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Research Article

The diagnostic accuracy of fine needle aspiration cytology in leprosy: a clinico-histopathological correlation

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ABSTRACT

Background: Leprosy is a chronic granulomatous condition mainly affects cooler parts of the body; skin, upper respiratory tract, anterior segment of the eye, superficial portion of peripheral nerves and testes. Redley and Joplin have classified it into five types; Tuberculoid (TT), Borderline Tuberculoid (BT), Mid Borderline (BB), Lepromatous Borderlilne (BL) and Lepromatous (LL). FNAC is simple, rapid and cost effective method over the biopsy to diagnose, classify and monitor leprosy in a patient. The present study was undertaken to evaluate and compare FNAC smears findings with histopathological findings and to classify lesions on RJ scale.
Methods: This prospective and descriptive study was done in department of pathology in Sri Venkateshwara institute of medical science, pondicherry, India between June 2007 to June 2010. The patients were examined by the investigator with dermatologist later on slit smear was done. FNAC perform and comparison with biopsy and clinical history was done using SPSS software version 16.0.
Results: Total 82 cases were included with age from 8 years to 79 years with mean age 38.16. Male to female ratio was 1.0: 0.7. FNAC shows parity 71.42% for tuberculoid and 58.33% for lepromatous leprosy and histopathology shows parity 100% for tuberculoid and 75% for lepromatous leprosy that indicate FNAC is useful usually for polar or stable group than the unstable or borderline cases.
Conclusion: FNAC is a quick and safe for early diagnosis and classify cases into paucibacilary and multibacillary. Exact RJ Scale categorization on FNAC should not be used in isolation but FNAC should be supplemented to the histopathological diagnosis.

Keywords: Leprosy, Fine needle aspiration cytology, Clinico-histopathological correlation, Redley and Joplin classification

INTRODUCTION

Leprosy is a chronic granulomatous condition mainly affects cooler parts of the body; skin, upper respiratory tract anterior segment of the eye, superficial portion of peripheral nerves and testes.[1]

In India despite declaring leprosy elimination national level in January 2006,[2] it is still a public disease of public health importance and endemic in many of the states. The leprosy is a major public health problem of the developing country with an estimated global new cases detection in 2009 was 227849 and India accounts 133717 (58.7%) of cases of global burden of leprosy.[3]

Leprosy present in various clinico-pathological form depending upon immune status of the patient.[4] Redley and Joplin have suggested immunological basis of

leprosy and classified it into five types; Tuberculoid (TT), Borderline Tuberculoid (BT), Mid borderline (BB), Lepromatous Borderline (BL) and Lepromatous (LL).[5] Later they developed clinical and bacteriological finding in each group with respective immunological and histopathological findings.[6]

In 1982 WHO classified leprosy into multibacillary and paucibacillary forms for treatment purpose.[7] On comparing with RJ classification the multibacillary is similar to lepromatous spectrum while paucibacillary to tuberculoid spectrum. Though biopsy is gold standard for classification leprosy cases, it is used along with bacteriological findings. However, FNAC can also be used to classify leprosy cases on WHO classification because it can easily distinguish between tuberculoid spectrum and lepromatous leprosy. The most important advantage is that FNAC is simple, rapid and cost effective method over the biopsy to diagnose, classify and monitor leprosy in a patient.[8]

The present study was undertaken to evaluate and compare FNAC smears findings with histopathological findings and to classify lesions on RJ scale.

METHODS

The This prospective and descriptive study was carried out in department of pathology in Sri Venkateshwara institute of medical science, Pondicherry, India between June 2007 to June 2010. After due explanation and taking consent of patient to participate in study total 82 new cases attending the dermatology and venereology department for treatment of leprosy were included in this study.

The patients were examined by the investigator with dermatologist and skin lesions were examined for their number, size, distribution, margins, border infiltration, loss of hair and sensation. The nerves were palpated and findings like their number, size, nodularity and tenderness were noted. These findings were entered into the study Performa. The patients were classified according to RJ Scale into TT, BT, BB, BL and LL. Apart from RJ Scale indeterminate leprosy (IL) category was also included for classification of cases. The slit skin smear of the skin lesions was taken for ZN Stain.

