

Original Research Article

Intraoperative squash cytology and histopathological correlation of primary temporal lobe lesions: a 6 year study at tertiary care centre of Kashmir, India

Mohd Iqbal Lone¹, Tazeen Jeelani^{1*}, Gazanfar Rashid¹, Nusrat Bashir², Dekyong Angmo³

¹Department of Pathology, SKIMS, Srinagar, J & K, India

²Department of Pathology, GMC, Srinagar, J & K, India

³Department of Microbiology, SKIMS, Srinagar, J & K, India

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*Correspondence:

Dr. Tazeen Jeelani,

E-mail: tazeenjeelani@gmail.com

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ABSTRACT

Background: Central nervous system (CNS) tumors constitute about 1-2% of all the tumors. They are the 6th most common tumors in adults and 2nd most common among childhood tumors. Gliomas are the most common CNS neoplasms. In addition to gliomas temporal lobe has predilection for some peculiar tumor subtypes having good prognosis, including pleomorphic xanthoastrocytoma (PXA), low grade astrocytic tumors and dysembryoplastic neuroepithelial tumor (DNET) in children.

Methods: Study was conducted in the department of pathology Sher-e-Kashmir institute of medical sciences (SKIMS) Soura, Srinagar Kashmir India. This was six-year study.

Results: Temporal lobe tumors were commonly seen in 3rd to 4th decade of life accounting for 37.9% of the cases followed by 4th to 5th decade (27.5%). The mean age of presentation being 40±10 yrs. Males outnumbered females with a male: female ratio of 1.7:1. Intraoperative squash smears were mostly reported as High grade gliomas (WHO Grade III-IV) accounting to a total of 42 cases (36.2%). On histopathology frequent temporal lobe tumor seen was Glioblastoma multiforme (GBM) 17.4%, followed by pleomorphic xanthoastrocytoma and oligodendroglioma accounting for 14.6% of cases each. On comparing the diagnostic accuracy of intraoperative squash smears to that of Histopathological diagnosis an overall accuracy of 86.2% was observed.

Conclusions: Intra operative squash technique in CNS tumors is universally accepted method. In temporal lobe lesions, on adequate sampling and careful examination, squash cytology has fairly good diagnostic accuracy rate of 86.2% when compared to histopathology.

Keywords: Diagnostic accuracy, GBM, DNET, PXA, Squash smears

INTRODUCTION

Temporal lobe of the brain is one of the four major lobes of cerebral cortex in humans and is mainly involved in processing sensory inputs for appropriate retention of visual memories, language and emotion control.¹ Central nervous system (CNS) tumors constitute about 1-2% of all the tumors.² They are the 6th most common tumors in adults and 2nd most common among childhood tumors. Among CNS neoplasms, Gliomas are the most common

tumors. In addition to gliomas temporal lobe has predilection for some peculiar tumor subtypes having good prognosis.³ Prognosis of CNS tumors depends on the extent of surgical resection, grade of the tumor, age of the patient and most importantly the molecular characteristics of the tumor.⁴ Intraoperative squash technique in CNS lesions is rapid and universally accepted method which provides fairly accurate diagnosis. It is superior in displaying abnormal cellularity along with cytoplasmic and nuclear details.⁵ Several

changes are being made in brain tumor classification and reporting with recent advances in the field and complexity in histology of these tumors, but histopathology still remains basic and important diagnostic method.⁶

METHODS

This 6-year study was conducted in the department of pathology Sher-e-Kashmir institute of medical sciences (SKIMS) Soura, Srinagar Kashmir India. It was three years retrospective study from January 2012 to December 2014 and three years prospective study from January 2015 to December 2017. Retrospective data was collected from the records section of the department of pathology SKIMS. In prospective study intra-operatively tissue received was squashed and smears were prepared which were stained using Hematoxylin and Eosin (H and E) stain and were examined by two separate pathologists. Tissue for Histopathological examination was received in 10% formalin and fixed overnight. After processing wax blocks were made and cut into 3mm thick sections using standard rotary microtome and stained with H and E. Microscopic examination was done by two separate pathologists to make diagnosis and reduce the bias.

