• Comment and Response •

Comment on "Comparison of 45-degree Kelman and 45-degree balanced phaco tip designs in torsional microcoaxial phacoemulsification"

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Dear Editor,

We read with interest the article "Comparison of 45-degree Kelman and 45-degree balanced phaco tip designs in torsional microcoaxial phacoemulsification" by Demircan *et al*[1]. The authors describe the intraoperative and post-operative outcomes of phacoemulsification in terms of cumulative dissipated energy (CDE), total ultrasound (US) time, torsional US time, total fluid use, percentage change in central corneal thickness and endothelial cell count in the two groups. A comparative evaluation has been made between the two groups involving the Kelman mini-flared tip and the Intrepid balanced phaco tip using the Infiniti Ozil IP Vision system (Alcon Laboratories Inc., Fort Worth, TX, USA) as has been explicitly mentioned in the article under the "Methods" section. However, we would like to highlight the fact that the Intrepid balanced phacoemulsification tip has been designed to be used only with the Centurion Vision System (Alcon Laboratories Inc., Fort Worth, TX, USA) and not with the Infiniti System. In fact, one of the major mechanisms of energy reduction with the Centurion System is enhancement of torsional US efficiency through this redesigned tip as has been reported in many studies[2-4]. Previous reports also make a comparative evaluation of the two tips, but either on the two different phacoemulsification machines or solely on the Centurion System[2-3]. Hence, it will be useful to clarify about the conditions of usage of the two tips to avoid any confusion to the readers.

Furthermore, a higher amplitude value of the balanced tip has been implicated as a factor for higher energy produced and a greater turbulence caused in the anterior chamber as compared to the Kelman tip which has been reflected in the percentage endothelial cell loss and change in central corneal thickness in the first week post-operatively[1]. However, these results are not reflected in the CDE values which is the total energy produced by the process of phacoemulsification within a closed system. Further, the other intraoperative parameters are also more favourable towards the balanced tip than the Kelman tip. With all intraoperative US parameters pointing towards a higher efficiency of the balanced tip, a relatively worse post-operative outcomes raise questions about the presence of any other confounding factors affecting the results in these two groups.

According to the analysis done for various variables in this study, it has been seen that for many parameters such as CDE, total US time and torsional US time, the standard deviation values are more than half of the mean. In such a situation, the standard deviation values become meaningless. It is an indication that the data deviates substantially from a normal Gaussian distribution of a bell shaped curve and almost always points towards a skewed distribution affecting the accurate comparison between the two sets of data. Typically in such cases, the standard deviation values should preferably not be reported. The recommendation is to use the range (minimum and maximum value) or the interquartile range (25^{th} percentile and 75^{th} percentile) instead of standard deviation. Furthermore, it is preferred to use a non-parametric test while applying the statistical test for such variables. Hence, a further look into the analysis of data in the study would be highly appreciated.

We hope our analysis adds value to the discussion of the article and await the author's response.

ACKNOWLEDGEMENTS

Conflicts of Interest: Aron N, None; **Sen S,** None; **Khokhar S,** None.

REFERENCES

1 Demircan S, Ataş M, Göktaş E, Başkan B. Comparison of 45-degree Kelman and 45-degree balanced phaco tip designs in torsional microcoaxial phacoemulsification. *Int J Ophthalmol* 2015;8(6):1168-1172.

2 Chen M, Anderson E, Hill G, Chen JJ, Patrianakos T. Comparison of cumulative dissipated energy between the Infiniti and Centurion phacoemulsification systems. *Clin Ophthalmol* 2015;9:1367-1372.

3 Yoo A, Nam KY, Tchah H, Kim MJ. Heat generation and efficiency of a new modified phaco tip and sleeve. *PLoS One* 2016;11(8):e0159049.

4 Tjia KF. Novel balanced phaco tip for microcoaxial torsional phaco. Paper presented at: The ASCRS meeting; April 27, 2014; Boston, MA, USA.

Table 1 Comparison of patient characteristics and intraoperative parameters

Variables	Kelman (*n*=58)	Balanced (*n*=58)	*P*
Age (a)	67.00±8.95	68.40±10.04	0.459
Gender (F/M)	25 (43.1)/33 (56.9)	26 (44.8)/32 (55.2)	0.825
Eye (right/left)	31 (53.4)/27 (46.6)	29 (50.0)/29 (50.0)	0.662
Anterior chamber depth (mm)	3.19±0.34	3.11±0.37	0.336
Pupil size (mm)	7.76±1.43	7.72±1.51	0.885
Total ultrasound time (s)	12.50 (0.08-60.00)	7.95 (0.00-46.10)	0.017
Torsional ultrasound time (s)	12.20 (0.08-58.20)	7.65 (0.00-45.00)	0.015
Cumulative dissipated energy	4.80 (0.26-22.21)	2.78 (0.00-16.13)	0.012
Estimated fluid use (mL)	45.50 (23.00-99.00)	41.50 (18.00-81.00)	0.048

Values are expressed as *n* (%), mean±SD, or median (minimum-maximum).

