TERUMO
INTERVENTIONAL
SYSTEMS

Radial Access for Visceral Interventions
— a New Route to the Abdominal Region —

Radial access for visceral intervention refers to abdominal angiography or endovascular therapy with a radial artery approach.
With laparoscopic surgery now mainstream in cholecystectomy, and transnasal endoscopy also becoming mainstream, the importance of minimal invasiveness can be considered equal to or more than the therapeutic effect.
From this point of view, the objective of this seminar is to examine radial angiography aiming at minimal invasiveness.

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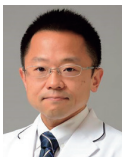

TACE via Radial approach
— Simultaneous Pursuit of Local Control and Minimal Invasion —

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At Toranomon Hospital, primary liver cancer is initially treated with hepatectomy (31%), radiofrequency wave (39%), TACE (26%), and other therapies (4%). While TACE is generally recommended in the intermediate stage, it has actually been performed in 56% of cases in the intermediate stage. In cases treated with TACE that were less advanced than the intermediate stage, 22% of the cases had one background factor and 25% had two or more factors. The remaining 53% selected TACE because of a localized tumor, the patient's wish, or other reasons. Based on these diverse backgrounds, an increasing need for a less invasive TACE procedure is expected, such as TACE via the radial approach.
In Japan, ultra-selective TACE with an expected higher radical cure rate is preferred over DEB-TACE. However, ultra-selective TACE via the radial approach has limitations in application compared to conventional angiography devices and test protocols. In Japan, CT during hepatic arteriography (CT-HA) is used to perform more selective TACE. In procedures via the radial approach, it is generally more difficult to perform CT-HA than in procedures via the femoral approach. Additionally, there is no protocol optimized for the radial approach yet. So, I present our procedure via the radial approach using CT-HA. At our hospital, the procedure is performed with the IVR-CT system while standing on the left side of the patient (Fig.1).
We experienced the following difficulties until we mastered the procedure:
(1) Radial artery puncture: Blood regurgitates in a different manner from that in the femoral artery.
(2) As the operator stands cephalad to the patient and moves the catheter, the right and left sides are reversed from the usual positions.
While taking CT-HA images, the patient's body is fixed with a drape in consideration of patient safety. Then, the cone beam CT is performed to obtain very clear 3D images. Navigation using embolization guidance is also possible allowing smaller amounts of contrast medium, and we can also readily instruct juniors. Preparation for CT-HA requires about 5 to 10 more minutes compared with the time for a procedure with the femoral approach, but this is acceptable. In addition, the use of a roadmap image and embolization guidance enables us to attempt ultra/super-selective TACE at a higher probability.
However, since the length of the hydrophilic coating of the micro catheter is 90 cm, strong resistance due to friction is often felt in the middle of catheter insertion into the 4Fr guide catheter, posing an impediment in attempting ultra/super-selective TACE. Thus, we adopted the Glidesheath Slender, a sheath with an outer diameter equivalent to 4Fr into which a 5Fr catheter can be inserted. Insertion of the 5Fr Glidecath II R.A.V.I. MG1 into the Glidesheath Slender can physically expand the lumen to reduce friction despite the insufficient length of the hydrophilic coating, making it easier to advance the catheter. Indeed, the change to this system eliminated the stress and facilitated treatment. Although it was difficult to advance the micro catheter to the proximity of the lesion depending on the case, a model without a stopcock has been developed to eliminate this problem, making the procedure easier (Fig.2).
Finally, cases requiring attention in the procedure via the radial approach are presented. The classification indices for tortuosity and extension of the aorta used in cerebrovascular treatments are used because they are understandable. Draw horizontal lines at the top of the aortic arch and the origin of the brachiocephalic artery. If the distance between them is within approximately double the size of the common carotid artery, the case is classified as type II, and if the two lines almost overlap, the case is classified as type I. The most difficult is type III with the distance more than double of the size of the common carotid artery (Fig.3). Type III cases should be avoided if they are in early stage.
While patients undergoing the procedure through the femoral approach are often not fully recovered on the day after the procedure, the procedure via the radial approach poses a smaller burden on both patients and operators immediately after the procedure. This is an advantage of the radial approach because this approach reduces the stress on both patients and operators in TACE that is performed repeatedly, allowing more treatment options. Because current patients with hepatic cancer are older than those in the past with decreasing PS and increasing complications under systemic chemotherapy, less invasive TACE via the radial approach will play a greater role. In addition, the bottlenecks can be eliminated by adjusting the test protocol and the devices to be used. Because the cervicothoracic images can be taken simultaneously while taking contrast-enhanced CT images to select more appropriate cases, TACE via the radial approach is expected to become more popular in the future.

