Neue Wege in der Perfusionsmessung

Echte dreidimensionale Blutflussvolumenmessungen mit der PixelFlux-Technik

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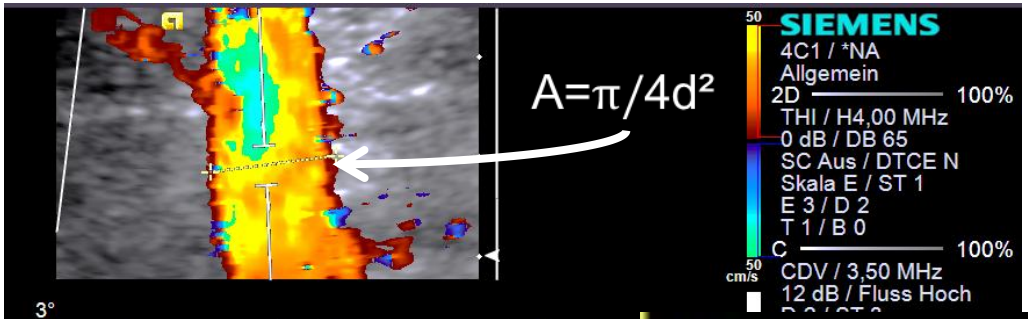
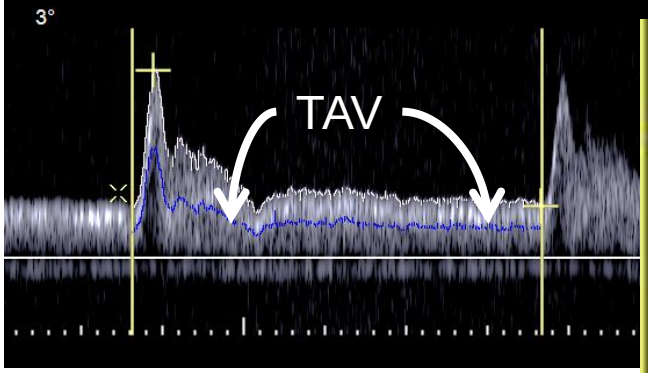
Vortrag auf der Jahrestagung der Sektion Pädiatrie der Deutschen Gesellschaft für Ultraschall in der Medizin (DEGUM), Chemnitz 2014

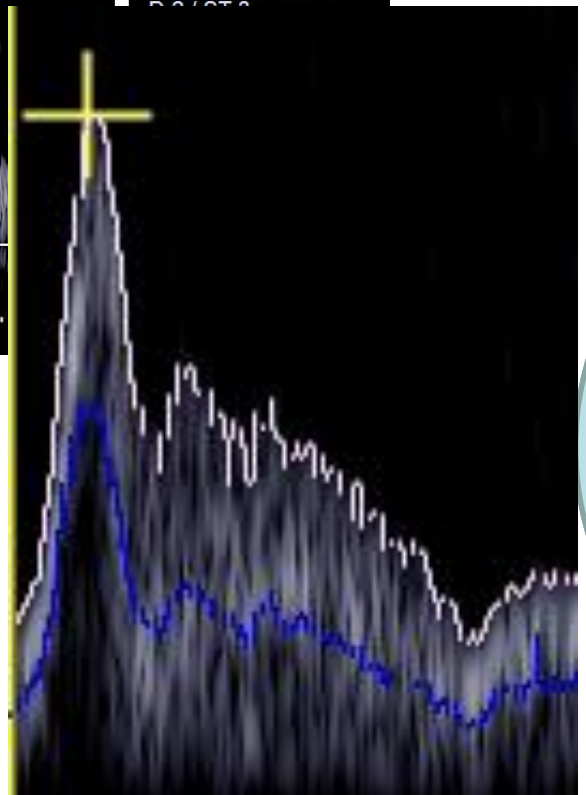
RI

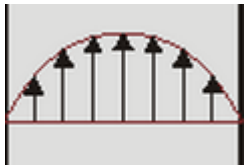
- Unzureichend
  - Weil:
    - Keine Information zum Flußvolumen
    - Einzelgefäß
    - Keine echte Geschwindigkeitsmessung
    - Keine Winkelkorrektur
    - Benachbarte Gefäße im Gewebe unberücksichtigt
    - Gefäßrarefizierung unbemerkt
  - Wird konsequenterweise zunehmend verlassen

