A New Suggested Strategy for Safe Injection of Ozurdex

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BACKGROUND AND OBJECTIVES: Ozurdex intravitreal injection is performed via a patented injection device. However, there is a common misconception among ophthalmologists regarding the relation between the speed of applicator button depression and the speed of pellet injection.

PATIENTS AND METHODS: Six dexamethasone intravitreal implants were injected into a calibrated ex vivo water bath. Three of the pellets were injected via rapid compression, whereas the other three implants were injected using a 3-second compression technique. The procedures were recorded using high-speed photography followed by calculation of pellet velocity and impact force.

RESULTS: The mean impact velocity and force of the pellet insertion is significantly higher in the fast injection group compared to the slow injection group.

CONCLUSIONS: By depressing the Ozurdex implant injector during a 3-second time interval, the impact force of the implant pellet is reduced by about 95%. This new technique will theoretically reduce the risk of retinal injury and vitreous hemorrhage from Ozurdex injections.

[*Ophthalmic Surg Lasers Imaging Retina*. **2019;50:e23-e25.**]

INTRODUCTION

Dexamethasone intravitreal implant (Ozurdex; Allergan, Irvine, CA) is composed of a biodegradable polymer that slowly releases dexamethasone into the vitreous over a number of months. This medication is used to treat macular edema in diseases such as diabetic retinopathy, retinal vein occlusion, and uveitis. Nevertheless, owing to the nature of injecting a physical implant pellet, there is a tangible risk of vitreous hemorrhage and/or retinal damage.[1-3] The Ozurdex applicator works via an accordion type mechanism (Figure 1) that imposes a direct correlation between speed of depression of the actuator and the speed of implant release. There are currently no guidelines on the recommended speed of Ozurdex intravitreal insertion.

TECHNIQUE

The goal of the study was to measure the force of Ozurdex pellet impact as well as pellet velocity in relation to the speed of pressing the insertion button. A test chamber was constructed and filled with water in order to simulate the typical resistance of a vitrectomized eye. A hole was made on the side of the test chamber to allow for insertion of the dexamethasone injector, a grid of 0.2-inch squares was placed behind the test chamber to measure the distance travelled by the pellet, and a high-speed photography camera (240 frames per second) was placed in front of the setup to capture the events

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Originally submitted January 27, 2018. Revision received April 27, 2018. Accepted for publication May 9, 2018.

This study was presented at the ARVO Annual Meeting in Baltimore on May 11, 2017, and at the ASRS Annual Meeting in Boston from August 11-15, 2017.

Dr. Singer has received grants from Aerpio, Allergan, Ampio, Genentech, and Regeneron outside the submitted work. The remaining authors report no relevant financial disclosures.

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doi: 10.3928/23258160-20190129-14

