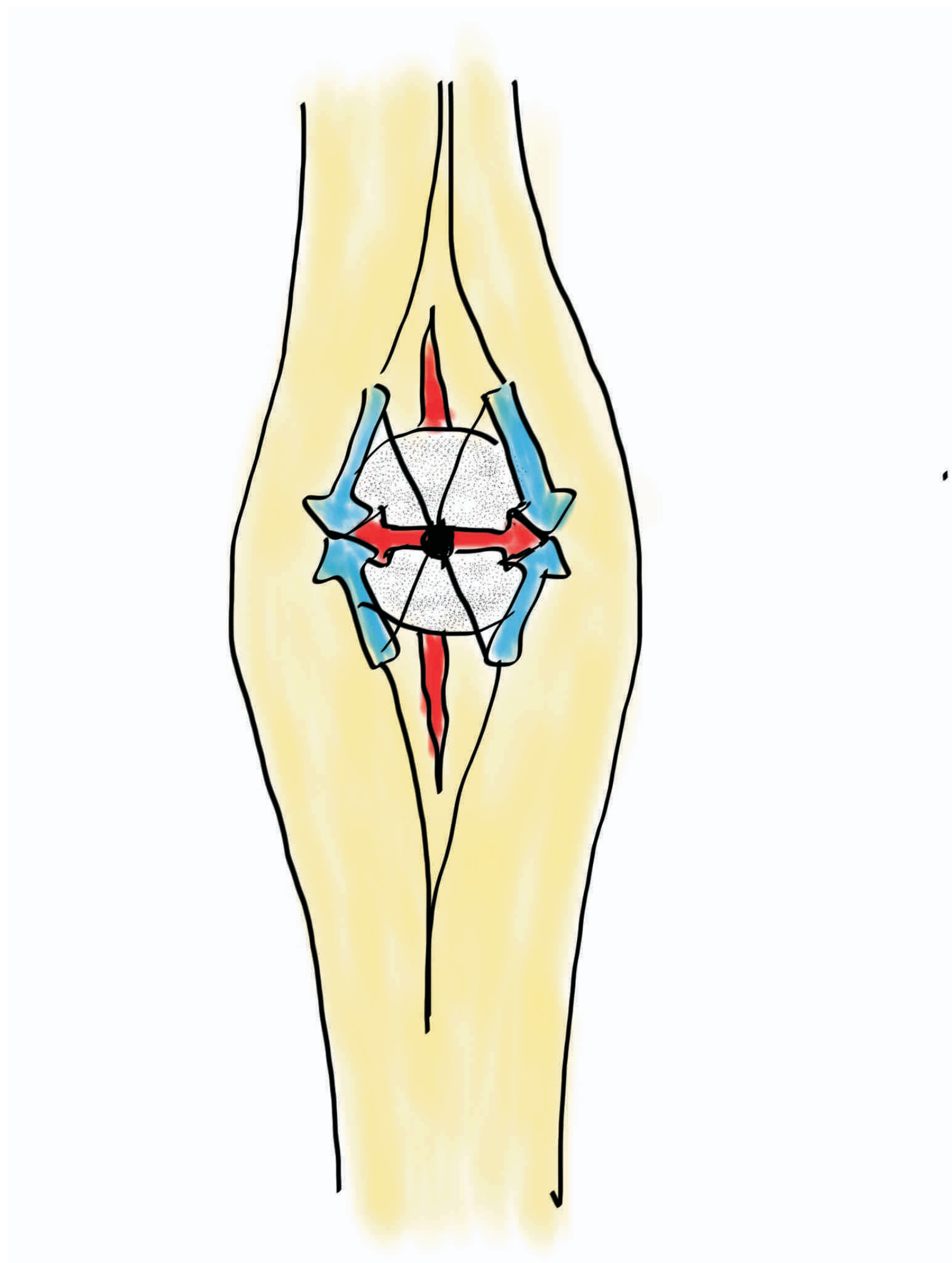


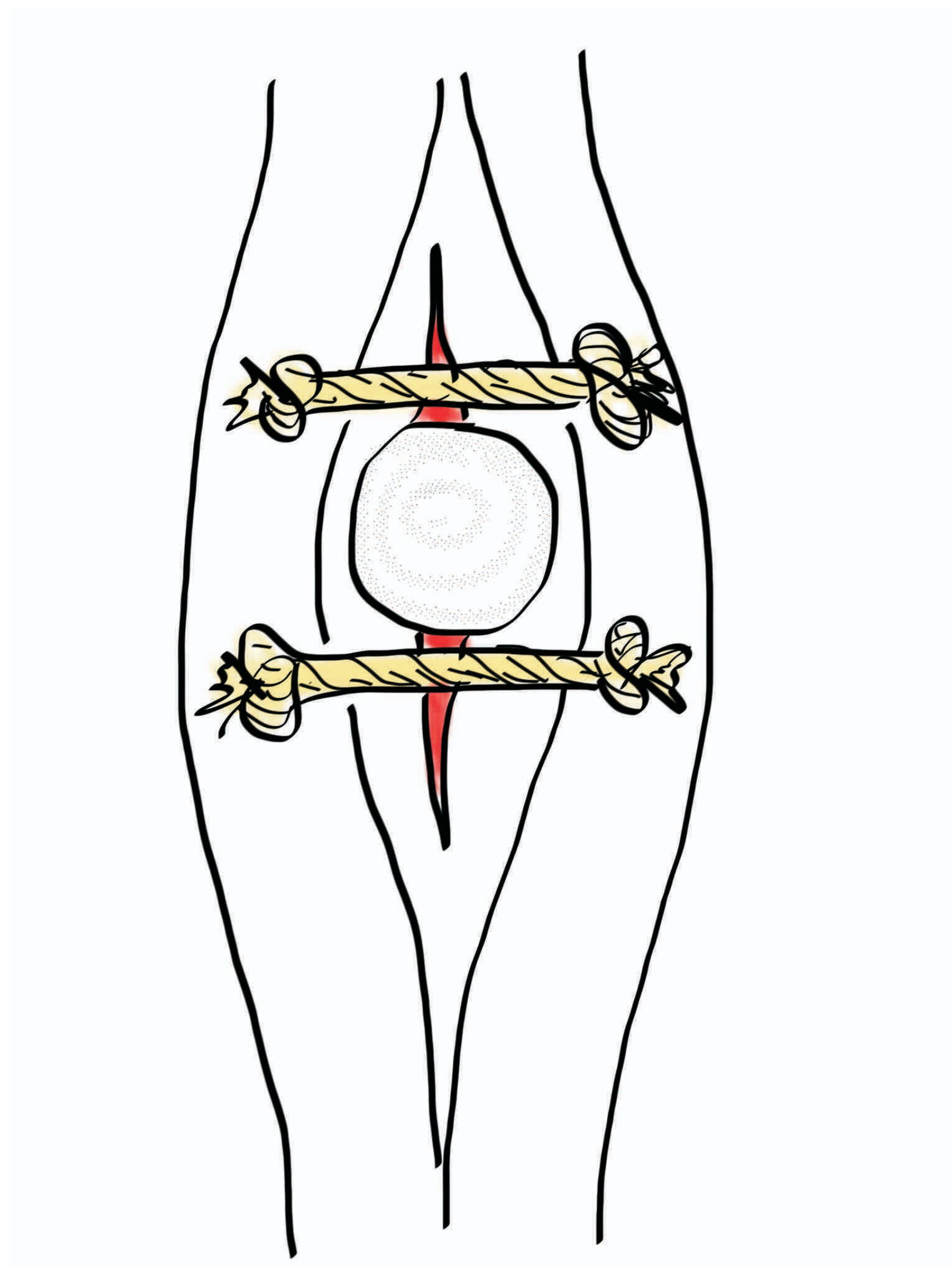
Tree Inspired Optimum Fibre Orientation against Bearing Stress and Lateral Tension