The skin biopsy was taken by the dermatologists, fixed in formal saline and sent to histopathology section. The tissue was processed and slides were stained with H&E Stain. The Ziehl Neelsens and Fite ferraco stain were used whenever required.[9] The reporting was done by the independent pathologist.

The FNAC of the representative lesion over skin in nodular cases was done by 22G Needle mounted on 20 ml syringe attached with Franzens aspirator. In macular and papular lesions slit skin smear were prepared. The aspirated material was smeared on glass slide with the help of cover glass. The smear was air dried and stained with May Grunwald Geimsa Stain. The slides were encoded and reported by blind (without information of clinical and histopathological findings) cytopathologist. The cytopathologist used the cytological criteria laid down by Singh et al.[10] and modified by Prasad PVS et al.[11] (Table 1) for reporting of the FNAC smear. The data encoded into numerical variable and put in SPSS software version 16.0 for analysis and evaluation.

Table 1: Sub classification of leprosy as defined by the Singh et al.[10]

Sr. No.	Type
1	**Tuberculoid leprosy (including TT and BT)**
a)	Cellular smear
b)	Cohesive epithelioid cell granulomas
c)	Numerous lymphocytes not infiltrating the granulomas
d)	No stainable AFB (BI=0)
2	**Borderline tuberculoid (BT)***
a)	Cellular material with lymphocytes, histiocytes and epithelioid cells
b)	Foamy macrophage is not features
c)	No stainable AFB
3	**Mid- borderline leprosy (BB)**
a)	Fair cellular yield
b)	Poorly cohesive granulomas composed of an admixture of epithelioid cells and macrophages
c)	Few lymphocytes infiltrating the granulomas
d)	BI = 1+ to 2+
4	**Borderline lepromatous leprosy (BL)**
a)	Moderate cellularity
b)	Single dispersed macrophages with ‘negative image’; no epithelioid cells
c)	Numerous macrophages diffusely admixed with macrophages
d)	BI = 3+ to 4+
5	**Lepromatous leprosy (LL)**
a)	Heavy cellularity
b)	Numerous foamy macrophages in a fatty background with intracellular and
c)	extracellular ‘negative image’
d)	Few lymphocytes
e)	BI = 5+ to 6+ (globi)
6	**Histoid leprosy***
a)	Cellular yields, elongated spindle cells, scattered lymphocytes.
b)	BI 6+
7	**Reaction**
a)	Numerous fragmented AFB (MI<1) and neutrophils suggest a Type II reaction in LL (erythema nodosum leprosum)

*Modified according to Prasad PVS et al.[11]

RESULTS

In present study total 82 cases were included. The age of the patients range from 8 years to 79 years with mean age and standard deviation 38.16 and 16.72 years respectively. Male to female ratio was 1.0: 0.7. Majority of cases 57 (69.5%) belongs to young active adult age group of 21 to 50 years (Table 2).

Table 2: Age and sex distribution of FNAC diagnosis.

	FNAC diagnosis								
	TT	**BT**	**BB**	**BL**	**LL**	**HL**	**Inadequate**	**Total**	**%**
Age Years									
01-10	1	0	0	0	0	0	0	1	1.2
11-20	2	2	0	1	0	0	2	7	8.5
21-30	6	10	1	2	2	1	5	27	32.9
31-40	2	3	1	6	1	1	1	15	18.3
41-50	2	6	1	1	1	1	3	15	18.3
51-60	1	1	0	3	2	0	0	7	8.5
61-70	3	1	1	0	0	0	1	6	7.3
71-80	0	0	0	3	1	0	0	4	4.9
Sex									
Male	9	11	2	11	6	3	6	48	82
Female	8	12	2	5	1	0	6	34	
Total	17	23	4	16	7	3	12	82	100.0

We observe 17 (20.7%) tuberculoid (TT), 8 (8.5%) lepromatous, 43 (52.43%) borderline including (BT, BB and BL), 3 (3.7%) cases of histoid leprosy on FNAC. Out of 82 cases 12 (14.6%) cases were reported as inadequate on cytology due to insufficient material (Table 3).

Table 3: FNAC diagnosis.

