Clinical and histological diagnosis of oral pathologic lesions, any concordance?

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ABSTRACT
Objective: This study aims to examine the concordance between clinical and histopathological diagnosis of surgical specimen of oral lesions using partial biopsy technique.
Methods: This was a retrospective study that utilized the data obtained from the case notes and histology record of 433 patients that had biopsy done between 2008 and 2017. Information on patients' age, gender, type of biopsy, presumptive clinical diagnosis and histopathologic diagnosis were obtained. Concordance between presumptive clinical and histopathologic diagnosis (incisional and final surgical specimen as the case may apply) and rate of misdiagnosis were assessed.
Results: Excisional biopsies were more often used for benign lesions while incisional biopsy with or without surgical specimen were more often used for malignant lesions. Benign lesions were more frequently diagnosed than malignant lesions. The presumptive clinical diagnosis was erroneous for 40.3% and 22.1% of lesions following incisional histopathology and surgical specimen histopathology report respectively. Lesions that were subjected to both incisional and surgical specimen biopsies had a misdiagnosis rate of 11.2%.
Conclusion: Incisional biopsy and post-surgical specimen histopathology investigation are important tools in the effective management of oral pathologic lesions.
Keywords: Clinical diagnosis, incisional biopsy, excisional biopsy, concordance, misdiagnosis.

INTRODUCTION: Arriving at a right diagnosis of medical conditions cannot be overemphasized, as appropriate diagnosis determines appropriate treatment.[1] Since the risk of misdiagnosis exists with any condition, it means the risk of inappropriate treatment also exists and some with disastrous consequence on the health of the patient. The process of making a diagnosis of oral lesions involves obtaining detailed history, clinical examination, after which an initial impression with possible differentials is made. It is upon this initial impression that some investigations like radiologic investigations are requested and subsequently a presumptuous clinical diagnosis is arrived at. However, to be able to plan and execute treatment for most lesions, a histopathologic examination is essential so as to have a definitive diagnosis that will allow for appropriate treatment. For lesions that have surgical removal as the treatment, the entire surgical specimen is also sent for histopathologic examination as a further confirmatory check on the initial clinical and histopathologic diagnosis. Histopathologic diagnoses to a large extent rely on clinical findings. The process by which the clinician arrives at a diagnosis as well as obtains the specimen for histopathologic examination may go a long way to influencing the histopathologic diagnosis. This is due to the fact that clinical misinformation may lead to misinterpretation of histopathologic findings, appropriate clinical information and right tissue specimen are essential elements for accurate histopathologic diagnosis[2,3]. There are different techniques of obtaining specimens for histopathologic examination and can be broadly divided into incisional biopsy technique (only part of the specimen of the lesion is obtained for histopathologic examination) and excisional biopsy in which the whole tissue is available for histopathologic examination. Documented reports have shown

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different rates of misdiagnosis with different techniques, the rate being higher with incisional biopsy techniques. The possible reasons suggested for the high rate of misdiagnosis in incisional biopsies include unrepresentative sample[4,5,6], inability to assess overall architecture, obscuring inflammation, presence of artifacts and faulty interpretation by pathologists[7,8]. In many instances, incisional biopsy is the only feasible technique for making definitive diagnosis upon which treatment is planned and executed. It is only after treatment has been executed that the entire specimen is available. Following treatment, the surgical specimen is subsequently sent for histopathologic examination to further check for the histopathologic nature of the lesion. Studies have reported rate of misdiagnosis to be least with excisional biopsy[9,10]. This study aims to examine the concordance between clinical and histopathologic diagnosis of both incisional and excisional biopsies.

METHODS

This was a retrospective study of patients who presented to the Oral and Maxillofacial surgery unit of the University College Hospital Ibadan, Nigeria over a 10 year period (2008 to 2017). Case files and histology records of all biopsies performed during the study period were retrieved and data including patients' age, gender, date and type of biopsy, presumptive clinical diagnosis, histopathologic diagnosis of biopsies of oral lesions were obtained. Cases with incomplete records were excluded from the study. For the purpose of this study, lesions were broadly classified as benign or malignant[11]. The benign lesions were further sub classified into inflammatory, cystic, odontogenic, salivary gland, fibro-osseous, soft tissue (non neoplastic lesions occurring on the intraoral soft tissue), osseous lesions and others. On the other hand, malignant lesions were sub classified into oral squamous cell carcinoma (OSCC), sarcomas, malignant salivary gland tumors, malignant odontogenic tumors, lymphoepithelial malignancies and others. The primary outcome is histopathologic diagnosis. All data were entered into and analyzed using SPSS for Windows (version 20.0; SPSS Inc. Chicago, IL). Using kappa Cohen score, the level of agreement between the histopathologic diagnosis of all biopsies and clinical diagnosis were assessed. And the agreement of histopathologic diagnosis of the final surgical specimens with incisional biopsies were also assessed. A p-value of less than 0.05 was taken as stastistically significant.

