UNIVERSITI SAINS MALAYSIA
GERAN PENYELIDIKAN UNIVERSITI
PENYELIDIKAN
LAPORAN AKHIR

STUDY OF COMPUTED TOMOGRAPHY PERFUSION IN TRAUMATIC BRAIN CONTUSION

PENYELIDIK

DR. AHMAD HELMY ABDUL KARIM

PENYELIDIK BERSAMA

DR. WIN MAR @ SALMAH JALALUDDIN
DR. AB RAHMAN IZAINI GHANI

2013

1. **Nama Ketua Penyelidik : Ahmad Helmy bin Abdul Karim**
Name of Research Leader

☐ Profesor Madya/ *Assoc. Prof.* ☑ Dr./ *Dr.* ☐ Encik/Puan/Cik *Mr/Mrs/Ms*

2. **Pusat Tanggungjawab (PTJ) : Department of Radiology, School of Medical Sciences**
School/Department

3. **Nama Penyelidik Bersama : Dr Win Mar @ Salmah Jalaluddin , Dr Ab. Rahman Izaini Ghani**
Name of Co-Researcher

4. **Tajuk Projek :** **Study of Computed Tomography Perfusion in Traumatic Brain Contusion**
Title of Project

5. **Ringkasan Penilaian/***Summary of Assessment*:	Tidak Mencukupi *Inadequate*		Boleh Diterima *Acceptable*	Sangat Baik *Very Good*	
	1	2	3	4	5
i) **Pencapaian objektif projek:** *Achievement of project objectives*	☐	☐	☐	☑	☐
ii) **Kualiti output:** *Quality of outputs*	☐	☐	☐	☐	☑
iii) **Kualiti impak:** *Quality of impacts*	☐	☐	☐	☑	☐
iv) **Pemindahan teknologi/potensi pengkomersialan:** *Technology transfer/commercialization potential*	☐	☐	☐	☑	☐
v) **Kualiti dan usahasama :** *Quality and intensity of collaboration*	☐	☐	☐	☑	☐
vi) **Penilaian kepentingan secara keseluruhan:** *Overall assessment of benefits*	☐	☐	☐	☑	☐

6. **Abstrak Penyelidikan**
(Perlu disediakan di antara 100 - 200 perkataan di dalam **Bahasa Malaysia dan juga Bahasa Inggeris**. Abstrak ini akan dimuatkan dalam Laporan Tahunan Bahagian Penyelidikan & Inovasi sebagai satu cara untuk menyampaikan dapatan projek tuan/puan kepada pihak Universiti & masyarakat luar).

Abstract of Research
(An abstract of between 100 and 200 words must be prepared in Bahasa Malaysia and in English).
This abstract will be included in the Annual Report of the Research and Innovation Section at a later date as a means of presenting the project findings of the researcher/s to the University and the community at large)

- as per attach

7. **Sila sediakan laporan teknikal lengkap yang menerangkan keseluruhan projek ini.**
[Sila gunakan kertas berasingan]
Applicant are required to prepare a Comprehensive Technical Report explaning the project.
(This report must be appended separately)
- as per attach of article published (Brief Communication)

Senaraikan kata kunci yang mencerminkan penyelidikan anda:
List the key words that reflects your research:

Bahasa Malaysia	*Bahasa Inggeris*
pendarahan otak	brain contusion
perfusi	perfusion
trauma	trauma

8. **Output dan Faedah Projek**
Output and Benefits of Project

(a) * **Penerbitan Jurnal**
Publication of Journals
(Sila nyatakan jenis, tajuk, pengarang/editor, tahun terbitan dan di mana telah diterbit/diserahkan)
(State type, title, author/editor, publication year and where it has been published/submitted)

Brief communication, Computed Tomography Perfusion Imaging on Traumatic Cerebral Contusion : A Preliminary Report, Ahmad Helmy ABDUL KARIM, Win Mar @ Salmah JALALUDDIN, Ab. Rahman Izaini GHANI, Malaysian J Med Sci. Oct-Dec 2010; 17(4):51-56
(Oral presentation at XIX Symposium Neuroradiologicum Bologna 4-9 October 2010 - enclosed).

