Cruciate ligament prosthesis: strength, creep, and fatigue properties


Abstract: The mechanical properties of the Richards polyethylene ligament implant were studied and compared with the strength of human cruciate ligament preparations. The implant yields and plastically deforms at a force of 420 newtons (ninety-four pounds) and approximately 10 per cent elongation when tested at a strain rate of 100 per second. This is one-fourth the average tensile strength of the human anterior cruciate ligament preparations. When tested at a strain rate of 1 per cent per second the implant's yield-point force was lowered by 15 per cent. The implant exhibits considerable viscoelastic behavior and will progressively elongate under repetitive loads when insufficient time is allowed for it to return to its original length. In bending, the implant did not fail after eighty million stress reversals (forty million revolutions) when tested while immersed in saline solution at body temperature. The tests indicate that the tensile strength of the implant is low in comparison with both the strength of human preparations and estimates of actual in vivo functional loads. We conclude that caution is required in the use of this implant.