Fig.1

Fig.2

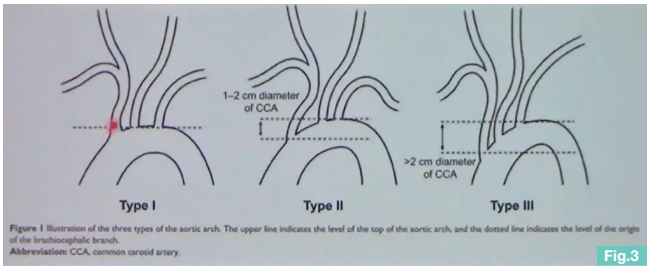

Figure 1 Illustration of the three types of the aortic arch. The upper line indicates the level of the top of the aortic arch, and the dotted line indicates the level of the origin of the brachiocephalic branch.
Abbreviation: CCA, common carotid artery.

Fig.3

Radial artery puncture can be started immediately

— Safe and Minimally Invasive TACE—

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In this article, I will explain radial artery puncture (hereinafter "radial puncture"), important when beginning the radial access for visceral intervention, starting with an introduction to the differences between a femoral puncture and how that is an advantage of radial puncture. The first advantage is that shaving before the procedure is not required. Secondly, unlike a femoral puncture which requires manual pressure hemostasis, manual pressure hemostasis is not required with radial puncture, allowing the patient to walk to the ward after the procedure. Subsequently, bedrest is also unnecessary. This allows the procedure to be performed in patients with concerns about the burden on the lower back, as well as patients with dementia having difficulty in maintaining continuous rest. Furthermore, the doctor does not have to stop the patient's rest, and the patient will be cared for only by nurses afterward. This improves the doctor's QOL and reduces overtime work. Additionally, as bleeding from the puncture site can be readily observed, it can be considered a more safe and reliable procedure.
The steps in the radial puncture in our hospital are as follows:
(1) Disinfect the region around the puncture site.
(2) Cover the puncture site with a clean sheet.
(3) Apply local anesthesia and then puncture the radial artery.
(4) Place the sheath into the blood vessel.

In our hospital, the doctors apply local anesthesia and then puncture the radial artery themselves, even if they are new to angiography. Then, the guide catheter is inserted, advanced through the brachial artery and the subclavian artery, and placed in the superior mesenteric artery, celiac artery, or other artery using the guide wire. After that, the procedure and treatment are performed using the micro catheter (Fig.4).
In switching from the femoral puncture to the radial puncture, attention should be paid to the following points:
(1) First, Allen's test must be performed. Compress both the radial and ulnar arteries firmly. Next, ask the patient to clench and unclench the fist while the arteries are compressed. The palm is observed to be blanched because the blood stream is blocked. Then, compression of the artery is released on either side. Without vascular insufficiency, the palm is reddened because the blood stream resumes. Compress and release the other side of the artery in the same manner to confirm that no vascular insufficiency is present. If the palm is not reddened within 10 seconds after release of the artery compression on either side, vascular occlusion is likely, and radial puncture should not be performed. This should be confirmed in the outpatient clinic.
(2) Vascular ultrasound must also be performed. Confirm the radial artery, brachial artery, and cervical vessels on the day before the angiography. Let us see an example of vascular ultrasound images taken in our hospital. The radial artery is normal. The brachial artery is tortuous but to an uneventful degree (Fig.5a). We can also detect the loop. As previous acquisition of such information allows safer angiography with the radial puncture, almost all cases undergo vascular ultrasound in our hospital.
(3) Before performing angiography, if possible, a chest CT evaluation is performed at least once to observe calcification around the aortic arch and the anatomy of vascular bifurcations. A case without severe calcification around the confluence of the left subclavian artery would be safer.

