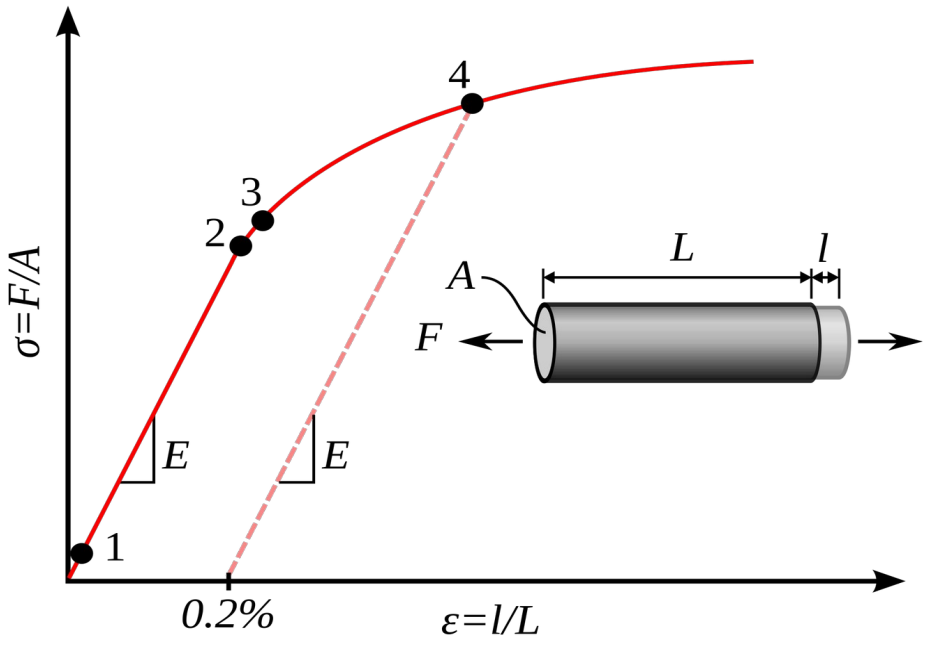
Elasticità



$$\frac{F}{A} = E\frac{\Delta l}{l}$$

Legge di Hooke (quella della molla..)

