4. **A Histopathologist’s Guide to Ocular Pathology**

M. Andrew Parsons

**Introduction**

A great deal of important information can be obtained at autopsy of both adults and children by the pathologic examination of the eye and its adnexal structures. This information can be related to the cause of death (e.g., violent shaking trauma in physical child abuse) or pertain to disease processes affecting the eye, the orbit, and the surrounding structures outside the orbit.

In this chapter I review the different methodologies that are required to remove eye and related tissues and the indications for electing to use these different procedures. I describe the reconstruction methods that are used to achieve the perfect cosmetic result that is so important when dealing with facial structures. I describe how to orientate, examine, and dissect the eye once it has been removed and how to record the important macroscopic pathologic findings in the eye.

The chapter is directed primarily at histopathologists who do not have detailed knowledge of eye diseases, and it is intended as a basic guide to obtaining and safely securing the eye and related tissues at autopsy, for subsequent examination, perhaps by (or with) a specialist ophthalmic pathologist. Space does not allow me to cover the huge range of primary or secondary diseases affecting the eyes in children and adults, but I direct the reader to sources of this information. However, I do review one area – the ophthalmic pathology of child abuse – in more detail, because this topic has considerable forensic and medicolegal significance and because the detailed methodology and documentation at autopsy are so important and are prone to more than usual professional and public “scrutiny and interest.”

It is important to recognize that the eye and adnexal ocular structures are “culturally sensitive” tissues, and for this reason their removal must be approached cautiously. Removing these tissues should be undertaken only for sound scientific reasons, with the fully informed consent of the relatives and/or the coroner (or equivalent authority) and with properly agreed procedures for the eventual

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retention or disposal of the ocular tissues. For this reason, I review not only the scientific indications and methods for the removal of such tissues but also the legal and ethical issues that must underpin this pathology “best practice.”

This chapter includes the guidelines originally published as “Necropsy techniques in ophthalmic pathology. Association of Clinical Pathologists Best Practice Guideline No. 164” in the Journal of Clinical Pathology.¹

**Background**

The eye and its adnexal structures can be affected by primary ophthalmic disease and diseases outside the eye, by direct extension from adjacent structures, or by secondary involvement in malignant or nonmalignant systemic diseases. Some of these diseases are relatively common, and the pathology is well known. Other diseases are rare, or their pathology is poorly understood. In some common conditions there is little opportunity to examine human tissues, as the conditions may not require biopsy, surgical intervention, or enucleation of the eye. For example, the opportunity to examine eyes in the early stages of documented primary open angle glaucoma (the most common form of glaucoma) hardly ever occurs, except when

- the eye is removed for incidental disease, for example, primary ocular malignancy
- the patients die at a relatively young age as a result of accident or disease, and the eyes are removed at autopsy

A valuable research opportunity may be missed if the eyes are not removed for examination.

Many of the patients who die of nonophthalmic diseases and have autopsies have had ocular surgery, laser treatment, or other forms of management of primary or secondary ocular disease. Some patients may have systemic diseases that affect the eyes, or they may have unsuspected or unreported eye disease. Examination of the eye at autopsy provides potentially important feedback to ophthalmic practitioners as part of the process of clinical audit.²³ This examination allows assessment of the accuracy of diagnosis and organ imaging, detection of unsuspected diagnoses such as infection,⁴ and determination of responses to medical or surgical treatment.⁵⁻⁷

Eye tumor tissue (e.g., primary malignant melanoma) and metastatic tumor tissue removed at autopsy from other organs, such as the liver, are important for research into the growth, progression, and treatment of eye cancer. An example of this is research into changes in the cytogenetics and molecular genetic changes in ocular malignant melanomas,⁸ where useful research can be performed on both viable and nonviable tumor tissue.

Eye tissues removed at autopsy are an important source of viable cells for tissue culture (e.g., retinal pigment epithelial [RPE] cells, trabecular cells) in research into nontumorous conditions such as proliferative vitreoretinopathy (a proliferation of RPE cells that occurs after retinal detachment and can prevent successful surgery to reattach the retina). Eyes obtained at autopsy also have been used by ophthalmologists in the evaluation of new treatment modalities, such as determining whether the effects of YAG laser cryoablation can be detected by ultrasound biomicroscopy.⁹