A NEW prototype atomic edged (BD) disposable ceramic blade approaches the quality of a diamond blade while offering the convenience of a disposable, according to Romesh Angunawela MRCOphth, The Rayne Institute, St Thomas’ Hospital, London, UK.

“The cutting performance of this disposable prototype atomic edged blade is an improvement on conventional steel and brings this disposable blade closer to the bench mark diamond blade in performance,” Dr Angunawela told the XXII Congress of the ESCRs.

Dr Angunawela used electron microscopy to compare the cutting edges of the three blade types, unused stainless steel, diamond, and the new disposable atomic edged blades. While the cutting edges of the diamond and ceramic blades were relatively smooth under electron microscopy, the difference to the steel edge blade was dramatic, demonstrating an uneven and serrated edge profile. He explained that the steel edge imperfections were an artefact of the manufacturing sharpening process.

He investigated the corneal wound profile by using scanning electron microscopy (SEM) of central corneal stab incisions and linear incisions of fixed organ cultured human corneas. According to cross sections of the electron micrographs of mini-incisions, the corneal cut morphology appeared clean and smooth with the diamond and atomic blades, while the morphology after steel blade incisions was not.

Dr Angunawela pointed out that the effect of the shearing force of the steel blade as it traversed through the corneal stroma caused irregular stromal damage. There was little observable difference in the wound profile of the atomic edged and diamond blades on SEM, which both appeared smooth. According to the investigators, the risk of transmissible primary infections during surgery is a very real risk for British ophthalmic surgeons. Therefore, an increase in the use of disposable instrumentation, not only in cataract surgery but also in corneal and refractive surgery, seems a logical and welcome development.

They explained that the physics involved in measuring blade sharpness is very complex. To measure the sharpness of the three different blades, the researchers defined it as the force required to penetrate the test medium, using a microdrive and a strain gauge to measure the forces, in Newtons (N) per square millimetre. The repeatability of this method was within an acceptable range (+/- 3.56 N/mm²).

As expected, the diamond knife required the least force, 2.24 N/mm² (SD 0.06), to penetrate the test medium. The steel blade required much more force, 71.94 N/mm² (SD 3.56), while the force required of the ceramic blade lay somewhere between the two, 42.10 N/mm² (SD 1.93).

In addition to the objective, measurable data presented by the investigating team, some of the surgeons participating at the congress were curious about the subjective feel of the knife, saying that experienced surgeons have a feel for the cut they are making and the sharpness of the instrument they are using. Dr Angunawela could verify his results, confirming from his viewpoint that the atomic edged blade felt closer to a diamond than steel knife when penetrating tissue.

Dr Angunawela and his team studied the pressure required to cause wound gape following corneal incision. The corneas were maintained in normal culture for a week before the researchers pressured them and observed for wound gape through an operating microscope.

The diamond incisions performed worst, causing wound gape at pressures as low as 20 mmHg. Surprisingly, the atomic edge blade seemed to require the most amount of pressure 40 mmHg to cause wound gape, he reported.

The team investigated wound healing using light microscopy (LM) of corneas fixed at four hours and four days following incisions, in each group. They recorded epithelial closure rates with a tandem scanning confocal microscope.

There was no distinguishable difference in corneal wound healing between the three blades based on LM analysis. Epithelial closure rates were comparable for all three blades with complete closure of the wound gape by 36 hours.

“It would appear that this novel ceramic blade approaches the performance of diamond blades with the added convenience of single use. I am told by the manufacturers (BD) that the cost should be comparable to that of steel blades,” he affirmed.