$\Delta l = allungamento$

$l = lunghezza$

$F = forza\ applicata$

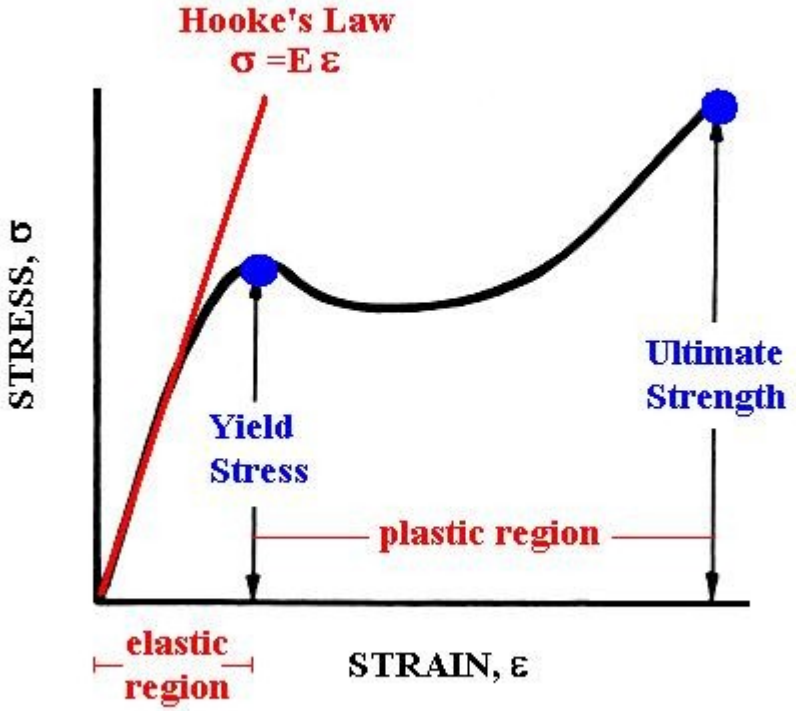
$A = Area$

$E = modulo\ di\ Young\ N/m^2$

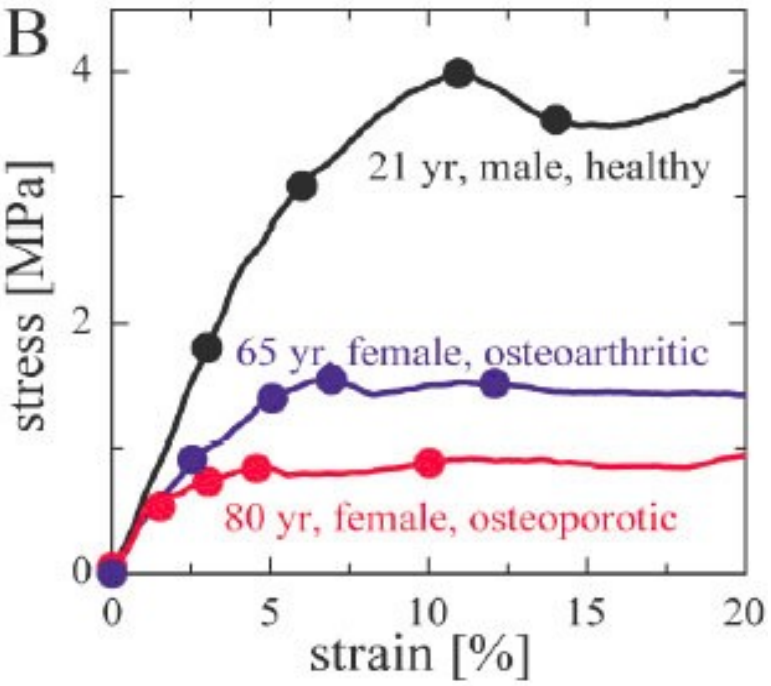
$$\frac{F}{A} = \sigma$$ **Sforzo o stress**

$$\frac{\Delta l}{l} = \epsilon$$ **Stiramento o strain**

STRESS-STRAIN CURVE FOR A TYPICAL MATERIAL



E=Modulus of Elasticity=Young's Modulus



Tendine

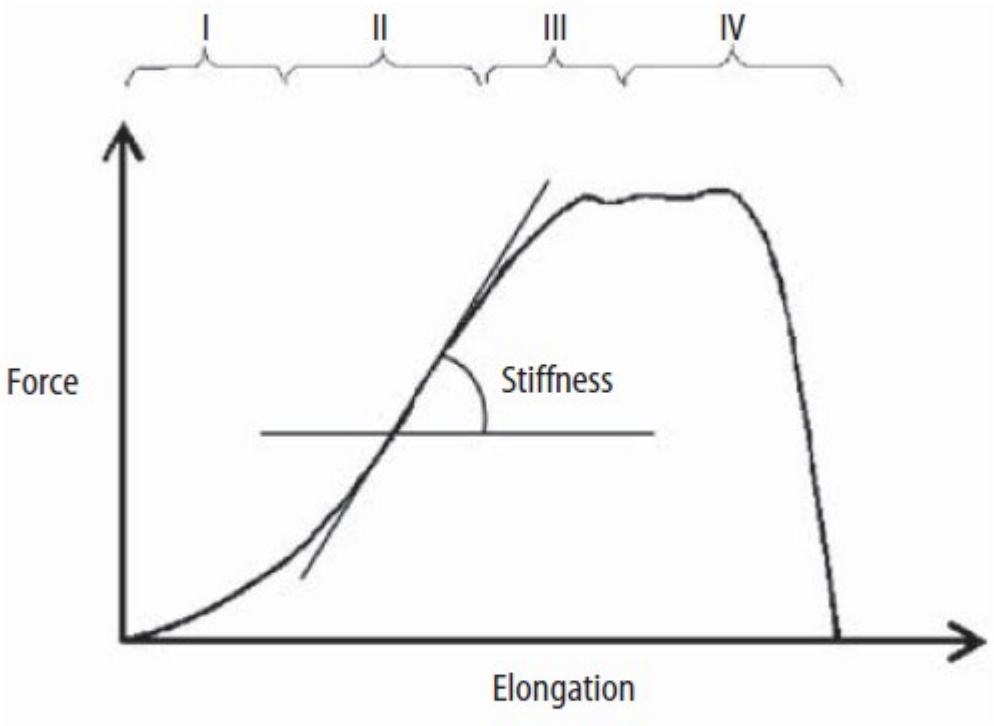
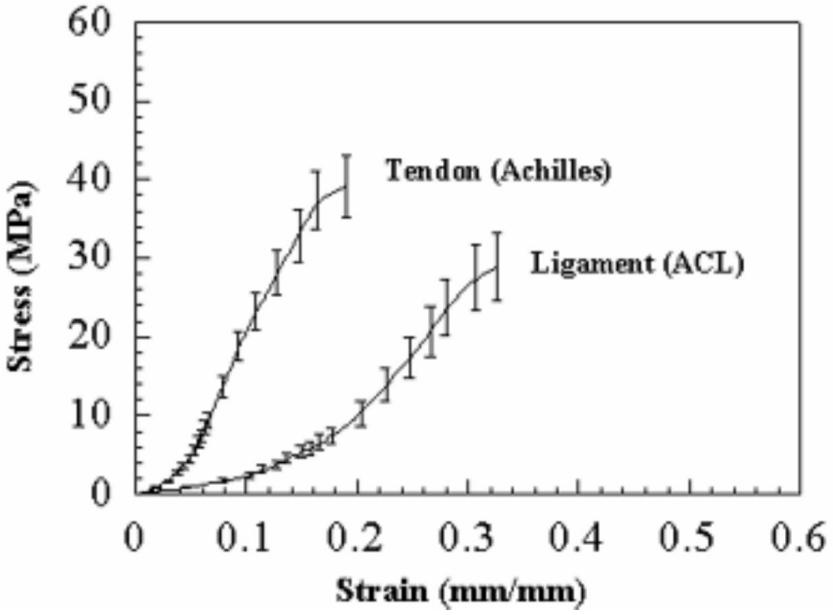