(b) **Faedah-faedah lain seperti perkembangan produk, pengkomersialan produk/pendaftaran paten atau impak kepada dasar dan masyarakat.**
State other benefits such as product development, product commercialisation/patent registration or impact on source and society.

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* Sila berikan salinan/*Kindly provide copies*

(c) **Latihan Sumber Manusia**
Training in Human Resources

i) Pelajar Sarjana: –
Graduates Students
(Perincikan nama, ijazah dan status)
(Provide names, degrees and status)

ii) Lain-lain: –
Others

9. **Peralatan yang Telah Dibeli:**
Equipment that has been purchased

Komputer : Macbook Pro 15 inch
Pencetak : HP Laser Jet P1505

10/9/2013
Tarikh
Date

Komen Jawatankuasa Penyelidikan Pusat Pengajian/Pusat
Comments by the Research Committees of Schools/Centres

Tidak Berat.

22/5/13

TANDATANGAN PENGERUSI
JAWATANKUASA PENYELIDIKAN
PUSAT PENGAJIAN/PUSAT
Signature of Chairman
[Research Committee of School/Centre]

Tarikh
Date

Brief Communication

Computed Tomography Perfusion Imaging on Traumatic Cerebral Contusion: A Preliminary Report

Ahmad Helmy Abdul Karim[1], Win Mar @ Salmah Jalaluddin[1], Ab Rahman Izaini Ghani[2]

Submitted: 23 Dec 2009
Accepted: 28 May 2010

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Abstract

Background: **Brain ischaemia and infarction are the leading factors in morbidity and mortality of traumatic brain injury. This study aimed to determine the perfusion status of pericontusional hypodense areas in traumatic cerebral contusion**

Method: **Ten patients involved in motor vehicle accidents were enrolled in this study, and contusions were diagnosed from plain computed tomography scans of the brain. Subsequent computed tomography perfusion (CTP) was performed to analyse the perfusion of pericontusional hypodense areas, which were divided into 4 regions of interest (ROI).**

Results: **Most ischaemic perfusion was found in ROI 6 (affecting 60% of patients), although the mean of the perfusion parameters were normal. A significant positive correlation was found between the perfusion status in the pericontusional area nearest to the skull vault (ROI 3) and its distance/thickness to the skull vault ($r = 0.698$, $P = 0.025$). Two adjacent pericontusional hypodense areas (ROI 4 and ROI 5) showed a significant positive correlation with each other ($r = 0.667$, $P = 0.035$) in terms of perfusion status. The presence of a hypodense pericontusional area is suggestive of oedema and perfusion disturbances.**

Conclusion: **CTP is a useful, fast, and appropriate method in evaluating perfusion of pericontusional hypodensity area that may help the treating physician to provide an appropriate treatment to the patient.**

Keywords: brain contusion, emission-computed tomography, medical imaging, oedema, perfusion, trauma

Introduction

Brain injury is the leading factor in morbidity and mortality following head trauma/injury. The devastating personal, social, and financial consequences of traumatic brain injury (TBI) are compounded by the fact that most people with TBI are young and otherwise healthy. Advances in the current management of TBI, including brain imaging, have led to increased survival rates in cases that would have previously been fatal (1). Because brain function is exceedingly complex, brain injury and recovery are also complex (2). Therefore, diagnostic imaging is extremely important in TBI patients to understand the clinical implications. To make matters even more complex, an early computed tomography (CT) scan does not identify which patients will develop neurological deficits, even after minor head injury. Although there is no consensus regarding which patients should be scanned, many authors agree that an abnormal result has a major impact on a patient's management (3). CT scan is a sensitive diagnostic tool for the evaluation of acute head injury; however, the prognostic ability of conventional CT scan has limited value.

Cerebral contusions are characterised by mixed densities of lesions, which are commonly surrounded by perilesional hypodense areas in close contact with the internal surface of the skull. Cerebral contusions have a tendency to enlarge over time and become significant space-occupying lesions, which exert a mass effect to surrounding brain parenchyma. This leads to an increased intracranial pressure with subsequent clinical deterioration or worsening neurological condition. A survey of 729 patients with TBI by the TBI European Brain Injury Consortium found that cerebral contusions alone (44%) or in association with subdural haematoma (29%) were the most frequent causes for delayed surgical intervention (4). In addition, ultrastructural studies have provided evidence that progressive