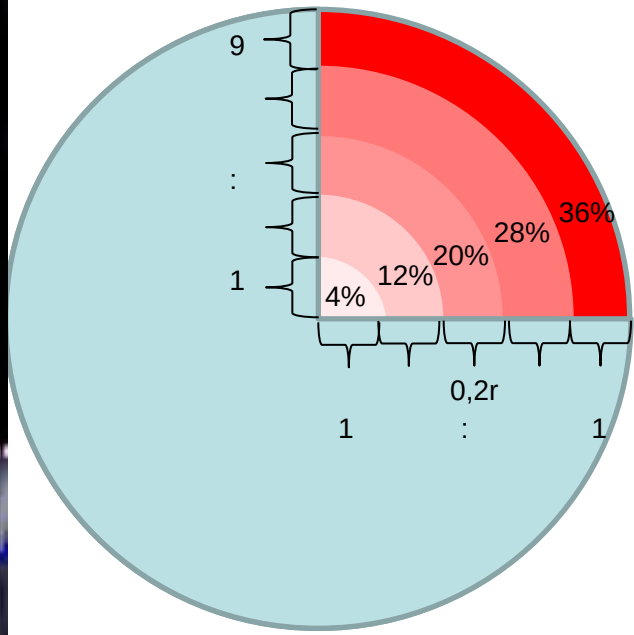
Herkömmliche 2D-Flußvolumenmessung



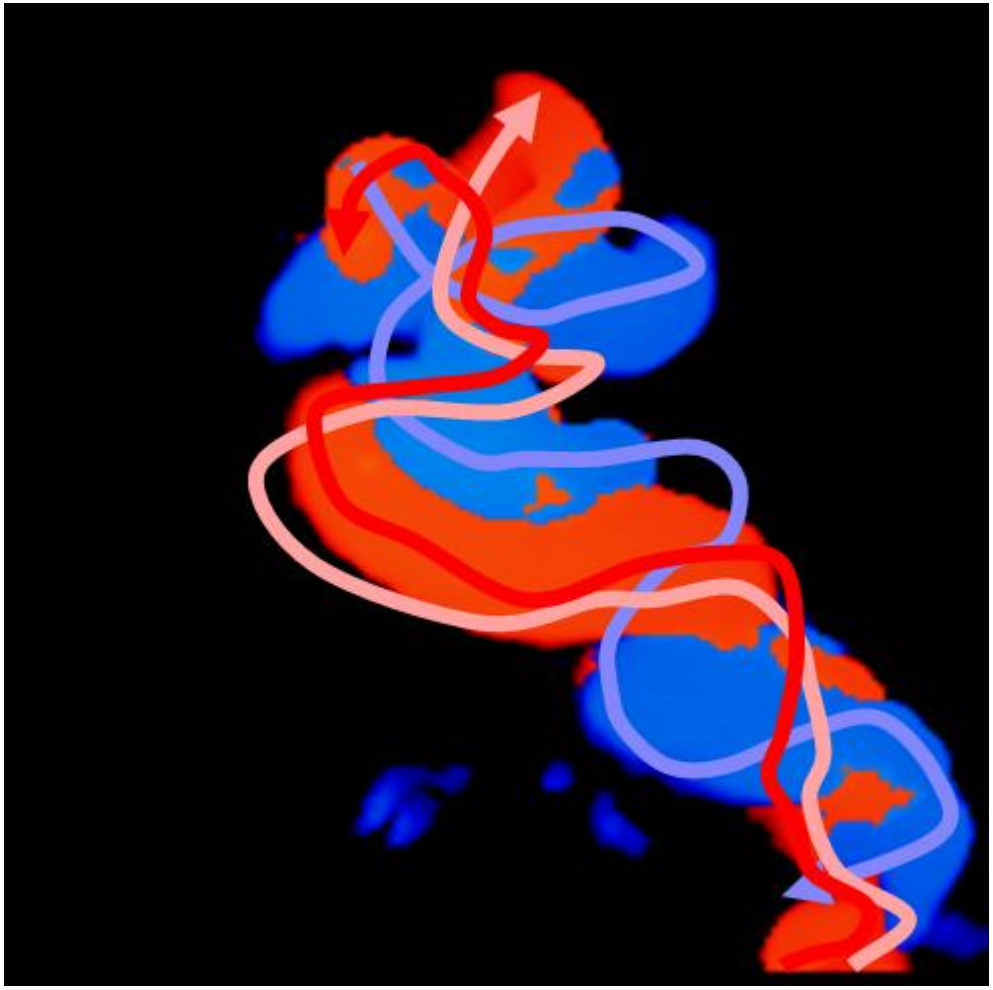






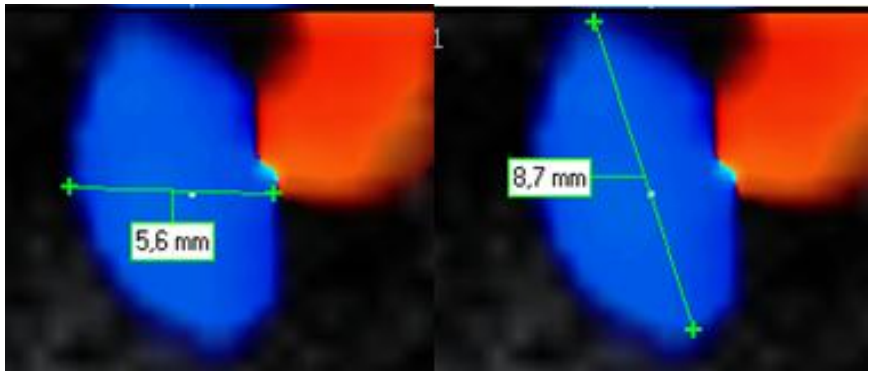


Schwierigkeiten der Perfusionsmessung



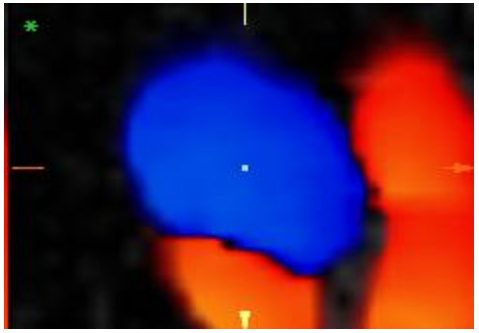
Umbilicalvene

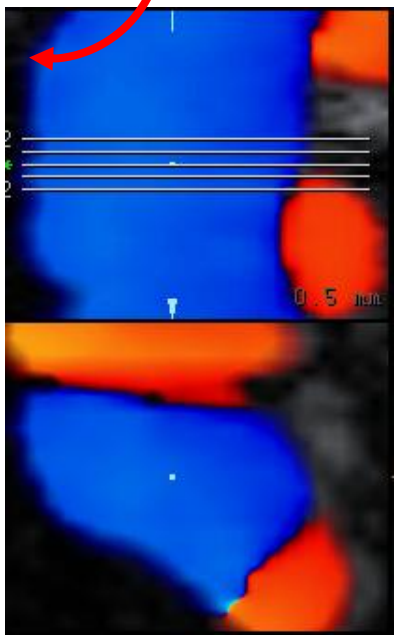
