https://doi.org/10.48047/AFJBS.6.3.2024.824-831

African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper Open Access

To compare frozen section diagnosis with routine histopathological diagnosis of head & neck lesions.

1.Dr Sunita Pawar, 2. Dr Dnyaneshwar Potpalle, 3. Dr Rukmini S

1. SENIOR RESIDENT, BIDAR INSTITUTE OF MEDICAL SCIENCES, BIDAR , Karnataka
2., ASSOCIATE PROFESSOR, MAHAVIR INSTITUTE OF MEDICAL SCIENCES, VIKARABAD, TELANGANA
3. , ASSOCIATE PROFESSOR, KARNATAKA INSTITUTE OF MEDICAL SCIENCES, HUBLI.

Corresponding author:- Dr Sunita Pawar, SENIOR RESIDENT, BIDAR INSTITUTE OF MEDICAL SCIENCES, BIDAR, Karnataka

Volume 6, Issue 3, Mar 2024

Received: 15 Jan 2024

Accepted: 05 Feb 2024

Published: 15 March 2024

doi: 10.48047/AFJBS.6.3.2024.824-831

Abstract:

Background: Head & neck lesions are a common clinical presentation in medicine, and accurate diagnosis is crucial for appropriate management. Accurate diagnosis of head & neck lesions is essential for optimal patient outcomes and can impact treatment decisions, prognosis, and quality of life. **Aim: T**o compare the diagnostic accuracy of frozen section diagnosis with routine histopathological diagnosis of head & neck lesions. **Materials & methods:** The Karnataka Institute of Medical Sciences, Hubli was the place of the present study from 2016 to 2020, analyzing all specimens for intraoperative consultation at the Department of Pathology. The study used a descriptive research design, requiring specimens to be fresh, normal saline, and without fixative. Exclusion criteria included situations where insufficient biopsy material was acquired, and specimens were placed in formalin fixative. **Results:** A total of 61 samples originated from head and neck lesions. In the frozen sections, we observed true positive cases in 13, true negative cases in 39, false positive cases were 0, and false negative cases were 9 cases. The concordance rate we observed was 85.2%, and the discordance rate was 14.8%. We found that when we compared frozen sections with histopathology methods, the sensitivity was 59.1%, the specificity was 100%, the positive predictive value was 100%, the negative predictive value was 81.25%, and the accuracy was 85.24%. **Conclusion:** The frozen section is a reliable and accurate method for assessing tumors and margins during intraoperative procedures. However, it's limited to specific tumors and can be challenging for large necrotic components or small samples. Pathologists' histology reporting on cryostat sections aids surgeons in making informed decisions, while patients benefit from meticulous examination and adequate sampling.

Key words: Frozen section; Biopsy; Malignancy; Intra-operative procedures; Surgeon; Pathological laboratory.

Introduction:

The frozen section technique is a pathological laboratory method used for rapid microscopic examination of a specimen [1]. Malignancy detection is a frequently employed technique in surgical operations to provide real-time adjustments of surgery throughout the operation [2]. An intraoperative diagnostic tool known as frozen section enables the operating surgeon to promptly diagnose a patient, therefore facilitating fast decision-making that can greatly influence patient care and prognosis [3]. The cryosection procedure was initially pioneered by William H. Welch at John Hopkins Hospital in 1891 [4]. With the advent of the cryostat in 1960, the intraoperative frozen section examination became a dependable method for quickly assessing the histological conditions of tissue samples during surgery [2]. The intraoperative consultations are necessary for several purposes, including determining the primary diagnosis (whether it is benign or malignant), assessing the margin status, determining the lymph node status (whether it is positive or negative for metastases), evaluating the suitability for biopsy, and facilitating additional supplementary procedures. It is crucial to regularly examine the frozen section report and compare it with the final paraffin analysis. Head & neck lesions are a common clinical presentation in medicine, and accurate diagnosis is crucial for appropriate management. Accurate diagnosis of head & neck lesions is essential for optimal patient outcomes and can impact treatment decisions, prognosis, and quality of life. Previous studies have shown that frozen section diagnosis can be useful in certain cases of head & neck lesions, but there is limited research comparing it to routine histopathological diagnosis [5-8]. There is a lack of studies comparing frozen section diagnosis with routine histopathological diagnosis of head & neck lesions, which limits our understanding of the accuracy and utility of each method. What is the diagnostic accuracy of frozen section diagnosis compared to routine histopathological diagnosis of head & neck lesions? The aim of this study is to compare the diagnostic accuracy of frozen section diagnosis with routine histopathological diagnosis of head & neck lesions. We hypothesize that frozen section diagnosis will have similar diagnostic accuracy as routine histopathological diagnosis of head & neck lesions.

