

# Preparation of round tendons to flat tendon. Does the preparation process have any influence on the structural properties?

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# Conflict of interest

Company:

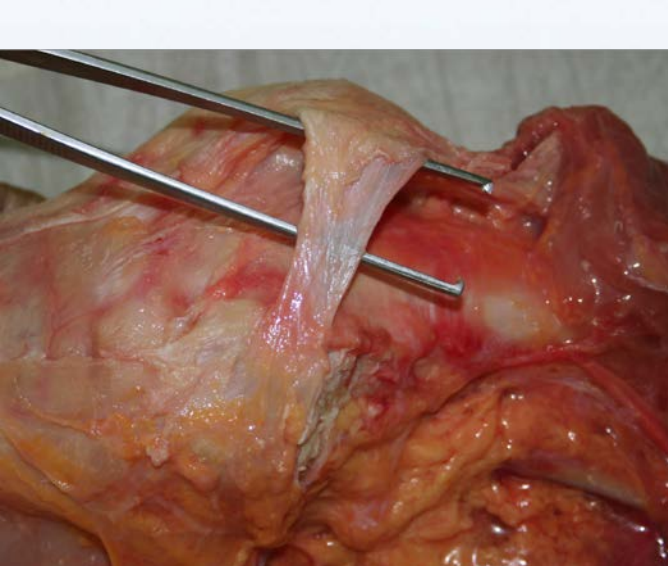
Karl Storz GmbH, Mathys AG, Bettlach,

Paid Consultant

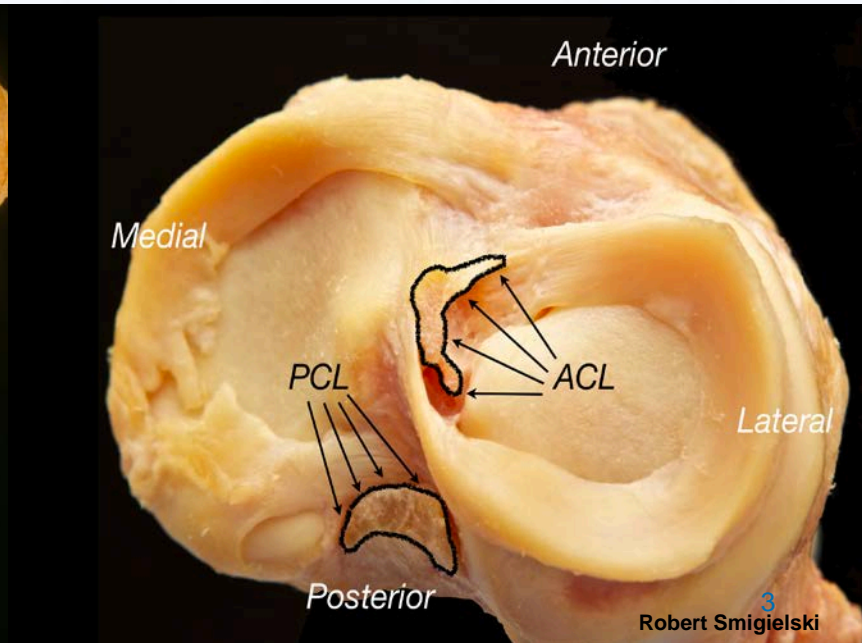
Research support by OSM Research Foundation, GOTS

# Introduction

- Hamstring tendons are currently famous transplants for tendon reconstruction in the knee joint
- Very often flat structures have been reconstructed using this tubular tendons:

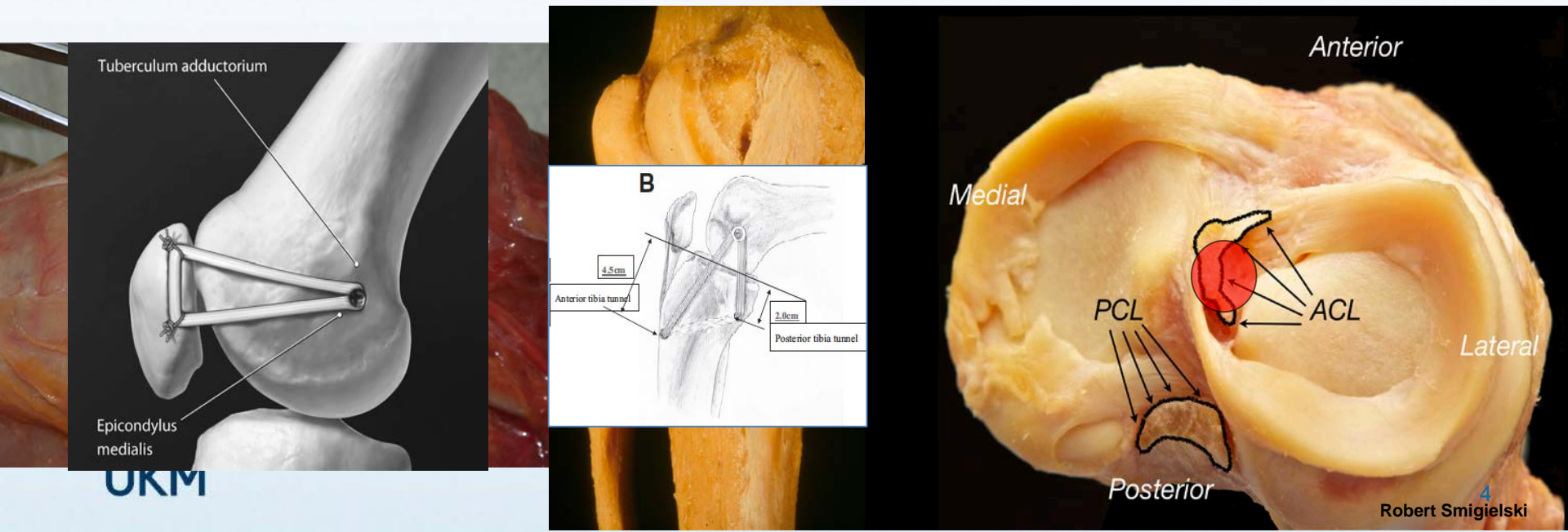


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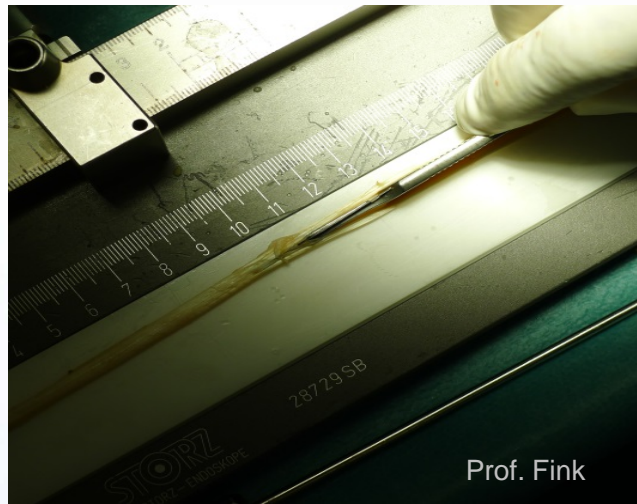


# Introduction

- Hamstring tendons are currently famous transplants for tendon reconstruction in the knee joint
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# Material & Methods



Prof. Fink



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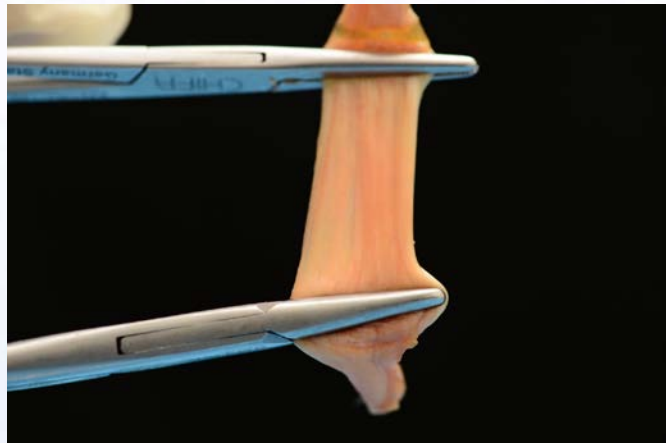
## –Smoothing process:

- Cutting half the diameter of the tendon with a knife
- Smoothing out of the tendon using a raspatory (e.g.)

