Novel Malleable Continuous Suction Tube Made of Ultrathin Stainless-Steel Foil Enclosed Between 2 Ultrafine Mesh Layers: Technical Note

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■ BACKGROUND: **Bloodless dry fields are indispensable for successful and safe neurosurgical operations using microscopes. Appropriate irrigation and suction systems are needed to obtain clear surgical fields. We invented a novel malleable continuous suction tube to address this need.**

■ METHODS: **We developed a malleable tube (MT) made of ultrathin stainless-steel foil (≈5 μm in thickness, 3.0 mm in diameter, 15 cm in length) contained between ultrafine stainless-steel wire mesh (50 μm in diameter) woven tubes. The MT was applied in an intraoperative continuous fluid suction system, connecting it to a conventional vacuum system through a device.**

■ RESULTS: **The MT can be placed at any part of the operative field, preferably close to its edges, without disturbing surgeon manipulation. This continuous suction system has been tested in neurosurgical operations and has shown excellent potential for maintaining the operative field clear and dry without any side effect or trauma on adjacent tissues.**

■ CONCLUSIONS: **The newly developed malleable suction tube is effective for microsurgery.**

INTRODUCTION

Bloodless dry fields are indispensable for successful and safe neurosurgical operations,[1-5] especially in the currently broadly applied, minimally invasive approaches requiring smaller incisions and craniotomies. To address this need, several modalities, such as irrigation and/or suction systems, have been introduced.[2,3,5] The optimal method would be continuous elimination of blood and fluid from operative fields,[6,7] with minimal contact and trauma to tissues, as well as minimal involvement of surgeon manipulation and attention. To this end, we developed a malleable tube (MT) made of ultrathin stainless-steel foil sandwiched between ultrafine stainless-steel wire mesh woven tubes. This MT has been applied as a continuous suction system and has been successfully used in neurosurgical operative procedures.

MATERIAL AND METHODS

The institutional review board of Tokyo Women's Medical University approved this retrospective study. The newly developed suction tube was made of ultrathin stainless-steel foil (5 μm in thickness, ≈3.0 mm in diameter, and 15 cm in length) sandwiched between ultrafine stainless-steel wire mesh (≈50 μm in diameter) woven tubes (**Figure 1**). We applied this MT as the main component of a continuous suction system (8802-02 and 8802-03, Fujita Medical Instruments Co., Ltd., Tokyo, Japan), which consisted of the MT, a connecting device, and a commonly available vacuum tube in our operating rooms (**Figure 2A**). These devices are commercially available by Fujita Medical Instruments Co., Ltd. and can be sterilized by autoclave sterilization and reused. The estimated costs for introducing these devices are 250 USD for the MT and 70 USD for the connecting device.

Key words
- Continuous drainage
- Malleable suction tube
- Microsurgery

Abbreviations and Acronyms
CSF: Cerebrospinal fluid
MT: Malleable tube
SCA: Superior cerebellar artery

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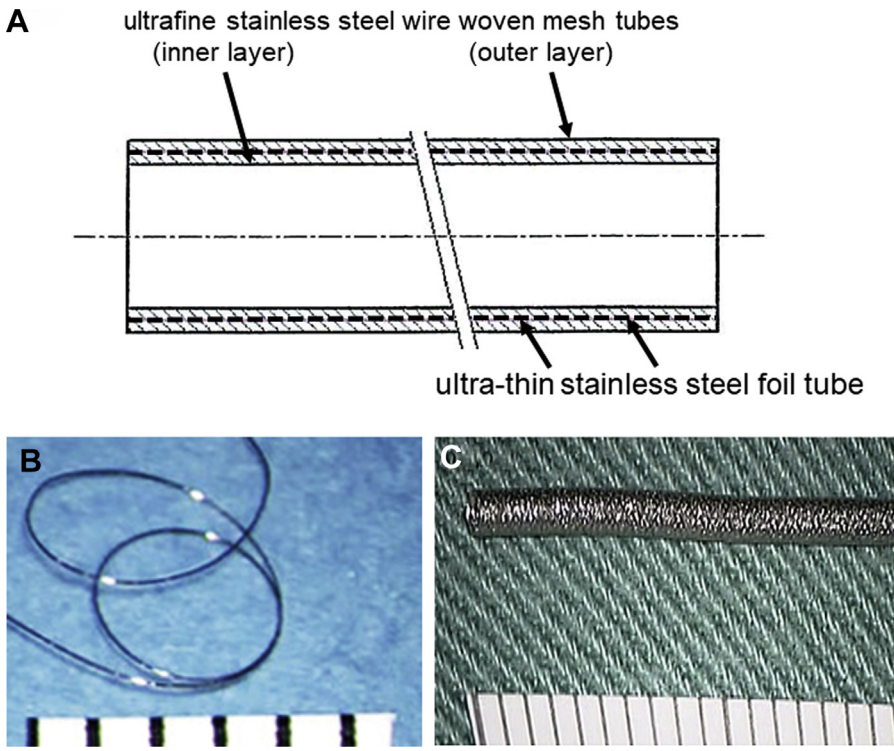

Figure 1. A novel malleable continuous suction tube made of ultrathin stainless-steel foil. (**A**) Blueprint of a malleable tube consisting of ultrathin stainless-steel foil sandwiched between ultrafine stainless-steel wire mesh woven tubes. (**B**) 50 μm in diameter ultrafine stainless-steel wire. (**C**) Novel malleable tube 3.0 mm in diameter. Major scale showing 1 mm.

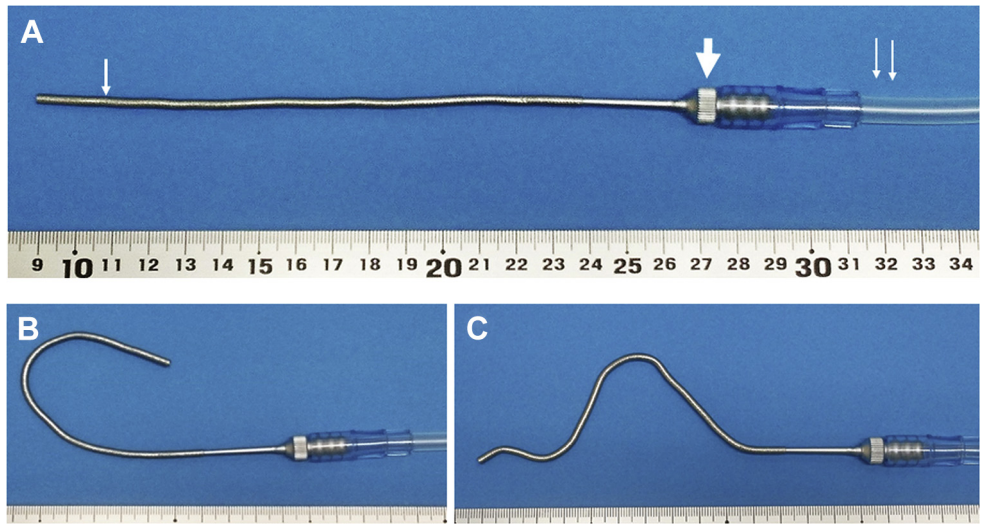

Figure 2. System of the malleable continuous suction tube. Our suction system consisting of a malleable tube (*small arrow*), a connecting device (*large arrow*), and a vacuum tube (*double arrows*) connectable to a conventional operating room vacuum system (**A**). The malleable tube can be bent into the desired shape by hand (**B** and **C**).