

Impact of Use of Ultrasound Guided Access on Ante-grade Femoral Approach selection

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ABSTRACT

Ultrasound guidance is increasingly used at medical care centers. Ante-grade femoral access is a good approach because it increases device support; improves the accessibility of distal vessels not accessible by the contralateral approach. Our aim for this study was to evaluate the effect of ultrasound guidance (USG) on the selection of endovascular femoral access and its role to decrease complications and limit risks for patients and staff. (210) patients were retrospectively randomized 1:1 to either fluoroscopic (105) or US guidance (USG) (105). The indication was CLI, excluding patients with significant disease of the distal aorta, iliac artery, CFA, and SFA origins, and those who are accessed by other means (Upper limb, graft, popliteal, or pedal). By using the US the ante-grade approach became more common in selected patients (70% vs.50%). With US guidance, 1st attempt pass success was (95% vs. 58% rate) .it also reduced the access complications rate (2.8% versus 29%). Ultrasound guidance may have a significant effect in access selection, decreasing complications, and reducing radiation risks.



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1. INTRODUCTION

Ultrasound guidance are increasingly used at medical care centers, and it is usual to see ultrasound machines in operative rooms, cath. labs, emergency departments, intensive care units, and medical words. With continuous improvement in quality and decreasing size of the ultrasound machine, it became a common practice by the endovascular surgeons (Fig. 1). Femoral access is still the most common site for coronary and peripheral arterial procedures worldwide [1]. Significant improvement and refining in interventional tools and techniques are a leading factor in the decreasing of vascular complications, such as puncture site and retroperitoneal hematoma, dissection, arteriovenous fistula, pseudoaneurysm, vessel thrombosis but the overall rate of complications remains approximately 3.7% to 4% [2], [3]. Known risk factors for complications include female gender, obesity, anticoagulants [4], [5] interventional vs diagnostic procedures,6 and larger sheath size [7]. Antegrade femoral access is a good access because it may increase device support, improves the accessibility of distal vessels not accessible by the contralateral approach with superior image quality. Antegrade access is the junction of the CFA and SFA or the first

centimeter of the SFA is also an acceptable option [8], and even up to 7 cm below the femoral head, this access can be done, but its safety needs further study [9].



Fig.1 Wireless Dual Head Ultrasound Probe (HOCHEY MEDICAL, Anhui, China)

2. Methods

A retrospective comparative study was performed at Baghdad medical city, Ghazi Al-Hariri Hospital, peripheral intervention department. In our study, 210 patients (140 male and 70 female) with critical limb ischemia (CLI), underwent endovascular intervention for PAD between October 2018 and May 2021, randomized into 2 groups, 105 patients, Non US Guidance (NUG) group, from October 2018 to October 2019, and 105 patients accessed with Ultrasound Guidance (UG) group, from November 2019 to May 2021. Patient has informed consent were given before intervention. Duplex study, ankle-brachial index (ABI), and other investigations (CBC, biochemistry, bleeding profile, and ECG) were performed in all patients before the intervention and classified according to TASC II classification. All patients with CLI included in the study, patients with significant disease of the distal aorta, iliac artery, CFA, and SFA origins and those who are accessed by other means (Upper limb, graft, popliteal or pedal) were excluded from this study. For (NUG) group, access of common femoral artery done by palpation aided by fluoroscopic bony landmarks and arterial calcifications. In US group, A 8-10 MHz high-resolution linear array sonographic probe (HOCHEY MEDICAL, Anhui, China) was used to guide forehead insertion of 18-gauge angiographic needle and guide wires. In patients with a large abdominal pannus, wide adhesive tape is used to elevate pannus away from the groin. The groin was prepped with 10% povidone iodine solution and draped properly. After local anesthesia with 1% plain lidocaine, ultrasound-guided forehead ante-grade single-wall arterial puncture of the CFA at a distance 1 to 2 cm from its bifurcation using a 7-cm-long, 18-gauge angiographic needle (Merit Medical Systems, Inc., South Jordan, UT) along a longitudinal plane, the needle tip directed toward the SFA orifice. When pulsatile back bleeding is achieved a J-shaped 0.035-in small guide wire (Merit Medical Systems, Inc, South Jordan, UT) introduced through the needle and passed to SFA under real-time sonography, to avoid entry into the deep femoral artery (Fig. 2). Needle removed with continuous pressure on guidewire entrance site, 4 or 5 or 6-Fr sheath threaded on it, dilator with the wire removed, and flushed with heparinized saline after aspiration of sidearm of sheath done sequentially.

