Research Article

Accuracy of Fine Needle Aspiration in Diagnosing Thyroid Cancer in a Tertiary Care Centre

Hani Z Marzouki, Talal Al-Khatib*, Hoda Alsayid, Raneem Abushanab and Saad Al-Muhayawi

Department of Otolaryngology-Head and Neck Surgery, King Abdulaziz University, Saudi Arabia

*Corresponding author: Talal Al-Khatib, Department of Otolaryngology-Head and Neck Surgery, Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia

Abstract

Introduction: Cancer is one of the leading causes of morbidity and mortality worldwide. Thyroid cancer is the fourth most common cancer and the second most common in female specifically. FNA is the most reliable method for investigating thyroid nodules with sensitivity between 89% to 98%, and specificity of 92%. Our aim is to determine the accuracy of FNA in diagnosing thyroid nodules in KAUH and identifying factors that might affect its accuracy.

Methods: A retrospective review of all patients who underwent thyroidectomy at King Abdulaziz University Hospital between 2010-2014 was performed. Chi-square test was used to test the associations between FNA result and histopathological diagnosis. One way-ANOVA tests were used to compare the means of size of the nodules, age and BMI of the patients for the different FNA diagnoses.

Results: A Total of 265 thyroidectomies were reviewed. Fifty-one of the thyroid nodules were benign. Papillary was the most common type of thyroid cancer accounting for 82.1%. Using Bethesda System for Reporting Thyroid Cytopathology Classification; 8.2% were unsatisfactory for diagnosis, 23.1% were benign, 35.8 % showed follicular lesions, were 5.2% were suspicious for malignancy and 23.9% were malignant. A comparison between FNA and the histopathology reports revealed an FNA sensitivity of 87.5% and specificity of 38.9% with positive predictive value of 57.6% and a negative predictive value of 76.6% in KAUH. Size of nodule, age and BMI of the patient did not affect FNA accuracy (p-value >.05).

Conclusion: This study confirms that FNA is a highly reliable tool to assess thyroid nodule whether it is benign or malignant. Size of the nodule, age and BMI of the patient did not affect the accuracy of FNA.

Keywords: Fine needle aspiration; Thyroid cancer; Tertiary care

Introduction

Cancers is related diseases with unsuppressed growth of cells. It is one of the main causes of morbidity and mortality worldwide. Thyroid malignancy is the 16th most common cancer worldwide, accounting for 2.1% of the new cases diagnosed in 2012 [1].

In 2007, the Saudi Registrar of Oncology reported thyroid malignancy as the 4th most common malignancy in both males and females, and the 2nd in females specifically [2]. Two more studies conducted in Saudi Arabia in 2008 and 2009 also reported it as the 2nd most common malignancy in females [3,4]. During the last two decades, Fine Needle Aspiration (FNA) has emerged as the most reliable, simple and readily available tool to investigate nodules in the thyroid gland. It has an estimated sensitivity of 89-98% and a specificity of 92% [5-7]. For these reasons FNA has been the initial investigation in diagnosing thyroid nodules [8].

To our knowledge there is very little evidence in our national literature about the accuracy of FNA and the factors that might affect its sensitivity and specificity. The aim of this paper is to identify the accuracy of FNA in diagnosing thyroid nodules, and compares it to the corresponding final histopathologic results and possibly identifying the factors that might affect its accuracy.

Methods

All the patients who underwent thyroidectomy at King Abdulaziz University Hospital between 2010 and 2014 were identified and an ethical approval was obtained from the university's IRB.

The data extraction form was divided into four parts, the first one includes demographic information and medical history In the second part information about the histopathological report were collected, including the pathological diagnosis, size and site of the nodule and if there is any lymph node involvement, their numbers and levels. The third part contained the sonographic investigation information. And the last part was information about the surgical technique and complications.

Statistical analyses were conducted using SPSS version 22. Descriptive analyses were first performed. Chi-square test was used to test the association between FNA results and histopathology diagnoses. One way-ANOVA test was used to compare the different variables of the nodules and the FNA results.

Results

A Total of 265 thyroidectomies were reviewed at King Abdulaziz University Hospital between 2010 and 2014.

Table 1: Histopathology diagnosis.