RESULTS

A total of 433 biopsies were carried out during the study period, out of which 170 (39.3%) were incisional, 142 (32.8%) excisional and 121 (27.9%) received both types (incisional and excisional) of biopsies. The mean age of the patients was 38.5 ± 18.8 years. There were 210 males (48.7%) and 322 females (51.3%). (M:F=1:1.1). Those aged 20-29 years and 30-39

Table 1: Socio-demographic characteristics by types of lesions biopsied

Socio -demographic characteristics	Benign n(%)	Malignant n(%)	Total N(%)	p value
Age group (years)				
0 -9	9(2.9)	10(7.8)	19(4.4)	
10 -19	41(13.1)	10(8.7)	51(11.8)	
20 -29	74(23.6)	15(13.0)	89(20.6)	<.001
30 -39	69(21.9)	12(10.4)	81(18.7)	
40 -49	46(14.6)	17(14.8)	63(14.5)	
50 -59	41(13.1)	18(15.7)	59(13.6)	
60 -69	19(6.1)	17(13.9)	36(8.3)	
79 -80	8(2.5)	15(12.2)	23(5.3)	
> 80	7(2.2)	5(3.5)	12(2.7)	
Gender				
Female	173(55.1)	49(41.2)	222(51.3)	
Male	141(44.9)	70(58.8)	211(48.7)	0.02

Table 2: Lesions (clinical diagnosis) by type of biopsy

Lesions	Incisional	Excisional	Both	Total	p value
Malignant					
OSCC	36(70.5)	2(3.9)	13(25.5)	51	<0.001
Sarcomas	12(52.2)	2(8.7)	9(39.1)	23	
SGT	17(48.6)	3(8.6)	15(42.9)	35	
Odontogenic	-	-	1(100.0)	1	
LET	11(78.6)	1(7.1)	2(14.3)	14	
Benign					
Inflammatory	4(23.6)	13(76.4)	-	17	
Cystic	5(26.3)	11(57.9)	3(15.8)	19	
Odontogenic	53(43.8)	17(14.0)	51(42.1)	121	<0.001
Salivary	4(33.3)	7(58.3)	1(8.3)	12	
Fibro-osseous	20(43.5)	8(17.4)	18(39.1)	46	
Soft tissue	2(2.7)	69(94.5)	2(2.7)	73	
Osseous	2(15.4)	8(61.5)	3(23.1)	13	
Others	4(50.0)	1(12.5)	3(37.5)	8	

* OSCC - oral squamous cell carcinoma, SGT - salivary gland tumours, LET - lymphoepithelial tumours

Table 3: Distribution of types of lesions biopsied (using clinical diagnosis)

	Types of lesions biopsied		
Benign n(%)		Malignant n(%)	
Inflammatory	17(5.5)	OSCC	51(41.1)
Cystic	19(6.1)	Sarcomas	23(18.5)
Odontogenic	121(39.2)	Salivary gland tumours	35(28.2)
Salivary	12(3.9)	Malignant odontogenic tumours	1(0.8)
Fibro-osseous	46(14.9)	Lymphoepithelial tumours	14(11.3)
Soft tissue	73(23.6)	Total	124(28.6)
Osseous	13(4.2)		
Others	8(2.6)		
Total	309(71.4)		

Table 4: Distribution of concordant/discordant lesions by clinical diagnosis,incisional excisional biopsy

