Tr. J. of Medical Sciences
28 (1998) 57-60

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The Validity of Mahmood Scoring System in Meningiomas

Received: November 22, 1995

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Abstract: Meningiomas are well known for their diverse histological apperance. Although generally considered benign, their behaviour is unpredictable and characterized by frequent recurrences. Histopathological features associated with aggressive behaviour have been described, but even the World Health Organization (WHO) grading system provides broad criteria for malignancy. Mahmood et al. described a scoring system, based on 6 histopathological features, establishing objective criteria. In this study, 73 specimens from 61 cases which were diagnosed as meningioma have been reviewed and scored by the criteria described by Mahmood et al. in order to search for the availability of the application of the system.

Out of 61 meningioma cases 52 (76.6%) were scored as typical with Mahmood scoring system and only 3 (5.8%) had recurrences. Other 9 cases were atypical and 6 (66.6%) had recurrences of which one turned out to be malignant. Statistical analysis by Mann Whitney Confidence Interval and Test considering both described parameters and final score revealed significant increase for recurrent meningiomas. These findings highlights the routine application of Mahmood scoring system to meningiomas for a better prognostic determination.

Key Words: Meningioma, score, grade, histopathology

Meningiomas have been recognised as an entitiy for nearly two centuries (1). They are well known for their diverse histological apperance, and it is related to the multipotential character of the aracnoidal cap cells, which is known to give rise to intracranial meningiomas (2). Of the many histological subtypes of meningiomas recognised, only papillary variant is known to have aggressive behaviour (3). Althought generally considered benign, their behaviour is unpredictable and characterised by frequent recurrences (1). Jaaskleinen et al. (4) and Rohringer et al. (5) attempted to classify these tumors into four groups by usnig a numerical grading system, their grading criteria were not completely elucidated and are therefore subjective. Also WHO classification (6) system provides the broad criteria for malignancy without suggesting a numerical scoring system. Mahmood et al. (7) used a scoring system similar to that proposed by Jaaskleinen et al. (4) and Rohringer et al. (5) but made the system more reproducible by establishing objective criteria and divided meningiomas into three groups ie. typical, atypical, malignant.

In this series specimens from patients diagnosed as meningioma have been reviewed and scored by the criteria described by Mahmood et al. (7) in order to search if the system is available for grading these cases.

Materials and Methods

Sections of specimens from 61 patients diagnosed as meningiomas have been reviewed. A detailed review of the patients' age, sex distribution and location of tumors were prepared. All the cases were typed as described by WHO classification (6), than scored as described by Mahmood et al. (7). A summary of the Mahmood scoring system is given in Table 1 (7). Six histopathologic features were evaluated. These were, hypercellularity, nuclear pleomorphism, mitosis, necrosis, loss of architecture and brain invasion (Figures 1-4). Than scores for each item described above and the total score (Mahmood score), were analysed by Mann Whitney Confidence Interval and Test (MWCIT) considering cases with recurrent disease and those without recurrences.

Histological feature	score 0	score 1	score 2	score 3
hypercellularity	10 whorls/HPF*	same, except perivascular increased cellularity	small, close whorls (30 whorls/HPF)	loss of whorls, crowded nuclei
nuclearf pleomorphism	uniform, bland nuclei, no nucleoli	occasional large nuclei	many large cells, small nucleoli	Large vesicular cells, prominet nucleoli
mitosis	none	1,2/10HPF	3-4/10HPF	more than 5/10HPF
necrosis	none	rare, each less than 1/2HPF	frequent, 1/2 to 1 HPF	Large, more than 1HPF
loss of architecture	none	incipient loss	ınvolving 1-2 adjacent HPF	involving 1-2 HPF
brain invasion	absent	pushing the brain not intervening menings	cords infiltrating the brain	-

Table 1. The summary of the criteria for the scoring of meningiomas described by Mahmood et al. (7). Final score is reached by addition of all the scores from each parameter (*HPF:High power field).

