X is for XMark tissue marking dyes

A-Z of Staining - a series of articles where we share a little extra information about stains, staining techniques and some of the interesting chemicals associated.

CellPath
INNOVATION IN CELLULAR PATHOLOGY

Welcome to the ABC of Staining where we continue with 'X' for XMark tissue marking dyes.

XMark tissue marking dyes are used to permanently ink surgical tissue resection margins to facilitate identification and correct orientation during histological examination. The dyes are positively charged and consequently form strong ionic bonds with the negatively charged tissue components. The ionic

bonding is permanent and resistant to tissue processing chemicals. For tissue components that have a neutral charge (amphoteric), the dyes are capable of reacting chemically as an acid or a base and are taken up by adsorption where they adhere to the tissue surfaces.

When tissues samples are taken during a surgical procedure, a rim of normal tissue (surgical margin) is also removed. The anatomical relationship of surgical samples and margins are important to ensure that tissues are correctly oriented during pathological examination. In some surgical cases such as mastectomy specimens, anatomical orientation is often clearly presented (Figure 1a). With breast lumpectomy samples however, it is virtually impossible to orientate tissues correctly due to the absence of any identifiable anatomy. In order for pathologists to be able to orientate these specimens correctly, surgeons regularly use sutures of varying length to help with anatomic identification (Figure 1b). In this way, pathologists are able to precisely evaluate the extent of tumour during tissue dissection and determine if the margins are clear (1).

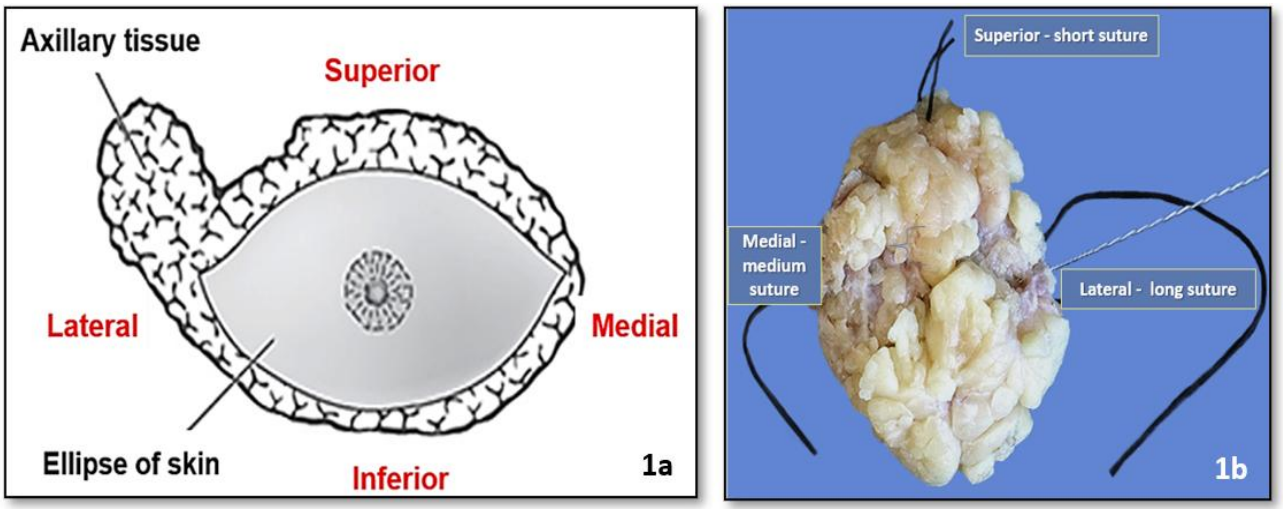

Figure 1. Anatomical orientation of a mastectomy specimen (a) and breast lumpectomy (b)

XMark tissue marking dyes are intended for the permanent marking of surgical margins and help to reduce prospective errors on all tissue samples. The coloured dyes are best applied to fresh or fixed tissue samples that have been gently patted dry so that the surgical margins are easily identifiable at both the gross and microscopic level (Figure 2). Tissue marking dyes are also commonly used during Mohs surgery where the dyes are applied to mark the surgical margins at the outer edges of the excised tissue. Once the tissue has been processed, sectioned and stained, the dyes help to maintain

the orientation of the sample with the original surgical site (2). This enables the pathologist to precisely map and examine the tissue layers for complete removal of tumour.

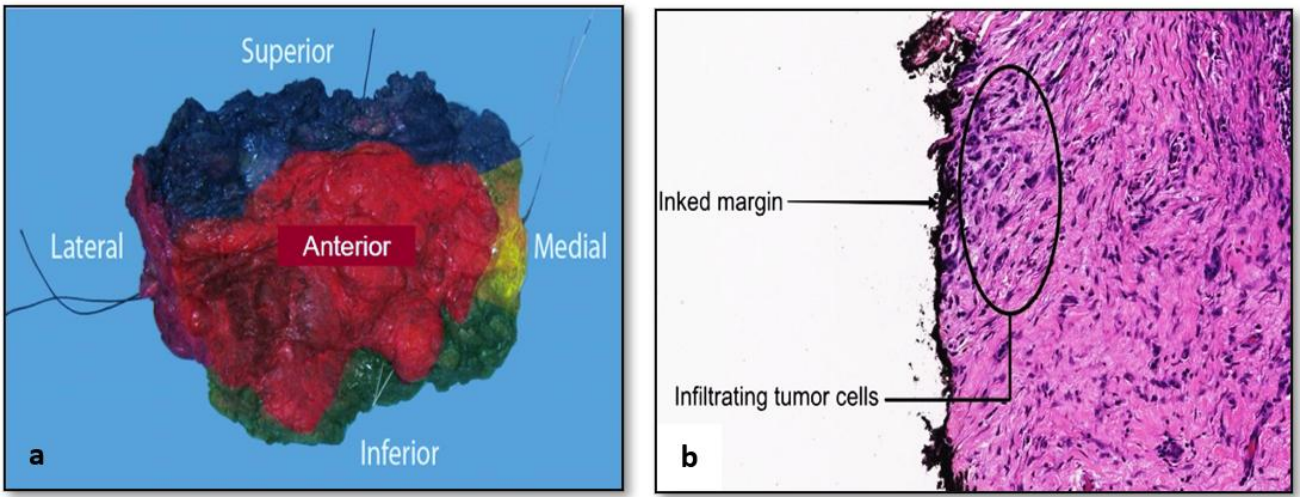

Figure 2. Inked margins on a breast lumpectomy (a) and a stained tissue section (b)

Further reading

1. Altaleb A (2021). Surgical Margin Assessment. In: Altaleb, A. (eds) Surgical Pathology. Springer, Cham. https://doi.org/10.1007/978-3-030-53690-9_21

2. Pennycook KM & Buckley C (2025). Mohs Micrographic Surgery Mapping Techniques. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK603713/

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