- nicht rund



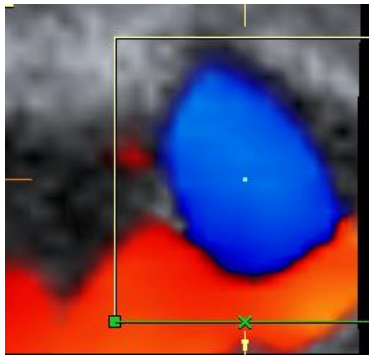
A= 0,24 cm² A= 0,59 cm²

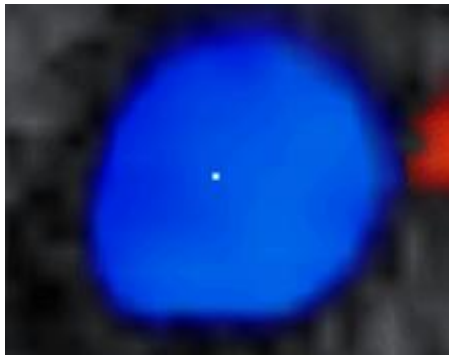
241%

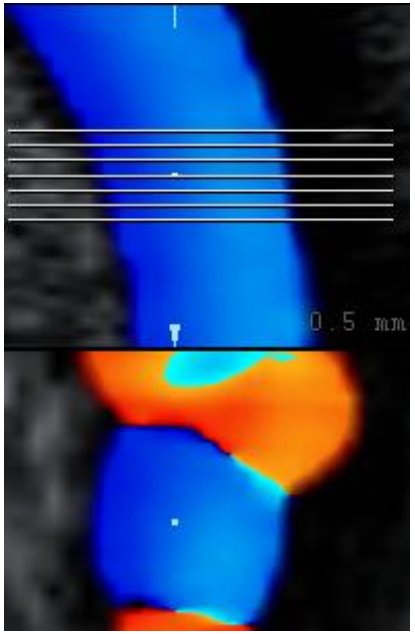




- exzentrischer Fluß



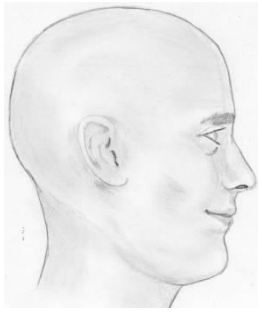


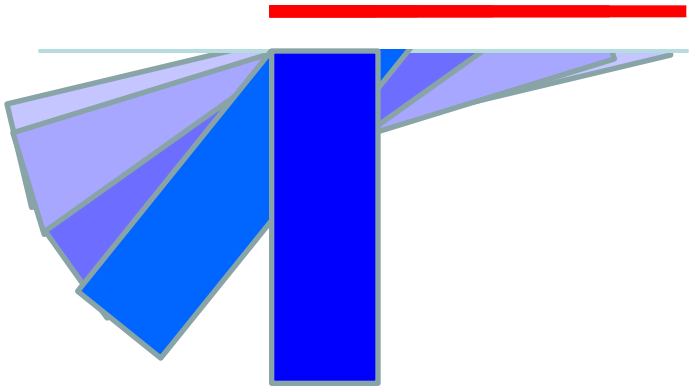