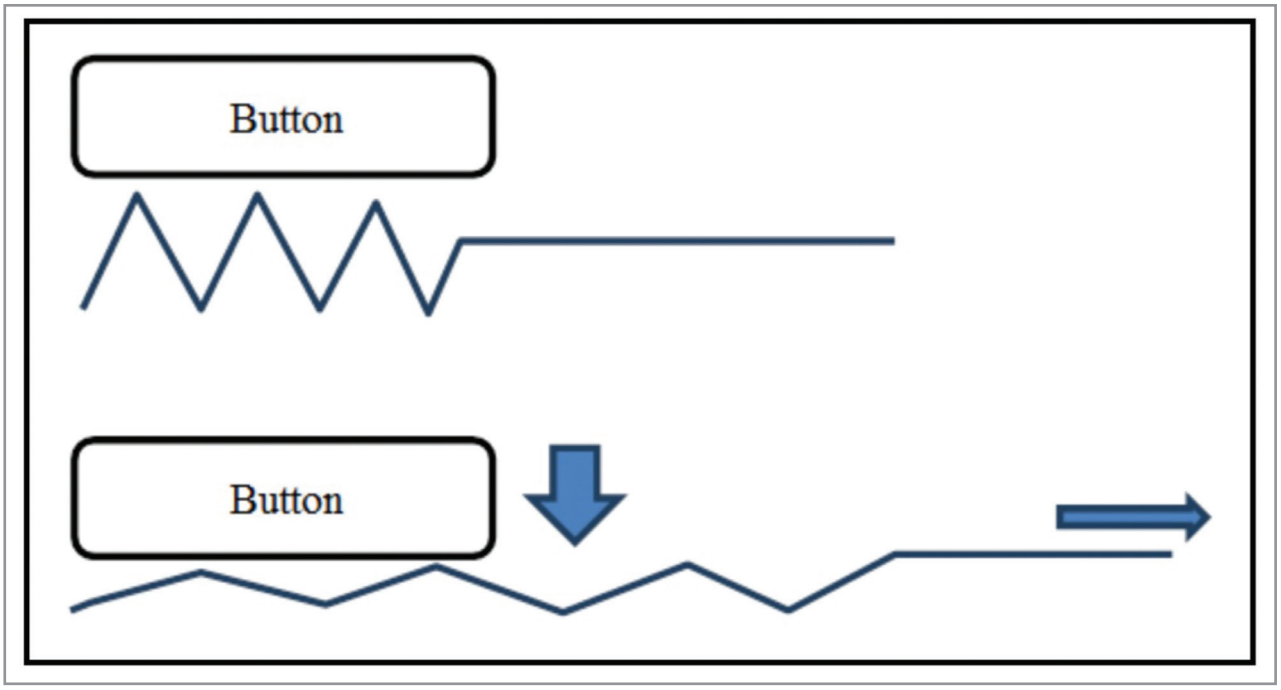

Figure 1. Mechanism of the dexamethasone implant injection.

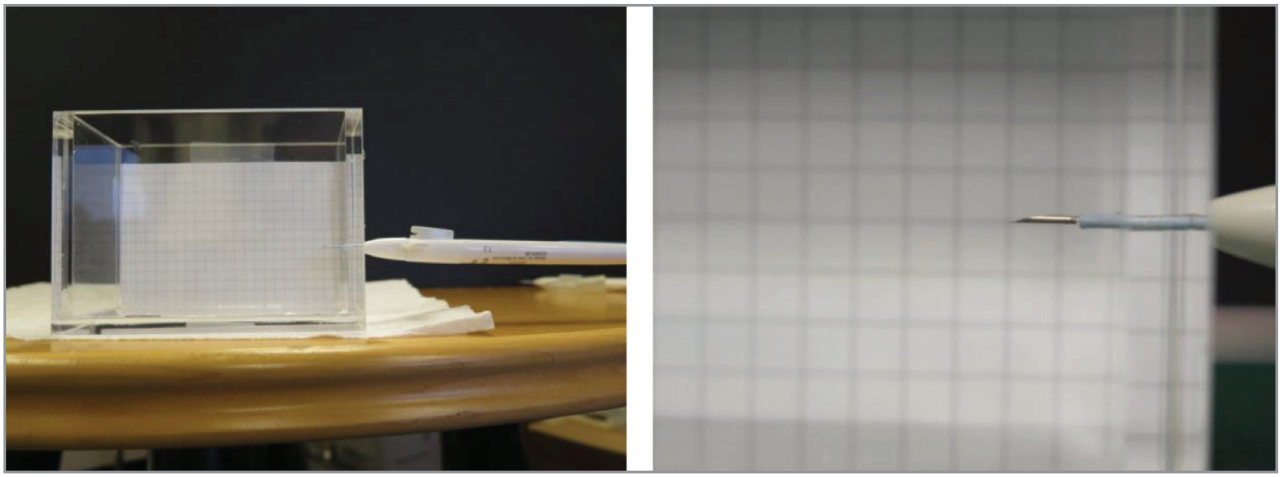

Figure 2. Experimental setup for Ozurdex injection (low magnification on left and high magnification of grid on right side of the image).

(Figure 2). Calculations were performed for two different insertion techniques:

1. Fast injection method (sample size = 3): Injection button is depressed directly within 1 second.
2. Slow injection method (sample size = 3): Injection button is depressed by rolling the thumb over the length of the button during a 3-second period.

The values that were calculated include impact velocity (Vf), which refers to the velocity of the pellet at approximately 16 mm from the tip of the needle to represent the hypothetical location of the retina. Velocity was calculated by measuring the change of pellet position on the square grid relative to the elapsed time recorded by the camera. The force at Vf was calculated by multiplying the average mass of the pellets (1.179 mg) by acceleration at the impact point. Figures 3A and 3B represent the trajectory of the pellet insertion using fast and slow injection techniques, respectively. The results of our study demonstrate that the mean impact velocities for fast and slow injection methods are 273.3 cm/sec ± 20.8 cm/sec and 21.7 cm/sec ± 3.6 cm/sec