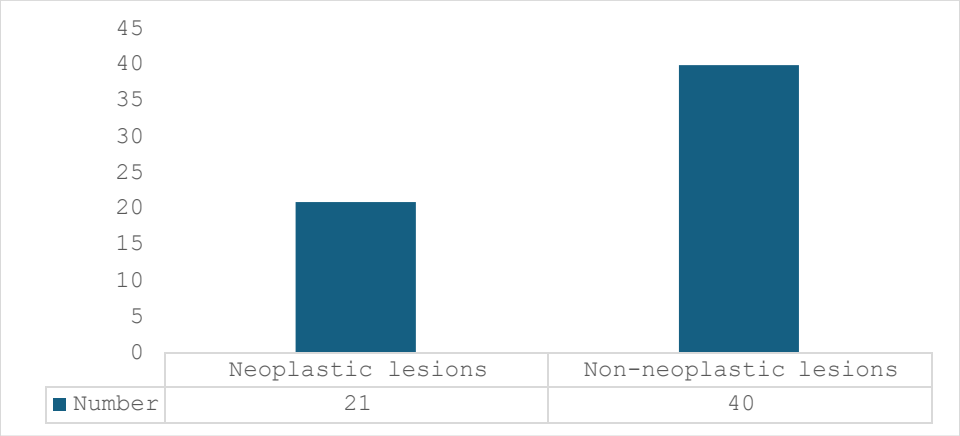
Materials & methods:

From January 2016 to December 2020, the Karnataka Institute of Medical Sciences, Hubli conducted a study that included both prospective and retrospective data. All the specimens obtained for intraoperative consultation at the Department of Pathology, Karnataka Institute of Medical Science, Hubli, were analyzed. The present study employed a descriptive research design. The inclusion criteria required all specimens to be submitted for intraoperative consultation in their fresh state, in normal saline, without any fixative. We also submitted an additional specimen for histology in formalin. The exclusion criteria were situations where insufficient biopsy material was acquired and the specimens were placed in formalin fixative, excluding them from the analysis. Research Methods and Data Collection: We recorded patient preoperative clinical information, such as age, symptoms and signs upon presentation, and clinical diagnosis. We underwent frozen sectioning of every intraoperative specimen, preserved in normal saline without any fixative. During the intraoperative consultation, we visually assessed the fresh specimens to determine their dimensions, exterior brightness, color, and uniformity. We precisely cut the sample bits to dimensions of no more than 2x2x2 cm before cryostat sectioning. We applied the cryo-compound onto the disc and aligned the tissue. We inserted the specimen disc into one of the holes of the quick-freeze shelf and frozen the tissue in a temperature range of -20º to -30º C. The Leica CM 1510 S cryostat was used at our surgical facility. After freezing the tissue, we mounted the specimen disc in the specimen head and obtained sections. We obtained sections of 5-micron thickness and exposed them to fast hematoxylin (H) and eosin (E) staining. e sections onto a glass slide using the brush technique, treated them with 95% ethanol for fixation, and then stained them with H & E. We extracted an average of one to four sections from a typical region of the lesion. The pathologist evaluated the slides and communicated the frozen section report to the clinician/operating surgeon. The surgical specimens underwent permanent paraffin sectioning. We conducted a comprehensive study to compare the frozen section report with the final histopathology report, aiming to determine if the frozen section was consistent or We computed the numerical values for sensitivity, specificity, positive predictive value, and negative predictive value of frozen sections. We computed the precision, sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of frozen sections and compared them to previously published results.

Results:

A total of 61 samples originated from head and neck lesions.

Figure 1: Neoplastic and non-neoplastic percentage in the present study head & neck lesions



Concordance & dis-concordance rates for frozen sections of head & neck lesions samples:

True positive: 13/61

True negative: 39/61

False positive: 0/61

False negative: 09/61

Concordance rate = True positive + True negative/ Total evaluation X 100 = 13+39/61 X 100 = 85.2%

Dis-concordance rate = 14.8%

Reliability indices for Histo-pathology of head & neck lesions samples

Sensitivity = True positive / True positive + False negative X 100 = 13/13+9 X 100 = 59.1%

Specificity = True negative / True negative + False positive X 100 = 39/39+0 X 100 = 100%

PPV = True positive / True positive + False positive X 100 = 13/13+0 X 100 = 100%

NPV = True negative / True negative + False negative X 100 = 39/39+9 X 100 = 81.25%

Accuracy = True negative+ True positive/True negative+ False positive+ True positive+ False negative X 100 = 85.24%.