Types of leprosy	Number (n)	Percentage (%)
Tuberculoid (TT)	17	20.7
Borderline tuberculoid (BT)	23	28.0
Mid borderline (BB)	4	4.9
Borderline lepromatous (BL)	16	19.5
Lepromatous (LL)	7	8.5
Histoid HL	3	3.7
Inadequate	12	14.6
Total	82	100.0

In our study various types of skin lesion such as macules, infiltrated papules, plaques, and nodules were observed. Macules account about 31 (37.8) of cases which may be causes for large number of cases with insufficient material (Table 4).

We compare both FNAC as well as histopathology diagnosis with clinical diagnosis in our study. The histopathology is superior with complete parity of 68 (82.92%) than FNAC which shows complete parity in 40 (48.78%) cases. After removing number of inadequate smear reported on FNAC from our calculations complete parity for FNAC become 40 (48.7%) (Table 5 & 6).

Table 4: Clinico-histopathological diagnosis.

Leprosy types	Histopathological diagnosis		Clinical diagnosis	
	n	**%**	**n**	**%**
Tuberculoid (TT)	11	13.4	7	8.5
Borderline tuberculoid (BT)	27	32.9	32	39.0
Mid borderline (BB)	12	14.6	15	18.3
Borderline lepromatous (BL)	16	19.5	11	13.4
Lepromatous (LL)	9	11.0	12	14.6
Indeterminate (LL)	2	2.4	2	2.4
Histoid HL	3	3.7	3	3.7
Non-specific dermatitis (NSD)	2	2.4	-	-
Total	82	100.0	82	100.0

Study observes maximum parity of both FNAC and histopathology against the clinical diagnosis in polar or stable groups, tuberculoid and lepromatous. FNAC shows parity 5 (71.42%) for tuberculoid and 7 (58.33%) for lepromatous leprosy and histopathology shows parity 7 (100%) for tuberculoid and 9 (75%) for lepromatous leprosy (Figure 1, 2, 3 & 4).

The parity in 58 out of 82 unstable or borderline groups (BT, BB, BL,) clinical cases, FNAC was 25 (43.1%) and

histopathology was 47 (81.0%) respectively. This clearly indicates that the FNAC is useful usually for polar or stable group than the unstable or borderline cases because of overlapping in the smear findings. Therefore histopathology is better choice over the FNAC in borderline or unstable group of leprosy cases.

Table 5: Clinical vs. FNAC diagnosis.

		FNAC diagnosis								
		TT	**BT**	**BB**	**BL**	**LL**	**HL**	**Inadequate**	**Total**	**Complete parity (%)**
Clinical diagnosis	**TT**	**5**	2	0	0	0	0	0	7	5 (71.42%)
	BT	11	**14**	1	2	0	0	4	32	14 (43.75%)
	BB	0	4	**3**	3	0	0	5	15	3 (20%)
	BL	0	3	0	**8**	0	0	0	11	8 (72.72%)
	LL	1	0	0	3	**7**	0	1	12	7 (58.33%)
	IL	0	0	0	0	0	0	2	2	0
	HL	0	0	0	0	0	**3**	0	3	3 (100%)
Total		17	23	4	16	7	3	12	82	82	40 (48.78%)

Table 6: Clinical vs. histopathological diagnosis.

		Histopathological diagnosis									
		TT	**BT**	**BB**	**BL**	**LL**	**IL**	**HL**	**NSD**	**Total**	**Complete parity (%)**
Clinical diagnosis	**TT**	**7**	0	0	0	0	0	0	0	7	7 (100%)
	BT	4	**25**	0	2	0	1	0	0	32	25 (78.12%)
	BB	0	1	**12**	2	0	0	0	0	15	12 (80%)
	BL	0	0	0	**11**	0	0	0	0	11	11 (100%)
	LL	0	1	0	1	**9**	0	0	1	12	9 (75%)
	IL	0	0	0	0	0	**1**	0	1	2	1 (50%)
	HL	0	0	0	0	0	0	**3**	0	3	3 (100%)
Total		17	11	27	12	16	9	2	3	2	82	68 (82.92%)

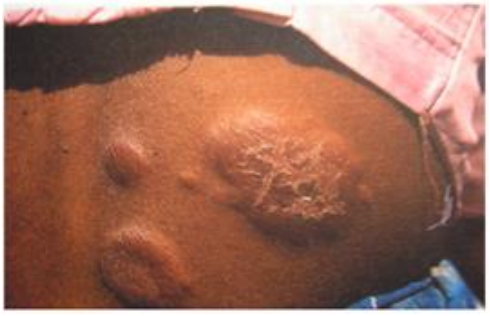

Figure 1: Showing type 1 leprosy reaction.