FIGURE 3.1. Typical force–elongation plot in a tendon tensile test to failure. I: "toe" region; II: "linear" region; III and IV: failure regions. Stiffness is the slope of the curve in the linear region.

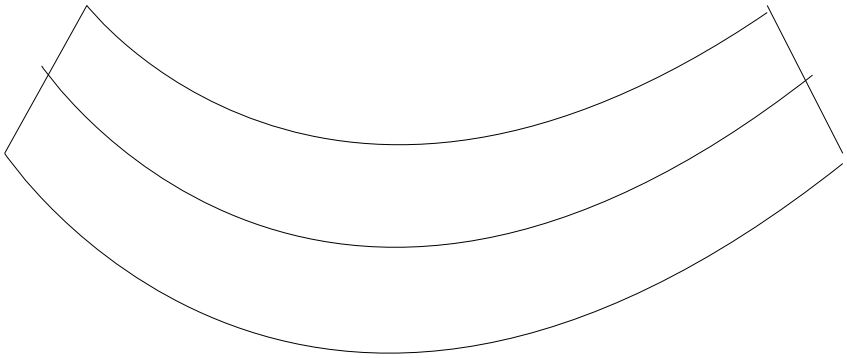
$$E=1.2 \times 10^{9} \ N/m^{2}$$



Tendine: **connette muscolo ad osso +rigido**

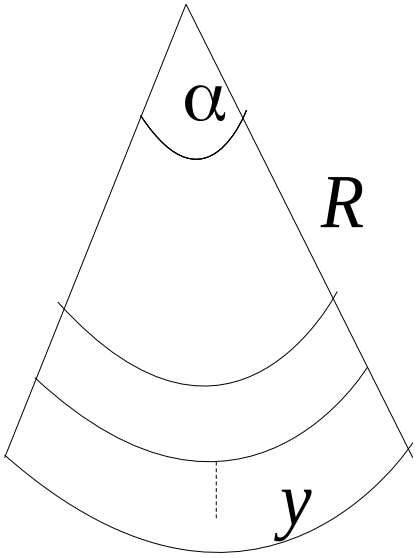
Legamento: **collega ossa diverse +elsastico**

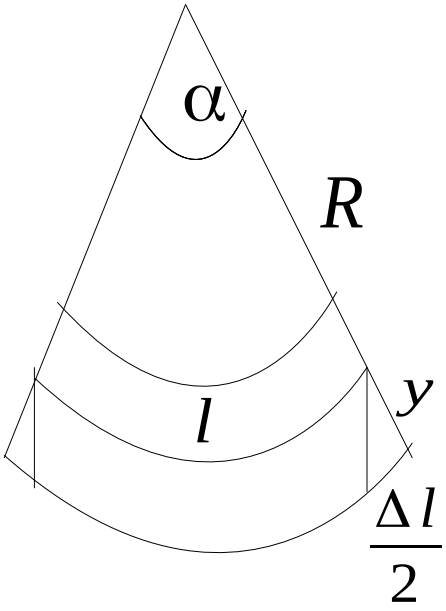
Osso viene deformato lateralmente, non orizzontalmente



l indeformato

$$2\pi : 2\pi R = \alpha : l$$





$$\frac{\Delta l}{2} = \frac{y \sin(\alpha/2)}{\cos(\alpha/2)} = y\, tg(\alpha/2)$$

$$\Delta l = 2\, y\, tg(\alpha/2) \simeq 2\, y\, \alpha/2 = \frac{2}{2}\, y \frac{l}{R} = y \frac{l}{R}$$

