Valor clínico de las imágenes de perfusión de baja dosis de CT en el diagnóstico de infarto cerebral agudo

Clinical Value of CT Low Dose Perfusion Imaging in the Diagnosis of Acute Cerebral Infarction

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Resumen
Este artículo explora el valor clínico de las imágenes de perfusión de baja dosis de CT en el diagnóstico de infarto cerebral agudo. Todos los pacientes recibieron dos dosis diferentes de imágenes de perfusión, voltaje convencional de 120 kV y dosis baja de 80 kV. Se observaron y compararon los parámetros de calidad de imagen, dosis de radiación y perfusión de la región isquémica en el centro del infarto. La tasa calificada de imagen de perfusión cerebral de la TC de dosis baja fue significativamente mayor que la de la TC convencional, y la diferencia de los datos de calidad de imagen entre los dos grupos fue prominente, lo cual fue aplicable al estándar estadístico (P <0.05). El valor promedio de ctdlvol, DLP y la dosis de radiación efectiva de la tomografía computarizada de perfusión cerebral de baja dosis fueron significativamente mejores que los de la TC convencional. La diferencia de dosis de radiación y valor promedio entre los dos grupos fue significativa, y la diferencia fue aplicable al estándar estadístico (P <0.05). Entre los resultados de las imágenes de perfusión de CT a diferentes dosis, no hubo diferencias significativas entre las imágenes de perfusión cerebral de CT de baja dosis y la CT convencional (P TTP se mantuvo sin cambios (P > 0.05). La imagen de perfusión de CT de baja dosis es de gran valor en el diagnóstico clínico de pacientes con infarto cerebral agudo, con características de imagen obvias. Puede evaluar bien y objetivamente el estado del área del infarto y la perfusión del flujo sanguíneo local, y puede mejorar la tasa de coincidencia del diagnóstico clínico, que vale la pena popularizar.

Palabras clave: examen de CT; Imágenes de perfusión en dosis bajas; Infarto cerebral agudo; Valor de diagnóstico clínico

Abstract
This paper explores the clinical value of CT low dose perfusion imaging in the diagnosis of acute cerebral infarction. All patients received two different doses of perfusion imaging, 120 kV conventional voltage and 80 kV Low dose. The image quality, radiation dose and perfusion parameters of the ischemic region in the infarct center were observed and compared. The qualified rate of brain perfusion image of low dose CT was significantly higher than that of conventional CT, and the difference of image quality data between the two groups was prominent, which was applicable to statistical standard (P < 0.05). The average value of ctdlvol, DLP and effective radiation dose of low-dose CT brain perfusion imaging were significantly better than those of conventional CT. The difference of radiation dose and average value between the two groups was significant, and the difference was applicable to statistical standard (P < 0.05). Among the results of CT perfusion imaging at different doses, there was no significant difference between low-dose CT brain perfusion imaging and conventional CT (P TTP remained unchanged (P > 0.05). CT low-dose perfusion imaging is of great value in the clinical diagnosis of patients with acute cerebral infarction, with obvious imaging characteristics. It can well and objectively evaluate the status of infarct area and local blood flow perfusion, and can improve the clinical diagnosis coincidence rate, which is worth popularizing.

Key words: CT examination; Low-dose perfusion imaging; Acute cerebral infarction; Clinical diagnostic value

1. Introduction

Acute cerebral infarction belongs to the type of cancer which is easy to occur in clinic. With the continuous deterioration of living environment and the continuous change of diet and living rules in recent years, the incidence of acute cerebral infarction is also increasing, which belongs to the second largest malignant tumor at present [1]. The injury of some patients in acute cerebral infarction is complex, and simple X-ray examination can not fully diagnose the severity of acute cerebral infarction, so the risk of missed diagnosis is high, the best
treatment opportunity is delayed, and the overall treatment effect is reduced [2]. With the continuous development of CT technology in recent years, low-dose CT brain perfusion imaging technology is gradually popularized in clinical practice. The application advantages of this technology mainly lie in low dose, less negative impact on patients, wide application population, and good image quality, which can better improve the overall level of diagnosis [3]. In order to improve the level of diagnosis, this paper briefly analyzes the diagnostic effect and imaging characteristics of low-dose CT perfusion imaging in patients with acute cerebral infarction.

2. Materials and methods

2.1 General information

This study was carried out from January 2018 to July 2018. 40 patients with acute cerebral infarction were selected as cases for study and analysis. Among the 40 patients, 32 were male and 18 were female. The age of the patients was 24 years old and 83 years old, with an average of (57.5 ± 3.3) years. All the patients met the diagnostic criteria of large area cerebral infarction specified by neurology branch of Chinese Medical Association. All patients were informed and agreed to participate in the study. Research is accredited by the ethics committee.

