Attachment Device for Side-biting Cannula
in Stereotactic Biopsy
—Technical Note—

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Abstract

An attachment device to fix a Sedan side-biting biopsy cannula to a stereotactic frame is described. The disadvantages of the biopsy cup forceps are resolved, and a relatively large amount of multiple specimens can be obtained along a single biopsy trajectory. This attachment device enables the side-biting cannula to follow a straight trajectory biopsy in various stereotactic frames.

Keywords: instrumentation, stereotactic biopsy, brain neoplasm

Introduction

Stereotactic biopsy can be achieved using various instruments including the aspiration cannula, forceps, and spiral cannula. The biopsy cup forceps provides the minimal amount of tissue compared to the other instruments, and taking specimens adjacent to the ventricle or tumor cyst without perforation is sometimes difficult. Opening of the forceps may injure brain tissue, so using this instrument for biopsy of deep eloquent areas such as the midbrain and pons should be avoided. In addition, the biopsy instrument must be inserted many times to obtain multiple specimens, which without an outer lumen may induce cerebral tissue damage. The Sedan side-biting cannula can obtain a specimen 1 cm in length and 1.5 mm in diameter, which is adequate for routine histological examination. Additional specimens can be obtained at any biopsy position by rotating the cannula so that the window faces in another direction. Various stereotactic biopsies using this side-biting cannula, including midbrain and pontine mass lesions, harvested multiple specimens along a single biopsy trajectory, which was monitored by computed tomography (CT) or magnetic resonance (MR) imaging.

Here we describe an attachment device to fix a Sedan side-biting biopsy cannula to a stereotactic frame, and a straight trajectory biopsy plan to obtain multiple specimens.

Clinical Materials and Methods

Stereotactic biopsies using the Sedan side-biting cannula (Stereotactic Medical Systems Inc., Rochester, Minn., U.S.A.) (Fig. 1) were performed in four patients at affiliated hospitals of Shinshu University from November 1997 to October 1998. The side-biting cannula was fixed to a stereotactic frame (designed by K. Sugita, Late Prof. of Nagoya University, and manufactured by Tokai-Rika Inc., Nagoya) using the new attachment device. Histological examination showed that two of the tumors were gliomas, one was a hamartomatous lesion, and one contained no tumor tissue suggesting multiple sclerosis. No complications such as postoperative hemorrhage or ventricular penetration were encountered.

The attachment device to fix the Sedan side-biting cannula to the arc of the stereotactic frame is made of stainless steel, and manufactured by Tokai-Rika Inc. at a relatively low cost (Fig. 2). The attachment device and side biting-cannula remained in the possession of T.K., and used to perform stereotactic biopsy at the affiliated hospitals.
Fig. 1 Photograph of the Sedan side-biting biopsy cannula. It consists of an inner and outer cannula each containing a 10 mm long side window. With the window closed, this instrument is advanced to a target point (upper). Then, the inner cannula is rotated to open the window (lower). Suction attracts tissue into the cannula, then the inner cannula is rotated to close the window and amputate the biopsy specimen.5)

Fig. 2 Photograph showing the attachment device to fix the Sedan side-biting cannula to the arc of the stereotactic frame. The left upper corner shows the overview of the attachment device. Arrowhead shows the attachment device between the side-biting cannula and guide tube of the stereotactic frame.

Fig. 3 Computed tomography scans showing the straight trajectory biopsy plan. The side-biting biopsy cannula is inserted to a point 1 cm shallower than the target point. The first specimen is harvested (left), then the biopsy cannula is inserted 1 cm deeper and the second specimen is obtained (center). Finally, the cannula is further inserted 1 cm deeper than the target point and two more specimens are harvested (right). Arrows show the directions of the biopsy windows at each target.
Illustrative Case

A 54-year-old female was admitted to our affiliated hospital because of disorientation. CT and MR imaging revealed multiple lesions in the left temporal region, thalamus, and the area adjacent to the left trigone. After the induction of general endotracheal anesthesia in the CT scan room, the patient was fixed in the stereotactic frame in the prone position. A target was selected in the left parieto-occipital lesion corresponding to the enhanced area on CT scans. A skin incision was made at the left parietal area to open a burr hole, and the Sedan side-biting biopsy cannula with a 1 cm window was inserted to a point 1 cm shallower than the target point. The first specimen was harvested, with the biopsy window facing in the medial inferior direction toward the mass (Fig. 3 left). The biopsy cannula was then inserted 1 cm deeper, facing in the medial inferior direction, and the second specimen was obtained (Fig. 3 center). Finally, the cannula was further inserted 1 cm deeper than the target point and two more specimens were harvested, facing the biopsy window in the medial inferior and lateral superior directions (Fig. 3 right). We encountered no ventricular penetration or the postoperative hemorrhage. The histological diagnosis was gemistocytic astrocytoma, and the patient underwent radiochemotherapy.

Discussion

In Japan, stereotactic biopsy is sometimes performed at the CT scan room in affiliated hospitals of a university, as the procedure occupies the facility for a long time.6) Introducing a new biopsy instrument at each affiliated hospital is not economically effective, but the stereotactic frames and biopsy instruments are sometimes the same models at affiliated hospitals.

The CT gantry hinders the insertion of the biopsy cannula parallel to a CT slice, so straight trajectory biopsy plan is necessary to obtain multiple specimens. Our present attachment device can fix a Sedan side-biting biopsy cannula to the stereotactic frame for straight trajectory biopsy. Use of this standard side-biting cannula and attachment device allows biopsy using the various stereotactic frames likely to be available at affiliated hospitals of a university.

References


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Commentary

Stereotactic biopsy is a useful technique for the histological diagnosis of deep seated brain lesions. However, postoperative hemorrhage might be encountered as a serious complication of this surgery. Inaccurate diagnosis of the lesion on account of the small size of the specimen is also a drawback of this technique. The authors employed the Sedan side-biting cannula for biopsy in 4 patients with brain tumor. They have devised a new attachment device to fix the side-biting cannula, thus providing a more accurate diagnosis of the tumor.

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In this report, Koyama et al. describe a new attachment device for the side-biting cannula such as the Sedan system used in stereotactic biopsy. Of course, the Sedan system is widely used and its convenience is also well known. However, the authors emphasize their original development of this simple attachment and its economical effectiveness. In Japan, some companies have developed stereotactic frames of their own and many hospitals have Japanese stereotactic frames. So, if the hospitals buy only the side biting cannulas and this newly developed attachment, they can use their stereotactic frames which they have already bought and can save money. But the accuracy and convenience of biopsy are kept at high level. This newly developed attachment might be a so-called
minor change, but simplicity and accuracy are both important factors for doctors to do many things for patients. I think it is a pity that the authors do not describe details of the device, for example, diameter, length, shape, kinds, etc., except for its basic materials. They precisely describe the procedure of biopsy in several sentences, so I am afraid that readers may think the explanation of the attachment device is inadequate. I expect the authors will provide another report which contains a more precise and adequate description of the new attachment device.

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