Use of the Proneview™ Helmet System with a Modified Table Platform for Open Access to the Eyes during Prone Spine Surgery

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Permanent, perioperative visual loss (POVL) is a rare but devastating complication of surgery. The majority of reported POVL cases are associated with spine surgery conducted in the prone position (67%) (1). POVL appeared to be related to a change in a patient's retinal and/or optic nerve perfusion (1–3). Our goal was to provide a clinically practical method for measuring intraocular pressure, ocular perfusion pressure, and ocular perfusion (using digital retinal vessel/optic disk imaging), so that clinicians may be guided in preventing POVL. Limited access to a prone surgical patient's eyes makes it challenging to obtain safe, physiologic ocular measurements.

The Proneview™ Helmet System (Dupaco, Oceanside, CA) was developed to address visual loss caused by direct pressure (4, 5). This system consists of a rigid helmet, a soft foam insert, and a mirror. The helmet and foam insert disperse the pressure while avoiding the eyes, nose and mouth. The mirror reflects the patient's eyes (Fig. 1A), but the viewer cannot gain access to the eyes for measurement purposes.

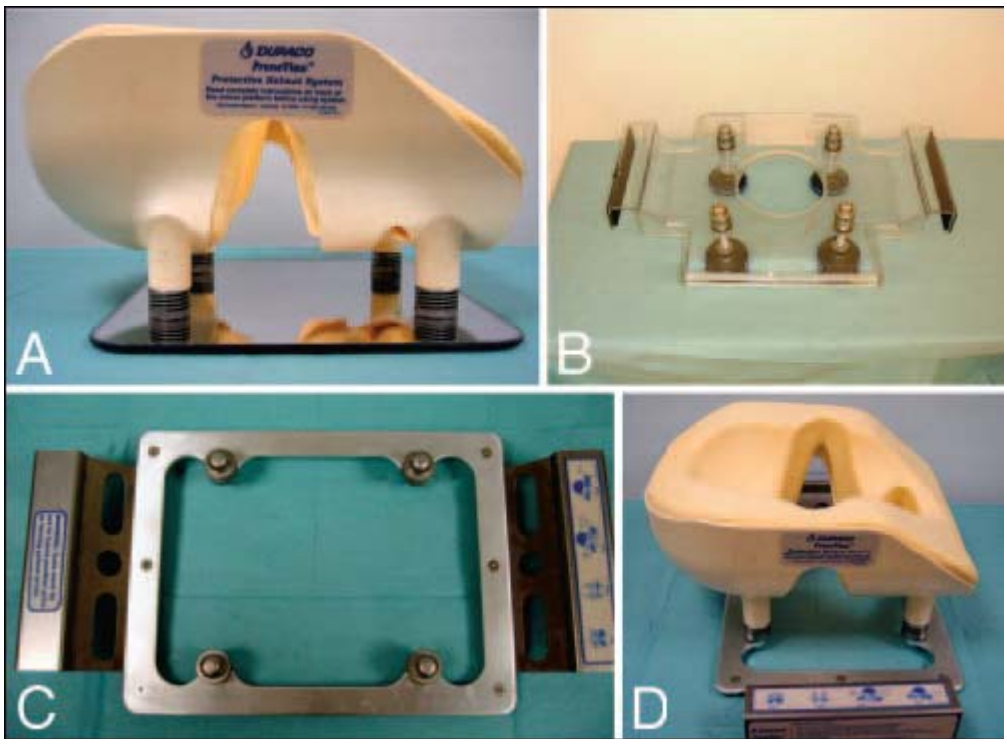

Figure 1. A, Standard Proneview™ Helmet System with mirror platform. B, First modification of table platform with small circular opening. C, Modified table platform for use with the Jackson spine table. D, Proneview™ Helmet System with modified table platform.