– The hamstring tendon gets a flat surface instead of his naturally tubular shape

# Hypothesis

Aim of this study was to evaluate the structural properties of porcine tendons after converting them into a flat shape and to compare these properties with the original round shaped tendons



We hypothesized, that the smoothing process of the hamstring tendons transforming from tubular to flat shape does not have any negative influence on the structural properties of the tendons.

# Material & Methods

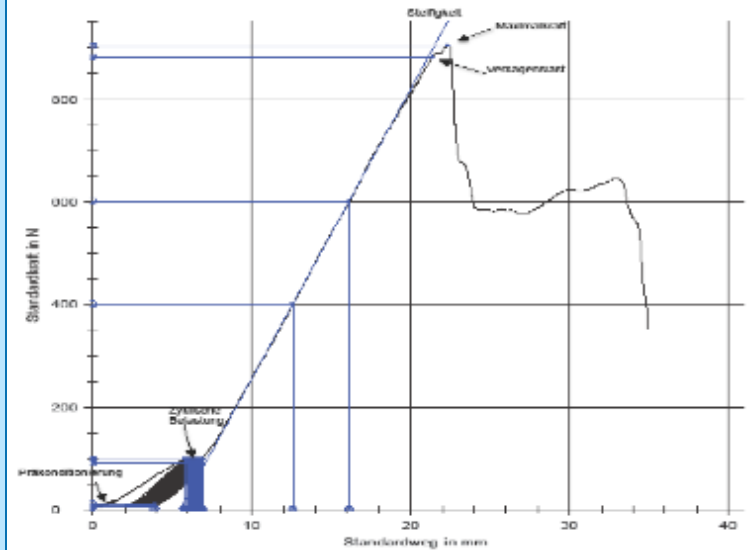
- 40 porcine flexor tendons
- Tendons have been divided in two diameter groups
  - **SemiT-Size**
  - **Gracilis-Size**
- Every tendon has been cutted in two parts (10 cm long)
- Fixation of each tendon in cryo clamp in material testing machine (Zwick/Roell) (free length 6 cm)



# Biomechanical Protocol

## Load to failure test:

- 20 cycles for preconditioning
- Displacement rate: 200 mm/min
- **Stiffness, Yield Load, Maximum load**



## Statistical Analysis:

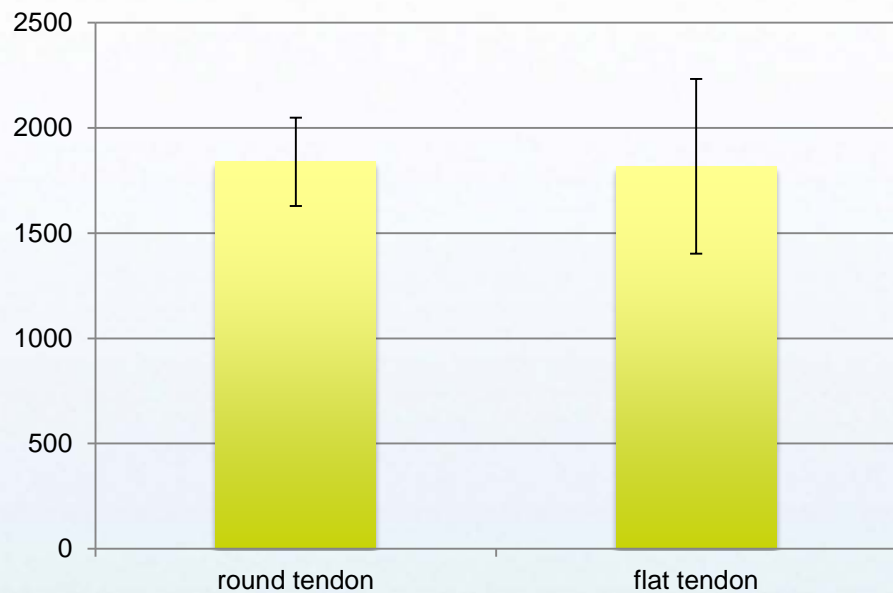
- Kruskal-Wallis Test
- Significance level at  $p < 0.05$