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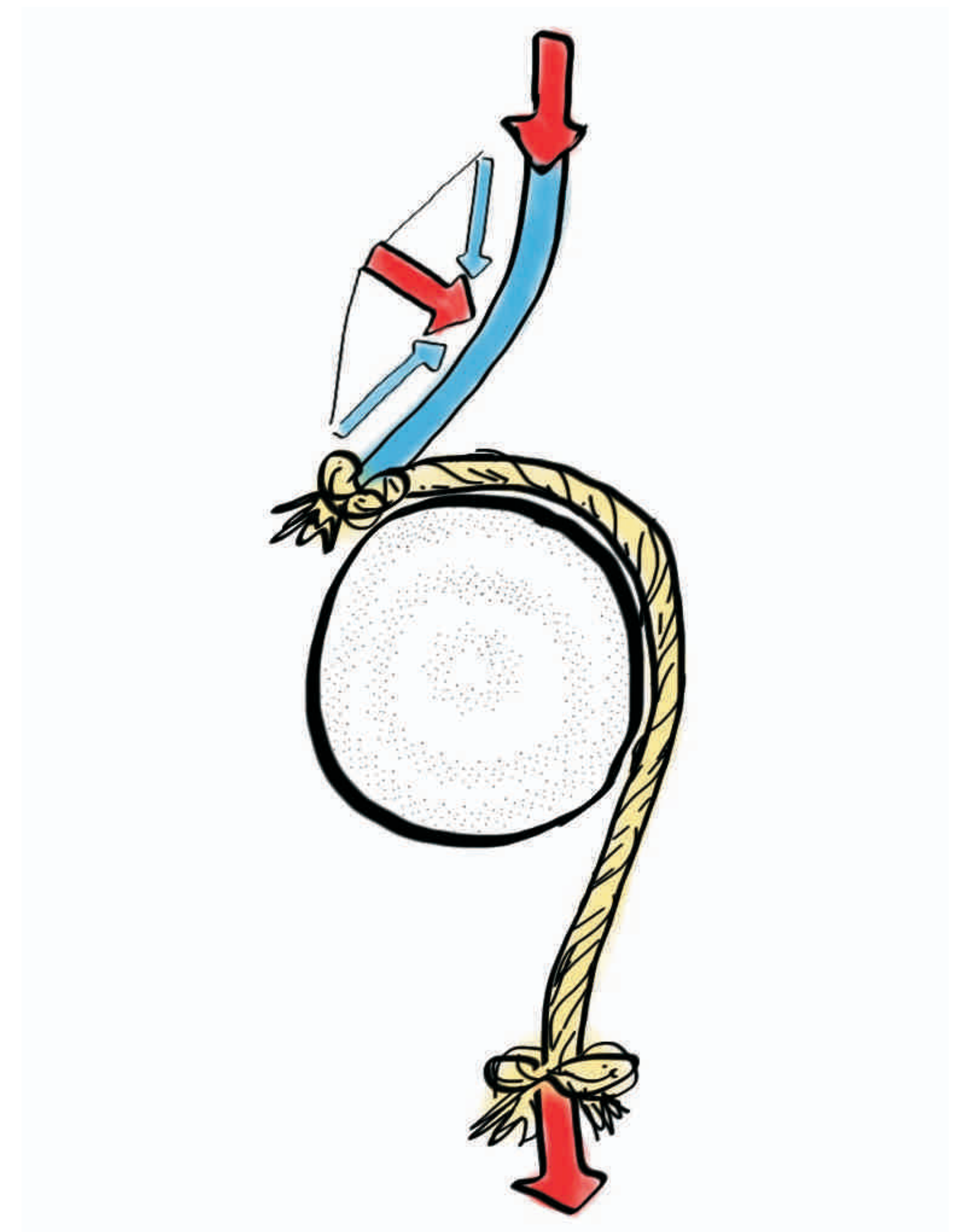
Branch knots loaded in compression may lead to global failure of trunk by fibre kinking.