$$\frac{\Delta l}{l} = \frac{y}{R} = \epsilon$$

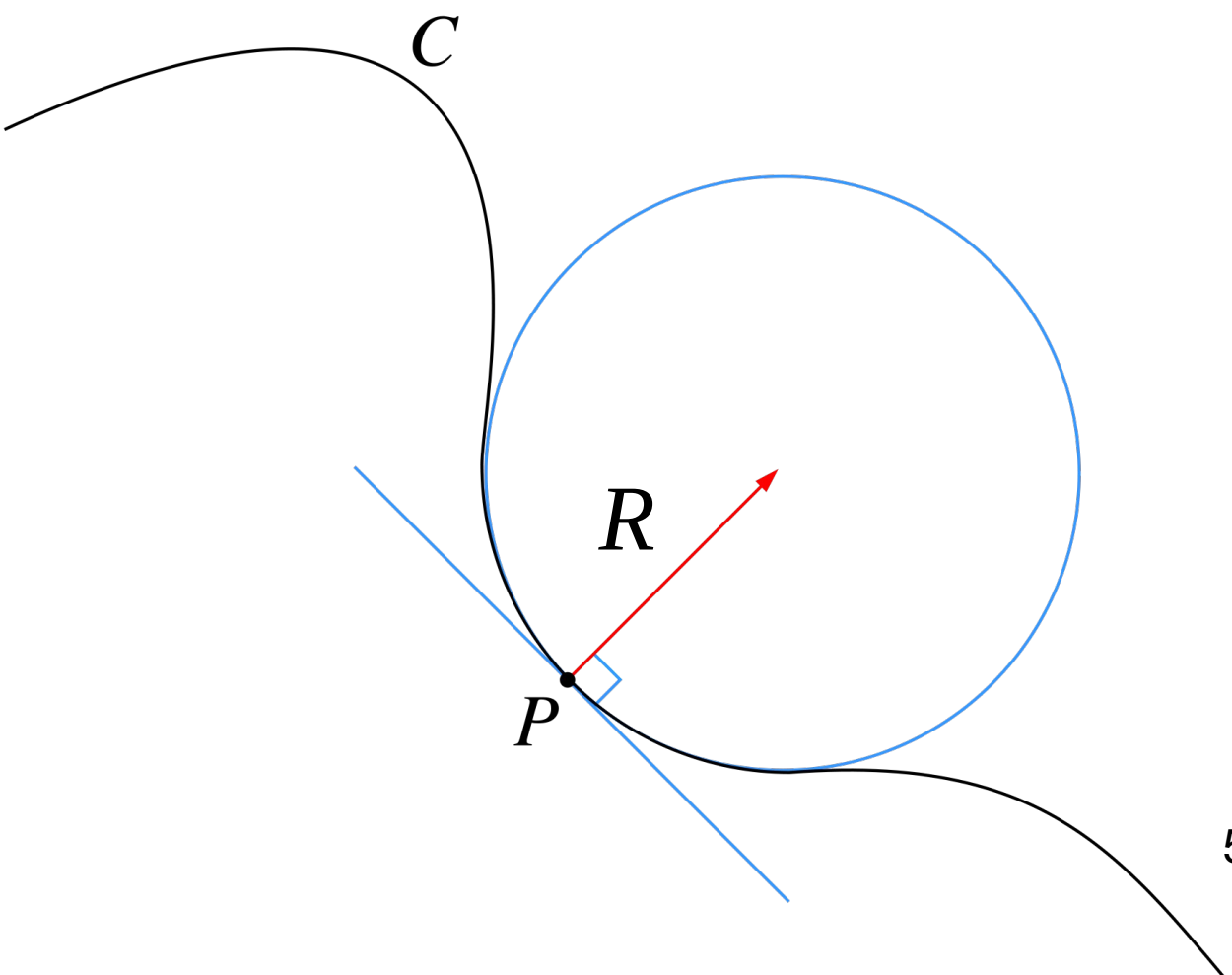
R è raggio di curvatura

Per un osso lo sforzo massimo si ha quando

$$y = r$$

La frattura si ha quindi quando lo sforzo massimo è maggiore del valore di stress che porta a rottura

$$\sigma_{MAX} = E\frac{r}{R}$$



Determinare l'allungamento di un osso (E = 1.8×10^8 N/m^2 in compressione e E = 0.9×10^8 N/m^2 in dilatazione) di lunghezza iniziale 300 mm e diametro a 30 mm per effetto di una forza di trazione di 4 kN.

$$\Delta l = \frac{F}{A}\frac{l}{E}$$

$$A = \pi R^2 = \pi * 0.015^2 = 7.1 \times 10^{-4} \ m^2$$

$$l = 0.3 \ m$$

$$\Delta l = 0.018 \ m \ = 1.8 \ cm$$

Le ossa si deformano meno in compressione che in trazione per i valori diversi del modulo di Young.