Frequency of Technical Errors in the Biopsy Samples Submitted to an Oral and Maxillofacial Pathology Laboratory

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ABSTRACT

Background and aim: Following a correct biopsy protocol is crucial for accurate diagnosis of oral and maxillofacial lesions. Pre-analysis technical errors during preparation and submission of biopsies can jeopardize the diagnostic process and the related treatment plan. The aim of the present study was to evaluate pre-analysis technical errors in the biopsy samples submitted to an oral and maxillofacial pathology laboratory.

Materials and methods: In this descriptive study, 166 biopsy samples submitted to the oral and maxillofacial pathology laboratory of the dental branch of Islamic Azad University of Tehran in 2013 were assessed. 13 samples were excluded due to incomplete information. 153 samples were evaluated and compared to the standard criteria with regard to four fields including: biopsy request form, storage solution, container, and quality. The frequency of errors was reported with 95% confidence interval.

Results: No errors were detected in 19 samples (12.4%); whereas, 123 samples (80.4%) had incomplete biopsy request forms, 7 samples (4.6%) had been kept in improper storage media, 2 samples (1.3%) had unsuitable containers, and 2 biopsies (1.3%) had poor quality.

Conclusion: It seems that failure to submit a complete biopsy request form is the most common technical error, which indicates the need for periodic retraining and updates regarding the biopsy protocols.

Original Article

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Introduction:

Following a correct biopsy protocol is crucial for accurate diagnosis of oral and maxillofacial lesions. Similar to other laboratory procedures, biopsy sampling is susceptible to errors, which can affect the diagnosis.[1] Harvesting a suitable piece of tissue during biopsy procedure is one of the major concerns that affects the final diagnosis and the related treatment plan.[2]

Clinically, biopsy is defined as a procedure in which a piece of vital tissue is cut and studied under microscope for diagnostic and therapeutic purposes.[3, 4] Histopathological laboratory procedures consist of nine steps, as follows: 1. Assessment and inquiry, 2. Harvesting the sample, 3. Registering the information, 4. Sample transportation, 5. Sample preparation, 6. Analysis 7. Report, 8. Interpretation, 9. Therapeutic findings. [5, 6]

The whole mentioned process is usually divided to three analytical stages: 1. Pre-analysis, 2. During analysis, 3. Post-analysis. Pre-analysis errors occur during sample harvesting, and include: smashing, stretching, rotation, and shrinkage of samples (which cause histologic artifacts), biopsy autolysis, damaged samples, and failure to register correct information on the biopsy containers. Errors during analysis occur upon slide preparation, and include bubble formation and inappropriate staining. Post-analysis errors include improper answering or incorrect diagnosis of lesions.[3, 4, 7, 8]

Rotation and shrinkage of the sample cause histologic artifacts in the microscopic view. Biopsy autolysis may occur due to delay in sample fixation, incorrect use of neutral buffered formalin, and unsuitable concentration or inadequate volume of the fixative solution. Samples may also get damaged during removal from a container with a small opening.[9-11]

Nonetheless, technical errors in biopsy submission may affect the diagnosis, and jeopardize patients' safety. They may also cause delay in diagnosis which might lead to morbidity and mortality.[12]

To date, various biopsy submission errors have been reported in different studies; however, the number of these studies is limited. The aim of the present research was to determine the frequency of errors in the biopsies submitted to the oral and maxillofacial pathology laboratory of the dental branch of Islamic Azad University of Tehran in 2013.

Materials and Methods:

In this descriptive study, all the samples submitted to the oral and maxillofacial pathology department during 2013 were evaluated with regard to four categories including: biopsy request form, storage solution, container, and quality. The gathered data were compared with the standard criteria.[8] The frequency of errors was reported with 95% confidence interval.

Results:

