Review of oligodendroglial grade III tumors in our institution, focusing on a radiological point of view.

Poster No.: C-1649
Congress: ECR 2016
Type: Scientific Exhibit
Authors: C. GÓMEZ VEGA, F. Jiménez Aragón, V. P. Goic, J. D. Guio Fernández, C. ARIZA MOLINA, C. López Menéndez, J. vidual gonzález, E. ARREGUI LOPEZ, M. T. Gomez San Roman; Ciudad Real/ES
Keywords: Neoplasia, Calcifications / Calculi, Surgery, Radiation therapy / Oncology, Contrast agent-intravenous, CT, MR, Oncology, Neuroradiology brain
DOI: 10.1594/ecr2016/C-1649

Any information contained in this pdf file is automatically generated from digital material submitted to EPOS by third parties in the form of scientific presentations. References to any names, marks, products, or services of third parties or hypertext links to third-party sites or information are provided solely as a convenience to you and do not in any way constitute or imply ECR's endorsement, sponsorship or recommendation of the third party, information, product or service. ECR is not responsible for the content of these pages and does not make any representations regarding the content or accuracy of material in this file.

As per copyright regulations, any unauthorised use of the material or parts thereof as well as commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method is strictly prohibited.

You agree to defend, indemnify, and hold ECR harmless from and against any and all claims, damages, costs, and expenses, including attorneys' fees, arising from or related to your use of these pages.

Please note: Links to movies, ppt slide shows and any other multimedia files are not available in the pdf version of presentations.

www.myESR.org
Aims and objectives

Oligodendroglial tumors or oligodendrogliomas (ODG) belong to a group of cerebral tumors known as "gliomas". They derive from oligodendrocytes, a glial cells with supporting function. ODG may also contain neoplastic astrocytes and may then be considered "mixed gliomas," known as oligoastrocytomas.

These tumors are histologically divided in low grade (WHO grade II), which represent well-differentiated ODG, or high grade (WHO grade III) called anaplastic oligodendroglioma, with a faster and more aggressive growth. Grade II ODG can malignize to grade III. However this transformation is difficult to predict.

Oligodendroglioma is the third most common glioma overall, accounting for 2%-5% of primary brain tumors and 5%-18% of all glial neoplasms. Their estimated incidence is 0.3 /100,000/year. ODG are more frequently detected in adult age groups with a peak incidence in the fourth and fifth decades. However anaplastic tumors are usually diagnosed in older age, at 45-74 years old. ODG are more common in males, with a 2:1 proportion.

The majority of all oligodendroglial tumors occur in the supratentorial brain, being the most common location the frontal and temporal lobes (50-65% and 47% respectively), although they might be also found anywhere in cerebral hemispheres.

Several ODG grow slowly and may be present years before being diagnosed. Cortical affectation is found in most cases. This is why seizures are the main clinical manisfetation. Headache is also usually reported. Other symptoms, like sensitive or motor disturbances and personality disorders are less common.

Surgery is the treatment of choice for ODG and adjuvant chemo and radiotherapy are oftently required. When total removal has not been possible, the tumor may recur as a higher grade tumor, however many years may pass to this due to slow growth. High grade tumors have more risk of recurrence.

The prognosis for oligodendroglial tumors is closely associated with histological grade and is better than other same grade tumors, as astrocytomas. The 5-year survival rate for grade II ODG is up to 78%, whereas for grade III is over 30%.

Some gene disorders have been associated with the prognosis. 1p and 19q chromosomal deletions are commonly identified in ODG, above all in those not placed in temporal
lobe, so this disorder is widely used for the proper differential diagnose between ODG and astrocytomas. Moreover, the presence of this disturbance is a good prognosis factor for treatment response, thus frontal ODG have a better prognosis. Abnormalities on chromosome 9 and 10 are normally detected in anaplastic tumors. The presence of Ki-67 >3% and TP53 mutation are associated with worse prognosis.

IMAGING FEATURES:

Neuroimaging is essential to diagnose ODG.

Oligodendrogliomas are nodular lesions with poorly defined borders and are frequently found in corticosubcortical region that reveal iso or hipodensity on CT whereas MRI shows T1 hipointensity and T2 isodensity.

Tumors with 1p and 19q delections have substantial imaging characterists. These compared to tumors without this delection cross more often the halfway line and display poorly defined edges on T1 MR image and calcifications.

Calcifications are commonly seen in ODG (80-90%). Moreover they can present cystic and hemorrhagic regions (20%), small brain bleeds with perivascular location associated with aggressivity.

In the last few years significant RMI advances make it possible to detect those lesions. MRI is better to CT in defining the full extent of tumor involvement.

Roughly 15-20% of ODG show enhancement post contrast, this is also associated with larger malignant although some anaplastic tumors do not have this characteristic. Sometimes, a ring enhancement pattern can be seen.

Hemosiderin artifact and calcifications have similar appearance on magnetic resonance image, both show hipointensity on EG sequences, thus this issue can affect their interpretation. CT is the radiological technique of choice for detect calcifications.

There are several details at neuroimaging for discern an oligodendroglioma from an oligoastrocytoma, a mixed tumour which normally has no calcifications (14%) and enhancement after injection of contrast (50%) is more often than in ODG.
The objectives of this study are:

- To analyze epidemiologic and histopathological characteristics (chromosome deletions 1p/19q) of grade III ODG in our institution.

- To describe morphological characteristics of this kind of tumors on MRI.

- To analyze if there are MRI differences between grade III ODG which progressed from grade II and those which were initially diagnosed as grade III.
Fig. 1: Sagittal T1-weighted magnetic resonance (MR) image shows a high signal intensity lesion into the ODG (arrow).

