学 位 論 文 の 要 旨

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学　位　論　文　名　　Factor for Diagnosis Delay on Symptomatic Dural Arteriovenous Fistula in Central Nervous Systems

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論 文 内 容 の 要 旨

INTRODUCTION

A symptomatic dural arteriovenous fistula (sDAVF) manifests with a variety of clinical symptoms, such as eye symptoms, tinnitus, headaches, and unspecified neurological symptoms. As such, patients rely on their subjective symptoms and consult with not only neurosurgeons (NS), but also physicians in different departments, such as neurologists (N), ophthalmologists (Oph), otolaryngologists (Oto), orthopedists (Orth), and general physicians (GP). However, since this condition is not well known by physicians other than NS, in many cases, it could take numerous consultation days to establish a diagnosis after the onset of symptoms. Using data of sDAVF patients who underwent surgical interventions at our hospital, the stages of the medical consultation process that are involved from the onset of sDAVF to a definitive diagnosis within our hospital’s medical district were analyzed. To identify the factors affecting the time lag to reach a definitive diagnosis, the number of days until a definitive diagnosis was established by retrospective investigation, and the rate-limiting stages of the medical consultation process were analyzed.

MATERIALS AND METHODS

The study period was from January 2004 to March 2018 (14 years and two months). Of the 27 consecutive DAVF patients who were hospitalized at our medical facility during the study period, 20 patients with sDAVF were selected for the present analysis. The following parameters were examined: specialty of the consulting physician, medical district of the consulting physician, day of symptom onset (Sx), day of first consultation (1^{st}Dr), day of referral to a secondary medical institution (2^{nd}Dr), day of first MRI test (1^{st}MR) and day of definitive diagnosis (Dx) .The specialization of the consulting physicians was as: NS, N, Oph, Oto, Orth, and GP.

Based on the number of physicians per 100,000 population, the medical districts of the consulting doctors were defined as follows: i) medically adequately served (MAS) areas: Izumo, Matsue, and Hamada districts (population: 500,333; number of physicians: 1610; number of physicians per 100,000 population: 321.8); and ii): medically underserved (MU) areas: Masuda, Ooda, and Unnan districts (population: 175,722; number of physicians: 302; number of physicians per 100,000 population: 171.9) .The number of consultation days was tabulated as an analytical parameter: i) Days (Sx-Dx): Number of days between Sx and Dx, ii) Days (Sx-1stDr): Number of days between Sx and 1stDr, iii) Days (1stDr-2ndDr): Number of days between 1stDr and 2ndDr, iv) Days (1stDr-1stMR): Number of days between 1stDr and 1stMR, and v) Days (1stMR-Dx): Number of days between 1stMR and Dx.

The present study used 70 days as the benchmark, which was the median duration to establish a definitive diagnosis, and the subjects were divided into two groups. The normal diagnosis group consisted of patients who were diagnosed within 70 days. The delayed diagnosis group consisted of patients who were diagnosed after 71 days. The Mann-Whitney-Wilcoxon (MWW) test was used to compare continuous variables between two groups. Significance was set at p=0.05. The study protocol was approved by the Shimane University Institutional Committee on Ethics (Study number: 3692).

RESULTS AND DISCUSSION

The median days of each stage of the medical consultation process before the DAVF diagnosis was made in the 20 subjects. The median Days (Sx-Dx) was 70 days (between 0 and 3659 days). The median Days (Sx-1stDr) was 6.5 days (between 0 and 1713 days). The median Days (1stDr-2ndDr) was 19.5 days (between 0 and 1146 days). The median Days (1stDr-1stMR) was 14 days (between 0 and 481 days). The median Days (1stMR-Dx) was 3.5 days (between 0 and 2641 days).

The normal and delayed diagnosis groups were divided based on the Days (Sx-Dx) to determine which stage of the medical consultation process was related to the delay in diagnosing DAVF. The statistical analysis showed that there was a significant difference (P=0.0043) in the Days (1stDr-1stMR) between the normal diagnosis group (5.5 days) and the delayed diagnosis group (83 days). There was also a significant difference (P=0.021) in Days (1stDr-2ndDr) between the normal diagnosis group (14.5 days) and the delayed diagnosis group (82.5 days). There was no significant difference in Days (Sx-1stDr) and Days (1stMR-Dx).

According to the analysis of the above results, the stage of the medical consultation process that affects the delay in diagnosing sDAVF, the rate-limiting stage, is not determined by how fast a patient consults a medical institution, but it is mostly influenced by how early a physician performs MRI, and also by how fast the first consulting physician refers the patient to

a secondary medical institution.

Transferred medical institutions, specialization of the consulting physician, affiliated medical districts, and the number of consultation days from the 1stDr to Dx were examined in the seven patients with eye symptoms. The patients visited between two to five medical institutions before reaching a definitive diagnosis, and the seven patients with eye symptoms targeted in the present analysis consulted with 21 physicians [N (2), NS (4), Oph (14), and GP (1)]. The mean number of consultation days for each physician was 37.5 days (between 0 and 273 days). The mean number of consultation days for each physician was calculated for MAS and MU areas. There was a significant difference (p=0.015) between MAS areas (14.1 days; between 0 and 147) and MU areas (84.4 days; between 0 and 273 days). Even when the investigation was limited to Oph, there was a significant difference (p=0.0125) between MAS areas (19.1 days; between 0 and 147 days) and MU areas (99.0 days; between 0 and 273 days) when the mean number of consultation days per Oph examining patients with eye symptoms was calculated.

In MU areas, significantly longer consultation days were required, even for physicians specializing in ophthalmology. Since this condition is not well known by physicians other than NS, in many cases, it could take numerous consultation days to reach a definitive diagnosis after the onset of symptoms. However, these results may be proof of a consultation process that occurred difference of DAVF cognitions between doctors of MAS areas and doctors of MU areas.

Delay in diagnosing DAVF will lead to intracranial hemorrhage, and in the spine, it may cause irreversible neurological conditions. Therefore, physicians in all departments involved in patient consultation need to recognize DAVF conditions. Patients with suspected DAVF based on their clinical symptoms should have a head MRI at an early stage or need to be referred to a secondary medical institution. The sub-analysis of eye symptoms showed a prolonged number of consultation days in MU areas compared to MAS areas. Days (1stDr-1stMR) could be shortened, leading to sDAVF diagnosis at an early stage by engaging in awareness-raising activities of DAVF, such as lecture programs targeting physicians in the medical districts that may not be sufficiently knowledgeable about DAVF, and through the creation of an environment that facilitates referral of patients to NS in base hospitals.

CONCLUSION

Since the delay in diagnosing sDAVF may lead to symptoms of irreversible neurological damage, it is crucial to avoid diagnostic delays. Receiving MRI test is the most significant stage that leads to sDAVF diagnosis. Therefore, it is important to raise awareness of DAVF among local community health clinics, including physicians in general practice, to broaden their understanding of DAVF.