# Results

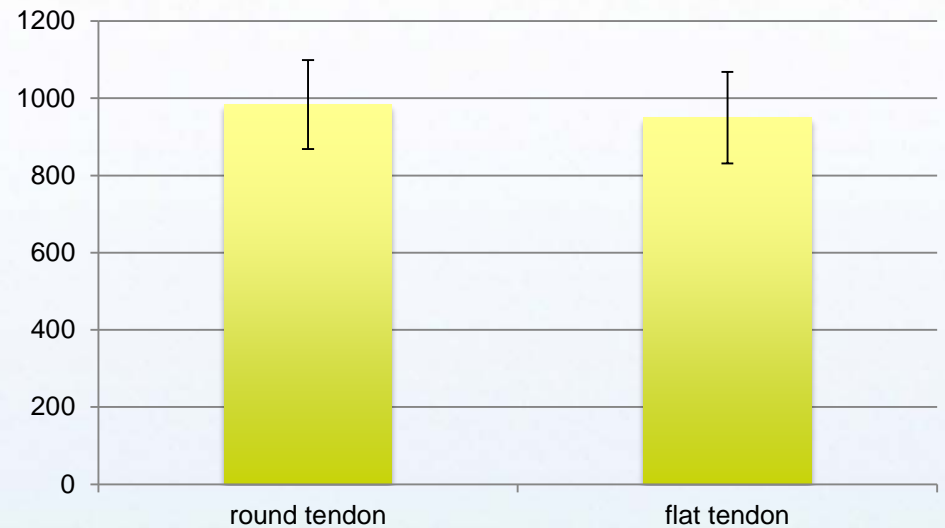
## Semi-T –Size

Fmax (N)



## Gracilis-Size

Fmax (N)