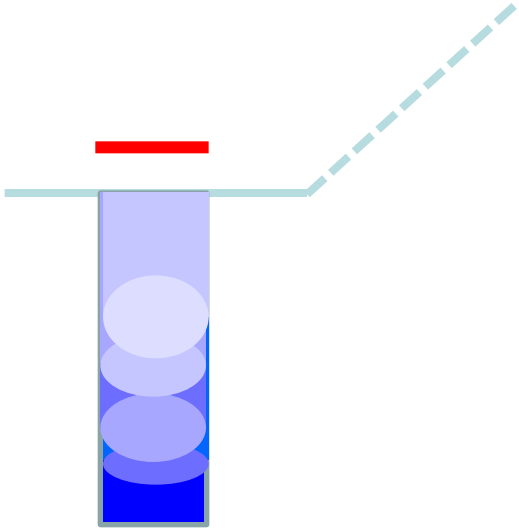
Effekt des Raumwinkels

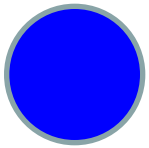
Blick von der Seite

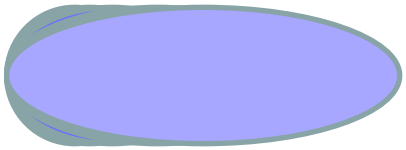
Blick aus Richtung des Betrachters



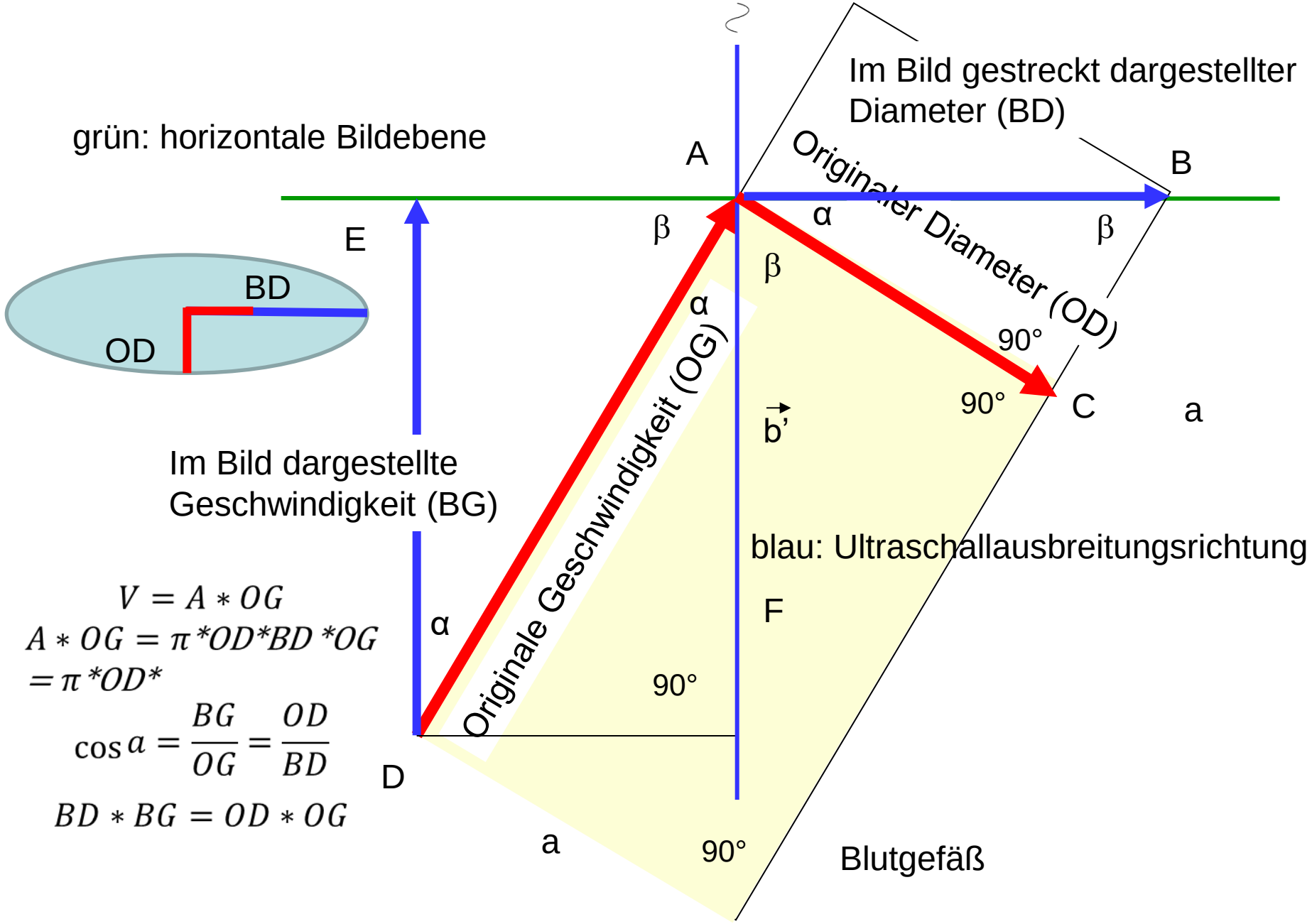








Schallkopfoberfläche



