Role Of CT Perfusion In The Evaluation Of Brain Gliomas

Essay

Submitted for partial fulfillment of master degree in Radiodiagnosis

Presented by

Mahmoud Mohammed Hassan Hassan Meky
M.B, B.CH.

Supervised by

Prof.Dr/ Mounir Sobhy Guirguis
Professor of Radiodiagnosis
Faculty of Medicine
Ain Shams University

Dr/ Mona Yehia Hemimy
Lecturer of Radiodiagnosis
Faculty of Medicine
Ain Shams University

Faculty of Medicine
Ain Shams University
2010

دور قياس التشبع الدموى بواسطة الأشعة المقطعية فى تشخيص أورام الخلايا الدبقية

رسالة
توطئة للحصول على درجة الماجستير فى الاشعة التشخيصية

مقدم من

محمود محمد حسن حسن مكى

تحت اشراف

الأستاذ الدكتور/ منير صبحى جرجس
أستاذ الأشعة التشخيصية
كلية الطب
جامعة عين شمس

د/منى يحيي هميمي
مدرس الأشعة التشخيصية
كلية الطب
جامعة عين شمس

كلية الطب
جامعة عين شمس
2010

Acknowledgement

First of all, thanks to GOD for blessing this work and guiding my efforts until it has reached its end as a little part of his generous help throughout our life.

I would like to express my deepest gratitude and immense appreciations to my supervisor ***Prof. Dr. Mounir Sobhy Guirguis****, Professor of radiodiagnosis, Ain-shams University, for his valuable instructions and support throughout this work.*

Also, I would like to express my grateful thanks and respect to Dr. ***Mona Yehia Hemimy Lecturer of radiodiagnosis****, Ain-shams University for her valuable guidance and honest supervision through this work.*

Finally, my parents who helped me and supported me all through, my deepest thanks to them.

Mahmoud Mohammed Hassan

CONTENTS

List of abbreviations

- **AA:** Anaplastic astrocytoma.
- **ACA**: Anterior cerebral artery.
- **ACommA:** Anterior communicating artery**.**
- **AIF:** Arterial input function.
- **BBB:** blood-brain barrier.
- **CBF**: Cerebral blood flow.
- **CBV**: Cerebral blood volume.
- **CNS:** Central nervous system.
- **CPC:** Choroid Plexus Carcinomas**.**
- **CPP:** Choroid Plexus Papilloma.
- **CSF:** Cerebrospinal fluid**.**
- **CT:** Computerized tomography.
- **DSC-MRI:** Dynamic susceptibility contrast MRI.
- **EGB:** Eosinophilic granular bodies.
- **FWHM:** Full width at half maximum**.**
- **GBM:** Glioblastoma multiforme**.**
- **GFAP:** Glial fibrillary acidic protein**.**
- **HU:** Hounsfield units.
- **ICA:** Internal carotid artery**.**
- **IRF:** Impulse residue function**.**
- **MCA**: Middle Cerebral Artery**.**

- **MR-PWI:** perfusion-weighted magnetic resonance imaging**.**
- **MS:** Multiple sclerosis.
- **MTT:** Mean transit time.
- **NAA:** N-acetylaspartate.
- **PCA**: Posterior cerebral artery.
- **PCT**: Perfusion computed tomography.
- **PCommA:** Posterior communicating artery**.**
- **PET:** Positron Emission Tomography**.**
- **PS:** Permeability surface-area product.
- **PXA:** Pleomorphic Xanthoastrocytoma**.**
- **ROI:** Region of interest.
- **SD:** Standard deviation.
- **SEGA:** Subependymal Giant Cell Astrocytoma**.**
- **SPECT:** Single Photon Emission Computed Tomography**.**
- **TDLs:** Tumefactive demyelinating lesions**.**
- **TTP:** Time to peak.
- **VEGF:** Vascular endothelial growth factor**.**
- **WHO**: World health organization**.**
- **XeCT:** Xenon-enhanced computed tomography**.**

List of figures

List of tables

Introduction

&

Aim Of The Work

Introduction

Glial cells are the most numerous among all cellular brain populations, they have a potential for pathological transformation and therefore they are the main supplier of CNS neoplasm. About 40–45% of all intracranial tumors are gliomas, and they form the heterogeneous group of brain neoplasms that contain relatively benign forms as well as very malignant tumors ***(Kornienko and Pronin, 2009).***

Perfusion computed tomography (PCT) is an imaging technique that allows rapid, noninvasive, quantitative evaluation of cerebral perfusion by generating maps of cerebral blood flow (CBF), cerebral blood volume (CBV) and mean transit time (MTT). The concepts behind this imaging technique were developed in the 1980s, but its widespread clinical use was allowed by the recent introduction of rapid, large-coverage multidetector-row CT scanners ***(Wintermark, 2009).***

CT-Perfusion imaging of brain tumors has been shown to be helpful for assessing preoperative tumor grade, differentiating between the tumor enhancement and the radiation necrosis, evaluating the response to anti-angiogenic agents ***(Anna Maria et al, 2009).***

Although such information may also be available from pathological examination of tumor tissue, in the case of cerebral tumors, biopsy is highly invasive with a risk of hemorrhage and infection, and is limited by sampling errors. Hence, the role of

imaging in cerebral neoplasms has begun to shift to provide information on tumor physiology as well as anatomy ***(Karim and Miles, 2007).***

The availability of computed tomography (CT) coupled with commercial perfusion software has made this method of assessment widely accessible to clinicians. Furthermore, reproducibility of the CT technique gives CT an advantage over other imaging modalities that enable similar vascular assessments such as dynamic contrast material enhanced magnetic resonance (MR) imaging ***(Goh et al, 2007).***

Aim of the work

To emphasize the role of CT perfusion in the evaluation of brain gliomas as regard tumor grading and response to treatment as well as differentiating between the tumor enhancement and the radiation necrosis.

Anatomy

(Gross and Radiologic Anatomy)