Inclusion criteria

All cases of temporal lobe lesions were included in whom both cytology (intra operative squash smears) and histopathology was available.

Exclusion criteria

Ischemic/Benign lesions and metastatic temporal lobe tumors were excluded from the study.

Cases where inadequate tissue was received intra-operatively were also excluded from study.

RESULTS

A total of 550 cases of primary brain tumors were identified in 6 years, out of which 116 (21.1%) cases were seen in temporal lobe of the brain. The commonest presenting symptom was headache and vomiting in 80% of the patients presenting with temporal lobe lesion.

Males outnumbered females with a male: female ratio of 1.7:1.

Temporal lobe tumors were commonly seen in 3rd to 4th decade of life accounting for 37.9% of the cases (44cases) followed by 4th to 5th decade {27.5% (32 cases)} of life. The mean age of presentation being 40±10 yrs. In this study the youngest patient was 4yr old male child diagnosed as dysembryoplastic neuroepithelial tumor (DNET) and the eldest patient was 78-year-old female diagnosed as Glioblastoma multiforme (GBM).

Intraoperative squash smears were mostly reported as High grade gliomas (WHO Grade III-IV) (Figure 1) accounting to a total of 42 cases (36.2%) and 15 cases (12.9%) were reported as Low grade gliomas (WHO grade I-II). Some of the squash smears were further sub-classified as Pilocytic astrocytoma 6 cases (5.2%), Pleomorphic xanthoastrocytoma (PXA) 9 cases (7.8%), Gemistocytic astrocytoma 2 cases (1.7%), Anaplastic astrocytoma 1 case (0.9%), Oligodendroglioma 7 cases (6%), Anaplastic oligodendroglioma 6 cases (5.2%), Glioblastoma multiforme 10 cases (8.6%), DNET 7 cases (6%), Glioneuronal tumor 8 cases (6.9%), Ganglioglioma and Gliosarcoma 2 (1.7%) and 1 (0.9%) case respectively (Table 1).

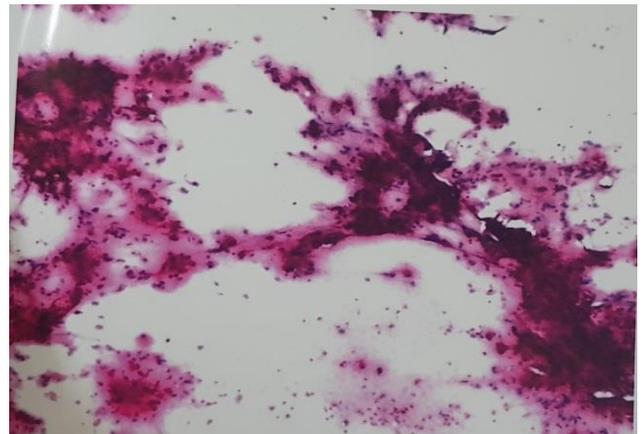


Figure 1: Squash smear of high grade glioma.

Table 1: Intraoperative squash cytology findings.

Squash cytology diagnosis	No. of cases (n)	Percentage (%)
High grade glioma	42	36.2
Low grade glioma	15	12.9
Pilocytic Astrocytoma	6	5.2
Gemistocytic Astrocytoma	2	1.7
Pleomorphic Xanthoastrocytoma	9	7.8
Anaplastic Astrocytoma	1	0.9
Oligodendroglioma	7	6.0
Anaplastic oligodendroglioma	6	5.2
GBM	10	8.6
DNET	7	6.0
Glioneuronal tumors	8	6.9
Ganglioglioma	2	1.7
Gliosarcoma	1	0.9
Total	116	100%

In this study frequent temporal lobe tumor was Glioblastoma multiforme (GBM) (Figure 2) 17.4%, followed by pleomorphic xanthoastrocytoma and oligodendroglioma (Figure 3) 14.6% each. Pilocytic astrocytoma comprised total of 8.6% of the cases while as

anaplastic oligodendroglioma comprised a total of 12% of the cases (Table 2).

