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Commentary on Accuracy and Precision in Producing the LASIK Flap

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Since Pallikaris introduced the LASIK technique, it has become the most popular procedure for photorefractive surgery[1]. As LASIK involves cutting an initial flap, less stromal bed will be left after the procedure. Cornea ectasia is a serious complication of LASIK, and although most surgeons accept that it is caused by insufficient residual corneal thickness[2], there is no definite proof for this presumed etiology. The microkeratome plays an important role in making the flap. Variation in flap thickness induced by microkeratome cutting affects residual corneal thickness and may be related to the corneal ectasia. Microkeratomes are designed to cut predetermined flap thicknesses according to the manufacturer's specified head gap. The distance between the fixed microkeratome plate and the edge of the metal blade determines the thickness of the flap. An ideal microkeratome should produce a corneal flap of the desired thickness with consistency. Several other factors may also be important in determining flap thickness: quality and entry angle of the blade, translation and oscillation rate, consistency across the cornea, suction ring pressure setting and suction duration, mechanism of the cut, room humidity, preoperative corneal thickness, and corneal diameter[3-6]. Factors that do not affect flap thickness are ring size, temperature, intraocular pressure, age, and average keratometric power[4,7-10]. The authors compared two brands of microkeratome and concluded that the Amadeus was better than the Moria in respect of deviations from the target thicknesses claimed by the manufacturers. The target thickness of the Moria was 160 μm and that of the Amadeus was 140 μm. The mean flap thicknesses of the Moria and the Amadeus were 138.68$\pm$20.637 μm and 127.29$\pm$20.387 μm, respectively. The authors' conclusion is correct in their comparison of the true result with the target result. On the other hand, the reproducibility of a microkeratome procedure may be more important in clinical significance. In this regard, these two microkeratomes have more or less similar results, and it is hard to distinguish the two brands in their clinical precision. Surgeons should be familiar with the actual flap thicknesses created by their microkeratomes during the LASIK procedure and should not rely on the figures provided manufactures, since equipment labeling does not necessarily represent the mean flap thickness actually obtained.

Thick corneas have been associated with thick flaps in several studies[5,11]. A thick cornea may be more compressed by the microkeratome than a thin cornea, creating a thicker flap.

Many authors have reported that the first cut usually results in a thicker flap than the second cut[5,12]. Similar results were reported when the same blade was used on both eyes. The second flap may be thinner than the first because the blade becomes duller after the first cut. If the flap on the first eye is thinner than expected, the use of a new blade for the second eye may avoid buttonhole or other flap complications. Surgery of the eye with the thickest cornea or less myopia should be performed first to preserve a thicker stromal base. The authors compared first and second cuts using unequal numbers of samples. As the comparison was between the first and second cut, only those cases in which the same blade was used on both eyes should have been included in the analysis. The authors reported that 42 eyes were used for the first cut and 18 eyes for the second cut in the Moria group; in the Amadeus group, 63 eyes were used for the first cut and 37 eyes for the second. In many cases, a new blade may have been used for each eye, which would explain why the number of first eyes is greater than the number of second eyes. These cases and those that received LASIK on one eye only should be excluded; only paired eyes cut with the same blade should be included in the analysis. As such, the result of this subject is questionable.

While publication of this article, a new technique for the flap cutting using the femtosecond laser has emerged[13].

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The femtosecond laser cuts corneal flaps approximately 90-100 μm thick with good reproducibility and surface smoothness. Compared with the mechanical microkeratome, which creates flap thicknesses ranging from 130μm to 180 μm, the femtosecond laser is a safer and more effective option for correction of moderate to high myopia, especially for patients with thin corneas for whom a microkeratome would compromise patient safety or make the LASIK procedure impossible.

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