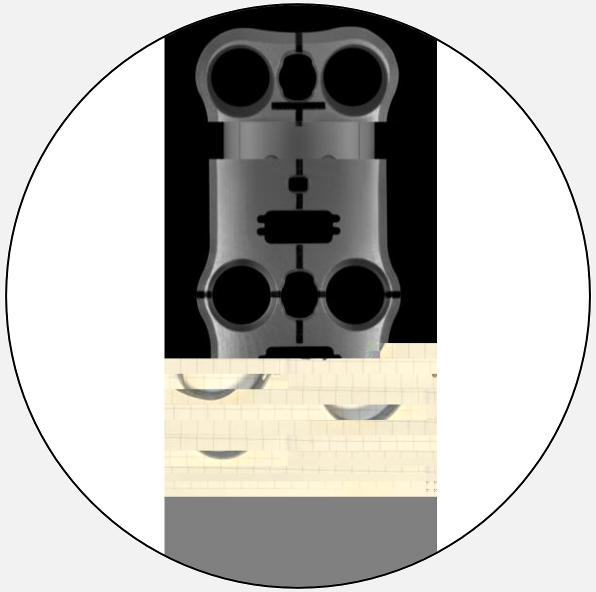
ĩBone density and structure is governed by the loads imposed on or removed from themòï Julius Wolff (1836-1902)

The mechanics of bone remodeling are much more complex. Stated simply, bone adaptation occurs in response to mechanical stress, among other factors.

[1] Brand RA. Biographical sketch: Julius Wolff, 1836-1902. *Clin Orthop Relat Res*. 2010;468(4):1047-1049.

PROBLEM

All existing products that claim the benefits of Wolff's Law increase the likelihood of kyphosis and subsidence



Stryker Aerofoil Compression Technology

"In accordance with Wolff's Law""

"Generate over 200N of compressive force"

Globus Unify Dynamic Cervical Plate

"Maximize the principles of Wolff's Law"

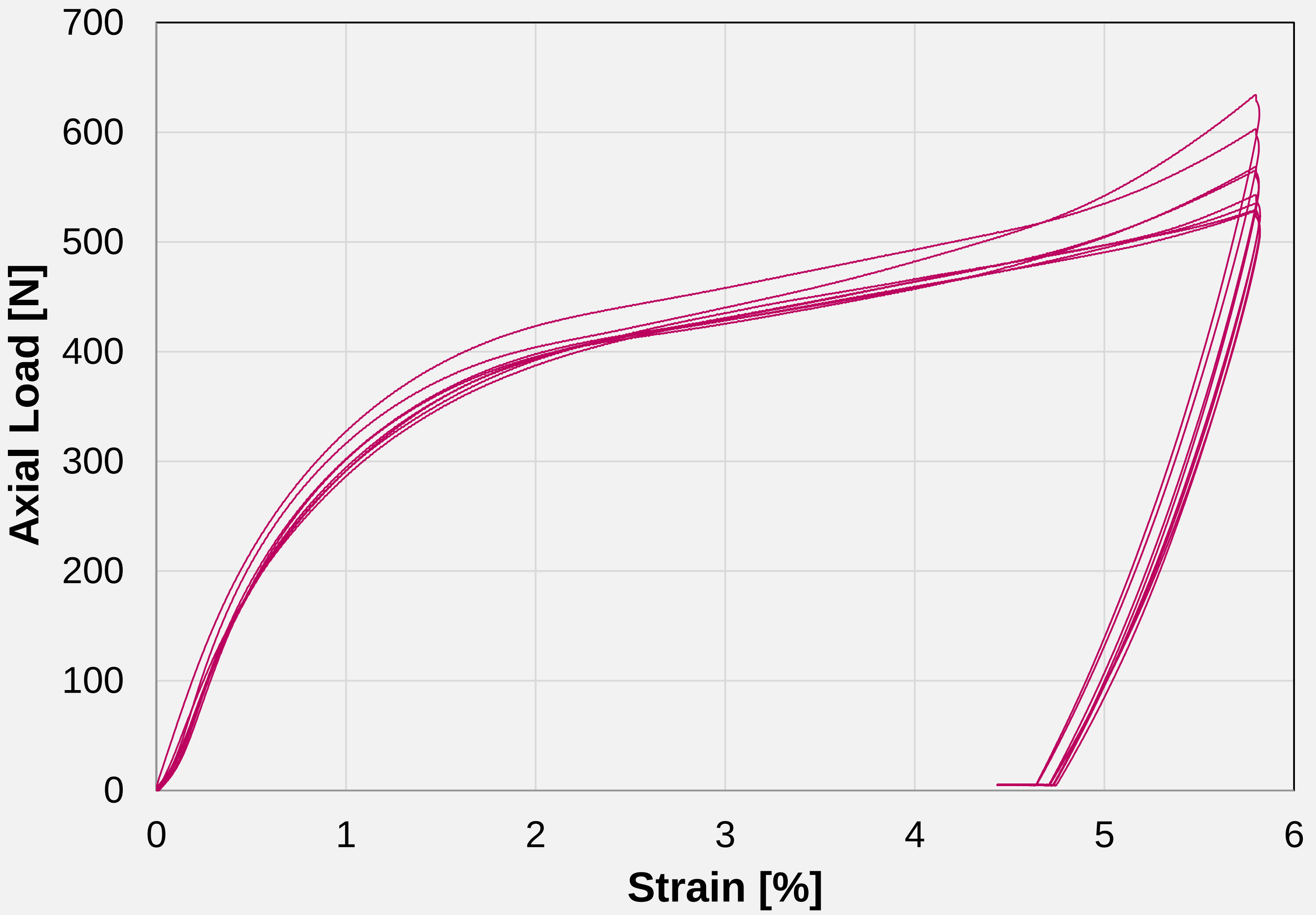
"Dynamization and optimized compression"