2.2 Method

All patients received CT scan. The thickness of the scan was 5 mm, the tube voltage was 80 kV, the tube current was 200 Ma, the collimator was 128 × 0.625 mm, the matrix was 512 × 512, and the FOV was 220 mm. According to the results of plain scan, the lesion scope was basically defined. Meanwhile, the basal ganglia area with the largest cross-section of infarction and the radial coronary area were taken as the center to carry out CT perfusion imaging within 3cm. The high-pressure syringe adopts 5ml / s rate, 50ml iodophor, delay 10s, and overall scanning time 50s. The obtained image is transferred to the EBE workstation and processed by brain perfusion software to obtain the final image. The evaluation of images was completed by two highly qualified doctors.

In conventional dose CT perfusion imaging, the tube voltage is 120 kV, and other parameters have no change.

2.3 Observation indicators

The image quality, radiation dose and perfusion parameters of the ischemic region in the infarct center were observed and compared.

The differences of image quality and radiation dose between the two groups were compared. At the same time, the image quality was evaluated by two doctors with high professional titles. The image quality was evaluated on a 4-point system, including 1 point for unclear structure, more particle noise, impact judgment, 2 points for fuzzy image edge, particle noise, rough particle size but can be judged, 3 points for fuzzy image boundary but good and no artifacts, no particle noise can be judged, 4 points The image edge is clear and contrast is good without artifacts and particle noise. 2 points and above are qualified. The effective radiation dose was adjusted according to the formula ed = DLP × K; K according to the examination site.

2.4 Statistical methods

The basic data and observation indexes of patients in this study were analyzed by SPSS software. After data entry, quantitative or qualitative processing is carried out, and discrete or continuous type method is adopted to realize data entry. For qualitative data, classification processing is not applied. In data processing, P value < 0.05 was used as the standard for statistical significance judgment. The percentage data shall be tested with X2, and the mean data shall be tested with t-value data.

3. Results

3.1 Image quality comparison

The qualified rate of brain perfusion image of low dose CT was significantly higher than that of conventional CT, and the difference of image quality data between the two groups was prominent, which was applicable to statistical standard (P < 0.05). See Table 1 for specific data. Figure 1 shows the contrast of CT plain scan and low-dose CT perfusion imaging.

<table>
<thead>
<tr>
<th>Project</th>
<th>1 point</th>
<th>2 points</th>
<th>3 points</th>
<th>4 points</th>
<th>Pass rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low dose CT (n=40)</td>
<td>0</td>
<td>3</td>
<td>24</td>
<td>13</td>
<td>100.0%</td>
</tr>
<tr>
<td>Conventional CT (n=40)</td>
<td>7</td>
<td>13</td>
<td>9</td>
<td>11</td>
<td>82.50%</td>
</tr>
</tbody>
</table>
3.2 Radiation dose comparison

The average value of ctdlvol, DLP and effective radiation dose of low-dose CT brain perfusion imaging were significantly better than those of conventional CT. The difference of radiation dose and average value between the two groups was significant, and the difference was applicable to statistical standard (P < 0.05). See Table 2 for details.

<table>
<thead>
<tr>
<th>Project</th>
<th>Scanning range (mm)</th>
<th>CTDLvol average (mGy)</th>
<th>DLP average (mGy × cm)</th>
<th>ED (mSv)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-dose CT cerebral perfusion imaging (n=40)</td>
<td>140</td>
<td>5.0±0.8</td>
<td>70.5±13</td>
<td>0.69±0.29</td>
</tr>
<tr>
<td>Conventional CT (n=40)</td>
<td>140</td>
<td>28.25±1.32</td>
<td>399.54±56.12</td>
<td>3.41±1.40</td>
</tr>
<tr>
<td>P value</td>
<td>-</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

3.3 Comparison of pathological diagnosis results with CT diagnosis results

Among the CT perfusion imaging results under different doses, the data of low-dose CT compared with conventional CT were not prominent, and the comparison results were meaningless (P<0.05). At the same dose, the ischemic area and infarct center area were compared with rCBF. Improvement, rCBV improvement, MMT shortening, data differences were prominently applied to statistical standards (P <0.05). The TTP was unchanged (P>0.05). The specific data is shown in Table 3.

<table>
<thead>
<tr>
<th>Group</th>
<th>rCBF (ml/min·g)</th>
<th>rCBV (ml/g)</th>
<th>MMT (s)</th>
<th>TTP (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infarct central area</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ischemic area</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low dose CT (n=40)</td>
<td>0.18±0.21</td>
<td>0.78±0.3</td>
<td>0.27±0.16</td>
<td>18.54±3.5</td>
</tr>
<tr>
<td>Conventional CT (n=40)</td>
<td>0.22±0.21</td>
<td>0.84±0.2</td>
<td>0.31±0.24</td>
<td>20.13±3.6</td>
</tr>
<tr>
<td>P value</td>
<td>&gt;0.05</td>
<td>&lt;0.05</td>
<td>&gt;0.05</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Ischemic area</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infarct central area</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low dose CT (n=40)</td>
<td>0.94±0.2</td>
<td>5.0</td>
<td>11.21±3.25</td>
<td>24.25±3.5</td>
</tr>
<tr>
<td>Conventional CT (n=40)</td>
<td>0.96±0.1</td>
<td>7.0</td>
<td>12.89±2.54</td>
<td>23.46±2.4</td>
</tr>
<tr>
<td>P value</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

Note: * represents the data difference between the central area of infarction and the central area of infarction (P < 0.05).