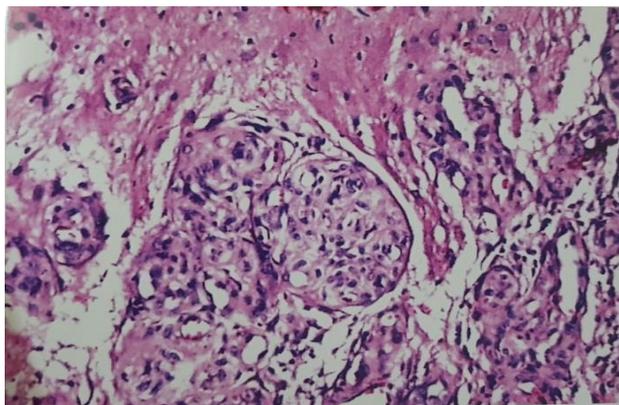


Figure 2: HPE of GBM showing glomeruloid body formation.

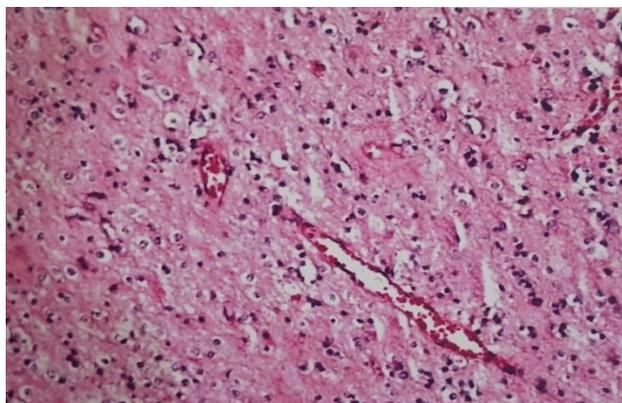


Figure 3: HPE of oligodendroglioma showing perinuclear halo with prominent background chickenwire pattern.

Table 2: Histopathological profile of temporal lobe tumors.

Histopathology (WHO Grade)	No. of cases (n)	Percentage (%)
GBM (IV)	20	17.4
PXA (II)	17	14.6
Oligodendroglioma (II)	17	14.6
Anaplastic oligodendroglioma (III)	14	12
Pilocytic Astrocytoma (I)	10	8.6
Gliosarcoma (IV)	9	7.8
DNET (I)	8	6.8
Anaplastic Ganglioglioma (III)	6	5.2
Gemistocytic Astrocytoma (II)	5	4.3
Ganglioglioma (I)	5	4.3
Anaplastic Astrocytoma (III)	2	1.7
Angiocentric glioma (I)	2	1.7
Ganglioneuroblastoma (I)	1	0.9
Total	116	100%

On comparing the diagnostic accuracy of intraoperative squash smears to that of Histopathological diagnosis an overall accuracy of 86.2% was observed. Diagnostic inaccuracy was highest in Angiocentric glioma followed by Anaplastic Ganglioglioma (Table 3). Misdiagnosis was attributed to inadequate intra-operative tumor sample and lack of histological architecture.

Table 3: Comparison of diagnostic accuracy of intraoperative squash cytology and histopathology.