Lesions	Incisional vs Concordant	Clinical Discordant	κ	p value	Excisional Concordant	vs clinical Discordant	κ	p value
Benign								
Inflammatory	1(22.5)	3(67.5)			7(58.3)	5(41.6)		
Cystic	1(20.0)	4(80.0)			6(54.5)	5(45.3)		
Odontogenic	39(69.6)	17(30.5)	.19	<.001	11(78.6)	3(21.4)	.61	<.001
Salivary	-	4(100.0)			2(100.0)	-		
Fibroosseous	10(50.0)	10(50.0)			6(75.0)	2(25.0)		
Soft tissue	1(50.0)	1(50.0)			53(81.5)	12(18.3)		
Osseous	2(100.0)	-			3(37.5)	5(62.5)		
Others	1(25.0)	3(75.5)						
Malignant								
OSCC	33(76.7)	10(23.2)			8(66.7)	4(28.5)		
Sarcomas	5(29.4)	12(70.5)			4(57.1)	3(42.9)		
SGT	14(48.5)	14(20.7)	.33	<.001	8(66.7)	4(33.3)	.29	<.001
Odontogenic	-	3(100.0)			-	-		
LET	9(69.2)	4(30.8)			1(50.0)	1(50.0)		

* OSCC oral squamous cell carcinoma, SGT - salivary gland tumours, LET - lymphoepithelial tumours

Table 5: Distribution of concordant/ discordant lesions by incisional biopsy and post-surgical treatment specimens

Lesions	Excisional Concordant	vs Incisional Discordant	κ	p value
Benign				
Inflammatory	1(100.0)	2(50.0)		
Cystic	2(50.0)	3(6.6)	.39	<.001
Odontogenic	43(93.5)	-		
Salivary	1(100.0)	2(9.5)		
Fibroosseous	19(90.5)	-		
Soft tissue	2(100.0)	1(20.0)		
Osseous	4(80.0)			
Others				
Malignant				
OSCC	8(88.9)	1(11.1)		
Sarcomas	5(83.3)	1(16.7)	.74	<.001
SGT	10(90.9)	1(9.1)		
Odontogenic	-	-		
LET	-	1(100.0)		

*OSCC - oral squamous cell carcinoma, SGT - salivary gland tumours, LET - lymphoepithelial tumours

years were more predominant 89 (20.8%) and 81 (18.9%) respectively (Table 1). Incisional biopsies were mostly used for malignant lesions compared with excisional which was regularly used for benign lesions (p<0.001) (Table 2). There were 126 (59.7%) incisional biopsy and 109 (77.9%) excisional biopsy specimens. Most of the lesions diagnosed were benign 309 (71.4%) while 124 (28.6%) were malignant. Odontogenic tumour 121 (39.2%) was the principal benign lesion followed by fibroosseous lesion 46 (14.9%) while for malignant lesions, oral squamous cell carcinoma (OSCC) 51(41.1%), salivary gland tumours 35(28.2%) and sarcomas 23 (18.5%) were the most common (Table 3).

Generally, the soft tissue lesions 12 (8.5%) were the most commonly misdiagnosed diseases (Table 4). The kappa score of histology in incisional and excisional biopsies to clinical diagnosis are as indicated in table 4 and for incisional and surgical specimen as indicated in table 5. Lesions that were subjected to both incisional and surgical specimen biopsies had similar diagnoses for 95 (88.8%) of lesions (Table 5).

DISCUSSION

In the present study, peak incidence of oral lesions occurred between 20-39 years in agreement with previous reports[11,12]. Possible reasons for this have been previously documented in the literature and include; active development of diverse pathological lesions during this age group as well as multiple embryonic tissue contained within the jaws during the first 25 years of life[13,14]. The male/female ratio was 1:1.1, at variance with the reported ratio of (1.02/1, male/female) in the study of Tatli et al. but similar to that in the study of Joe and Franklin (0.9/1) and the study of Patel et al. (0.74/1) for submitted biopsy specimens[15-17]. Possible reasons that have been suggested for the higher female gender presentation include females having more oral lesions, females being more health conscious and accessing oral health services for clinical examination more[12,18]. However when benign and malignant lesions were considered separately, there were more females than males for benign lesion group while the malignant lesion group had more males than females. Possible reasons have been suggested to be the fact that more males are involved in the risk factors for malignant lesion such tobacco use and alcohol consumption[119,20]. Benign lesions were more frequently diagnosed than malignant lesions in correlation with previous audits from Nigeria[21], Tanzania[11], Singapore[22] and East Africa[23] Commonest benign lesion of odontogenic origin and commonest malignant lesion of OSCC reported in this study concurs with findings from previous studies.[17,24] Previous studies have shown odontogenic tumours to be the commonest benign