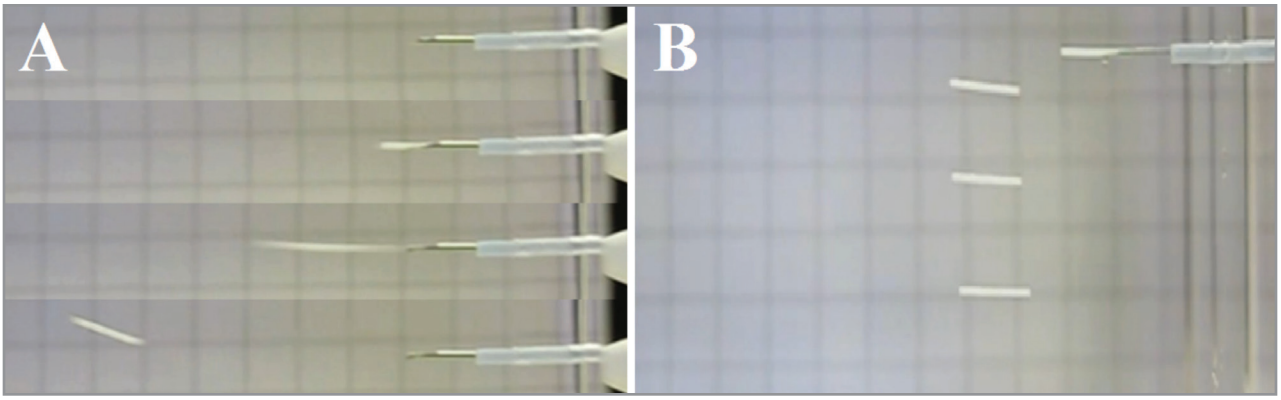

Figure 3. Trajectory of the pellet insertion using the fast (A) and slow (B) injection techniques.

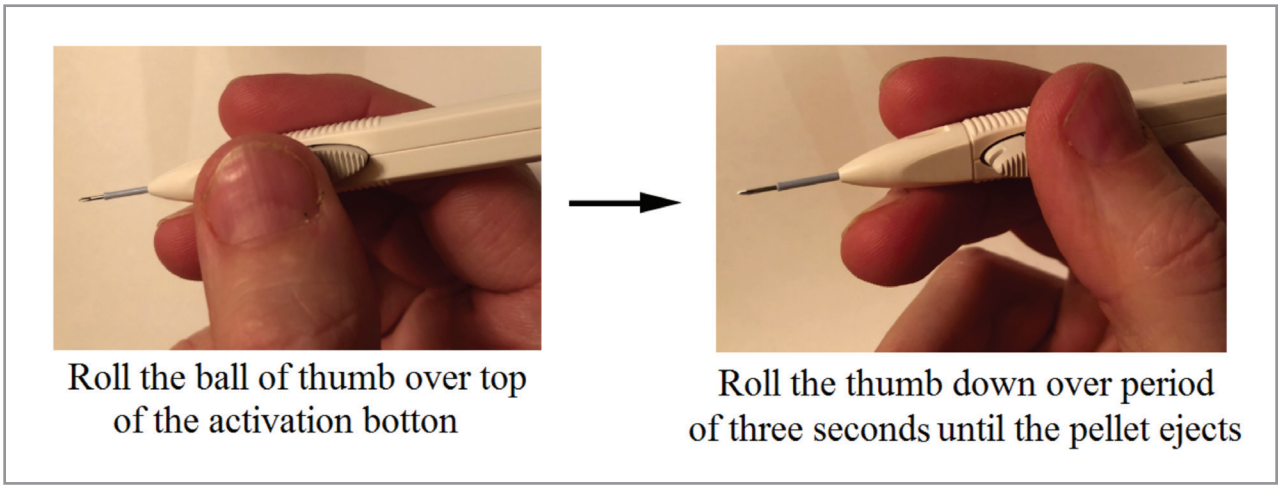

Figure 4. Injection of Ozurdex during a 3-second period for reduced impact velocity and force of the pellet.

($P < .0001$), respectively. Likewise, the mean pellet forces at impact velocity for fast and slow injection methods are 0.74 mN ± 0.08 mN and 0.04 mN ± 0.027 mN ($P < .0002$), respectively.

DISCUSSION

Rapid injection of Ozurdex correlates with high speed of pellet insertion, which will likely increase the risk of retinal tear and vitreous hemorrhage. The results of our study demonstrate that injection of Ozurdex during a 3-second period significantly reduces the impact velocity and force of pellet insertion. Therefore, we recommend administering Ozurdex injections by rolling the ball of the thumb across and down from the top of the activation button over a period of 3 seconds (Figure 4).

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