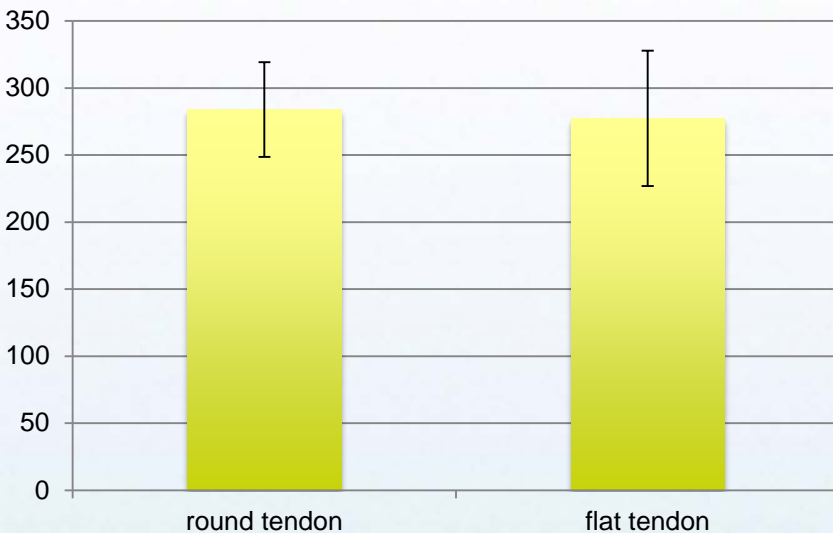


–No significant differences between round tendons and flat tendons

# Stiffness

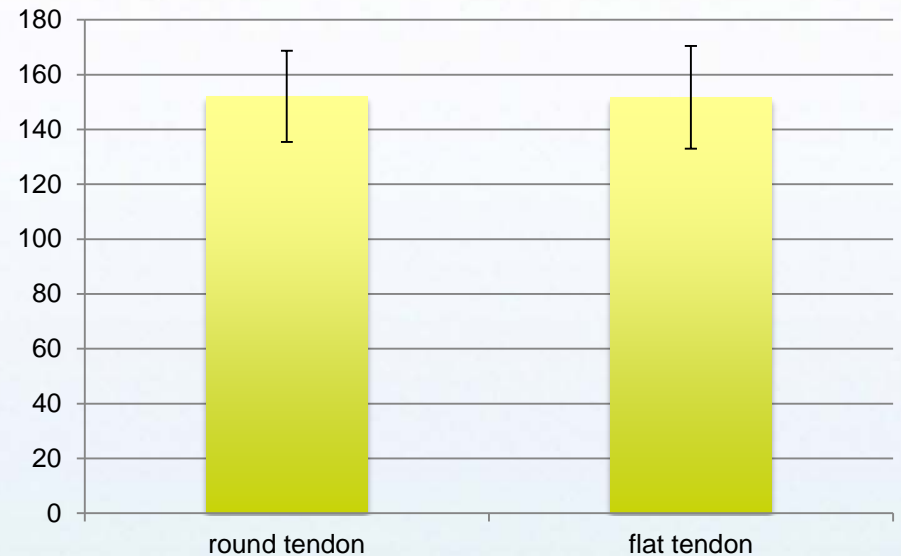
## Semi-T –Size

Stiffness (N/mm)



## Gracilis-Size

Stiffness (N/mm)