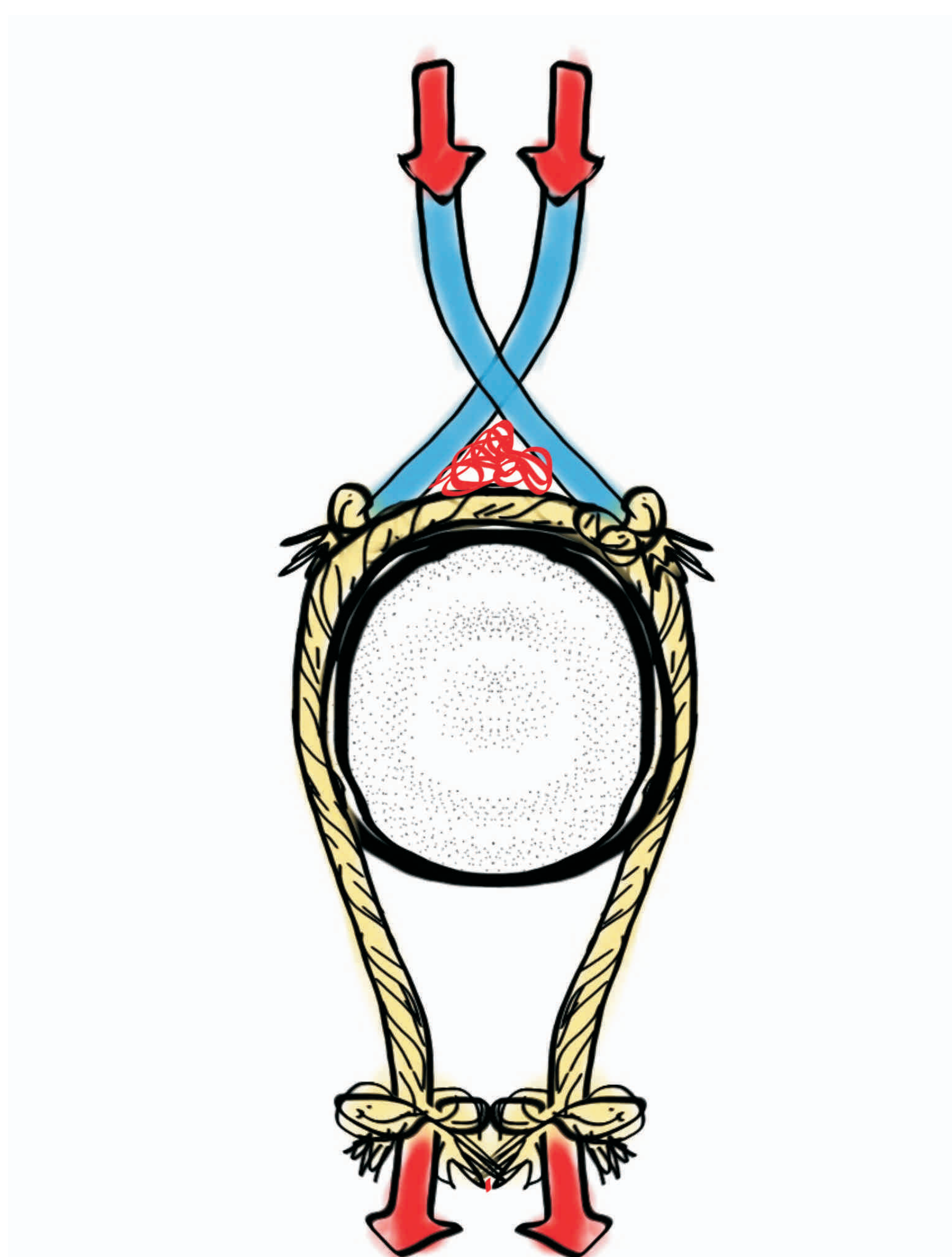
Failure mode is caused by lateral tensile stresses (red arrows) which start vertical cracks above and below branch cross-section. Finally fibre bundles separated by those cracks start to kink and global failure of the trunk completes the failure mode.