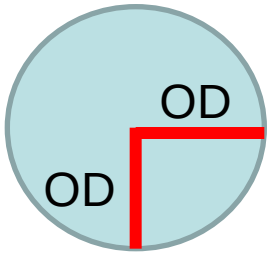
$$V = A * OG$$

$$A * OG = \pi * OD * BD * OG$$

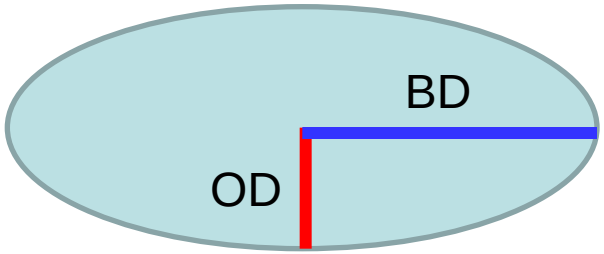
$$= \pi * OD *$$

$$\cos a = \frac{BG}{OG} = \frac{OD}{BD}$$

$$BD * BG = OD * OG$$

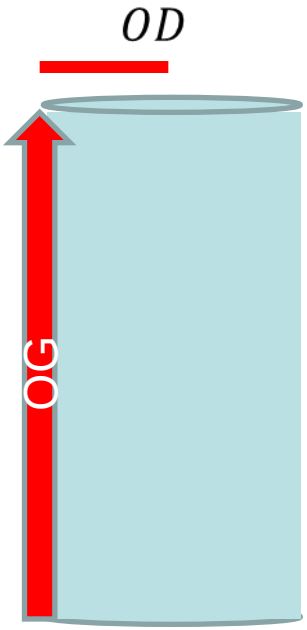


