Prevalence of Idiopathic Normal-Pressure Hydrocephalus in the Elderly Population of a Japanese Rural Community

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Abstract

The prevalence of idiopathic normal-pressure hydrocephalus (NPH) in a community was investigated by retrospective analysis of data from a previous community-based study of 170 randomly selected elderly residents aged 65 years or older. Magnetic resonance (MR) images of the subjects were reviewed for the specific structural features of idiopathic NPH, i.e. ventricular enlargement and narrow cerebrospinal fluid (CSF) space at high convexity and high midline areas. The clinical features of idiopathic NPH, gait disturbance, urinary incontinence, and cognitive impairment, were evaluated on the basis of records of the subjects’ neurological examinations, a health questionnaire, the Mini-Mental State Examination, and Clinical Dementia Rating. Thirteen of the 170 subjects showed lateral ventricular enlargement greater than 0.3 on Evans’ index. Five subjects (2.9%) demonstrated both ventricular enlargement and narrow CSF space at the high convexity/midline. All five subjects with these MR imaging signs had cognitive impairment, one had gait disturbance, and one had urinary incontinence. The present study found 2.9% of community-dwelling elderly subjects showed radiological and clinical features consistent with idiopathic NPH.

Key words: idiopathic normal-pressure hydrocephalus, epidemiology, prevalence, magnetic resonance imaging

Introduction

Normal-pressure hydrocephalus (NPH) is a neurological disorder characterized by the clinical triad of gait disturbance, mental deterioration, and urinary incontinence, which are reversible with ventricular shunting.1,5) NPH can be divided into two types, secondary NPH and idiopathic NPH. Secondary NPH may develop as a result of abnormalities of the arachnoid, such as those occurring after subarachnoid hemorrhage, meningitis, cranial trauma, or intracranial surgery. Idiopathic NPH reportedly accounts for one third of cases of NPH,2,12) but the epidemiology has not been fully analyzed. The incidence was estimated as 2.2 per million of the population of the Dutch capital, Amsterdam.12) The results of a door-to-door survey indicated a prevalence of 0.4% among people over the age of 65 years living in German villages.11) However, these studies had methodological limitations, so an extensive community-based study is required to clarify the prevalence of idiopathic NPH.

The present study retrospectively analyzed the data from a previous community-based study performed in a rural town in Japan.

Materials and Methods

One hundred seventy elderly residents aged 65 years or older were randomly selected from the town of Tajiri, which is a typical agricultural town located in Miyagi Prefecture in the northern part of Japan, as previously described.7) Briefly, 2516 elderly residents of the town aged over 65 years were targeted initially. In the first phase, a total of 2352 respondents completed a health questionnaire that included questions about past medical history and activities of daily living. In the second phase in 1992, 240 elderly people were randomly selected from the first survey population (n = 2352), adjusted for age and sex, and requested to undergo magnetic resonance
Fig. 1 Axial and coronal T1-weighted magnetic resonance images showing measurement of Evans’ index (A/B) and assessment of narrow cerebrospinal fluid space at the high convexity/midline (arrows).

Table 1 Subjects with Evans’ index greater than 0.3 and narrow cerebrospinal fluid space at the high convexity/midline

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Age (yrs)</th>
<th>Sex</th>
<th>Evans’ index</th>
<th>Cognitive function</th>
<th>Gait disturbance</th>
<th>Urinary incontinence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MMSE</td>
<td>CDR</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>69</td>
<td>F</td>
<td>0.30</td>
<td>23</td>
<td>0.5</td>
<td>–</td>
</tr>
<tr>
<td>2</td>
<td>74</td>
<td>M</td>
<td>0.33</td>
<td>23</td>
<td>1</td>
<td>–</td>
</tr>
<tr>
<td>3</td>
<td>81</td>
<td>F</td>
<td>0.33</td>
<td>17</td>
<td>0.5</td>
<td>–</td>
</tr>
<tr>
<td>4</td>
<td>73</td>
<td>M</td>
<td>0.34</td>
<td>27</td>
<td>0.5</td>
<td>not recorded</td>
</tr>
<tr>
<td>5</td>
<td>82</td>
<td>M</td>
<td>0.37</td>
<td>19</td>
<td>0.5</td>
<td>+</td>
</tr>
</tbody>
</table>

CDR: Clinical Dementia Rating, MMSE: Mini-Mental State Examination.
Idiopathic NPH was 2.9% in a community-dwelling population aged over 65 years (5 of 170 subjects).