Discussion:

The accuracy of the frozen section described in the literature varies between 96.96 and 90.6% [5, 9]. The College of American Pathologists has reviewed over 90,000 frozen sections from 461 institutions and has shown a concordance rate of 98.52% [10]. Documentation shows discordance rates up to 11% [11]. However, the accuracy of the frozen section varies with the site of biopsy, type of specimen, and diagnosis [10]. Our study found that frozen sections had a concurrence rate of 85.2% and a discordance rate of 14.8%. Our overall accuracy rate was 85.2%. Other studies have shown the accuracy rate of head and neck frozen sections to be in the range of 96% to 98% [12, 13]. Cambridge University Press published Intraoperative Consultation in Surgical Pathology [14] in 2010, which consolidated results from about six relevant studies to put the error rates at less than 2%. Our accuracy rate is slightly below, but not grossly off the mark.

Our study did not report any false positive cases, but it did observe 15 false negative cases. The frozen section reported seven cases, all from head and neck lesions, as false negatives for margin status. The sampling error was the reason for the false negativity.

When compared to histopathological staining, frozen sections for head and neck lesions usually have a high level of specificity often very close to 100% which shows that they can find malignancies. However, the sensitivity generally decreases, particularly when dealing with more complex malignancies or when tissue preservation is not optimal. The sensitivity rates for frozen sections vary between 85% and 91%, contingent upon the lesion’s intricacy and the pathologist's expertise. The sensitivity (59.1%) and specificity (100%) values do not match a similar-sized study by Du E et al. [15]. Our specificity values also do not match approximately with the values found in other studies [16, 17]. The involvement of subspecialized head and neck pathologists is a significant determinant of accuracy. Empirical research suggests that specialists get superior diagnosis precision in comparison to ordinary pathologists. For instance, a particular investigation documented a comprehensive accuracy rate of 97.6%, accompanied by a 19.8% enhancement in

sensitivity when managed by subspecialized pathologists [18]. Contrasting with standard histology, frozen sections offer quick but sometimes less conclusive findings, often caused by sampling problems and delayed diagnosis, underscoring the need for routine histological assessment for confirmation.

In order to evaluate the clinical utility of frozen section diagnosis in comparison to routine histopathological examination for head and neck lesions, it is essential to consider the PPV and NPV. Research indicates that the PPV and NPV values for frozen sections in head and neck surgeries are generally high, which indicates that the diagnostic accuracy in determining tumor margins and staging is robust. The present study observed a PPV of 100% and NPV of 81.25%. For example, a study on oral squamous cell carcinoma determined that the PPV of frozen section diagnosis was 95.2%, while the NPV was 88.1% [19, 20]. This implies that the permanent histopathological analysis is highly probable to corroborate a positive margin identified by a frozen section. On the other hand, a frozen section's identification of a negative margin carries a slightly lower certainty of verification as negative, potentially leading to the missed presence of residual tumors. When comparing frozen section results to permanent histopathological sections, another study reported a PPV of 96.7% and an NPV of 94.9% [18, 21]. These results support the use of frozen section diagnosis as an aid during surgery to help surgeons make decisions, especially when immediate margin assessment is needed to stop tumor recurrence. Nevertheless, the NPV's minor fluctuations indicate that it is necessary to exercise caution when interpreting negative results in order to prevent the occurrence of false negatives. These values emphasize the efficacy of frozen sections, despite the fact that discrepancies with routine histopathology still occur, particularly in more complex or challenging cases.

Conclusion:

The frozen section is a reliable and accurate method for assessing tumors and nodes during the intraoperative process but limited to specific tumors like borderline ovarian tumors. Technical difficulties, interpretation errors, and sampling errors can make the evaluation difficult. Pathologists' histology reporting on cryostat sections aids surgeons in making informed decisions. Patients can benefit from the frozen section method if they meticulously examine macroscopic samples and conduct adequate sampling.

Conflict of interest:

There is no conflict of interest among the present study authors.