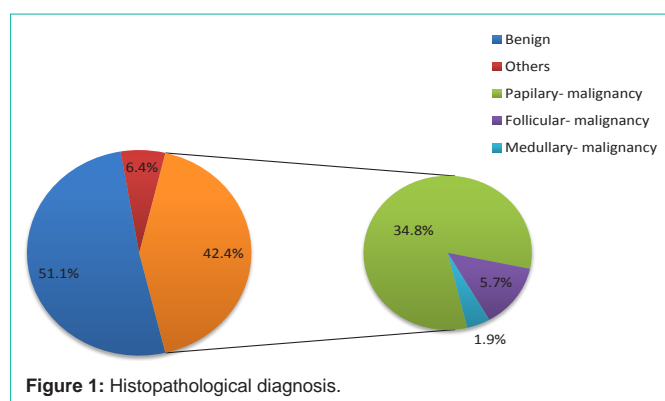|		Frequency	Valid Percent
Valid	Papillary- malignancy	92	34.8
	Follicular- malignancy	15	5.7
	Medullary- malignancy	5	1.9
	Benign	135	51
	Total	264	100
Missing	System	1	
	Total	265	

Figure 1: Histopathological diagnosis.

As shown in Table 1, 112 of the specimens had thyroid malignancies (42.42%). In the current series, prevalence of papillary thyroid cancer was the highest of all malignancies (34.8%). 135 of the lesions were (51.13%) (Figure 1). Prior to surgery, 134 patients underwent FNA, the remaining 131 did not. Using Bethesda System for Reporting Thyroid Cytopathology classification on total number of reported FNA.11 (8.2%) of the specimen were unsatisfactory for diagnosis, 31 (23.1%) were benign, 48 (35.8%) showed follicular lesions, were 7 (5.2%) were suspicious for malignancy and 32 (23.9%) were malignant. The other 5 results did not fall under any category.

There were 48 FNAs reported as follicular lesions, 64.6% (31/48) of them were benign by the final histopathology and 31.2% were malignant. Out of the 7 FNAs that were reported as suspicious of malignancy, 71.4% confirmed to be malignant in the final pathology while the rest came back as benign.

A comparison of the FNA and the histopathological results shown in Table 2 revealed an FNA sensitivity of 87.5% and specificity of 38.9%. With positive predictive value of 57.6% and a negative predictive value of 76.6% as shown in Table 3. Follicular lesions and suspicious of malignancy categories were treated as malignant. FNA reports that were unsatisfactory for diagnosing a thyroid nodule and 8 other reports that did not fall under any FNA or histopathological category were excluded.

We only studied one factor that was shown to affect the FNA accuracy in other studies, which is the size of the nodule. P values were not significant (>0.05) reviling that the size does not affect the accuracy of the FNA (Table 4).

Discussion

Cancer is an abnormal growth of cells, which tend to proliferate in an uncontrolled way. It can involves any tissue of the body and have many different forms in each body area. Thyroid tumours are the most common cancers of endocrine system [9].

Its incidence rates have been increasing worldwide, in 2014 thyroid cancer ranked the fifth for estimated new cancer cases of 47,790 (6%) becoming the most rapidly increasing cancer in the United States [1].

In our study, the vast majority of thyroid nodules 135 (51.1%) were benign. Papillary was by far the most common type of thyroid malignancies representing 82.1% of all thyroid cancers (Figure 2), supporting previous researches that were done in that field.

In 2012 American cancer society estimate that about 80% of all thyroid cancers cases are papillary thyroid cancer [1]. Since 1973 till 2009 in United States, rate of thyroid malignancy has increased

Table 2: Comparison between Fine Needle Aspiration and Histopathological Results.

FNA Diagnosis / Histopathological Diagnosis			Malignant papillary	Malignant follicular	Malignant medullary	Benign	Other	Total
Result	Non-diagnostic or Unsatisfactory	Count	2	0	0	9	0	11
		%	18.2%	0.0%	0.0%	81.9	0.0	100.0%
	Benign	Count	7	0	0	23	1	31
		%	22.6	0.0%	0.0%	74.2	3.2	100.0%
	Follicular Lesion	Count	10	4	1	31	2	48
		%	20.8%	8.3%	2.1%	64.6	4.2%	100.0%
	Suspicious for Malignancy	Count	5	0	0	2	0	7
		%	71.4	0.0%	0.0%	28.6	0.0%	100.0%
	Malignant	Count	26	2	1	3	0	32
		%	81.3	6.3	3.1	9.4	0.0%	100.0%
	Other	Count	0	0	0	5	0	5
		%	0.0%	0.0%	0.0%	100	0.0%	100.0%
Total		Count	50	6	2	73	3	134
		%	37.3%	4.5%	1.5%	54.5	2.2%	100.0%

Table 3: Sensitivity, Specificity, Positive Predictive Value and Negative Predictive Value.

