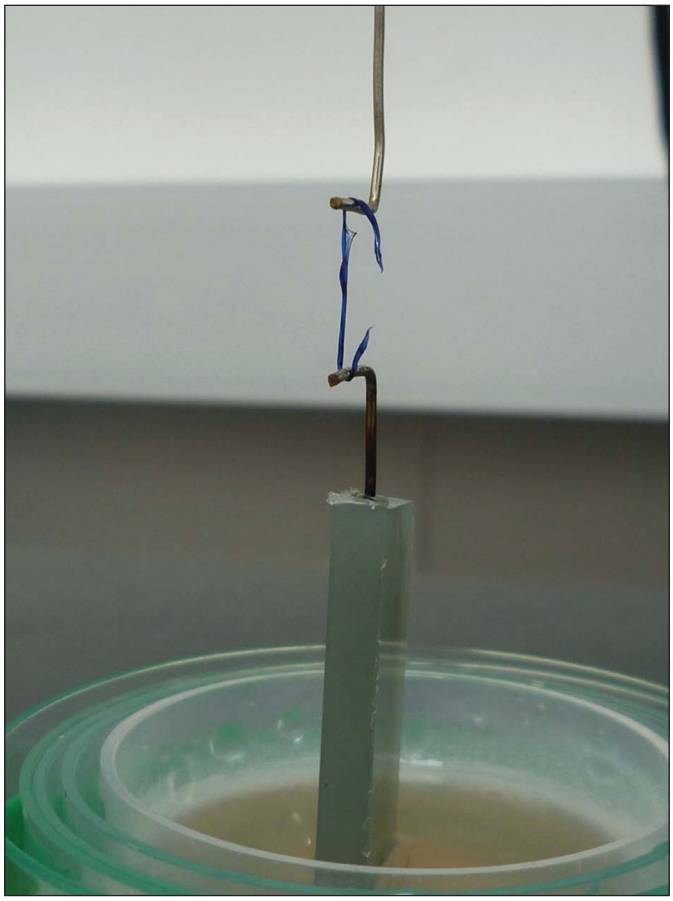

**Figure 1.** The ring-shaped specimen at the time of rupture. The chamber was removed and the capsule was stained with trypan blue for better visualization. The lower pin is fixed; the upper one is incorporated with the force transducer.

Mechanical testing was carried out with a high-precision testing machine. The specimen support consisted of two polished metal pins. It was submerged into room-temperature balanced salt solution during the test to prevent dehydration of the tissue. The ring-shaped specimen was slipped carefully over the two pins. One pin incorporated a force transducer that was separated from the other one until the capsule ring was torn (Fig 1). The software of the testing machine continuously created a force vs displacement curve.

Figure 2 shows a typical force vs displacement diagram. The curve can be divided into two sections: first, the flat part of the curve presumably reflects a gradual alignment of the collagen network in the direction of stretching; the second, steep part reflects that the molecules become load bearing.[15] Note that the second part of the curve is at least as long as the first one. This suggests that the collagen network remained relatively intact and is able to bear a remarkable load. According to this, the denaturation of collagen caused by thermal damage is not significant. The graph also shows that the

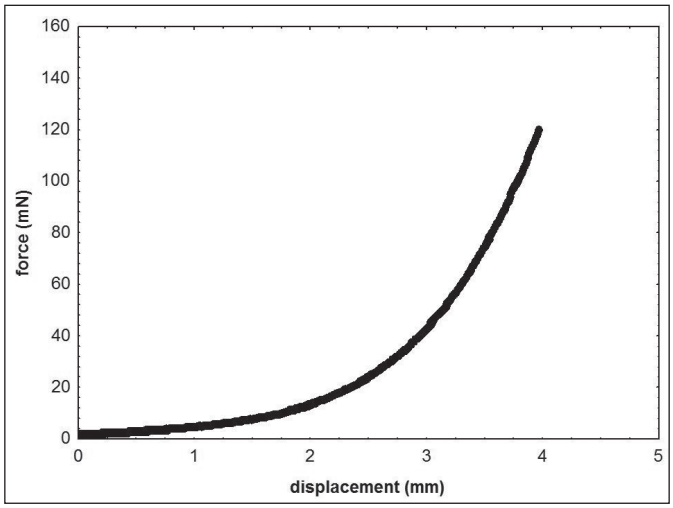


**Figure 2.** A typical force vs displacement diagram.

rise in force is steep and the curve ends suddenly. This characteristic is useful from a clinical point of view because a surgeon may feel the stretching limit of the capsulotomy during surgical maneuvers.

The impact of stress concentration at points of microgrooves on mechanical stability of femtosecond laser capsulotomy is unclear at this time. In our opinion, further mechanical and histological examinations should be performed for a correct answer.

Laboratory and clinical studies are controversial, but in summary, they assumed that a capsulotomy created by femtosecond laser differs from manual capsulorrhexis from a biomechanical point of view and this should be taken into consideration by the surgeon. If the surgeon respects the learning curve, it may contribute to the safety of the operation. According to our preliminary laboratory results and own clinical experiences, femtosecond laser capsulotomy has a remarkable strength and stretching capacity and more than adequate resistance for a safe phacoemulsification and a successful IOL implantation.

## References

1. Marques FF, Marques DM, Osher RH, Osher JM. Fate of anterior capsule tears during cataract surgery. *J Cataract Refract Surg*. 2006;32(10):1638-1642.
2. Gimbel HV, Neuhann T. Development, advantages, and methods of the continuous circular capsulorhexis technique. *J Cataract Refract Surg*. 1990;16(1):31-37.
3. Luck J, Brahma AK, Noble BA. A comparative study of the elastic properties of continuous tear curvilinear capsulorhexis versus capsulorhexis produced by radiofrequency endodiathermy. *Br J Ophthalmol*. 1994;78(5):392-396.
4. Trivedi RH, Wilson ME Jr, Bartholomew LR. Extensibility and scanning electron microscopy evaluation of 5 pediatric anterior capsulotomy techniques in a porcine model. *J Cataract Refract Surg*. 2006;32(7):1206-1213.