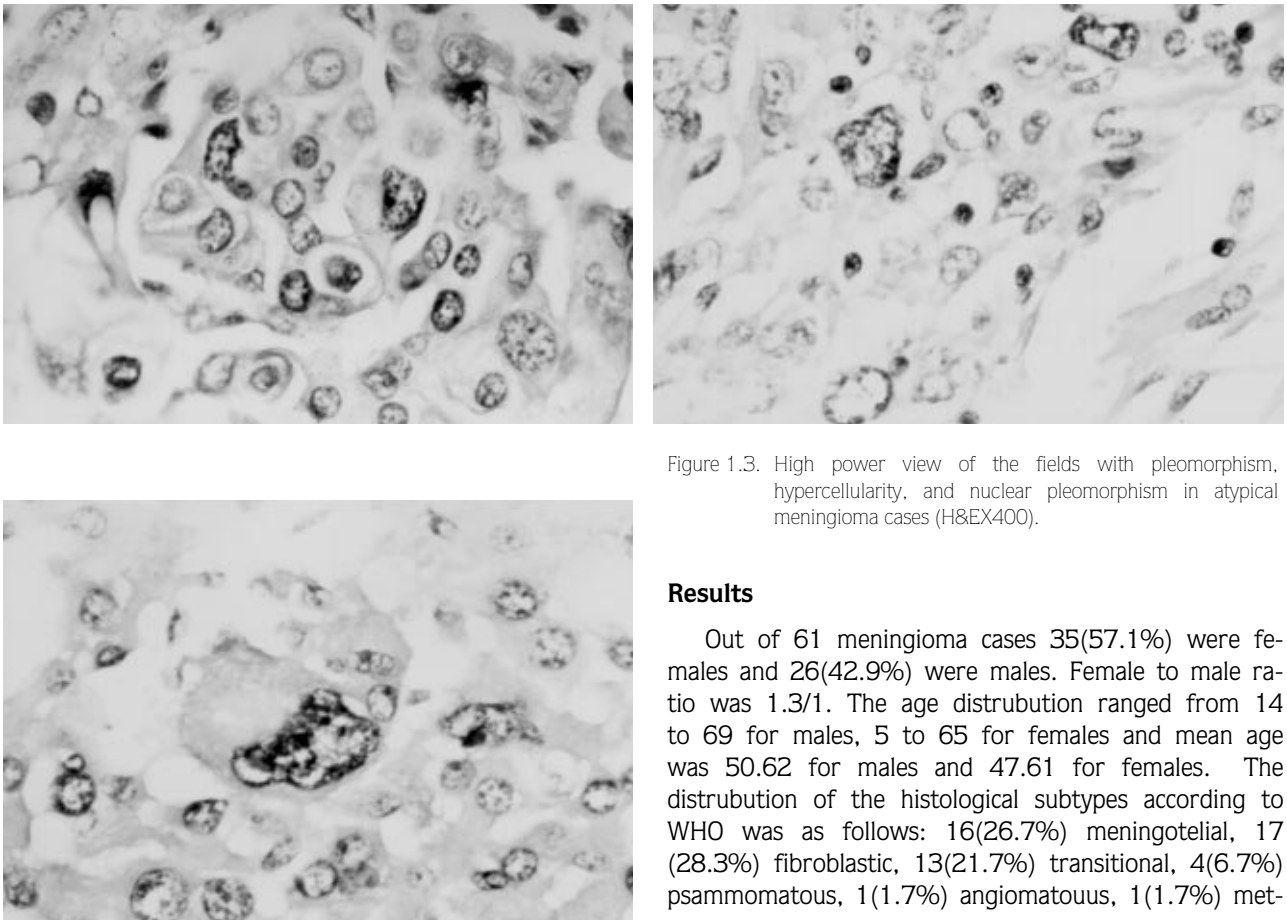

Figure 1.3. High power view of the fields with pleomorphism, hypercellularity, and nuclear pleomorphism in atypical meningioma cases (H&EX400).

Results

Out of 61 meningioma cases 35(57.1%) were females and 26(42.9%) were males. Female to male ratio was 1.3/1. The age distrubution ranged from 14 to 69 for males, 5 to 65 for females and mean age was 50.62 for males and 47.61 for females. The distrubution of the histological subtypes according to WHO was as follows: 16(26.7%) meningotelial, 17 (28.3%) fibroblastic, 13(21.7%) transitional, 4(6.7%) psammomatous, 1(1.7%) angiomatouus, 1(1.7%) met-

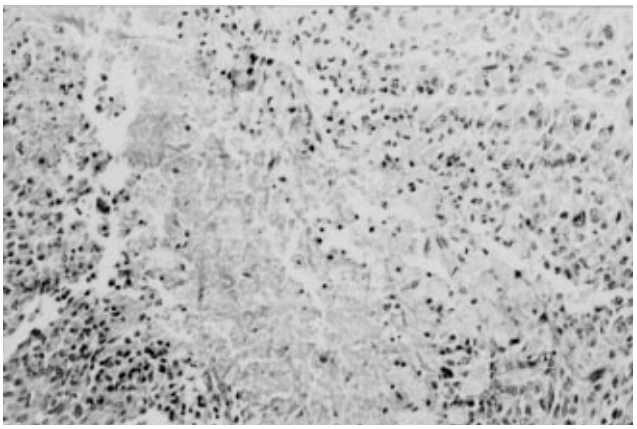

Figure 4. Necrosis and loss of achitecture in atypical meningioma (H&EX100)