This study does have some limitations. First, there may be exclusion bias, as some of the original randomly selected subjects were unable to undergo MRI imaging due to physical problems. These subjects may have high risk of idiopathic NPH. Second, the retrospective nature of this study may have resulted in a detection bias in the questionnaire and neurological examination, which may not have very high sensitivity and specificity. Neither CSF tap test nor logical examination, which may not have very high sensitivity and specificity. Neither CSF tap test nor shunt surgery was undertaken, so no definite diagnosis of idiopathic NPH was possible.

Despite these limitations, the results of the present study suggest that there may be a significant number of people in communities who have idiopathic NPH but are overlooked or misdiagnosed as a result of non-specific clinical features. A further prospective community-based study including specific diagnostic measures such as the CSF tap test is needed.

References


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Commentary

Idiopathic normal pressure hydrocephalus (iNPH) is becoming more and more important in the rapid aging of Japanese society. The guidelines for management of iNPH was published in 20041) in Japanese and the English version was published in 2008.2) One of the important issues in the Japanese guidelines is attention to the MRI-based diagnosis, which indicates the diagnostic importance of tightness in the high convexity and midline regions in elderly patients. This paper is important in revealing the prevalence of iNPH in the community-dwelling elderly population by using MRI-based diagnosis. The authors found that about 3 percent of elderly subjects aged 65 years or more in the local community showed radiological and clinical features consistent with iNPH. This indicates that iNPH should be included in the differential diagnosis of elderly patients having gait disturbance, dementia, or urinary incontinence.

References

1) Ishikawa M; Guideline Committee for Idiopathic Normal Pressure Hydrocephalus, Japanese Society of Normal Pressure Hydrocephalus: Clinical guidelines for
The incidence of idiopathic normal pressure hydrocephalus (iNPH) is not well known. The authors in this paper investigated 170 randomly selected elder residents aged 65 years or older in a community. All 170 people had MR examination. The authors found that if the person has enlarged ventricles, Evans' index of 0.3 or greater, or narrow cerebrospinal fluid (CSF) space at the high convexity/midline, these are important imaging features of iNPH. In this group there were five patients with both MR imaging signs of iNPH and all five had cognitive impairment; one had gait disturbance, and one had urinary incontinence. So iNPH was diagnosed. From this study, the authors think that the prevalence of iNPH was 2.9% in a community-dwelling population aged over 65 years. But I do not think this prevalence is accurate, because there were 40 people unable to take the MR examination due to older age. These 40 people may include more iNPH patients. On the other hand, from the Japanese guidelines for idiopathic normal pressure hydrocephalus, we know that the diagnosis of "possible" iNPH is based on the presence of one or more classical symptoms, ventricular dilation with closing sulci at the high convexity, and clear CSF with normal CSF pressure in middle aged and elder patients. If we follow up in this way, and pay more attention to the clinical symptoms of this person, the prevalence may be higher than 2.9%.

Reference


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Although normal-pressure hydrocephalus (NPH) was first described by Hakim in 1964 and is characterized as communicating hydrocephalus in elderly patients presenting with the clinical triad of gait disturbance, dementia, and incontinence, the prevalence of the idiopathic NPH (iNPH) remains unclear. So, this article is an important contribution to our understanding of iNPH for two reasons. Firstly, the authors present primary criteria to select patients with iNPH. Secondly, the research results suggest that there may be some patients with iNPH who are overlooked.

As we know, patients with iNPH may have intracranial volumes, as shown by MR imaging, larger than normal. For this reason, I think that adding this MR imaging sign to the imaging screening criteria of iNPH may be better. We also wish for a further prospective community-based study including specific diagnostic measures such as the CSF tap test will be finished early.

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