CT Angiography and hsCRP evaluated in Type II Diabetes Complicated with Stroke. Anatomical and Biochemical Correlation

Corresponding Author:
Dr. Amithnandan D Dwivedi,
Assistant Professor, Institute of Medical Sciences, 221005 - India

Submitting Author:
Dr. Amithnandan D Dwivedi,
Assistant Professor, Institute of Medical Sciences, 221005 - India

Article ID: WMC004038
Article Type: Research articles
Submitted on: 18-Feb-2013, 06:31:03 AM GMT    Published on: 18-Feb-2013, 12:31:50 PM GMT
Article URL: http://www.webmedcentral.com/article_view/4038
Subject Categories: NEUROLOGY
Keywords: Stroke; High sensitive c reactive protein (hsCRP), CT Angiography (CTA); Type II Diabetes.

How to cite the article: Dwivedi AD, Tripathi S, Garg S, Iqbal A, Tripathi K. CT Angiography and hsCRP evaluated in Type II Diabetes Complicated with Stroke. Anatomical and Biochemical Correlation. WebmedCentral NEUROLOGY 2013;4(2):WMC004038

Copyright: This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC-BY), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Source(s) of Funding: None

Competing Interests: None

Additional Files: TABLE 1 AND 2
CT Angiography and hsCRP evaluated in Type II Diabetes Complicated with Stroke. Anatomical and Biochemical Correlation

Author(s): Dwivedi AD, Tripathi S, Garg S, Iqbal A, Tripathi K

Abstract

Aims and objectives: Endothelial dysfunction is considered as root cause of vascular diseases like stroke, myocardial infarction (MI) and venous thromboembolism. Soluble endothelial dysfunction markers are emerging as surrogate markers of disease risk. We aim to correlate the findings of Computed Tomography Angiography (CTA) with hsCRP in patients of Type II Diabetes presenting with stroke.

Material and method: 40 patients of Type II Diabetes diagnosed to have ischemic stroke or Transient Ischemic Attack (TIA) based on clinical history, examinations and imaging were included. We assessed high sensitive C-reactive protein (hsCRP), levels in all patients within 24 hours and CT-Angiography of bilateral neck vessels within 48 hours of hospital admission.

Results: Increase in hsCRP, was significant in cases as compared to controls. This biochemical marker correlated significantly with CT Angiographic findings.

Conclusion: This study demonstrates that hsCRP, is good surrogate biochemical marker for assessing disease risk and burden in patient of Type II Diabetes presenting with stroke. Our study gives a good opportunity to combine anatomical details with disease pathophysiology at biochemical level.

Introduction

Endothelial dysfunction has a central role in the pathogenesis of many vascular diseases related to atherosclerosis [1]. It is associated with a number of conventional risk factors including hypercholesterolemia, smoking, hypertension, diabetes mellitus, insulin resistance and obesity [2]. It is useful to measure biological markers of vascular endothelial function in vivo because such markers might provide insight into the evolution and prognosis of complication like stroke in patients of Type II diabetes. CT Angiography of neck vessels gives anatomical details of the vessels and the disease burden at a macroscopic level. Among several markers of inflammation, hsCRP is found to be significant in people with diabetes. Several studies demonstrate that hsCRP remained a significant predictor of diabetes risk even after adjusting with body mass index, family history of diabetes mellitus, smoking and other factors [3]. CTA has been rarely used to measure disease burden and define the pathology of native vessels.

Methods

This research work was a hospital based cross sectional study conducted in Department of Medicine and Department of Radiodiagnosis, Institute of Medical Sciences, Banaras Hindu University, Varanasi, India, in accordance with the declaration of Helsinki guidelines on good clinical practice. The Institutional ethical committee approved the study and written informed consent was obtained from each patient.

Patients of Type II Diabetes diagnosed to have ischemic stroke or Transient Ischemic Attack (TIA) based on clinical history, examinations and imaging were taken up. A Non Contrast Computerized Tomography (NCCT) of head was performed in every patient. Patients with cerebrovascular hemorrhage and cardio-embolic ischemia were excluded from the study. Computed Tomography Angiography (CTA), using 64-slice CT scanner (GE Light speed) was performed in every patient within 48 hours. Patients with age <40yrs, renal failure, hemorrhagic stroke, infection, patients on anticoagulants, antiplatelet agents, Angiotensin Converting Enzyme (ACE) inhibitors and statins were excluded from the study. A total of 40 patients and 40 controls were studied. A detailed clinical history and physical examination were conducted. Physical examinations included anthropometric measurements such as height, weight, body mass index and waist circumference. Venous blood samples were drawn from the cases within 24 hours and serum was separated from the blood and preserved in -80 degree Celsius temperature till the
estimation. The serum hsCRP level was measured by sandwich enzyme-linked immune-sorbent assay (ELISA) kit (Diagnostic Biochem Canada) as per manufacturer’s protocol.

We graded CTA findings by a scoring system:

0 – No changes
1 – Eccentric or focal changes without calcification without narrowing
2 – Eccentric changes or focal changes with calcification without significant stenosis
3 – Circumferential changes without calcification without stenosis
4 – Circumferential changes with calcification without significant stenosis
5 – Significant stenosis.

