International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2013): 4.438

Utility of Desmin in Morphological Diagnosis of Rhabdomyosarcoma

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Abstract: ***Aims: To study the utility of desmin and vimentin in diagnosis and classification of different types of rhabdomyosarcomas(RMS) and importance of desmin as a specific marker for diagnosis of RMS. Settings and Design: Retrospective study of 25 case were carried out at V.S.General Hospital and the data were collected from Nov. 1994 to Nov.1999 from Cancer Research Institute, Ahmedabad (India). Methods and Material: Patients of all age groups and both gneders were included in this study. In all the 25 cases ,material was received in the form of incisional or excisional biopsies. Formalin fixed paraffin embedded blocks were prepared and stained by routine haematoxyllin and eosin stain. Immunohistochemistry was performed with desmin and vimentin for the final confirmation of the diagnosis. Results: Out of total 25 studied cases, 18 cases were of embryonal type RMS, 4 cases were of alveolar type RMS, 2 cases were of pleomorphic RMS and 1 case was of botryoid variety of RMS. Conclusions: Embryonal RMS is the most common type of RMS(18 cases out of 25) and desmin was the specific and important marker for confirmation of diagnosis.***

Keywords: Rhabdomyosarcoma,Desmin,Vimentin.

1. Introduction

RMS is a malignant tumour of uncertain histogenesis. Malignant nature of the lesion is determined both from its histologic appearance and by presence of pulmonary metastasis.(1)

In 1930's and 1940's, the diagnosis of adult or pleomorphic RMS gained in popularity. They displayed striking degree of cellular pleomorphism and cross striation were found to be absent in most instances.It was soon realized that the most of these tumours were in fact other types of pleomorphic sarcoma,especially MFH. During this period it also became evident that many childhood sarcomas,formely diagnosed as "Round" or "Spindle cell sarcomas" were RMS of embryonal or alveolar type.(2)

Newer immunohistochemical technique for specific stains of desmin,vimentin and myoglobin has improved the diagnostic certainity.(2)

Keeping the above mentioned details in purview, an attempt has been made to study various types of RMS in the present study, particularly focussing on the varied histomorphological features and the role of certain special immunohistochemical stains like desmin and vimentin in confirming the diagnosis.

2. Subjects and Methods

The present study is a retrospective study of 25 cases. The cases were collected from the year Nov.1994 to Nov.1999. All the cases were selected from Cancer Research Institute, Ahmedabad.

Material was received in the form of an incisional biopsy or the whole excised tumour mass. Tissue were fixed in 10% formalin and processed through paraffin technique. Sections were stained by routine haematoxyllin and eosin method. Immunohistochemical stains for Desmin were carried out in all the cases to confirm final diagnosis and vimentin was carried out in18 cases due to limited availability of resources .

Depending on the various histomorphological pattern, cases of RMS were categorized into embryonal RMS,alveolar RMS, pleomorphic RMS and botryoid RMS.

3. Results

In present study out of 25 cases of RMS,18(72%) cases were of embryonal type,4(16%) cases were of alveolar type,2(8%) cases were of pleomorphic type,1(4%) case of botryoid type. Above observations show that embryonal RMS is the most common form and pleomorphic RMS is the least common form of RMS amongst our study group.

In the present study, out of 25 cases, immunohistochemical stain for Desmin was carried out in all the cases and it was found to be positive in 24(96%) cases. In embryonal RMS, Desmin positivity was found in all 18(100%) cases while it was found to be positive in 3(75%) cases of alveolar RMS. In pleomorphic RMS Desmin positivity is in2(100%) cases and in botryoid RMS desmin positivity was in1(100%) case ,which suggests that Desmin is ont of the most important and a specific immunohistochemical stain for the final diagnosis of RMS.

Out of 25 cases in 18 cases immunohistochemical stain for vimentin was carried out and it was found to be positive in10(out of 12)(83.33%%) cases of embryonal RMS,2(out of 3)(66.66%) cases of alveolar RMS and 1(out of 2)(50%) of cases of pleomorphic RMS and 1(out of 1)(100%) of cases of botryoid type of embryonal RMS.

4. Discussion

Elaborate study of histomorphology of RMS is very pertinent in view of the fact that few histological components are determinant of tumours aggressiveness. An attempt was made to delineate the morphologic features of the studied cases with this view in mind. However,the study being done retrospectively, the direct extrapolation of the findings into clinical consequences has become impractical because of scanty data available.

Final diagnosis of RMS in 25 cases was made by immunohistochemical stain with desmin and in 18 cases by Immunohistochemical stain with vimentin. In all the cases, initial diagnosis was made from histomorphological study of H & E stained sections. Desmin is a sensitive marker but not a specific marker because it gives positivity, not only in rhabdomyosarcomas, but also in leiomyosarcoma. However, the characteristic histomorphological pattern of rhabdomyosarcoma in H & E stained sections help us to differentiate it from leiomyosarcoma.

In this study, microscopic examination of H & E stained sections of all 18 cases of embryonal RMS showed presence of many malignant round cells arranged in diffuse pattern along with a few spindle shaped cells. These cells were having acidophillic cytoplasm and prominent hyperchromatic nuclei. Rhabdomyoblasts with varying degree of differentiation were seen. Multinucleated giant cells with clear cytoplasm (spiderweb cells) were conspicuous. In all the cases, confirmation of diagnosis was done by positive result of immunohistochemical stain for Desmin. 10 cases of the 12 cases statined for vimen were positive for the said immunohistochemical stain.

