



Pathology & Biology Section – 2005

G84 Postmortem Monocular Indirect Ophthalmoscopy

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After attending this presentation, attendees will become aware of how to perform postmortem indirect ophthalmoscopy and how it differs from direct ophthalmoscopy.

This presentation will impact the forensic community and/or humanity by describing an efficient, low cost method to examine the posterior retina following death that permits a wide field of view compared with direct ophthalmoscopy.

Postmortem fundal examination can be conducted with a hand held direct ophthalmoscope, head mounted binocular indirect ophthalmoscope or by monocular indirect ophthalmoscopy. The direct ophthalmoscope provides a detailed monocular retinal inspection with high magnification (15x for an emmetrope, less in hyperopia and more in myopia), but a small field of view (6.5 - 10?). Unfortunately, postmortem corneal changes can make fundal examination less than optimal with the direct ophthalmoscope. Binocular indirect ophthalmoscopy, a technique for evaluating the entire ocular fundus, provides a stereoscopic, low magnification, wide-angle, moderate to high resolution view of the retina. However, the binocular indirect ophthalmoscope is moderately expensive and requires some training to properly use.

Monocular indirect ophthalmoscopy is performed using a bright focal light source (penlight, Finhoff transilluminator, headlamp, otorhinolaryngology headlight or light source from direct ophthalmoscope) and a high plus condensing lens. The decedent's eyelid is held open with an eyelid speculum while glycerin or an ophthalmic irrigating solution is used to keep the cornea moist during the examination. After dimming the room lights, the light source is positioned against the examiner's lateral canthus/cheek or between the examiner's eyes. The light source must be directed through the pupil to illuminate the fundus. The image of the retina is then projected out of the eye, and in an emmetropic eye with no refractive error the image of the fundus will be formed at infinity. An aspheric condensing lens is held between the thumb and index finger then placed in front of the eye, thus focusing the retinal image in front of the observer. Initially the condensing lens is held to one side of the decedent's eye until the pupillary red reflex is established and moved between the eye and the examiner (initially about 1-2 cm from the decedent's eye) and then slowly pulled towards the examiner and away from the decedent's eye until the image of the fundus fills the lens, usually about 3-5 cm or equivalent to the focal distance of the lens. Alignment of the condensing lens is critical. It must be held parallel with the plane of the iris, with the flat surface of the lens facing the decedent's eye (position the surface rim of the lens with a silver ring towards the decedent's eye). The condensing lens must be centered in-line and perpendicular to the axis from the examiner's pupil to the decedent's pupil. Resting the examiner's little finger on the decedent's forehead is helpful as it helps stabilize the lens. The real inverted, laterally reversed image is less magnified than that of a direct ophthalmoscope, but the field of view is much larger.

Indirect ophthalmoscopy permits viewing of the posterior fundus and equator even if there is less than perfect anterior segment media; however, postmortem corneal clouding may cause the fundus to appear hazy. A disadvantage of the technique, as with conventional direct ophthalmoscopy, is the lack of a stereoscopic view; however, stereopsis can be achieved but this depends on the condensing lens, viewing distance, and interpupillary distance of the examiner. This technique is about as difficult as direct ophthalmoscopy to learn. Presently available aspheric lenses range from +14 to +40 diopters and come in different diameters. Lower power lenses provide higher magnification but offer a smaller field of view and must be held farther from the decedent's eye, making positioning of the lens less steady. Further investigation is needed to identify techniques that mitigate postmortem corneal clouding.

Postmortem Indirect Ophthalmoscopy, Direct Ophthalmoscopy, Ocular Fundus