		Histopathology		Total
		Malignant	Benign	
FNA	Malignant	49	36	85
	Benign	7	23	30
	Total	56	59	115

Table 4: One way-ANOVA Test Comparing Means Between FNA Result VS the Sizes of the Nodules.

		Sum of Squares	df	Mean square	F	Sig.
size_nodule_right	Between groups	35.103	10	3.510	.902	.536
	Within groups	315.357	81	3.893		
	Total	350.460	91			
size_nodule_left	Between Groups	62.383	11	5.671	1.242	.274
	Within Groups	374.568	82	4.568		
	Total	436.951	93			
size_nodule_ isthmus	Between Groups	13.708	8	1.713	1.206	.355
	Within Groups	22.732	16	1.421		
	Total	36.440	24			

from 3.6-4.9 to 8.7-14.3 per 100000 individuals. Virtually the entire increase was attributable to papillary: from 2.7-3.4 to 7.7-12.5 per 100000 individuals [10,11].
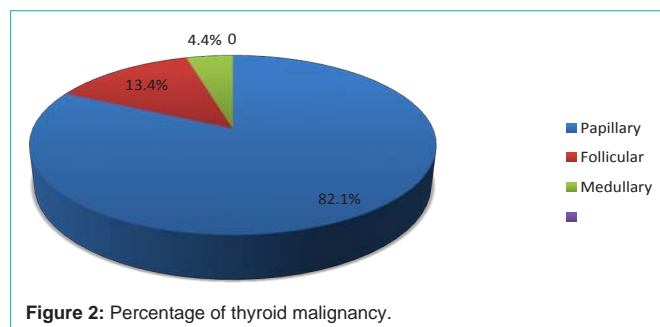
There are many ways to Asses thyroid nodule including physical examination, Thyroid ultrasonography, cytological and histopathological investigation. Physical examination is the least sensitive; it is reliable only if a nodule is at least 1 cm in diameter. It cannot determine whether it is malignant or not [12,13]. Thyroid ultrasonography can detect few millimetres in size nodule, but it is an operator dependent and cannot yield a reliable histopathological diagnosis [13].

Previous studies reported FNA diagnostic sensitivity of 89% to 98% and specificity of 92% [7]. Results of our study indicate a sensitivity of 87.5%, which is in agreement with those of previous studies suggesting Fine Needle Aspiration (FNA) as a successful diagnostic tool but surprisingly specificity of 38.9%. Factors that may affect FNA accuracy include nodule size, sampling techniques, and physician skills when performing the aspiration, pathologist experience and many other factors requiring further researches. Calculation of FNA accuracy was relied on histopathological reports, as it is the gold standard investigation that will determine whether the nodule is benign or malignant.

Results also show that our FNA reports which were unsatisfactory for diagnosing a thyroid nodule was low (3.4% in this paper) compared to previous researches ranging between 2–21%.

As any other test, FNA has its limitations, including false positive, false negative and results that fall into follicular lesions or suspicious of malignancy categories, which are neither benign nor cancerous.

In our research we studies only one factor that may affect FNA accuracy, which is the size of the nodule. In a retrospective study

Figure 2: Percentage of thyroid malignancy.

of cases which did a thyroid surgery following an FNA, 17% of the FNA results were false negative in thyroid nodules measuring 3cm or larger [14].

Other prospective research of many cases that underwent FNA prior to thyroidectomy identified a nodule size of ≥4cm as the only clinical factor associated with false negative results [15]. In our study p value of thyroid nodule size were insignificant which shows that the size does not affect the FNA accuracy.

Conclusion

The main goal of the study is to identify FNA accuracy in diagnosing a thyroid nodule. This study has shown an FNA sensitivity of 87.5% and specificity of 38.9% with a positive predictive value of 57.6% and a negative predictive value of 76.6%. It has also identified the prevalence of thyroid cancer types in patients who underwent thyroidectomy from 2010-2014. Sizes of the nodules made no significant difference in the accuracy of FNA.

Overall, this study strengthens the idea that FNA is a highly reliable tool to assess whether the thyroid nodule is benign or malignant.

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