In case of multiple lesions, scores were summated. Each side was scored in this fashion and finally the scores of both sides were added.

Statistical analysis

Sigma stat version 3.5 was used to calculate all statistical data. If the data were normally distributed than the measure of central tendency and dispersion used was mean ± standard deviation. If the data were not normally distributed than the measure of central tendency and dispersion used was median ± Inter Quartile range. Means of two groups were compared by using student t-test. Medians of two groups were compared by using Mann Whitney rank sum test. Correlations between two quantitative variables were achieved through Pearson’s correlation. Comparison between two proportions was done by Chi-square test, but if 20% variables were below 5; Fisher exact tests was used.

Results

In our study, patients with recent stroke or TIA (cases) were compared with controls. Both the groups were comparable in baseline characteristics like age, sex ratio and BMI. (Table 1).

Level of hsCRP was significantly higher in cases (8.75±3.45) as compared to controls (1.15±1.0). Multidetector CT Angiographic findings were more prevalent in cases. The CTA score was higher in cases (4±4) as compared to controls, but was not statistically significant (Table 2). Levels of hsCRP correlated significantly with the CTA scores and the disease burden (Fig 1).

Discussion

The participants of this study have basic physical characteristics viz. age, height, weight, BMI and sex-ratio similar to other studies on biochemical markers of ischemic stroke and TIA performed in the past [4]. In our study, we found that the markers of endothelial dysfunction like hsCRP were significantly higher in cases than in controls. This signifies that patients of Type II diabetes with ischemic stroke had more oxidative stress than in healthy controls.

Raised hsCRP account for this increased risk and is an independent risk factor for ischemic stroke [5-7]. Extensive work by Cao et al and Curb et al also provided similar evidence that elevated hsCRP is predictive of stroke independent of carotid intima-media thickening (IMT) and development of risk factors like diabetes and hypertension [8,9]. Our study also correlated levels of hsCRP with CTA scores. Even after extensive search of literature, we could not find a study on analysis of correlation between biochemical markers of endothelial dysfunction and CTA findings.

CTA scores, which signify anatomical extent and severity of atherosclerosis, correlated significantly and linearly with levels of hsCRP. Rothwell PM et al and Takaya N et al showed that some parameters of carotid artery atherosclerosis such as carotid artery stenosis, type of plaque, and presence of complications are identified factors for the future stroke risk [10,11].

Cases with stroke had a higher oxidative stress in the form a significantly higher hsCRP. This suggests that hsCRP not only have a prognostic value in patients but may also play an etiological role in atherosclerosis and stroke. This finding corroborates with the fact that CRP is not only a marker of atherosclerosis but is actually involved in pathogenesis of early atherosclerosis as shown in the work by Torzewski M et al [12].

Conclusion(s)

This study demonstrates that hsCRP, is a good surrogate biochemical marker for assessing disease risk and burden in patients of Type II diabetes suffering from ischemic stroke. It showed a linear correlation and statistical significance with CT angiography score. A combination of CTA score and
levels of hsCRP gives a good opportunity to combine anatomical details with disease pathophysiology at biochemical level.

**Abbreviation(s)**

CTA;hsCRP

**References**

Illustrations

Illustration 1

Graph showing correlation of hsCRP and CTA score.

\[ y = 0.661x - 3.015 \]

\[ R^2 = 0.348 \]
Illustration 2

Table 1

Characteristics of the study subjects.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Cases</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>60.55±13.456</td>
<td>60.625±13.378</td>
</tr>
<tr>
<td>Sex(M/F)</td>
<td>18/22</td>
<td>22/18</td>
</tr>
<tr>
<td>BMI</td>
<td>29.576±3.273</td>
<td>28.691±2.602</td>
</tr>
</tbody>
</table>

The level of significance for all above mentioned characteristics are not significant among Cases and control groups (P>0.05)
Levels of high sensitive C-reactive protein and Multi-detector CT Angiographic score in cases and controls

<table>
<thead>
<tr>
<th>Parameters</th>
<th>CASE</th>
<th>CONTROLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>hsCRP (mg/L)</td>
<td>8.75±3.45</td>
<td>1.15±1.0</td>
</tr>
<tr>
<td>MDCTA</td>
<td>4±4</td>
<td>1±1</td>
</tr>
</tbody>
</table>

The hsCRP level is statistically significant (P<0.001) whereas MDCTA score is not significant (P>0.05) in cases compared to controls.
Disclaimer

This article has been downloaded from WebmedCentral. With our unique author driven post publication peer review, contents posted on this web portal do not undergo any prepublication peer or editorial review. It is completely the responsibility of the authors to ensure not only scientific and ethical standards of the manuscript but also its grammatical accuracy. Authors must ensure that they obtain all the necessary permissions before submitting any information that requires obtaining a consent or approval from a third party. Authors should also ensure not to submit any information which they do not have the copyright of or of which they have transferred the copyrights to a third party.

Contents on WebmedCentral are purely for biomedical researchers and scientists. They are not meant to cater to the needs of an individual patient. The web portal or any content(s) therein is neither designed to support, nor replace, the relationship that exists between a patient/site visitor and his/her physician. Your use of the WebmedCentral site and its contents is entirely at your own risk. We do not take any responsibility for any harm that you may suffer or inflict on a third person by following the contents of this website.