In this study, amongst all the 4 cases of alveolar RMS, microscopic examination of H & E stained sections showed small,round or oval cells ,separated in nests by connective tissue septa. The tumour cells in the periphery of alveolar septa appeared to be firmly attached with fibrous septa but those in centre were freely floating. The tumour cells were having vesicular nuclei with prominent nucleoli and abundant eosinophillic cytoplasm,. At places they showed presence of elongated strap cells, multi-nucleated giant cells and occasional spider-web cells. Out of them immunohistochemical stain for Desmin was carried out in all cases and found to be positive in 3 cases and in remaining 1 case diagnosis was confirmed by H & E stained sections. IHC for vimentin was carried out in 3 cases and found to be positive in 2 cases and in remaining diagnosis was confirmed from desmin positivity and classical features on H & E stained sections.

Out of 25 cases, 2 cases were of pleomorphic RMS, In both cases, microscopic examination of H & E stained sections showed marked degree of cellular pleomorphism and also showed multinucleated giant cells, spindle cells, spider cells, strap cells, racquet cells with eosinophillic cytoplasm and hyperchromatic nuclei. Cross striations were found to be absent in these cells. In all the cases immunohistochemical stain for Desmin and vimentin was carried out in this desmin was found to be positive in 2 cases and vimentin was positive in 1 case.

Out of 25 cases, 1 case is of botryoid RMS, microscopic examination of H & E stained sections showed large amount of mucoid stroma and paucity of malignant tumour cells.Malignant tumour cells seemed to be accumulated below "cambium layer".This solitary tumour showed Desmin positivity and vimentin negativity.

Table 1: Desmin Positivity In Rhabdomyosarcoma

Name of study	Desmin					
	Embryonal RMS		Alveolar RMS		Botryoid RMS	
	Positive cases {Total cases}	% Positivity	Positive cases {Total cases}	% Positivity	Positive cases {Total cases}	% Positivity
Altma-nnsberger et al [5](1985) (total Cases 25)	20	100%	4	100%	1	100%
	{20}		{4}		{1}	
	{18}		{4}		{1}	

Table 3: Vimentin Positivity In RMS.

Name of Study	Vimentin					
	Embryonal RMS		Alveolar RMS		Botryoid RMS	
	Positive cases (total cases)	% positivity	Positive cases (total cases)	% positivity	Positive cases (total cases)	% positivity
Altmansberger et al [5] (1985) (total cases 25)	15 (20)	75%	4 (4)	100%	0 (1)	-
Present Study (total cases 50)	10 (12)	83.33%	2 (3)	66.66%	0 (1)	-

5. Importance of Desmin as a Specific Marker for RMS

Altmannsberger et al (1985) carried out a study of a cases of soft tissue sarcomas, which were labelled as RMS on examination of H & E stained slides.Out of these 9 cases,7 were labelled as embryonal RMS,1 as pleomorphic RMS and 1 as alveolar RMS. In all these cases special IHC stain for Desmin was carried out and it was found to be negative in all cases.After reviewing of the slides final diagnosis was changed as under:

Sr. No.	*Initial Diagnosis*	*Final Diagnosis*
1	Embryonal RMS	Malignant histiocytosis
2	Embryonal RMS	Ewing's sarcoma
3	Embryonal RMS	Infantile fibrosarcoma
4	Embryonal RMS	Unclassified Non-muscular Sarcoma
5	Embryonal RMS	NHL
6	Embryonal RMS	Ewing's sarcoma
7	Alveolar RMS	Round cell liposarcoma
8	Embryonal RMS	Neuroblastoma
9	Pleomorphic RMS	Pleomorphic liposarcoma

While in present study following are the initial diagnosis and diagnosis cofirmed after desmin positivity

Sr No.	*Case No.*	*Initial Diagnosis*	*Final Diagnosis*
1	26	Malignant round cell tumour	Embryonal RMS
2	3	Malignant round cell tumour	Embryonal RMS
3	35	Malignant round cell tumour	Embryonal RMS
4	36	Malignant round cell tumour	Embryonal RMS
5	38	Malignant round cell tumour	Embryonal RMS
6	43	Malignant round cell tumour	Embryonal RMS
7	44	Malignant round cell tumour	Embryonal RMS
8	50	Malignant round cell tumour	Embryonal RMS
9		Malignant round cell tumour p/o RMS	Embryonal RMS
10		Round cell tumour ?Emb.RMS?Ewing's sarcoma	Embryonal RMS
11		?NHL,? AlveolarRMS? Extraskeletal Ewing's sarcoma	Alveolar RMS
12		?soft tissue sarcoma	Alveolar RMS
13		Small round cell tumour ?Carcinoma?RMS	Embryonal RMS
14	49	?Soft tissue sarcoma	Undifferentiated(In determinate RMS)

Above observations show that the Desmin is a very sensitive marker for the diagnosis of RMS. The study by Altmannsberger et al (1985) and the present study highlight the importance of Desmin positivity or negativity to include or exclude the diagnosis of RMS.However,certain cases of leiomyosarcomas show reactivity for Desmin and Vimentin.Hence,a careful morphologic study of H & E stained slides would proved to be of use in dealing whether such a case is leiomyosarcoma or RMS.(Ackermann(1996)).

6. Conclusion

In present study retrospective study of histomorphology of RMS was carried out in 25 cases. All 25 cases of RMS were classified in four histological types (Embryonal, Alveolar, Pleomorphic, Botryoid) by microscopic examination of H & E stained slides and by IHC stains for Desmin and Vimentin. Desmin was found to be positive in 24 out of 25 cases and vimentin was found to be positive in 15 out of 18 cases. Thus desmin was found to be the most sensitive marker for diagnosis of RMS.

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