We removed the mirror and substituted a table platform that attaches to the Jackson spine table (Orthopaedic Systems, Inc., Union City, CA). We first constructed a table platform of heavy plastic with a central circular opening (Fig. 1B), allowing us to measure intraocular pressure with the Tono-pen XL (Medtronic, Jacksonville, FL). This platform did not provide enough space to photograph the optic disk/retinal image with the Nidek NM 200D camera (Nidek, Fremont, CA). Our next modification was an open-table platform (Fig. 1C) containing a rectangular, stainless steel hole 22.9 cm by 30.5 cm. This platform is compatible with the modified Proneview™ Helmet System. It attaches to the rails of the Jackson spine table (Fig. 1D). The platform's cephalic and caudal sides contain posts to engage the Helmet legs. To accommodate the Nidek camera, we removed the large adjustment knobs and bolts on the platform's underside and replaced them with stove bolts. This provided access to the patient's eyes.

With IRB and written informed consent we studied our apparatus in nine volunteers. While the volunteers were in the prone position, we captured high-quality, reproducible digital retinal images and measured their intraocular pressure.

Figures 2A and 2B demonstrate the excellent access to the eyes. Figure 2C shows the quality of a retinal/optic disk image we obtained with this modified system.

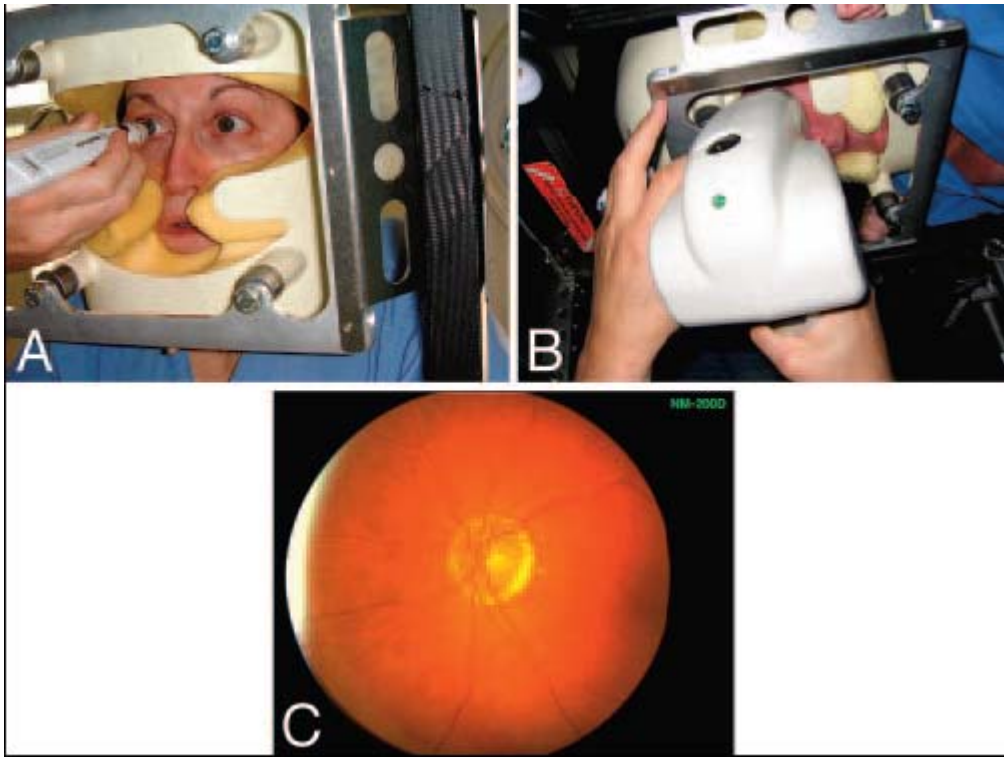

Figure 2. A, Measurement of intraocular pressure with the Tono-pen XL in the prone position. B, Observer capturing photographs of the optic disk and retina using the Nidek NM 200D camera in the prone position. C, Optic disk/retinal image of a volunteer taken from the prone position with the Nidek NM 200D camera.

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