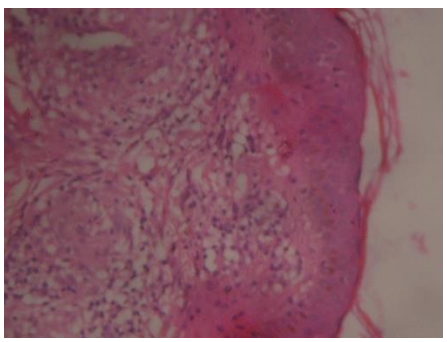

Figure 2: Showing histopathology of lepromatous leprosy (H & E stain 400X).

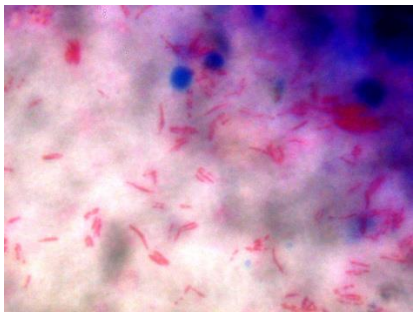

Figure 3: FNAC showing lepra bacilli in globi (Modified fite ferraco stain 1000X).

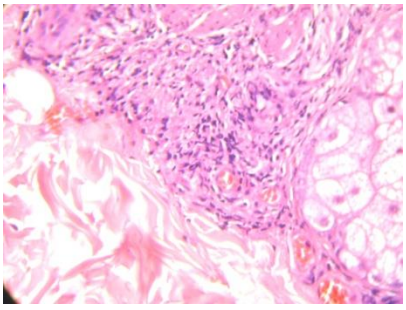

Figure 4: Showing histopathology of tuberculoid leprosy (H & E Stain 400X).

The complete clinical parity in histoid leprosy was 100% in both FNAC as well as histopathology; this was due to unique findings such as presence of elongated spindle cell along with scattered lymphocytes and bacillary index (BI) of 6+.

DISCUSSION

The age of the patients in present study varies from 8 years to 79 years with mean age of 38.16 years. The maximum number 57 (69.5%) of case were in active age group of 21 to 50 years. The Jindal et al[12] and Rao et al[13] also observed maximum number of cases 47.8% in 20-40 years and 67.39% in 21-50 years respectively. The above observation was similar to our observation.

The male to female ratio in our study was 1.0:0.7. The male to female ratio is highly variable as observed by Moorthy et al[14] 1.8:1.0 and Prasad PVS et al[11] 2.4:1.0 and Rao et al[13] 5:1.

We reported 12 (14.6%) cases as inadequate due to insufficient cellularity on smear it may be either due to non-representative FNAC or macular lesion. The Jaswal TS et al[15] also reported inadequate smear in 28% cases which was higher than our observation.

Clinical spectrum of disease shows that most of the cases were in borderline categories, BT, BB, and BL, which account about 58 (70.7%) of cases. the similar observation also made by the Sheoni et al,[16] Nandkarni et al,[17] Moorthy et al[14] and Prasad PVS et al.[11]

Prasad PVS et al.[11] observed maximum clinico-cytological parity in BT, BL and LL, However in our study we have found maximum clinico-cytological parity 3 (100%) and 8 (72.72%) in HL and BL respectively. The maximum clinico-cytological disparity was observed 25 (43.1%) in borderline group. This was similar to observation made by Rao et al.[13]

In our study we observed 3 (3.7%) cases of histoid leprosy. Sehgal et al[18] also observed histoid in 2.79 to 3.7%. Therefore our result was very close to previous workers.

Lastly, FNAC being simple, safe and cost effective is preferable procedure than biopsy in leprosy. FNAC in leprosy should not be used in isolation to classify patients on RJ scale. However it should be used to classify cases in to multibacillary and paucibacillary types in the patients who are not willing to go for biopsy or where biopsy services are not available.

CONCLUSION

FNAC may be used as diagnostic tool in leprosy particularly in area where histopathology service is not available. It gives quick and early diagnosis and classify cases into paucibacillary and multibacillary. Exact RJ scale categorization on FNAC should not be used in isolation but FNAC should be supplemented to the histopathological diagnosis.

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