Finally, I will discuss preparation before starting the radial puncture.
(1) If anything is questionable in the vascular anatomy of the arm, consult the texts on anatomy. Additionally, it is very useful to create an image of the vascular anatomy from the confluence of the left subclavian artery to the descending aortic arch using a workstation capable of creating 3D-CT images.
(2) It may seem difficult to move the catheter through the aortic arch. However, even a beginner can perform the procedure in a safe and understandable manner by rotating the 3D-CT and the angiography tube bulb in an understandable angle using information from the 3D-CT. After becoming accustomed to the procedure, you will be able to move the catheter through the aortic arch without having to rotate the tube bulb in most cases. In general, the artery runs dorsally from the left subclavian artery and then toward the descending artery. So, if you find that the guide catheter moves dorsally, advance the guide catheter downward to allow the catheter to move through the aortic arch uneventfully.
(3) Our hospital uses the Glidecath II R.A.V.I. MG1. This is set to allow the catheter tip, the first curve, to be readily engaged in the celiac artery. The second curve allows the catheter to readily move downward from the aortic arch to the inferior vena cava with a secure backup, and the size of the curve is made compatible with the average size of the aorta. Recently, the radial artery puncture has been performed in all cases in our hospital. We also use Progreat λ and Glidesheath Slender 5Fr. The guidewire is 0.035 (as the guide catheter) and the micro guidewire is 0.014" to 0.016" (as the micro catheter).
Now, minimally invasive angiography via a radial puncture is available as an option. Although it may seem difficult to introduce the procedure, the use of vascular ultrasound and 3D-CT may allow early and safe introduction. This procedure is expected to be popular in the future.

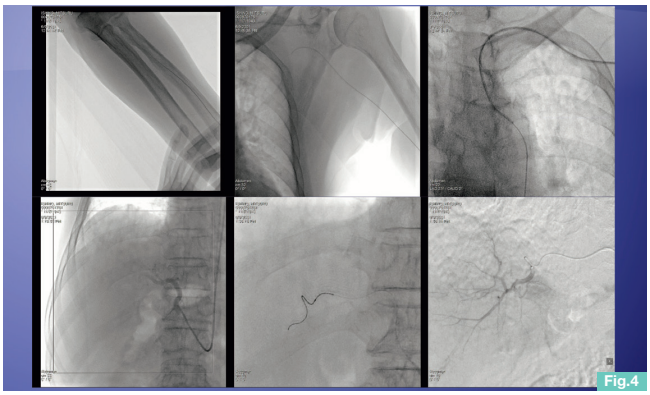

Fig.4

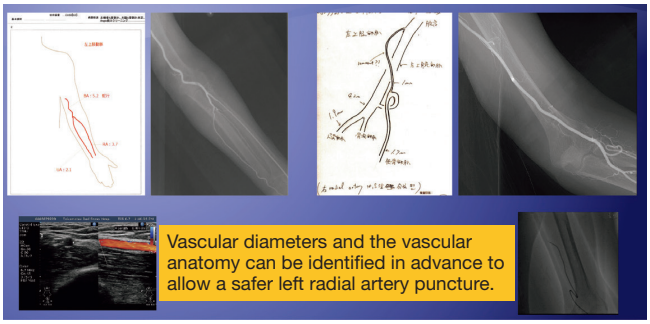

Fig.5a/b

Generic name : Central circulatory angiography catheter Trade name : Glidecath II Medical Device Approval Code : 20500BZZ01149

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