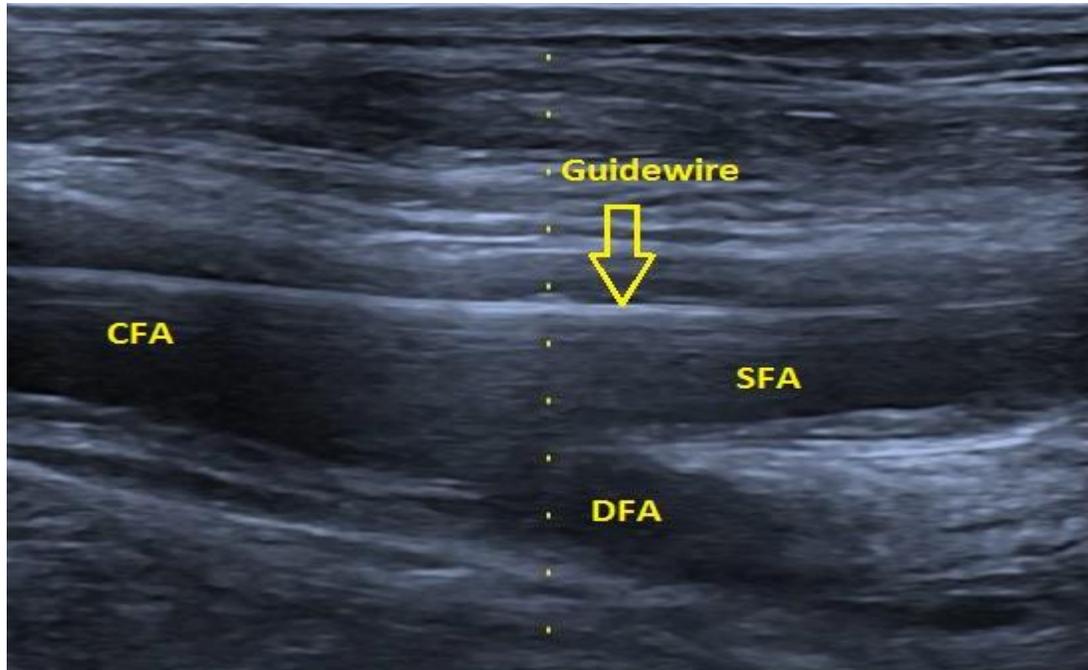


Fig 2 Guidewire passed to SFA under real-time sonography

The aim of the study is to evaluate the impact of US on the selection of endovascular access, complications and decreasing the risk for patients and staff.

3. Results

Patients included in our study are 210 with CLI, of them 140 (67%) male and 70 (33%) female. 105 patients (50%) accessed without ultrasound guidance (NUG) from October 2018 to October 2019, and 105 patients (50%) accessed with ultrasound guidance (UG) from November 2019 to May 2021. The mean age was (59) ranging from 35 to 85 years. First attempt access was successful in 100 patients (95%), in UG group, while 61 patients (58%) in NUG group. Median time to proper passage of the sheath to SFA in UG patients was 60 s, while it was 125 s for NUG. In NUG access through antitrade approach in 52 patients (50%), & the crossover approach in 53 patients (50%), while in UG the antitrade approach in 74 patients (70%), the crossover approach in 41 patients (30%). Regarding access site complications for NUG Hematoma developed in 12 patients (11%), Retroperitoneal hematoma in 1 patient (1%), and Venipuncture in 18 patients (17%), while in UG Hematoma developed in 2 patients (1.9%), no Retroperitoneal hematoma, and Venipuncture in 1 patient (0.9%). Median Fluoroscopy time (time of patients and staff exposure to X ray) is 18 minutes in NUG technique, while in RUG approach the median fluoroscopy time is 16 minutes, $P < 0.001$.

4. Discussion

Femoral ultrasound guidance for access is a relatively easy to learn and straightforward technique which utilizes equipment that is readily available in most hospitals. With an increasing learning curve, it facilitates precise antegrade CFA cannulation or even SFA regardless of anatomic variation [10]. In our study, the use of ante-grade CFA access is significantly higher than retrograde crossover access, 126 (60%) of patients that increase to (70%) after the introduction of UG in our work, this is due to three reasons; first, our center may have good experience in this approach [11], second, we have shortage of long guidewires and catheters that reach contra lateral distal lesions, and the third is most of other studies are for cardiac interventions where they need retrograde approach exclusively. The results were in agreement with all studies reviewed

in terms of conclusion, and the difference is due to the high level of experience with the classical method without the use of ultrasound guidance [10], [12- 14]. The first time access trial in our study was 100 (95%) of patients, shortening the time to the sheath insertion in CFA (60 seconds) and negate the fluroscopic delineation of the femoral head before access. The result is that the ipsilateral femoral ante-grade access time is significantly shorter than the crossover for peripheral interventions; this is in agreement with most previous studies [15], [16]. Fluoroscopy time was decreased by the effect of US use and selection of ante-grade femoral access (16 minutes) and this is reflected in the reducing of radiation exposure for both patients and staff. UG decreases access site complications to about 2.8% versus 29% in NUG, which is comparable to other studies [10- 14], [17], [18].

5. Conclusions

Ultrasound guidance may have a significant effect in selecting the ante-grate femoral access, in decreasing complications, and reducing radiation risks for patients and staff.

6. References

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Table I. Demographics of the patient population and procedures performed

Characteristic	NUG	UG
PATIENTS	105 (50%)	105 (50%)
antitrade femoral approach	52(50%)	74 (70%)
cross over approach	53 (50%)	41 (30%)
first attempts access	61(58%)	100 (95%)

Median time to pass sheath	125 s	60 s
Median Fluoroscopy time	18 minutes	16 minutes
Complications, Hematoma Retroperitoneal hematoma Venipuncture.	12 (11%) 1(1%) 18 (17%)	2 (1.9%) 0(0%) 1 (0.9%)
Contrast volume, mL, median	100	91