Secure Surgical Method for Catheter Placement via the Occipital Artery to Achieve Retrograde Superselective Intra-Arterial Chemotherapy for Advanced Oral Cancer: Alternative to Approach via the Superficial Temporal Artery

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Received: 17 August 2011 / Accepted: 3 February 2012 / Published online: 15 February 2012
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Abstract We describe secure surgical method for catheter placement using ultrasonic scalpel via the occipital artery to achieve retrograde superselective intra-arterial chemotherapy for advanced oral cancer, as alternative to approach via the superficial temporal artery.

Keywords Catheter placement · Occipital artery · Retrograde superselective intra-arterial chemotherapy · Superficial temporal artery

For the treatment of advanced oral cancer, we generally perform superselective intra-arterial catheterization via the superficial temporal artery (STA) because of long-term catheterization and lower risk of cerebral infarction than Seldinger's method [1, 2]. More effective chemoradiotherapy is thus possible since catheter placement via STA enables continuous chemotherapy and daily concurrent radiotherapy [2]. However, retrograde superselective intra-arterial chemotherapy is not possible if the STA can not be used or if the catheter can not be placed into the target artery, for example, because of a thin-diameter vessel, meander of the external carotid artery, intraoperative laceration, or when previous intra-arterial chemotherapy has been performed.

In such cases, the occipital artery (OA) offers another route [3]. Catheter placement via the OA is, however, difficult and not well-established because the OA is anatomically located in a deep region under the sternocleidomastoid muscle and splenius capitis muscle. The OA is generally identified by palpation of its pulsation, but the identification is time-consuming when palpation is difficult. Additionally, electrocautery for dissection of muscles has the potential to injure the OA and careful intervention is necessary. We describe here a newly developed method of secure catheter placement using ultrasonic scalpel via the OA to achieve retrograde superselective intra-arterial chemotherapy for the treatment of advanced oral cancer.

Institutional review board approval was obtained from Yokohama City University Hospital. Fourteen patients with squamous cell carcinoma of the tongue, buccal mucosa or floor of the mouth underwent catheter placement via the OA under local anesthesia. The exposure of the OA was achieved using an ultrasonic scalpel (Harmonic Scalpel, Ethicon Endo-Surgery, OH, USA) and Doppler ultrasound. Preoperatively, three-dimensional computed tomography angiography of the carotid artery was performed to identify the course of the external carotid artery and the relationship between the OA and the target artery such as the lingual artery and facial artery (Fig. 1). The OA was identified posterior of the mastoid process by Doppler ultrasound, and then a 3.5 cm skin incision was made and the sternocleidomastoid muscle and splenius capitis muscle were safely transected using the ultrasonic scalpel without the OA injury (Fig. 2). After exposure of the OA, a 0.016-inch guidewire (GT wire, Terumo Corp., Tokyo, Japan) was inserted into the common carotid artery through the OA. A vinyl hook-shaped catheter (NECK, 4 Fr in outer diameter, Medikit Corp., Tokyo, Japan) was inserted into the OA

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Fig. 1 Three-dimensional computed tomography angiography of the external carotid artery and its branch

along the guidewire and placed below the bifurcation of the target artery. The tip of catheter was then superselectively inserted into the target artery by drawing it back under fluoroscopic guidance, and the position of catheter was checked by injection of contrast medium and blue dye (Fig. 3). After that, the catheter was fixed to the OA with 3-0 silk. When the catheter was unstable or target artery is located distally from the OA, the guide-wire was inserted again into the catheter and replaced with a polyurethane straight catheter (ANTHRON P-U catheter; tapering type, 5 Fr in outer diameter, 2.7 Fr in outer diameter at the tip of the catheter, Toray Medical Corp., Tokyo, Japan) by the guide-wire exchange method. The transected muscles, subcutaneous tissues and skin were sutured. Finally, the catheter was fixed to the skin around the mastoid process.

The catheter could be placed superselectively to the target artery in all patients. Mean exposure time of the OA was 17.6 min, and mean operating time was 77.4 min. The mean exposure time of the OA in our series was considerably less than that in a previous report by Hasegawa et al. [3] (42 min) since we could identify the position of the OA easily using Doppler ultrasound and we used ultrasonic scalpel which achieves good hemostasis, minimizes injury to important structures and, in comparison with electrocautery, can reduce operative time, blood loss and drainage volume, and shows improved arterial blood flow [4, 5]. Three-dimensional vascular mapping, the use of Doppler ultrasound and ultrasonic scalpel offers a safe and reliable

Fig. 2 Surgical approach for catheterization via the occipital artery

method for catheter placement via the OA that shortens the surgical time. In conclusion, this approach via the OA can be extended to the indication of retrograde superselective intra-arterial chemotherapy.

Conflict of interest None.

Fig. 3 Fluoroscopic view of catheter placement into target artery via the occipital artery

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