lesions with ameloblastoma accounting for majority of the cases in Africans and Asians while Odontomas account for majority in Caucasians[25,-27]. Similarly, OSCC has been shown to be the commonest oral malignant lesion with reports ranging from as high as 75-95% in most climes and as low as 41-44% in Nigerian studies[28,-31]. The pattern noticed in this study shows majority of the malignant lesions having only incisional biopsy without surgical specimen histopathology result. This appears worrisome as it could indicate that most of the patients eventually did not turn up for treatment. However, other possibilities may include late presentation of these patients as observed in previously documented studies,[11,24,32] other treatment options (mainly palliative) other than surgical intervention could have been employed in managing these cases. These reasons are presumptuous and merits further studies to clarify. On the other hand, majority of the benign lesions have surgical/excisional biopsy histopathology results but without incisional biopsy result. This could be due to the fact that majority (85%) of the lesions for excisional biopsies were soft tissue lesions that are normally often treated by excisional biopsy. The result from this study indicated a relatively low concordance rate (less than 40%) between clinical diagnosis and incisional biopsy and between clinical diagnosis and surgical specimen histopathologic results. A relatively higher rate of concordance was however observed between incisional biopsy specimen and surgical specimen results. Overall the rate of erroneous clinical diagnosis in the present study is 34.2%; however, with respect to incisional biopsy result, the rate of erroneous clinical diagnosis (lack of concordance) is over 40% which is higher than reported by Bacci et al. (31.5%)[3], but lower than that in the study of Kondori et al. (43%)[33] and Patel et al. (49.4%)[19]. Although these high rates of erroneous clinical diagnosis appears worrisome and the reason(s) for this finding does not seem to be immediately apparent, the fact that the study was carried out in a Teaching Hospital with different levels and cadres' of dental practitioners may be partly responsible. It is known that clinical diagnosis involves various skills that are acquired over time and are improved over time with practice and experience. However, the fact that tumors are managed mainly based on the histologic diagnosis rather than the clinical diagnosis, assuage some of the apprehensions from the high rate of discordance of clinical diagnosis in this study and further reinforces the indispensability of biopsies in the management of oral benign and malignant lesions. When clinical diagnosis and incisional biopsy are compared, the most common erroneous diagnosis occurred with inflammatory followed by cystic lesions at variance with the study of Tatli et al[15] where highest rate of discordance was reported for non-odontogenic and malignant lesions[3] and the study of Bacci et al. that reported highest rate of clinical misdiagnosis for malignant lesions. Concordance rate in this study was highest (88.8%) between incisional biopsy and surgical histopathologic diagnosis which is in agreement with the findings in the study of Chen et al.,[8] but at variance with some other studies where a much lower concordance was reported[35,36]. Goodson et al.[35] reported diagnostic error in about half of incisional biopsy specimen of oral dysplasia, similarly Cohen et al. reported misdiagnosis in 73.3% of leukoplakias[35]. These authors opined that incisional biopsy result be regarded as provisional diagnosis and that full excision of the lesion should be done for definitive diagnosis[35,36]. Reasons that have been suggested for misdiagnosis in incisional biopsy include sampling error, insufficient tissue for diagnosis, presence of obscuring inflammation, tissue artifacts and pathologist discrepancy[6,-8,37]. The 14.9% under diagnosis and 12.4% over diagnosis involving malignant lesions in the present study concurs with findings in previous studies that have also reported different rates of misdiagnosis involving malignant lesions[15], some with values lower than reported in this study (Tatli et al. 9%, Kondori et al. over 5%)[33] while Burns and Nielson reported a much higher value of 32.5%[34].These misdiagnoses (especially under diagnosis) may be of dire consequence and underscores the importance of histopatologic examination as an essential tool in arriving at a diagnosis or in confirming diagnosis following excisional biopsy. It also goes to show the risk of executing treatment without histopathologic result especially in environments where attendance at follow up review following treatment is poor and patients may thus miss the opportunity of getting appropriate treatment and may lead to adverse outcome of treatment. With regards to clinical diagnosis and excisional biopsy result we found the rate of erroneous clinical diagnosis to be 28.7%, with no overdiagnosis or underdiagnosis involving malignant lesions. This could be due to the fact that majority of lesions that are subjected to excisional

biopsy are usually lesions that can be easily identified and diagnosed clinically with some degree of accuracy. However, as recorded in this study, and as also reported in the study of Kondori et al., a number of these lesions that appear to be easy to recognize and diagnose can also have error of diagnosis.[33] This underscores the importance of submitting all specimens for histopathologic examination.