Author Reply to the Editor

Dear Editor,

We thank Aron *et al* for their comments relating to comparative evaluation of Kelman and balanced phaco tip in phacoemulsification. Our study differ from prior studies that compared efficiency of the two tips either on the between Infiniti and Centurion system or only on Centurion system. In this study an Ozil handpiece with either a 0.9 mm 45-degree beveled miniflared Kelman tip or a 0.9 mm 45-degree beveled Intrepid balanced tip were used in the Infiniti Phacoemulsification System[1].

Chen *et al*[2] compared Infiniti and Centurion Phacoemulsification System. They found that an adjusted average energy reduction of 38% when using the Centurion System. The Intrepid balanced mini tip's design enables approximately 50% more lateral movement and transfer energy to its distal end compared to miniflared Kelman tip. As Aron *et al* mentioned that with all intraoperative ultrasound parameters pointing towards a higher efficiency of the balanced tip, a relatively worse postoperative outcomes raise questions about the presence of any other confounding factors affecting the results in these two groups. It is explained that the Intrepid balanced phacoemulsification tip has been designed to be used only with the Centurion Vision System (Alcon Laboratories Inc., Fort Worth, TX, USA) and not with the Infiniti System. Another confounding factor may be improvement in active fluidics technology that is designed to significantly reduce occlusion break surge and ensure stability of the anterior chamber, even at high vacuum settings in the Centurion Vision System (Alcon Laboratories Inc., Fort Worth, TX, USA)[3-4].

We repeated statistical analysis with a non-parametric test (Mann Withney *U* test). As seen Table 1, there were no significant differences between two tests for any variables.

We hope we clarified the points related to Dr. Aron *et al*'s comments and again thank them for the valuable contribution.

REFERENCES

1 Demircan S, Ataş M, Göktaş E, Başkan B. Comparison of 45-degree Kelman and 45-degree balanced phaco tip designs in torsional microcoaxial phacoemulsification. *Int J Ophthalmol* 2015;8(6):1168-1172.

2 Chen M, Anderson E, Hill G, Chen JJ, Patrianakos T. Comparison of cumulative dissipated energy between the Infiniti and Centurion phacoemulsification systems. *Clin Ophthalmol* 2015;9:1367-1372.

3 Tjia KF. Removing dense cataract with the CENTURION Vision System: demonstrating technological advances. *Cataract & Refractive Surgery Today* October 2014.

4 Tjia KF. Novel balanced phaco tip for microcoaxial torsional phaco. Paper presented at: The ASCRS meeting; April 27, 2014; Boston, MA, USA.

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Further Response

Dear Editor,

We thank Demircan *et al*[1] for their response to our comments on the article published in your esteemed journal titled "Comparison of 45-degree Kelman and 45-degree balanced phaco tip designs in torsional microcoaxial phacoemulsification". We appreciate them for having repeated the statistical analysis with non-parametric tests achieving similar results without a change in the final outcome of their study. Further, we agree with their results that a higher endothelial cell loss and a greater central corneal thickness in the first post-operative week with the balanced tip may be seen due to the greater amplitude of excursion of the balanced tip leading to a higher energy production. However, few questions still remain unanswered. The new Intrepid balanced phaco tip has been specifically designed to be used with the Centurion Vision System (Alcon Laboratories Inc., Fort Worth, TX, USA). The authors, however, used the balanced tip with the Infiniti Ozil IP Vision System (Alcon Laboratories Inc., Fort Worth, TX, USA). Both the Infiniti and the Centurion Vision systems work on different fluidic mechanisms (gravity based fluidics in Infiniti *vs* active fluidics in Centurion System). Whether the balanced tip works with a similar efficiency with the Infiniti System based on entirely different fluidics is questionable.

We hope to get the author's response to this query that might add value to the discussion of the article.

REFERENCES

1 Demircan S, Ataş M, Göktaş E, Başkan B. Comparison of 45-degree Kelman and 45-degree balanced phaco tip designs in torsional microcoaxial phacoemulsification. *Int J Ophthalmol* 2015;8(6):1168-1172.