aplastic, 5(8.5%) atypical and 4(6.7%) anaplastic. One case turned out to be sarcomatous in the recurrence. With the Mahmood scoring system 52(76.6%) of the cases were scored as less than 4 ie typical, and only 3(5.8%) of them had recurrences. The other 9 cases (13.4%) had scores greater than 4 ie atypical and 6 (66.6%) of them had rcurrences. 1(1.7%) case had multiple recurrences and turned out to be sarcomatous reaching a score of 17 with brain invasion. But at first operation non of the cases had brain invasion so statistical analysis could not be performed for this feature. The analysis by MWCIT results revealed all other features (hypercelllularity, and total Mahmood score were significantly higher for cases with recurrences. p value was found to be 0.0147 for nuclear pleomorphism, 0.0044 for mitosis, 0.0012 for mitosis, 0.0012 for necrosis, 0.0002 for loss of architecture, and less than 0.0001 for hypercelllularity and total Mahmood score. These results suggest that total score and hypercellularity are the most valuable parameters in predicting recurrences, followed in order by loss of architecture, necrosis, mitosis and nuclear pleomorphism.

Discussion

Meningiomas comprise 13-19% of intracranial neoplasms and are only second in incidence to gliomas (1,8). Their origin is generally belived to be from aracnoidal cap cells. They are seen most frequently between 30-60 years with a mean age of 45 (9). In this series the median age is 48.84 and 83% of the cases were between 30-60 years.

The predominance of meningiomas in th female sex is well known (8). In the series of Capadano et al. 71% of the cases were found to be occuring in females with an average age of 52.64 and 29% occurred in males with a mean age of 53.46 (10). In this series only 57.1% of the cases were females and the median age was a little younger than males.

In the series of Rohringer et al. (5) among 193 meningiomas, meningioteliomatous (38%) and transitional (33%)types were most frequently observed. In contrast in another series (9) meningotelial (28%), fibrous (26%) and transitional (14%) types were most frequent. In this series the most frequent types were meningotelial (26.7%), fibrous (28.3%) and transitional (27.1%).

The greatest interest in meningiomas are about the malignant potential and the clinical and histopathological implications. In the series of Mahmood et al. (7) out of 276 cases, 92% were benign with a female to male ratio of 2.3/1 and 8% were atypical or malignant with a female to male ratio of 0.9/1, suggesting increased malignant potential for the male patients. In this series 15.1% of the cases were atypical or malignant but female to male ratio was 1.2/1. The only malignant meningioma which started with a histopathologic configuration of atypical type was a male patient. The repotred incidence of meningiomas in the first two decades of life is 1.8 to 6% (8,9). In this series 3(4.8%) cases were of the first two decades of life.

New tools are available for the determinaton of the recurrences of the meningiomas. Kunishio et al. (11) stated that AgNOR scores or proliferative potential were significantly different between recurrent and nonrecurrent meninigiomas. But still the grading system according to the degree of anaplasia is of great value and cytogenetic analysis confirmed that complex chromosomal abnormalities and telomeric associations are observed more frequently in tumors with anaplasia (10). Malignancy in meningiomas has been a contravercy and some have even stated that, biological behaviour cannot be predicted on histopathological analysis (12).

In spite of this Mahmood et al. (7) stated that they believed it was simply a reflection of the absence of the criteria for defining malignancy and described a detailed scoring system. In a series of 25 atypical and malignant meningiomas with the described criteria Mahmood et al. (7) reported recurrences in 51.85% and mortality in 44% of the patients during 5 to 15

years follow up. In contrast only 2% of the benign meningiomas had recurrences.

In this series all the detailed criteria described by Mahmood et al. (7) have been applied to meningioma cases and a high recurrence rate (66%) have been demonstrated in atypical meningiomas. Also all parameters that could be evaluated by statistical analysis (hypercelularity, mitosis,necrosis, nuclear pleomorphism, loss of architecture) and the total score were found valuable for determining recurrences. Of these the lowest p value was found for hypercellularity and total Mahmood score. These results suggest the scoring system described by Mahmood et al (7) is valuable both at the level of each parameter and total score. Although upto now no single histopathological parameter have been accepted for determinig recurrences in meningiomas (4-8), these results encourage us to reevaluate our ongoing opinions. The results obtained by few or single criteria was found unsatisfactory, which may be caused by uncertain and obscure criteria used till now. We belive these features should be evaluated in larger series seperately by different working groups before routine application. But these results encourage Mahmod scoring system in meningiomas.

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