Supplementary material

This appendix describes the relation of the translational (T) and compressive force (C) force vectors to the geometric parameters radius (r) and concavity depth (d) of the ball-and-socket configuration (Fig. a).

The BSSR approximates the ratio of the peak translational force causing dislocation and the compressive load that provides stability: (Fig. aa)

$$BSSR = \frac{T}{C} \tag{1}$$

On the basis of Pythagorean trigonometric identities, the right triangle formed by (T), (C) and the resulting hypotenuse (R) (Fig. ab), was put in relation to the right triangle formed by geometrical entities of the ball-and-socket configuration including (r), (d), or combination thereof: (Fig. ac)

$$\tan\alpha = \frac{C}{T} \tag{2}$$

$$\sin\alpha = \frac{r-d}{r} \tag{3}$$

The relation between sin α and tan α leads to following equation:

$$\sin\alpha = \frac{\tan\alpha}{\sqrt{1+\tan^2\alpha}} \tag{4}$$

When inserting (3) in (4)

$$\frac{\tan\alpha}{\sqrt{1+\tan^2\alpha}} = \frac{r-d}{r}, \tag{5}$$

(2) in (5)

$$\frac{\frac{C}{T}}{\sqrt{1+\left(\frac{C}{T}\right)^2}} = \frac{r-d}{r} \tag{6}$$

and finally solve for $\frac{C}{T}$

$$\frac{C}{T} = \frac{\frac{r-d}{r}}{\sqrt{1-\left(\frac{r-d}{r}\right)^2}}, \tag{7}$$

the BSSR can be calculated with the geometric entities (r) and (d):

$$BSSR = \frac{\sqrt{1-\left(\frac{r-d}{r}\right)^2}}{\frac{r-d}{r}} \tag{8}$$
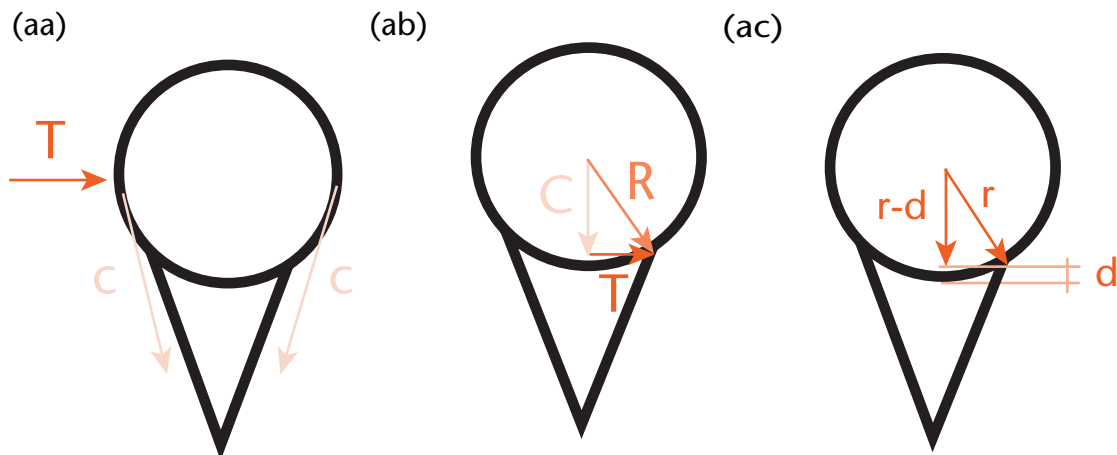

Fig. a

aa) Schematic drawings describing the translational force (T) in a certain direction and the load (C) compressing the humeral head into the glenoid socket. ab) The two legs of a right triangle, compressive force (C) and translational force (T) form the resulting hypothenuse (R). ac) This right triangle can be described by the geometric measures of the glenohumeral joint including the radius (r), concavity depth (d) and the difference of both. (Reprinted with permission from **Moroder P, Ernstbrunner L, Pomwenger W, et al.** Anterior Shoulder Instability Is Associated With an Underlying Deficiency of the Bony Glenoid Concavity. *Arthroscopy* 2015;31:1223-1231.)