学 位 論 文 の 要 旨

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学 位 論 文 名　Aggressive Intraoperative Cisternal Clot Removal After Clipping Aneurismal Subarachnoid Hemorrhage in Elderly Patients

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論 文 内 容 の 要 旨

INTRODUCTION

Opportunities to treat aneurysmal subarachnoid hemorrhage (aSAH) in elderly patients are expected to increase in Japan, which largely comprises a super-aging society. However, surgeons often select conservative treatments rather than acute surgical intervention due to the advanced age of the patients, which is a significantly poor prognostic factor. However, this decision is subjective and differs among treatment facilities. Considering this, there is room for further improvement in the prognosis of such patients.

In the elderly patients at our institute, we apply clipping as soon as possible regardless of the disease severity and simultaneously perform aggressive intraoperative clot removal. The necessity of intraoperative clot removal was not mentioned in the 2015 Japanese stroke guidelines; however, we have introduced this method in February 2017 as cisternal clot removal could prevent prolonged intrathecal drainage management and cerebral vasospasm, which causes prolonged bed rest. In this study, we examined patient outcomes before and after introducing an aggressive intraoperative irrigation procedure for clot removal in our hospital and described its effects on the recovery of elderly patients with aSAH.

MATERIALS AND METHODS

The study protocol was approved by the Ethics Committee of Shimane University. We included in this retrospective study patients 70 or more years of age who were diagnosed with aSAH and underwent clipping between April 2014 and March 2019. We used the modified Rankin Scale to assess the primary outcome of neurological status at discharge. We performed

univariate analysis using the following factors: sex, age, neurologic and general medical condition, radiographic data, aneurysm location, treatment approach, and timing of the aneurysm surgery. Primary brain damage (PBD) was defined as the presence of intracranial hemorrhage or severely high ICP.

We divided the patients into two groups based on the surgical treatment method: (1) the irrigation group, in which we performed aggressive irrigation for clot removal after clipping, and (2) the non-irrigation group, in which we performed conventional clipping only. We focused mainly on subarachnoid clots and analyzed them semi-quantitatively using computed tomography (CT).

We treated the individuals in both groups according to the institutional standard of care. We administered early rehabilitation treatment that started with range-of-motion exercises from the day after surgery and performed gait training as soon as the patients' conditions allowed. In cases with an intrathecal tube in place, we allowed drainage until the ICP normalized. Symptomatic cerebral vasospasm(SCV) was defined as new neurological symptoms appearing in days 4-14, no other causes (intracranial disease, systemic complications), and the cause of the symptoms proven by radiological examinations, including vascular evaluations. Perioperative cerebral ischemia(PCI) was defined when we observed low-density lesions on CT or high-signal intensity on MRI diffusion-weighted images, with or without symptoms, within 14 days after onset of aSAH. We inserted ventriculoperitoneal shunts (VPSs) or lumboperitoneal shunts (LPSs) in patients with secondary hydrocephalus during hospitalization. We measured the modified Rankin Scale (mRS) scores at discharge and defined 0-2 as a good score and 3-6 as a poor score.

RESULTS AND DISCUSSION

Cohort characteristics for the irrigation (n=21) and non-irrigation (n=19) groups do not differ significantly. Clot removal was significantly greater in the irrigation group (n = 21) than in the non-irrigation group (n = 19)(p=0.017). The period of intrathecal drainage was significantly shorter in the irrigation group (p=0.002). The rate of occurrence of PCI was higher in the non-irrigation group. The mRS scores of good and poor were 12 and 9 in the irrigation group, and 3 and 16 in the non-irrigation group, respectively (p=0.010).

The adverse characteristics of elderly aSAH patients include the likely occurrence of rebleeding, acute hydrocephalus, and severe cerebral vasospasm. The prognostic factors for poor outcomes are age, H&K grade IV and V, Fisher group 3-4, the occurrence of SCV or PCI, and prolonged bed rest. Our study makes a novel suggestion that the postoperative residual amount of subarachnoid clots is associated with the patient outcome at discharge. Prolonged bed rest in elderly aSAH patients is a poor prognostic factor. Focal symptoms due to SCV or PCI and perioperative management using intrathecal drainage are the main causes of prolonged bed rest in aSAH patients. First, paralysis occurs due to focal symptoms, and poor awakening causes prolonged ventilation management and aspiration pneumonia, which inhibit the early out-of-bed

mobilization of the patient. Then, management using intrathecal drainage prevent early mobilization and causes an increased risk of meningitis. Therefore, the drainage period should be kept as short as possible. Cerebral atrophy in elderly patients is an important factor in irrigation procedures for clot removal. The subarachnoid clot in such patients tends to be thicker and heavier due to cerebral atrophy, resulting in prolonged withdrawal from drain management. On The other hand, cerebral atrophy makes it easier to obtain a surgical field with good visibility. In the current study, we safely performed irrigation for clot removal over a wide surgical area with good visibility. Good visibility probably contributed to the prevention of perforator infarction during surgery. The results of this study suggest that intraoperative aggressive removal of clots can be safely performed in elderly patients and can shorten the bed rest period.

Severe elderly aSAH patients have a poor prognosis even after acute surgical treatment and that aggressive medical treatment is not recommended. However, sometimes the consciousness level of pure-SAH-type patients, i.e., those with no intracerebral hemorrhage, may improve with time even if they were initially diagnosed as poor-grade patients. In our study, 4 out of 5 pure-SAH poor-grade patients who underwent aggressive clot removal in the acute phase had good outcomes. Our results emphasized that performing aggressive clot removal contributes to improving outcomes in the elderly, not only due to prevention of SCV and PCI but also by shortening periods of bed rest by improving drain management.

Coil embolization was assessed in The International Subarachnoid Aneurysm Trial study, reported to have better outcomes than clipping. However, several studies report that the outcome of clipping is superior to that of coil embolization among the elderly. The outcome of clipping and aggressive irrigation of present study was superior to the reported outcomes of coil embolization, and indicate that it may be more effective, especially in severe cases.

CONCLUSION

We concluded that applying rapid surgical clipping treatments in elderly patients with aSAH and performing aggressive surgical clot removal in the acute phase of the disease resulted in good patient outcomes. Additionally, we found that even in patients with poor-grade prognoses, our recommended treatment may lead to a favorable outcome; therefore, surgeons should not default to conservative treatments simply because the patient is elderly and should explore aggressive treatments as well.