4. Discussion

Because atherosclerotic disease occurs, resulting in arterial stenosis or infarction, resulting in abnormal blood flow perfusion of brain cells, leading to cytotoxic edema [4]. As time passes, the performance of cellular ischemia and hypoxia will continue to increase, resulting in changes in necrosis or apoptosis. After the occurrence of cerebral infarction, there will be a localized reduction of functional capillaries. At this time, a large number of microvascular bed lesions will be induced, and the amount of blood perfusion in the infarct site will be reduced [5]. CT perfusion imaging can effectively reflect the blood flow hypoperfusion in the infarction site. This infarction manifests a large amount of necrosis or apoptosis in the brain cells. This process itself cannot be reversed. During the recovery of cerebral infarction, the infarction The local blood flow around the
lesion can be effectively improved. At this time, the infiltration of the infarcted lesions will also enhance the blood perfusion enhancement [6]. The clinical application of CT has a significant role in promoting the development of medical technology. However, spiral CT itself is a high radiation dose. For some special groups, such as newborns and pregnant women, the clinical risk is high, which also promotes clinical radiation. Learning related technologies continue to develop and innovate [7]. Low-dose CT cerebral perfusion imaging is a new inspection technique. Its main function is to use the quantum noise reduction software to process the information while maintaining the image edge instruction, and to maintain the relatively smooth processing to the maximum extent. Effective control dose under the quality environment [7]. The intelligent adjustment function of the exposure is applied, and the scanning condition is controlled according to the change of the human body structure and the size, and such treatment can also effectively control the dose. The application of low-dose CT cerebral perfusion imaging is relatively low in radiation dose and does not cause secondary injury to patients. It is a non-invasive and reproducible diagnostic technique. Applying the intelligent anti-artifact technology method, this technology can realize the original data processing after scanning, and filter out the large projection data by means of the algorithm to form compensation, and indirectly control the X-ray quantity while obtaining clear images. Use [8]. The multi-planar reconstruction image has a low distortion rate and a clear advantage in maneuverability. It can clearly display the tube pile and the missing position scan image of the lesion, and can display the shape, size and specific parts of all lesions [9]. Overall, low-dose CT cerebral perfusion imaging can achieve early detection and diagnosis of lesions, and provide strong data support for subsequent treatment methods and prognosis evaluation. Many studies abroad have found that low-dose CT perfusion imaging combined with late data reconstruction can accurately determine a variety of tumors, cerebral perfusion and other symptoms, including the disease of cerebral infarction, which can achieve accurate, direct observation and small Primary infarction lesions can not only detect lesions, but also serve as measures for efficacy judgment and prevention after intervention [10]-[11]. Aiming at this phenomenon, it also proves the value of applying low-dose CT in the diagnosis of lesions, which can better improve the clinical guiding value. It is a safe, efficient and non-invasive surgical program with many advantages [1-13].

The results of this study showed that the qualified rate of low-dose CT cerebral perfusion imaging images was significantly higher than that of conventional CT. The difference in image quality data between the two groups was prominent, and the data differences were prominently applied to statistical standards (P<0.05). The scanning range of the two methods was the same. The average CTDLv0l, DLP average and effective radiation dose of low-dose CT cerebral perfusion imaging were significantly better than conventional CT. The differences between the two groups of radiation dose and mean data were prominent, and the data differences were prominently applied to the statistical criteria. P < 0.05). Among the CT perfusion imaging results under different doses, the data of low-dose CT cerebral perfusion imaging was not prominent compared with conventional CT, and the comparison results were meaningless (P>0.05). The ischemic area and infarct center area were under the same dose. Compared with rCBF, rCBV, and MMT shortening, the data differences were prominently applied to statistical criteria (P<0.05). The TTP was unchanged (P>0.05). The results of this study show that low-dose CT cerebral perfusion imaging is not urgent, you can better define the infarct tissue, and have a more prominent evaluation of the infarct size, number and range, and can effectively observe the brain tissue perfusion of patients with cerebral infarction. The status has a significant prognostic significance [14-15]. At the same time, the low radiation dose is less harmful to the human body. Low-dose CT cerebral perfusion imaging examination can ignore the radiation exposure problem, and is a high-level clinical examination technique with high diagnostic reliability and accurate prognosis.

5. Conclusion

In summary, CT low-dose perfusion imaging is of great value in the clinical diagnosis of patients with acute cerebral infarction, and has obvious imaging features. It can evaluate the infarct area and local blood perfusion status well and objectively, which can improve the coincidence rate of clinical diagnosis. It is worthy of promotion. popular.

References