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Author Reply to the Editor

Dear Editor,

We thank Aron *et al* for their reply to our response relating to comment on comparative evaluation of Kelman and balanced phaco tip in phacoemulsification[1]. They want to know that the new Intrepid balanced phaco tip has been specifically designed to be used with the Centurion Vision System (Alcon Laboratories Inc., Fort Worth, TX, USA). The authors, however, used the balanced tip with the Infiniti Ozil IP Vision System (Alcon Laboratories Inc., Fort Worth, TX, USA). Both the Infiniti and the Centurion Vision Systems work on different fluidic mechanisms (gravity based fluidics in Infiniti *vs* active fluidics in Centurion System). Whether the balanced tip works with a similar efficiency with the Infiniti System based on entirely different fluidics is questionable.

Both the Infiniti Vision System and the Centurion Vision System use peristaltic pumps to control aspiration. Similar to other gravity-based phacoemulsification aspiration systems, the Infiniti uses a bottle of balanced salt solution suspended by an adjustable pole with gravity supplying the infusion pressure. The Centurion can operate in 1 of 2 infusion modes; that is, using gravity as a passive force or using an active system that compresses a compliant, balanced salt solution-filled bag between motorized plates. The actively controlled system applies or releases bag pressure in response to varying irrigation pressure at the cassette to maintain a target intraocular pressare (IOP) during surgery despite varying aspiration flow rates. Nicoli *et al*[2] compared these 3 configurations in laboratory study. They concluded that two passive or gravity-based fluidics systems showed predictable decreases in IOP with increasing aspiration flow rates, whereas an active fluidics phacoemulsification system that regulated fluid flow by applying pressure to a compliant irrigation reservoir maintained target IOPs across zero-flow and active-flow conditions. Actively controlled fluidics systems should improve anterior chamber stability during phacoemulsification cataract surgery. In another study, Solomon *et al*[3] compared that the active-fluidics configuration and the gravity-fluidics configuration. They found that the cumulative dissipated energy (CDE) was significantly lower with the active-fluidics configuration than with the gravity-fluidics configuration. Together, these findings suggest that the active-fluidics configuration achieved greater surgical efficiency than the gravity-fluidics configuration. On the other hand They used different phaco tips and sleeves between the active fluidics and gravity-fluidics configurations. These variables might have contributed to the observed differences in surgical efficiency between the Centurion Vision System and Infiniti Vision System phaco systems. Because the 45-degree Intrepid balanced tip used on the Centurion is more efficient when removing nuclear material than the 45-degree mini-flared tip. This is shown by the manufacturer's recommendation to use lower power settings for the balanced tip than for mini-flared tips[4]. They assessed these configurations because they represented the most commonly used configurations for the 2 systems; nevertheless, further evaluation using the same tip and sleeve for each phaco system would enable more direct assessment of efficiency differences between the 2 systems. Furthermore, because the Centurion Vision System was newly introduced at the time of their study, recommended settings for the overall community of ophthalmic surgeons had not yet been optimized. Although performing more previous surgeries provided surgeons with adequate experience with the Centurion Vision System, the lack of longer experience and ideal predetermined settings was a challenge. With similar reasons, in our study, we only evaulated efficiency of balanced tip compared with Kelman tip in the gravity based fluidics on the Infiniti Vision System. Because the Centurion Vision System has both fluidics systems.

In conclusion, Packard[5] emphasized that unless both tips are used on both machines so that the fluidics of each can be compared independently.

We hope we clarified the points related to Dr. Aron *et al*'s reply to our response for comment and again thank them for the valuable contribution.

REFERENCES

1 Demircan S, Ataş M, Göktaş E, Başkan B. Comparison of 45-degree Kelman and 45-degree balanced phaco tip designs in torsional microcoaxial phacoemulsification. *Int J Ophthalmol* 2015;8(6):1168-1172.

2 Nicoli CM, Dimalanta R, Miller KM. Experimental anterior chamber maintenance in active versus passive phacoemulsification fluidics systems. *J Cataract Refract Surg* 2016;42(1):157-162.

3 Solomon KD, Lorente R, Fanney D, Cionni RJ. Clinical study using a new phacoemulsification system with surgical intraocular pressure control. *J Cataract Refract Surg* 2016;42(4):542-549.

4 Alcon Centurion™ Vision System Council Meeting 2014. Sunday 12th October, Milan Italy. EuroTimes February Supplement, 2015. Available at: https://issuu.com/eurotimes/docs/20-2_alcon-supplement. Accessed on July 24, 2016.

5 Packard R. Confusion about the importance of phaco tip configuration in comparing machine performance. *J Cataract Refract Surg* 2016;42(9):1391.

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