

AMPATHCHAT

Dr Jackie Chokoe- Maluleke

Frozen Section: An invaluable tool for intra-operative surgical consultation

History

- The frozen section technique has evolved and has improved immensely from 1818, when Dutch anatomist Pieter de Reimer utilised cold brine (salt water) to harden tissues, until 1895, when Thomas Cullen, MD, published the first written frozen section technique from Johns Hopkins [1].
- Dr Louis B Wilson standardised each step of the freezing, cutting and staining procedures by using a Spencer automatic freezing microtome equipped with a carbon dioxide attachment [1].
- The details of Dr Wilson's method on the frozen section were published on 2 December 1905 in the Journal of the American Medical Association [1]. This method remains in use to this day.

Method

- Fresh tissue collected by the surgeon in theatre is handed over to the attending histopathologist.
- The tissue is taken to a room adjacent to the theatre, or to the pathology laboratory nearby for processing.
- The tissue is described and the dimensions recorded.
- A cytologic imprint or scraping can be done during the same setting. This is a cytology technique whereby the fresh tissue is scraped onto the glass slide and stained with the Papanicolaou stain and Giemsa for cytological examination.
- The tissue is frozen with frozen aerosol spray and mounted on a cryostat for sectioning, with temperatures of between -20 to -30 °C inside the cryostat.

- The tissue sections of 5 to 10 mm are cut and picked up onto a glass slide.
- A modified Hematoxylin and Eosin stain is used to stain the sections, and is mounted with a synthetic resin mounting media, which is fast drying and cover slipped.
- The pathologist examines the glass slide under the microscope.
- The pathologist may either go into the theatre again if the laboratory is adjacent to the theatre or telephone the surgeon to deliver the results.
- The frozen section technique takes on average of 20 minutes from the time the specimen is submitted to a pathologist to the time the result is delivered to the surgeon [2].



Laboratory / theatre cryostat

Concepts

- The pathologist and the surgeon should discuss the case a day or two before surgery – good communication is essential.
- All the relevant information must be conveyed to the pathologist with regard to any previous biopsies. If there were any previous biopsies, those slides should be reviewed beforehand.
- The pathologist may also need to look at radiological images, especially for bone, soft tissue and central nervous system cases.
- Frozen section provides rapid diagnosis. However, it should not be used to replace the paraffin-embedded tissue technique, which is the longer process, and takes more time.
- Frozen section should not be treated as an emergency procedure due to the difficulty of the procedure.
- The pathologist must be prepared and have a high index of suspicions as to what diagnosis is being sought.
- The pathologist should have a final say on whether or not a frozen section should be performed or not.

Indications for frozen section ^[2]

- Establish the nature of the lesion.
- Establish the presence of a lesion.
- Confirm the presence of a benign lesion.
- Confirm that sufficient tissue is present for diagnosis.
- Establish the grade of the malignant lesion.
- Determine the presence of synchronous lesions.
- Determine the organ of origin.
- Determine the adequacy of margins.
- Establish evidence of invasion.
- Determine the presence of infection.
- Acquire fresh tissue for special studies – electron microscopy, genetic and molecular studies.

Limitations

1. Sampling errors:

- Poor sampling of the tissue
- Poor selection of appropriate tissue after grossing
- Extensive tumour degeneration or necrosis
- Poor assessment of capsular or vascular invasion-follicular carcinoma
- Malignant component in ovarian teratoma

2. Technical problems:

- Freezing artifacts / xylene artifacts. (inadequate xylene treatment)
- Poor-quality section
- Bloated cell morphology
- Poorly stained section

3. Interpretative errors:

- Tumours that are difficult to diagnose, for example, angiosarcoma, signet ring carcinoma
- Heterogeneity of the tumour
- Mixed tumour and biphasic tumour
- Variable degrees of tumour differentiation
- Difficulty in assessing ganglion cells and hypertrophied nerve bundles in Hirschsprung's disease

In conclusion

- Frozen section is an integral part of patient management intraoperatively, whereby the result of the frozen section can alter the surgical procedure immensely.
- Good communication between the surgeon and the histopathologist is essential in this regard.
- A frozen section requires the pathologist to leave the office and all other work and drive to the hospital, gown up and assist in the diagnosis of the one patient in order to preserve scarce resources and not waste unnecessary time. It is critical to assess the need for a frozen section.
- If an operation can continue and be concluded without waiting for the frozen section's result, then that frozen section request was not warranted in the first place.

REFERENCES:

- [1] Gal, AA. 2005. The centennial anniversary of the frozen section technique at the Mayo Clinic. *Archives of Pathology and Laboratory Medicine* 129(12): 1532–1535.
- [2] Jaafar, H. 2006. Intraoperative frozen section consultation: concepts, applications and limitations. *Malaysian Journal of Medical Sciences* 13(1).