© PACS Hospital General Universitario de Ciudad Real
Fig. 2: Patient referred from primary case. Axial T2*-weighted magnetic resonance (MR) image shows low signal intensity of the mass (arrow), these findings confirm the presence of intrallesional hemorrhage.

© PACS Hospital General Universitario de Ciudad Real
**Fig. 3:** Right parieto - occipital ODG. Axial T2*-weighted magnetic resonance (MR) image shows rounded hyperintense areas, which are suggestive of cystlike components (arrows).

© PACS Hospital General Universitario de Ciudad Real
Fig. 4: Image associated with the previous case. Mentioned above lesions can be seen as low intensity images (red arrows) in Sagital T1-weighted magnetic resonance (MR), these findings confirm the presence of cystic areas. Furthermore, image shows a small lineal hyperintense lesion in the bottom side of tumour (blue arrowhead), this finding can suggest intralesional bleeding.

© PACS Hospital General Universitario de Ciudad Real
**Fig. 5:** Image associated with two previous cases. The lesion described (blue arrowhead) is hypointense in Axial T2*-weighted magnetic resonance (MR) image (arrow), thus intrallesional bleeding is sure.

© PACS Hospital General Universitario de Ciudad Real
**Fig. 6:** Right frontal ODG sited in right basal ganglia, with extension through the middle line and lateral ventricle collapse. Axial contrast-enhanced T1-weighted MR image shows intense outlying enhancement of the mass (arrow).

© PACS Hospital General Universitario de Ciudad Real
Fig. 7: Axial T2*-weighted magnetic resonance (MR) image shows low signal intensity into the tumour(arrow), which would seem to be a calcified lesion.

© PACS Hospital General Universitario de Ciudad Real
Fig. 8: Image corresponding to the previous case. CT Image shows a hyperattenuating image (arrow) and firm up the finding (calcified lesion).

© PACS Hospital General Universitario de Ciudad Real
Fig. 9: Postsurgical study of grade III ODG. Axial contrast-enhanced T1-weighted MR image does not show pathological enhancements.

© PACS Hospital General Universitario de Ciudad Real
Fig. 10: Image referred to previous case. Four months later, a periferical oval enhancement (arrow) could be seen in the same sequence, this finding was suggested of tumour recurrence.

© PACS Hospital General Universitario de Ciudad Real
Methods and materials

All cases of grade III ODG diagnosed in our institution in the last five years (since January 2009 to March 2015) were reviewed, focusing on their epidemiological, histopathological and Imaging characteristics who underwent MR imaging from.

All patients had underwent a MRI previously to surgery. The studies were realized in a 1,5T MR and included the following sequences: T1, T2, T2 gradient, diffusion and T1 post contrast. Tumor location, enhancement, calcifications, susceptibility artifact in T2* and T2 injury were the analyzed characteristics. But though the presence of enhancement is associated more commonly with agresiva ODG, its absence does not confirm a low grade ODG.

All the patients of the study had biopsy that confirmed ODG, classified by pathologist according to the WHO criteria.

MRI differences between grade III ODGT which progressed from grade II and those which were initially diagnosed as grade III were analyzed.
Results

-Seventeen patients with grade III ODG were included in the study. Eight of them (47%) progressed from grade II, in which complete surgery resection was achieved in 37.5% of them.

-The average age of diagnosis was 50 years old.

-A slight females predominance was observed in the gender distribution, represented 53% of the patients, 9 women and 8 men, our results did not agree with the literature.

-The most common localization was frontal lobe (64.7%).

-Seizure were the main clinical manifestation, it occurred in 47% of cases, in second place headache occurred in 23.5% of patients and sensitive and motor disturbances were others less often symptoms.

-1p and 19 q chromosomal deletions were identified in the 71.4% of cases.

-Of the total number of patients with 1p and 19q combined deletion.

- Antecedent of grade II ODG was presented in the 70% of them.
- Recurrence of anaplastic ODG was diagnosed in 30% of cases.
- Grade III ODG were placed in frontal lobe in 80% and none in temporal lobe, these results were coincidental with the published literature.
- Calcifications were seen in 30% of the patients.
- The patient who presented two recurrences showed no deletion.

-Surgical was performed in 94% of grade III ODG but only in the 50% of patients the complete tumor removal was realized.

-All the patients received adjuvant Radio and Chemotherapy.

-In the 88.2% of cases, Radiotherapy was used with curative intent.
- Four of the patients or 23.5% reported tumor recurrence between 2013 and 2014 and one of them (25%) developed recurrence to the second round.

- MRI characteristics: 59% showed post-gadolinium enhancement, 41.2% had calcifications and 23.5% susceptibility artifact on T2* weighted at diagnosis.

- De novo III grade ODG and progression from II grade were properly diagnose by MRI on 82.3% of cases (71.4% showed post gadolinium enhancement).

- Statistically significant results were not found when comparing radiological features (cystic areas, calcifications…) between grade III diagnosed from the beginning and those which progressed from grade II (41.2%).
Conclusion

- Radiological techniques like CT and RMI may suggest the ODG diagnosis as well as their histologic grade (grade II, low grade, or grade III, anaplastic).

- Grade II tumors can progress to grade III. Currently there are not enough resources to predict this progression.

- CT is the best radiological technique to identify calcified lesions given the similar appearance of hemorrhage areas and calcifications on T2*weight RMI.

- In the study, no significative differences were found between grade III diagnosed from the beginning and those which progressed from grade II (41.2%).
References