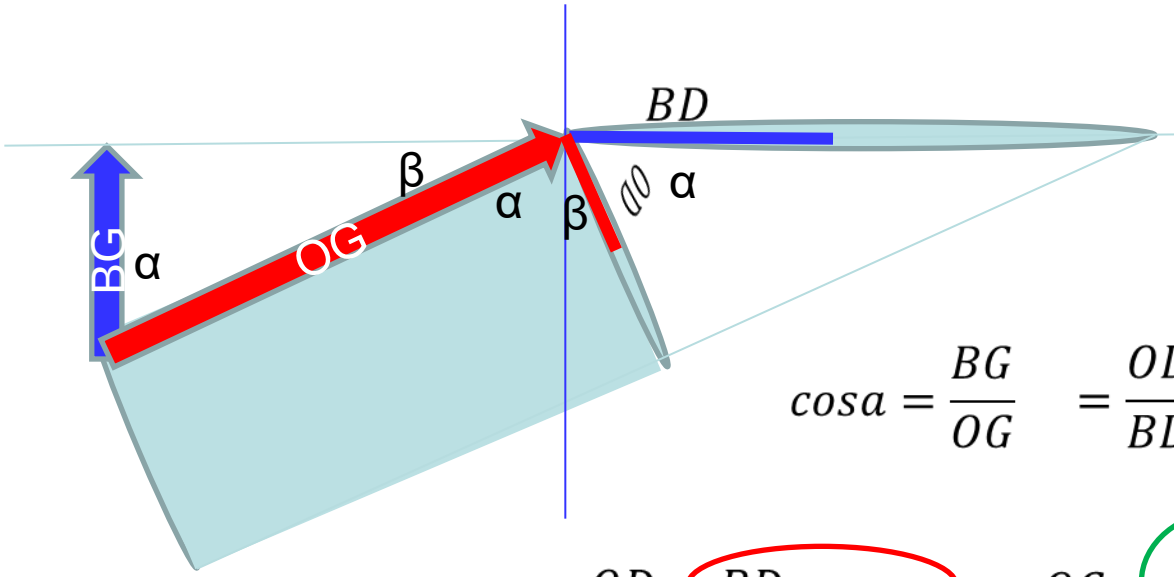
$$\frac{A_B}{A_O} = \frac{BD}{OD}$$



$$V_O = \pi * OD * OD * OG$$

$$V_B = \pi * OD * BD * BG$$





$$cosa = \frac{BG}{OG} = \frac{OD}{BD}$$

$$OD = BD * cosa \qquad OG = \frac{BG}{cosa}$$

$$V_O = \pi * OD * OD * OG = \pi * OD * BD * cosa * OG$$
$$= V_B = V_O$$