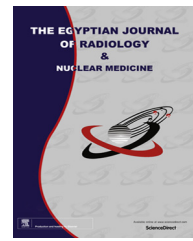




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ORIGINAL ARTICLE

# Transradial approach for transarterial chemoembolization of hepatocellular carcinoma in Egyptian patients: Initial study



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**KEYWORDS**

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**Abstract** *Background and aim:* Experience gained in transradial approach for cardiac catheterization resulted in many advantages including less bleeding complications, more patient comfort, and decreased costs with immediate ambulation. We described our initial experience with transradial approach for transarterial chemo-embolization (TACE) in Egyptian patients with HCC.

*Materials and methods:* In this prospective study, transradial TACE procedures were performed in 20 patients with HCC. Barbeau test was performed using a pulse oximeter to confirm the patency of the palmar arch. A 6F sheath was placed in the left radial artery using US guidance. A solution of 5000 U heparin, 10 mg verapamil, and 100 µg nitroglycerin was administered intra arterially. Technical success, early (30-day) complications, and patient acceptance were evaluated.

*Results:* Technical success was achieved in all cases (100%). No major complications were encountered in the first 30 days. Mild pain was observed in 1 case (5%) and managed by analgesics. No radial artery thrombosis was found with an asymptomatic small hematoma in one patient (5%) which resolved spontaneously. 5/20 patients (25%) had prior transfemoral artery TACE and all 5 patients (100%) preferred the radial approach.

*Conclusion:* Transradial approach for TACE is feasible, safe, well-accepted and preferred in patients with previous femoral approaches.

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## 1. Introduction

Transradial catheterization for coronary angiography and cardiac intervention is becoming increasingly popular and its use has been expanding worldwide (1). Multiple observational and randomized trials have shown an association between radial access and reduced risk for bleeding and vascular complications (2). Hepatocellular carcinoma (HCC) is the fifth most

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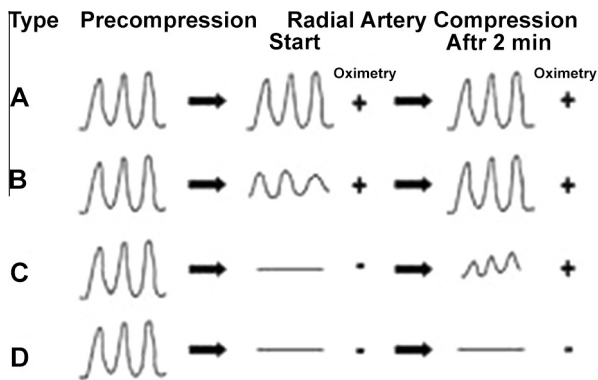
common malignancy in the world and is responsible for ~500,000 deaths worldwide annually (3). Egypt has the highest prevalence of HCV in the world and the prevalence of HCC is increasing in the last years (4). Transarterial Chemoembolization is a minimally invasive procedure and is by far the most common procedure performed in the intermediate stage HCC (5). Access site hematoma is most frequently encountered and occurs in about 2% of patients (6). The aim of this

initial study was to highlight the feasibility, safety and patient acceptance of radial access in Egyptian patients with HCC undergoing transarterial chemoembolization (TACE).

## 2. Materials and methods

A prospective study including 20 patients with HCC underwent TACE via transradial route after approval of the study protocol by the ethical committee of our institution and an informed consent was obtained after explaining the procedure details, benefits and risks.

All procedures were performed by same interventional radiologist in a single plane angiography suite (Infinix INFX-8000V, Toshiba Medical, Japan). Patients were positioned supine on the angiography table. The left wrist approach was preferred and the radial pulse was palpated. A Barbeau test (7) (i.e., a modified Allen test with the use of pulse oximeter) was performed by placing a pulse oximeter on the patient's left thumb, followed by baseline pulse waveform analysis. The left radial artery was then manually compressed. Waveform analysis was continued for as long as 2 min. Pulse waveform responses to compression were graded according to Barbeau classification (Fig. 1). A response type of A, B or C suggesting palmar arch patency (7) was confirmed before radial artery puncture.