CONCLUSION

The results from this study showed that clinical diagnosis gave erroneous diagnosis in about 34% of cases while incisional biopsies gave erroneous diagnosis in about 10% of cases and that benign lesions are more likely to be misdiagnosed than malignant lesions. This study has therefore helped to buttress the importance of biopsies (incisional, excisional and postsurgical) in the diagnosis and management of oral benign and malignant lesions. The study also showed that post-surgical biopsies are crucial in the effective management of these lesions and that clinical diagnosis alone are not sufficient and cannot be depended on in treatment planning and overall care of
benign and malignant oral lesions.

REFERENCES

1. Sreedharan S, Govinda BS, Krishnan IS, Krishna KK. "Mis- or Missed Diagnosis: A Series of Four Cases," Case Reports in Dentistry, 2012; Article ID 946327, 5 pages. Available at: https://doi.org/10.1155/2012/946327. Accessed: 06-02-2019
2. Rad M., Hashemipoor MA., Mojtahedi A et al. Correlation between clinicaland histopathologic diagnoses of oral lichen planus based on modified WHO diagnostic criteria. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2009;107(6):796-800. doi:10.1016/j.tripleo.2009.02.020
3. Bacci C, Donolato L, Stellini E, Berengo M, Valente M, A comparison between histologic and clinical diagnoses of oral lesions. Quintessence Int 2014;45:789–794; doi: 10.3290/j.qi.a32440
4. Scolyer RA, Thompson JF, Stretch JR, Sharma R, McCarthy SW. Pathology of melanocytic lesions. J SurgOncol. 2004;86(4):200-211
5. McCarthy SW, Scolyer RA, Palmer AA. Desmoplastic melanoma: a diagnostic trap for the unwary. Pathology. 2004;36(5):445-451.
6. Ferrara G, Argenziano G, Cerroni L. et al. A pilot study of a combined dermoscopic pathological approach to the telediagnosis of melanocytic skin neoplasms. J Telemed Telecare. 2004; 10(1):34-38.
7. Crotty KA, Scolyer RA, LiL W, Palmer AA, Wang L, McCarthy SW. Spitznaevus versus Spitzoid melanoma. Pathology. 2002; 34 (1): 6-12.
8. Chen S, Forman M, Sadow PM, August M. The diagnostic accuracy of incisional biopsy in the oral cavity. J Oral Maxillofac Surg 2016; 74: 959-964
9. Yamagishi T, Shimizu K, Ochi N et al. Histological comparison between preoperative and surgical specimens of nonsmall cell cancer for distinguishing between "squamous" and "non-squamous" cell carcinoma. Diagnostic pathology 2014; 9:103. http://www.diagnosticpathology.org/content/9/1/103. Accessed: 13/12/2018
10. Jonathan CNg, Sarah S, John PD et al. The Impact of Partial Biopsy on Histopathologic Diagnosis of Cutaneous Melanoma Experience of an Australian Tertiary Referral Service Arch Dermatol. 2010; 146(3):234-239. doi:10.1001/archdermatol.2010.14
11. Moshy JR, Sohal KS. The types, incidence and demographic distribution of benign oral and maxillofacial neoplasms among patients attending Muhimbili National Hospital in Tanzania, 2008–2013. Tanzania J Health Res. 2016; 18: 1–5
12. Odukoya O. Odontogenic tumours: analysis of 289 Nigerian cases. J Oral Pathol Med 1995; 24:454-457.
13. Butt FMA, Chindia ML, Wakoli KA. Problem in diagnosing odontogenic myxoma. East African Medical Journal 2007; 84: 141-145.
14. Hoffman, S. & Sheiham, A. Intraosseous and pasrosteal tumors of the jaws: 1977, 2nd Series 02-04.
15. Tatli U, Erdoğan Ö, Uğuz A, Üstün Y, Sertdemır Y, Damlar İ. "Diagnostic Concordance Characteristics of Oral Cavity Lesions," The Scientific World Journal, vol. 2013, Article ID 785929, 7 pages, 2013. https://doi.org/10.1155/2013/785929. Accessed 13/12/18