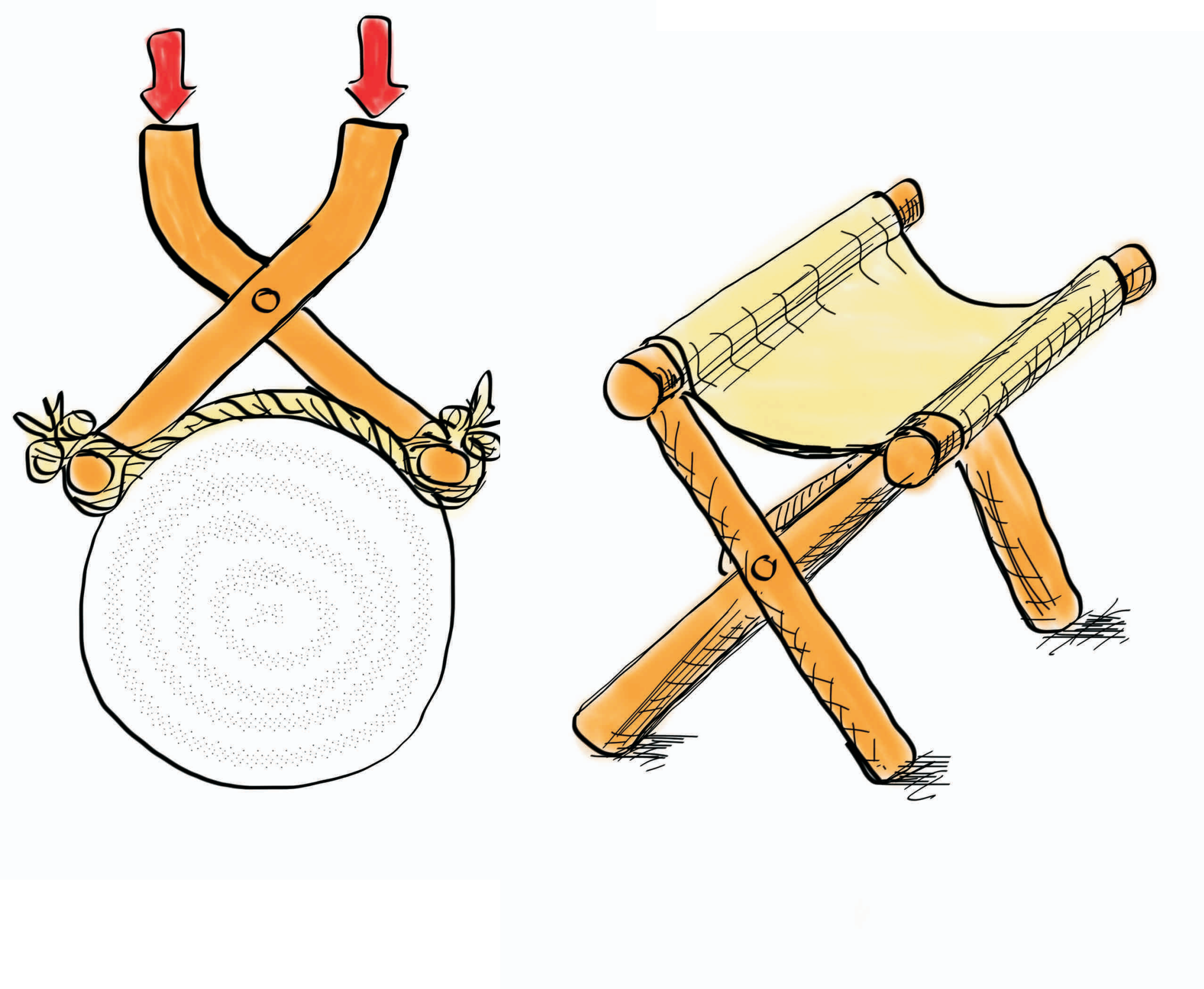
Horizontal grain bridging the prospective cracks could prevent this failure mode.



Curved fibres above the branch are bent inward due to lateral forces. Often these fibres bend abruptly into a horizontal tension sling just above the branch.



Compression-tension converters may switch their orientation over the years. Red interwoven area in between the curved compressed fibres is here loaded in compression.



Function of these compression-tension converters can be easily explained by looking at a camping stool.



Natural example.

Result: Fibre slings can convert compression into tension!