

Orbital Pathology Update

Orbital pathology – Iatrogenic findings and artefacts

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Abstract

The relationship between the ophthalmologist and ophthalmic pathologist is particularly important in orbital disease, as diagnosis is heavily dependent on correlation with clinical context. If the patient has previously had treatment to the orbit or an adjacent area, whether for the same or a different condition, tissue changes may occur which affect the histological appearance of any specimen taken. This article is an overview of therapeutic interventions which may cause either orbital pathology or an altered appearance of the tissue, either of which can pose a diagnostic challenge. The problem of artefact is also addressed as another factor which may alter the appearance of a specimen. It is hoped that the information provided in this brief review will help clinicians better evaluate what information may be relevant when submitting a specimen.

Keywords: Histopathology, Orbit, Radiation, Artefact, Iatrogenic

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Introduction

Orbital surgery is an ophthalmology subspecialty where diagnosis often requires integration of information from other specialties, including radiology and histopathology. In many organisations the ophthalmologists and histopathologists have a close working relationship. In some countries the ophthalmologist may even examine his or her own specimens histopathologically.

Not all organisations or individuals have such a relationship, however, particularly if few specimens are generated or if the laboratory is geographically distant from the ophthalmology department. The histopathologist typically does not know the patient and relies on the surgeon for information. Ignorance of the history can potentially lead to misdiagnosis. At best, time and resources are wasted: at worst, patient care is compromised. It is particularly important where there is limited opportunity for communication that the ophthalmologist and histopathologist do not inadvertently mislead each other.

Histological diagnosis requires not just macroscopic examination (grossing) of the specimen and examination of microscope slides, but interpretation in the clinical context and judgement as to the most likely diagnosis for a specific case. Relevant clinical information could include: age, sex, clinical presentation, time course, site, and knowledge of previous history and interventions. The more comprehensive the information provided, the more easily and quickly the histopathologist can arrive at a diagnosis.

In management of orbital conditions, two major prior interventions that the patient might not even remember in the context of the current problem are radiotherapy and introduction of foreign material that might affect the orbit. The latter may be related to trauma and reconstruction rather than planned therapy, and either intervention may have occurred years or decades previously.

The two interventions mentioned above may give rise to pathologies of their own (such as radiation damage, radiation-induced tumour or foreign body reaction), which may or may not be directly related to the current indication for surgery. The prior intervention might cause an unusual

Received 19 November 2017; received in revised form 1 February 2018; accepted 8 February 2018; available online xxx.

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Peer review under responsibility
of Saudi Ophthalmological Society,
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pathology, which might not otherwise be considered in the differential diagnosis. Even if not related, changes in the specimen's appearance because of previous treatment can be taken into account. Knowledge of these prior interventions will therefore contribute to the histopathologist's ability to help.

Prior patient interventions are not the only challenges histopathologists face when examining a specimen. On a more general note, specimens are vulnerable to various artefacts which may occur any time from the surgical procedure and sampling to examination of prepared slides in the laboratory. Artefacts are certainly not unique to orbital surgery and pathology, but they will be briefly covered here, to give a flavour of how they may hinder the diagnostic process. There are opportunities for surgeons to help reduce artefact, and some suggestions will be made.

This review is based on a PubMed literature search and personal experience of the author, with an emphasis on issues which may affect provision of an accurate diagnosis. Illustrative cases from the author's own practice are provided as examples.

An overview of artefacts

In the context of histopathology, artefacts can be broadly defined as any changes in tissue between removal at surgery and microscopic examination that are caused by the process rather than reflecting pathology. Their major significance is that they may either be mistaken for genuine pathology, or obscure the diagnosis.

There are many causes of artefact,^{1,2} and laboratories strive to minimise the impact of artefacts that may occur after specimen receipt. However, they are limited in what they can do to rectify artefacts that occur before receipt.