Nexus Spine Active Cervical Plate

"Wolff's Law is bone's best friend"

"Only cervical plate with continuous compression"

NITINOL STRAIN DATA



Å Average residual strain after loading cycle was 4.4% ± 0.1%

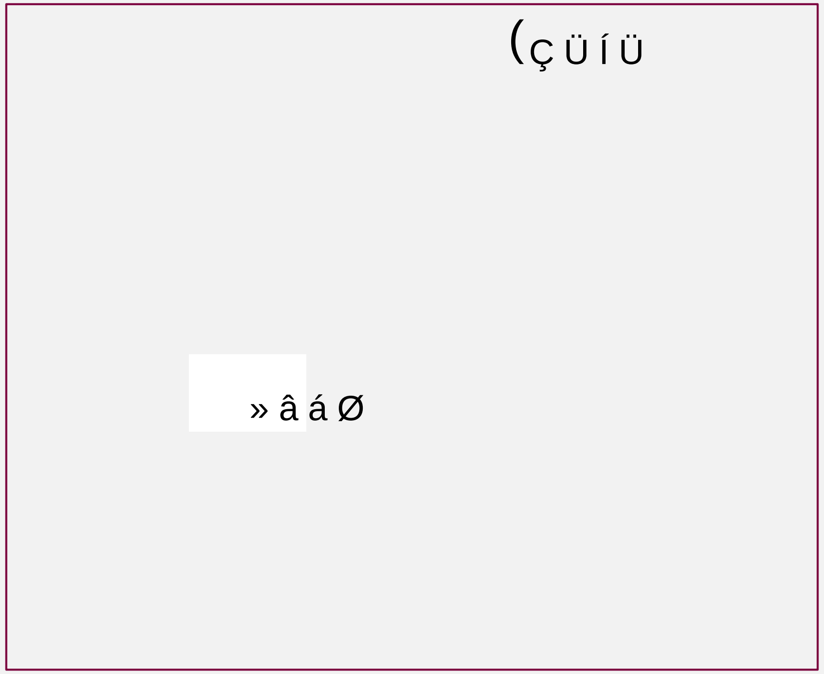
Å Compression sleeve is able to shrink by 4.4% while still loading the graft material

Å Accommodates bone resorption during remodelling process

RADIAL STRESS CALCULATION

Thin wall assumption used to calculate the radial stress applied to the bone graft as a result of the hoop stress from the nitinol compression sleeve

Specimen	r z • € at 37ºC
1	409.7 N
2	331.0 N
3	397.6 N
4	385.0 N
5	357.2 N
6	319.6 N
7	362.1 N
8	381.5 N
Average “ SD	**368.0 “ 29.5 N**



(ÇÜíÜ / PS L »âáØ &à / tP

(ÇÜíÜ L *Load from nitinol compression sleeve*

»âáØ L 5PNA PDOOPHAAR AKPJ KJ

&à L #RAN=@CE=IAPAN

t L *Thickness*

w L *Width*

Å Load from compression sleeve at 37ºC converted to radial stress on bone graft

Å Average radial stress from 8 specimens was **6.0** “ 0.5 MPa

Å A fraction of radial stress will transform to axial stress

Å Axial force calculated from axial stress by multiplying by cross-sectional area