**Fig. 1** Barbeau classification of pulse waveform responses to compression of the radial artery (7).



**Fig. 2** First case of transradial chemoembolization using a 100 cm 5F catheter with Cobra head configuration, note the catheter was able only to catheterize the hepatic artery with the mandatory use of a microcatheter. A: Showing hepatic angiography. B: Super selective catheterization of the feeding artery. C: After injection of cytotoxic/lipiodol mixture and finally. D: Control angiogram after embolization.

Sonographic evaluation of the left radial artery was then performed to ensure adequate vessel size. Barbeau type D response and/or radial artery diameter of less than 2 mm were considered contraindications to transradial approach.

Under local anesthesia after a skin snip the left radial artery was punctured under ultrasound guidance by using a 21-gauge, 2.5-cm echogenic-tip needle and single puncture technique. When pulsatile arterial blood return was obtained, a 0.018-in. guide-wire was advanced into the radial artery and confirmed the presence by real time sonographic visualization and after that the needle was removed and a 6-F radial sheath (Prelude® Merit medical, Utah, USA) was placed. A radial cocktail (a solution of heparin 5000 U, nitroglycerin 100 µg, and verapamil 10 mg) (8) then was slowly injected through the access sheath.

After radial sheath placement, a 125-cm, 4F Bern catheter (Impress®, Merit Medical, Utah, USA) (in 16 cases) and a 100 cm 5F cobra head catheter (4 cases) were introduced over a 180 cm 0.035-in. hydrophilic guide wire (Terumo®, Japan) was introduced down the aorta in standard fashion. The catheter was used to navigate the celiac trunk and superior mesenteric arteries and catheterize the hepatic artery.

In cases of difficult anatomy, a Renegade Hi-Flo® (Boston Scientific, Natick, Massachusetts) (2 cases) or Progreat® (Terumo) (1 case) microcatheters were additionally employed. TACE was performed by using conventional method with

Doxyrubicine and lipiodol emulsion followed by gel foam embolization (Fig. 2).

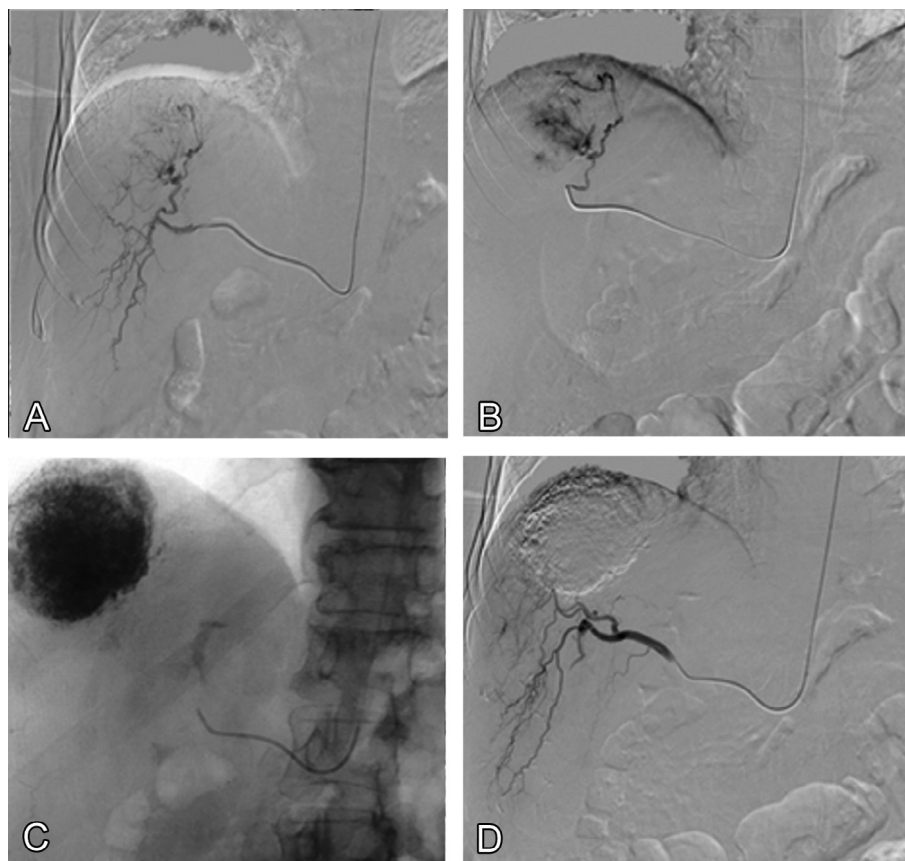
After completion of embolization catheters and wires were removed. And compression was done for at least 60 min using a special tourniquet allowing compression of the radial artery alone, preserving the blood flow of the ulnar artery, with an expandable belt permitting stepless regulation of compression. After complete arterial hemostasis the radial pulse was rechecked and sterile dressings were applied to the skin.