Certain artefacts may occur during surgery. Although some are unavoidable (such as diathermy artefact when ensuring haemostasis), the surgeon may be able to ameliorate some of them. Ideally, diathermy and tissue handling (eg crushing with forceps) should be kept to a minimum. Specimen fragmentation may be unavoidable, particularly when debulking a friable tumour, but it makes assessment of margins nearly impossible. If sampling a specimen eg for research, it is advisable to avoid compromising surgical margins.

Although intraoperative artefact may be inevitable, artefacts due to inappropriate fixation can always be avoided. If tissue is left out of fixative (the standard fixative is 10% neutral buffered formalin), preservation is compromised, and it may dry out. If tissue is put into an inappropriate fluid (such as water or saline) fixation will not take place, the tissue may autolyse and/or structural changes may occur. A specimen in formalin does not need to be refrigerated, and it especially should not be frozen. Freezing causes ice crystals to form and disrupt the tissue (Fig. 1). If intraoperative histological diagnosis is being made, using a frozen-section procedure, the appearance is similar to accidental freezing. However, these are anticipated, and the equipment used freezes the tissue rapidly in order to minimise artefact.

Iatrogenic pathology of the orbit

As previously mentioned, interventions may directly give rise to the presenting pathology (such as radiation-induced tumours) or they may modify the appearance of the tissue.

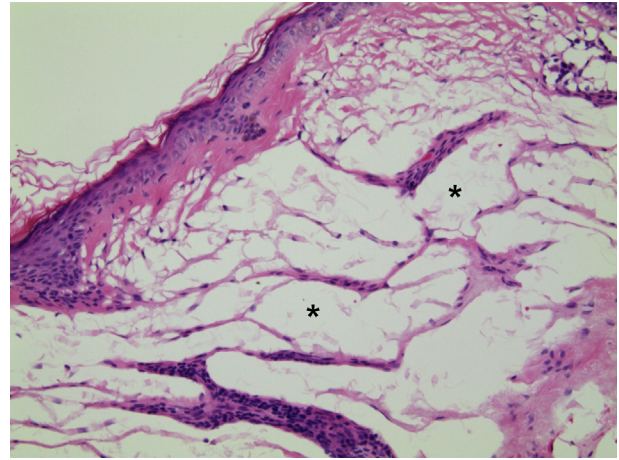


Fig. 1. This probable skin tag was biopsied, placed in a formalin pot and then inadvertently frozen. The dermis has large empty clefts (*) caused by formation of ice crystals, and it is impossible to assess architecture. (Haematoxylin & eosin. Original magnification x200).

This section will cover changes in the orbit that may occur after previous interventions, grouped here as: surgery, foreign material, radiotherapy, and chemotherapy.

Interventions may have occurred a long time ago, including when the patient was a child, and details may not be forthcoming – either because the patient doesn't remember, or because it's not considered relevant to the current problem.

Surgery

Orbital surgery is a form of direct physical trauma, which may have been performed previously for the presenting condition or some other condition. The postoperative healing process includes tissue changes that may obscure the underlying pathology. Such changes include acute and chronic inflammation, tissue necrosis, haemorrhage which may organise (with cholesterol clefts or the impression of a spindle cell proliferation), fat necrosis and scarring.³ With active scarring there may be an exuberant fibroblastic proliferation that can mimic a spindle cell tumour. In the long term, there may be dense fibrosis with a hyaline or keloidal appearance. If there is associated inflammation, this might suggest a diagnosis of chronic inflammation and fibrosis.

Each time surgery is performed, the healing process is stimulated. Multiple biopsy procedures carried out over time may obliterate the original pathology. Ideally the first biopsy should be of sufficient size to enable a diagnosis.

Other issues arising from previous surgery can include aberrant anatomy and landmarks.

The lacrimal gland can rarely manifest necrotising dacryometaplasia (analogous to the more common necrotising sialometaplasia of the salivary gland) following surgery, trauma or radiation, and possibly related to traumatic ischaemia with or without local anaesthetic injection.^{4,5} This condition is a pitfall for the unwary histopathologist as it may mimic carcinoma.

Iatrogenic foreign material

This section will cover foreign material which enters the orbit following an intentional intervention such as surgery

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