No errors were detected in 19 samples (12.4%); whereas, 134 samples (87.6%) contained errors at least in one of the evaluated categories (CI 95%=82.4-92.8). (Diagram 1)
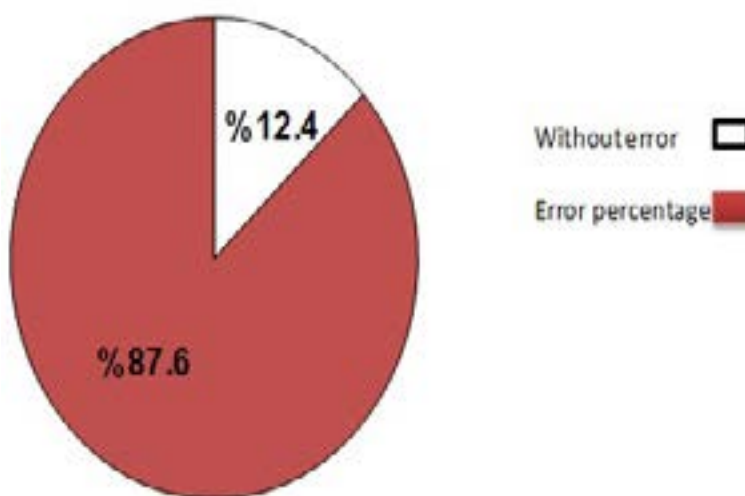

Diagram 1- Distribution of erros in the 153 biopsy samples submitted to the pathology laboratory of the dental branch of islamic azad university of Tehran in 2013

123 samples (80.4%) had incomplete biopsy request forms, 7 samples (4.6%) had been kept in improper storage media, 2 samples (1.3%) had unsuitable containers, and 2 biopsies (1.3%) had poor quality. (Table 1)

Table 1- Frequency of errors in the biopsies submitted to the oral and maxillofacial pathology department of the dental branch of Islamic Azad University of Tehran in 2013.

Type of error	Frequency of samples with error	Percentage of samples with error
Without error	19	12.4
Biopsy request form	123	80. 4
Storage solution	7	4.6
Biopsy container	2	1.3
Quality of the sample	2	1.3

Figure 1- An unsuitable biopsy container

Figure 2- Submission of a small and traumatized sample

Discussion:

In the present study, 80.4% of the samples presented with errors related to biopsy request forms, which lacked patient name, age, medical history, sample harvesting area, differential diagnosis, name and especially of the requesting physician, radiographs, and history of previous biopsy). 4.6% of the errors were related to biopsy storage solution (use of insufficient volume of formalin, or use of non-formalin solutions), 1.3% of the samples had errors in the sample container (unsuitable size of container, unlabeled containers, or both), and 1.3% of the samples had poor quality (small sample size, superficial sampling, and traumatized samples). In a study by Zargaran et al, 60.4% of the errors were related to biopsy request forms, 8% of the errors were detected in biopsy storage solutions, 19% in the sample container; while, 12.6% of the errors were related to the quality of samples. The most common error was an improper biopsy request form, which is similar to the findings of the present study.[1] In the study by Carraro et al, the frequency of this error was equal to 61.9%.[13] In the current study, the most frequent errors were incomplete biopsy request forms, unsuitable storage solution and sample container, and poor biopsy quality, respectively. These results are similar to the findings of the study by Zargaran and colleagues.[1] In the study by Wagar et al, the most common error was submission of unlabeled samples, which complicated sample identification.[2] This error was not encountered in our study.

It seems that sending labelled packages containing 10% formalin to the biopsy centers of the university and private clinics have reduced the frequency of this error in our study.

We found that incomplete biopsy request forms with the frequency of 87.5% (138 cases), was the most frequent error. Recording the age, sex, alcohol consumption or smoking habits, appearance of the sample, presence or absence of other illnesses, type of biopsy and differential diagnosis are essential for diagnosing pathologic lesions, since diagnosis of some lesions depends on the age, sex, or certain occupations. It should be noted that rendition of differential diagnosis is valu-

able in the diagnosis of biopsy samples, as it shows the clinician's clinical point of view.[14]

Incomplete clinical information and absence of a differential diagnosis may lead to additional paraclinical tests. Absence of radiographs related to intraosseous lesions leads to inability to make a correct histopathological diagnosis. Although dentistry students and residents study the biopsy-related courses during the third year of their education, there is a need for retraining in this field.[14, 15]

In a research by Plebani et al, pre-analysis error rate was reported to be 50 to 75%.[15] It seems that the 87.6% error rate in the present study is concerning, and shows the need for retraining and updates regarding the biopsy protocols. According to the performed evaluations, it seems that submission of incomplete biopsy request forms by biopsy performers is the most common pre-analysis error. It is recommended to send standard request forms and pamphlets to different departments of the dental branch of Islamic Azad University of Tehran.

Conclusion:

It seems that failure to submit a complete biopsy request form is the most common pre-analysis technical error, which indicates the need for periodic retraining and updates regarding the biopsy protocols.

Conflicts of Interest:

the authors of this manuscript certify that they have no conflicts of interest regarding this research.

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