Repeat evaluation of the access site and radial pulse was performed for all patients before discharge and at the routine 1-month follow-up visit using Doppler ultrasonography and results were recorded.

### 3. Results

Twenty patients with intermediate stage HCC were treated by transradial TACE, 12 patients (60%) with solitary HCC and 8 (40%) with multicentric HCC of which 5 (25%) of them were bilobar, 11 in the right lobe and 4 in the left lobe.

Preprocedural evaluation of left radial artery in all patients showed that 14 (70%) patients had type B response while two patients with type A and four patients with type C. None of the patients who presented for TACE during the study period were excluded from TRA based on Barbeau (type D) or radial artery size less than 2 mm. During the procedure, there were



**Fig. 3** Transradial chemoembolization using a 4F 125 cm bern catheter (Impress, Merit Medical). A: Right hepatic angiogram from the SMA showing tumoral blush at right dome. B: superselective catheterization using the 4F catheter. C: After injection of cytotoxic lipiodol emulsion and finally. D: Control angiogram after embolizaion.

no access-related complications and there was no incidence of radial artery occlusion, nor did any TRA cases require conversion to TFA.

TACE performed via left TRA was technically successful in all 20 patients. A 4-F, 125-cm Bern catheter was used to catheterize the hepatic arteries in 16 (80%) of cases and in only three cases we used a microcatheter 2.7F, and in the initial 4 cases we used a 100 cm 5F catheter with Cobra head configuration and in all of these cases the use of microcatheter was mandatory.

In twelve cases (60%) the hepatic artery was seen arising from the celiac trunk and within 8 cases the right hepatic artery was seen arising from the SMA (Fig. 3).

After the procedure a normal radial pulse examination was documented in each case. No hematoma or other access site complications were observed. All patients who underwent transradial TACE were discharged at the same day of the procedure. No patients required overnight admission.

Post-procedure and 1-month *follow-up clinical and duplex US evaluation* revealed a normal left radial artery pulse in 100% of cases.

Minor side effects of TACE such as pain, fever and vomiting occurred in most of the patients (17/20) with no major complications were encountered after TACE.

#### 4. Discussion

The usage of transradial access has significantly grown worldwide mainly in cardiac interventions. Despite this growth, its utilization is rarely applied by interventional radiologists. Most transarterial liver treatments mainly chemoembolization

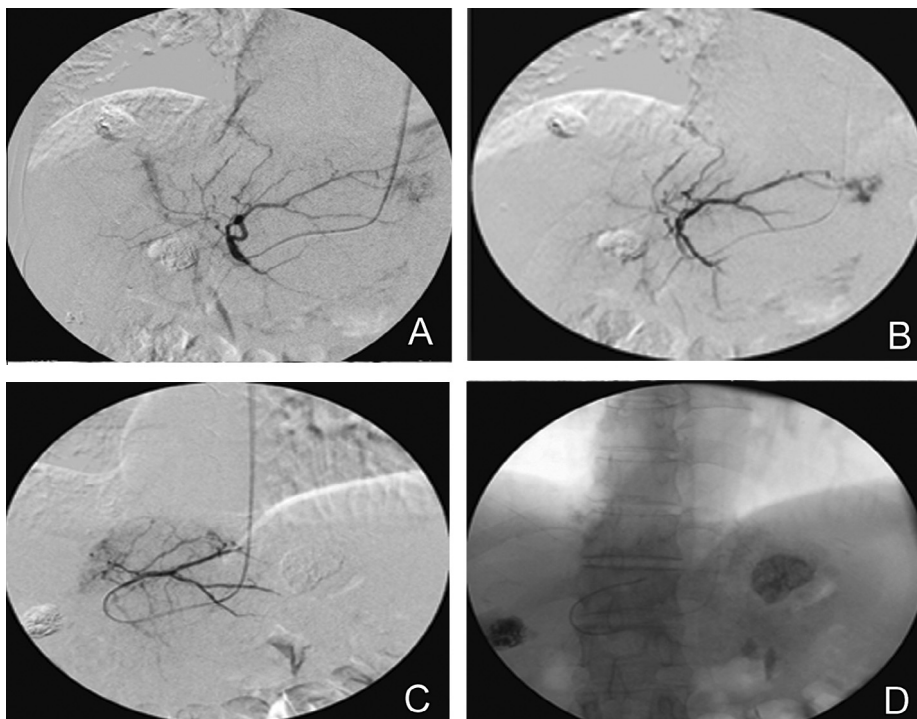
procedures are performed using transfemoral approach. The risk of bleeding complications associated with femoral approach has been reported to range from 2% to 12% (9). The experience in percutaneous cardiologic interventions showed that transradial approach is associated with less local vascular and bleeding complications with more patient acceptance (10,11).