Histopathology	Squash cytology same	Squash cytology different	Number of cases (N)	Accuracy (%)
GBM	19	1	20	95.0
PXA	15	2	17	88.2
Oligodendroglioma	15	2	17	88.2
Anaplastic oligodendroglioma	12	2	14	85.7
Pilocytic astrocytoma	9	1	10	90.0
DNET	7	1	8	87.5
Gliosarcoma	7	2	9	77.7
Gemistocytic astrocytoma	5	0	5	100
Ganglioglioma	4	1	5	80.0
Anaplastic astrocytoma	2	0	2	100
Anaplastic ganglioglioma	4	2	6	66.6
Angiocentric glioma	1	1	2	50.0
Ganglioneuroblastoma	0	1	1	0.0
Total	100	16	116	86.2%

Results obtained in this study were in accordance with many other studies carried across the world (Table 4).

Table 4: Comparison of various studies on diagnostic accuracy of intra operative squash smears.

Study (year)	Diagnostic accuracy (%)
Bleggi-Torres, et al	97.3%
Roseller K, et al	89.9%
Iqbal M, et al	95.3%
Mitra Sumit, et al	84.9%
Sanjay Kumar, et al	88.9%
Our study	86.2%

DISCUSSION

Brain tumors have been difficult to describe with respect to pattern of occurrence and causes. In this respect progress has been made recently to understand characteristics of these tumors.⁷ Temporal lobe tumors are common in 3rd to 4th decade of life with mean age of presentation being 39.6±10 years.⁸ One study conducted on gliosarcomas over a period of 12 years by Sarkar C et al, found that majority of the patients were 40 years and above in age.⁹ Brain lesions per se are more common in

males compared to females and same is true for parietal lobe lesions. In this study males outnumbered females with male to female ratio of 1.7:1. In a clinicopathological study carried out by Manisha Khanna et al on 115 patients observed a male female ratio of 2.3:1.¹⁰ In another study of 306 patients by Nandita Ghosla et al also found a male preponderance with male female ratio of 1.5:1.⁸ This is similar to the results obtained in this study. Ohgaki H conducted a population based study in 2004 in which they observed that GBM was the most common temporal lobe lesion with mean age of 51.6 years.¹¹

In this study we also noted that GBM was commonest tumor on histopathological examination. 17 (14.6%) cases of PXA were observed and most of the patients belonged to younger age group. Giannini C et al in their study concluded that PXA was commoner in younger age group while as GBM was more frequent in older age group.¹² On histological subtyping GBM was commonest tumor in temporal lobe (17.4%) followed by PXA and oligodendroglioma (14.6%) each. In 2014 Shrestha et al conducted a prospective study on 60 patients in which they observed GBM was the most common tumor.¹³ Similar results were observed by Ohgaki H et al, in their epidemiological study conducted in 2005.¹⁴

On comparing squash cytology with histopathology our study revealed that diagnostic accuracy of intra-operative squash is 86.2%. This is in accordance with many other studies carried across the world. In 2015 Sarat Das et al, conducted a study to assess the utility of intraoperative crush smear cytology and correlated with final Histopathological diagnosis. Complete correlation between the two methods was achieved in 89.6% of the cases.¹⁵

To determine the utility of squash smear cytology, Savita S Patil et al conducted a prospective study of 50 patients in the year 2016 which showed the accuracy of 82.7%.¹⁶ Mitra Sumit et al, studied diagnostic accuracy of squash preparation and frozen sections for CNS tumors including temporal lobe lesions in 114 patients wherein they compared results with histopathology and observed that diagnostic accuracy of squash cytology was 88.5%.¹⁷ In a retrospective study of 306 cases by Nandita Ghosal et al where cyto-histological correlation to determine the accuracy rate of smear preparation, found an accuracy of 93%.⁸

CONCLUSION

Intra operative squash technique in CNS tumors is universally accepted method. In temporal lobe lesions, on adequate sampling and careful examination of the smears, squash cytology has fairly good diagnostic accuracy rate of 86.2% when compared to histopathology. Thus, providing rapid and accurate intraoperative diagnosis which is beneficial for the patient and can guide the surgeon on the extent of tumor resection.

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Ethical approval: Not required

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