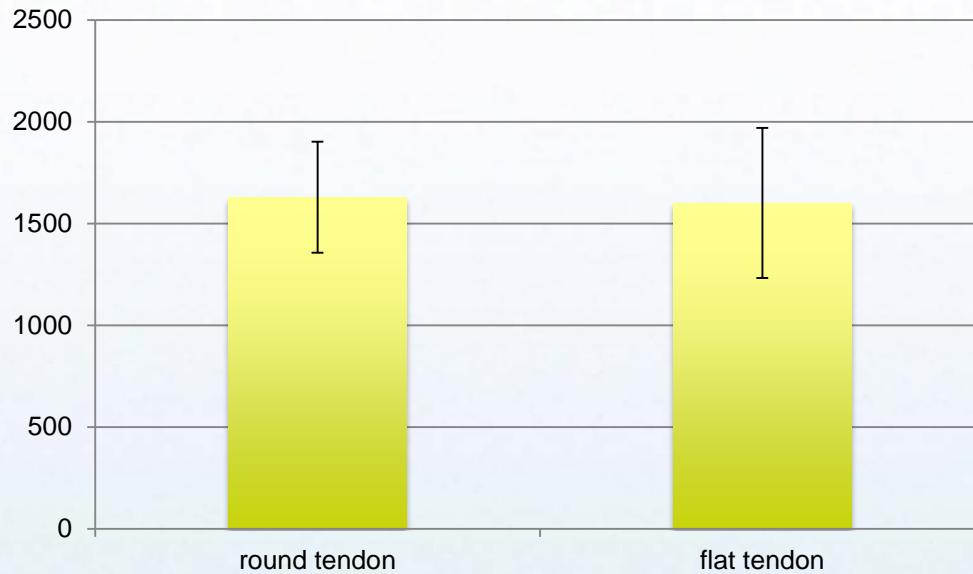


–No significant differences between round tendons and flat tendons

# Yield Load

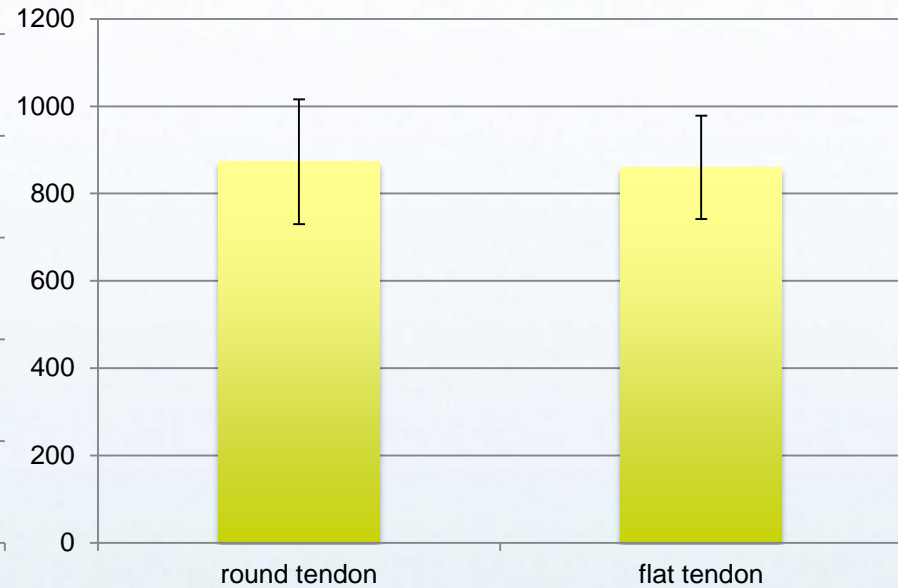
## Semi-T –Size

Yield load (N)



## Gracilis-Size

Yield load (N)



–No significant differences between round tendons and flat tendons

## Discussion / Hypothesis

- ✓ The flat shaped tendons after smoothing process do not show different structural properties in comparison to the original round shaped tendons
- ✓ Therefore the prepared flat tendons seem to be biomechanical stable grafts which have not been harmed by the smoothing process

## Discussion

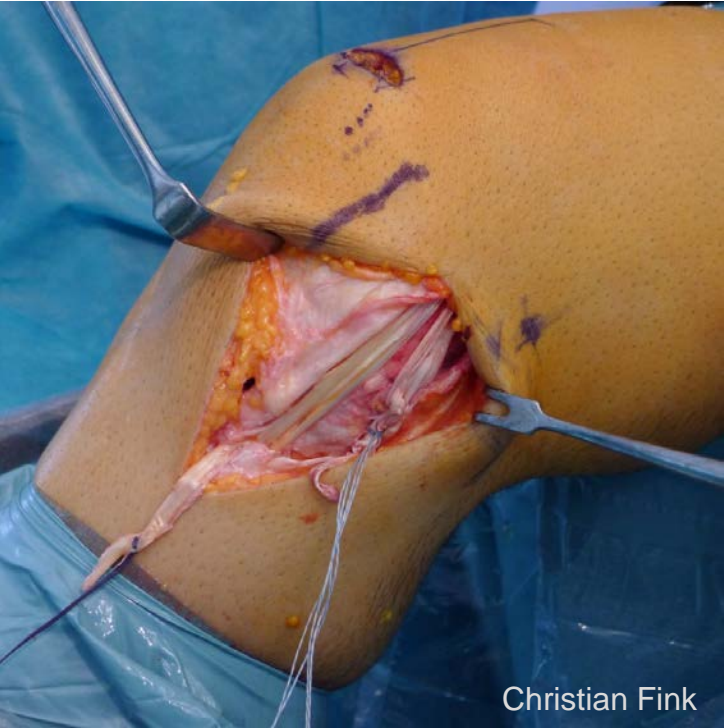
– These biomechanical data show no compromising of the structural properties of the tendon (porcine tendon model)

### – Limitation:

- Porcine tendon model
  - But first experiments with human tendons show similar results
- Just „load to failure“-tests without cyclic testing
- Just biomechanical time point zero data
- No information about biological healing aspects

# Potential use of flat hamstring tendons

## MCL reconstruction



## ACL reconstruction