We represent our first experience in transradial chemoembolization for HCC in Egyptian patients.

We used the left radial artery in our cases to avoid serious cerebral complications, several studies showed that both have same clinical outcomes with the right radial approach being technically more challenging and with higher radiation exposure compared to left approach and the learning curve of RRA is longer than that of LRA (12).

Preprocedural testing for dual circulation of the hand using the modified Allen's test using the pulse oximeter (Barbeau test) (7) was used as it acts as more objective method for assessment as radial artery occlusion in the setting of an abnormal collateral test may result in hand ischemia, although there are no definitive reports of hand ischemia as a direct result of poor collateral circulation (13). We applied this test in all our patients to avoid any possible ischemic complications in this initial study.

No access site complications were encountered in our patients, all punctures were done under ultrasound guidance to overcome weak pulse after local anesthetic and to avoid double arterial puncture or any local complications, the radial cocktail was given immediately into the introducer sheath as multiple reviews (8) suggest that a combination of heparin, verapamil, and nitroglycerin best prevents radial artery spasm



**Fig. 4** Transradial Chemoembolization in 51 years old male with history of transfemoral TACE. A: Notice previous right TACE. B: Selective left hepatic angiography showed left tumoral blush. C: Subtracted image after TACE. D: Note lipiodol concentration at the tumor after TACE in non-subtracted image.

and occlusion, although there is no agreement on a standard regimen.

Technical success for transarterial chemoembolization was achieved in all our patients, although there were obstacles regarding catheter and guide wire lengths especially in our initial cases with relatively longer procedure time during the learning curve, we found that 4F or 5F, 125 cm catheters are optimal for hepatic catheterization and in the majority of cases super selective catheterization was achieved without the need to use micro catheters with the use of 180 cm 0.035 in. guide wires

Hemostasis was done using a special tourniquet in all our patients with only a single small asymptomatic hematoma which spontaneously resolved, this special tourniquet used for compression was applied due to the unavailability of new commercially compression devices at our institution, and the study by Pancholy et al., (14) demonstrated that the named patent hemostasis technique with monitoring the patency of the radial artery during hemostasis, and reducing compression accordingly, resulted in a significant reduction in radial artery occlusion.

The apparent advantage of transradial approach in TACE was the patient's acceptance and preference as there was no need for recumbence with early ambulation immediately after the procedure (Fig. 4).

As 25% of our patients had previous trans-femoral TACE (one of them had two previous sessions) the radial approach for all cases was preferred with better quality of life, and a rather old study done by Cooper et al. (11) demonstrated a strong patient preference with better quality of life metrics as well as lower hospital costs in a randomized trial of transradial approach versus transfemoral approach during cardiac catheterization. More studies will be necessary to see whether these metrics are also favored during transradial TACE.

A major limitation of our study is the small sample size, and lack of a comparative study and also the time needed for catheterization, but in this initial study we were focusing on the feasibility, safety as well as patient acceptance, and further studies are needed to evaluate these limitations as well as regarding quality of life scores comparing both femoral and radial accesses.

## 5. Conclusion

Transradial approach for chemoembolization is feasible, safe and well accepted and even preferred in patients with previous femoral approaches.

## Conflict of interest

The authors declare that there are no conflict of interests.

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