References:

1. Krithiga M, Priya K. Correlation between histopathology and frozen study of ovarian carcinoma.
2. Reddy R, Prabhala S, Kumar A. Concordance of intraoperative frozen section diagnosis with routine histopathological diagnosis. Breast.;18:35-2.
3. Ray M, Mohanty P, Agarwal S, Mohapatra D. Accuracy of Intra-Operative Frozen Section Consultation of Gastrointestinal Biopsy Samples in Correlation with the Final Histopathological Diagnosis. Int J Cur Res Rev| Vol. 2021 Jan;13(01):41.
4. Gupta A, Jain N. Evaluation of a step-by-step approach to frozen section diagnosis in ovarian masses. Asian Journal of Medical Sciences. 2021 Dec 1;12(12):133-9.
5. Patil P, Shukla S, Bhake A, Hiwale K. Accuracy of frozen section analysis in correlation with surgical pathology diagnosis. Int J Res Med Sci. 2015 Feb;3(2):399-404.
6. Mishra S, Gupta M, Bharat V, Bansal R. Qualitative comparative study of frozen section with routine histological technique. National journal of laboratory medicine. 2016 Apr 5;2:44-50.
7. Phulgirkar PP, Dakhure SD. The Diagnostic accuracy of frozen section compared to routine histological technique-A comparative study. Int J Sci Healthcare Res. 2018;3:88-92.
8. Dinusha P, Vallapureddy Thejaswini V, Reddy AJ, Reddy SS. Study of assessing diagnostic efficacy of squash smear technique and frozen section by comparing with histopathology in CNS lesions, with special reference to IHC. Panacea Journal of Medical Sciences. 2023 Apr 14;13(1):188-97.
9. Phulgirkar PP, Dakhure SD. The Diagnostic accuracy of frozen section compared to routine histological technique-A comparative study. Int J Sci Healthcare Res. 2018;3:88-92.
10. Novis DA, Gephardt GN, Zarbo RJ. Interinstitutional comparison of frozen section consultation in small hospitals: a college of American pathologists Q-probes study of 18532 frozen section consultation diagnoses in 233 small hospitals. Archives of pathology & laboratory medicine. 1996 Dec 1;120(12):1087.

11. Dahlin DC. Seventy-five years' experience with frozen sections at the Mayo Clinic. InMayo Clinic proceedings 1980 Nov (Vol. 55, No. 11, pp. 721-723).
12. Mahe E, Ara S, Bishara M, Kurian A, Tauqir S, Ursani N, Vasudev P, Aziz T, Ross C, Lytwyn A. Intraoperative pathology consultation: error, cause and impact. Canadian Journal of Surgery. 2013 Jun;56(3):E13.
13. Olson SM, Hussaini M, Lewis Jr JS. Frozen section analysis of margins for head and neck tumor resections: reduction of sampling errors with a third histologic level. Modern Pathology. 2011 May 1;24(5):665-70.
14. Ranchod M, editor. Intraoperative consultation in surgical pathology. Cambridge University Press; 2010 Oct 28.
15. Du E, Ow TJ, Lo YT, Gersten A, Schiff BA, Tassler AB, Smith RV. Refining the utility and role of frozen section in head and neck squamous cell carcinoma resection. The Laryngoscope. 2016 Aug;126(8):1768-75.
16. Esbona K, Li Z, Wilke LG. Intraoperative imprint cytology and frozen section pathology for margin assessment in breast conservation surgery: a systematic review. Annals of surgical oncology. 2012 Oct;19:3236-45.
17. Khoo JJ. An audit of intraoperative frozen section in Johor. The Medical journal of Malaysia. 2004 Mar 1;59(1):50-5.
18. Roy S, Parwani AV, Dhir R, Yousem SA, Kelly SM, Pantanowitz L. Frozen section diagnosis: is there discordance between what pathologists say and what surgeons hear?. American Journal of Clinical Pathology. 2013 Sep 1;140(3):363-9.
19. Layfield EM, Schmidt RL, Esebua M, Layfield LJ. Frozen section evaluation of margin status in primary squamous cell carcinomas of the head and neck: a correlation study of frozen section and final diagnoses. Head and Neck Pathology. 2018 Jun;12:175-80.
20. Ali JP, Mallick BA, Rashid K, Malik UA, Hashmi AA, Zia S, Irfan M, Khan A, Faridi N. Diagnostic accuracy of intraoperative frozen section for margin evaluation of oral cavity squamous cell carcinoma. BMC Research Notes. 2024 Feb 1;17(1):43.
21. Higginson JA, Breik O, Thompson AH, Ashrafian H, Hardman JC, Takats Z, Paleri V, Dhanda J. Diagnostic accuracy of intraoperative margin assessment techniques in surgery for head and neck squamous cell carcinoma: A meta-analysis. Oral Oncology. 2023 Jul 1;142:106419.