16. Jones A, Franklin CD. An analysis of oral and maxillofacial pathology found in adults over a 30-yr period. J Oral Pathol Med. 2006;35: 392
17. Patel KJ, De Silva HL, Tong DC, Love RM. Concordance between clinical and histopathologic diagnoses of oral mucosal lesions. J Oral MaxillofacSurg 2011; 69:125–133.
18. Adedapo HA, Lawal AO, Adisa AO, Adeyemi BF. Non-doctor consultations and self medication practices in patients seen at a tertiary dental center in Ibadan. Indian J Dent Res. 2011; 22(6):795-798.
19. Johnson N. Tobacco use and oral cancer: a global perspective. J Dent Educ. 2001; 65(4): 328-339.
20. Muwonge R, Ramadas K, Sankila R et al. Role of tobacco smoking, chewing and alcohol drinking in the risk of oral cancer in Trivandrum, India: a nested case-control design using incident cancer cases. Oral Oncol. 2008; 44(5):446-454.
21. Arotiba JT, Adebola RA, Ajike SO, Adeola DS, Ladeinde A. Orofacial tumors and tumor-like lesions in Kano, Nigeria. Nig J Surg Research 2003; 5:134-139
22. Tay ABG. A 5 year survey of oral biopsies in an oral surgical unit in Singapore: 1993-1997. Ann Acad Med Singapore 1999; 28:665-671
23. Kamulegeya A, Kalyanyama BM. Oral maxillofacial neoplasms in an East African population: a 10 year retrospective study of 1863 cases using histopathological reports. B M C O r a l H e a l t h 2 0 0 8 ; 8 : 1 9 oc;10.1186/1472-6831-8-19
24. Bassey GO, Osunde O, Anyanechi C. Maxillofacial Tumors and Tumor-like Lesions in a Nigerian Teaching Hospital: an eleven year retrospective analysis. African Health Sciences. 2014; 14: 56-63. 10.4314/ahs.v14i1.9.
25. Lawal AO, Adisa AO, OlusanyaAA. Odontogenic tumours: A review of 266 cases. J Clin Exp Dent. 2013; 5(1): e13-7.
26. Lu Y, Xuan M, Takata T et al. Odontogenic tumors: A demographic study of 759 cases in Chinese population. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 1998; 86:707-714.
27. Buchner A, Merrell PW, Carpenter WM. Relative frequency of central odontogenic tumors: a study of 1,088 cases from Northern California and comparison to studies from other parts of the world. J Oral Maxillofac Surg. 2006; 64:1343-1352.
28. Chidzonga MM, Mahomva L. Squamous cell carcinoma of the oral cavity, maxillary antrum and lip in a Zimbabwean population: A descriptive study. Oral Oncol. 2006; 42:184-189.
29. Mehrotra R, Yadav S. Oral squamous cell carcinoma: etiology, pathogenesis and prognostic value of genomic alterations. Indian J Cancer. 2006; 43:60-66.
30. Ajayi OF, Adeyemo WL, Ladeinde MO et al. Primary malignant neoplasms of orofacial origin: a retrospective review of 256 cases in a Nigerian tertiary hospital. Int. J. Maxillofac. Surg. 2007; 36:403-408.
31. Lawal AO, Adisa AO, Effiom OA. A review of 640 Oral squamous cell carcinoma cases in Nigeria. J Clin Exp Dent. 2017; 9(6):e767-e771.
32. Aregbesola SB, Ugboko VI, Akinwande JA, Arole GF, Fagade OO. Orofacial tumors in suburban Nigerian children and adolescents. Br J Oral MaxillofacSurg 2005; 43: 226-231
33. Kondori I, Mottin IW, Laskin DM. Accuracy of dentists in the clinical diagnosis of oral lesions. Quintessence Int 2011;42:575–577
34. Burns JC, Nielson F. Accuracy rate of clinical diagnosis of malignant lesions. VDA Journal 2010;87:34–36
35. Goodson M, Kumar A, Thomson P. Oral precancer excision is required for definitive diagnosis: Incisional versus excisional biopsies in oral leukoplakia management. Oral Oncol. 2011; 47:S74
36. Cohen EG, Patel SG, Lin O et al. Fine-needle aspiration biopsy of salivary gland lesions in a selected patient population. Arch otolaryngol Head Neck Surg. 2004; 130:773
37. Zadik Y, Orbach H, Panzok A, Smith Y, Czerninski R. Evaluation of oral mucosal diseases: interand intra-observer analyses. J Oral Pathol Med 2012;41:68–72