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Servizio Sanitario Regionale FVG

Simposio PLAN-1-HEALTH
La riscoperta dell'accesso femorale

La "scoperta" dell'accesso ecoguidato alla vena femorale superficiale

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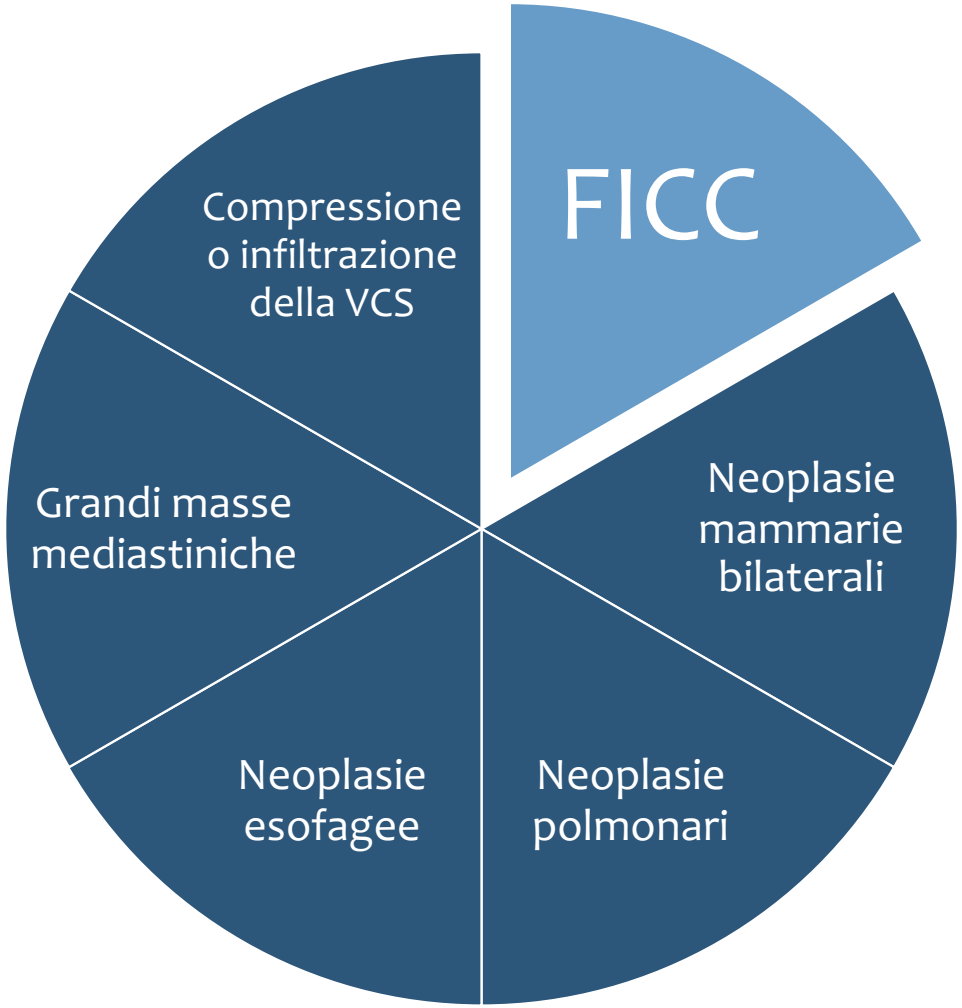
Condizioni cliniche nelle quali l'approccio cervico-toracico o l'approccio brachiale non sono fattibili o controindicato



Editorial

JVA The Journal of Vascular Access

Femoral venous access: State of the art and future perspectives

The Journal of Vascular Access
1–11

DOI: 10.1177/11297298231209253
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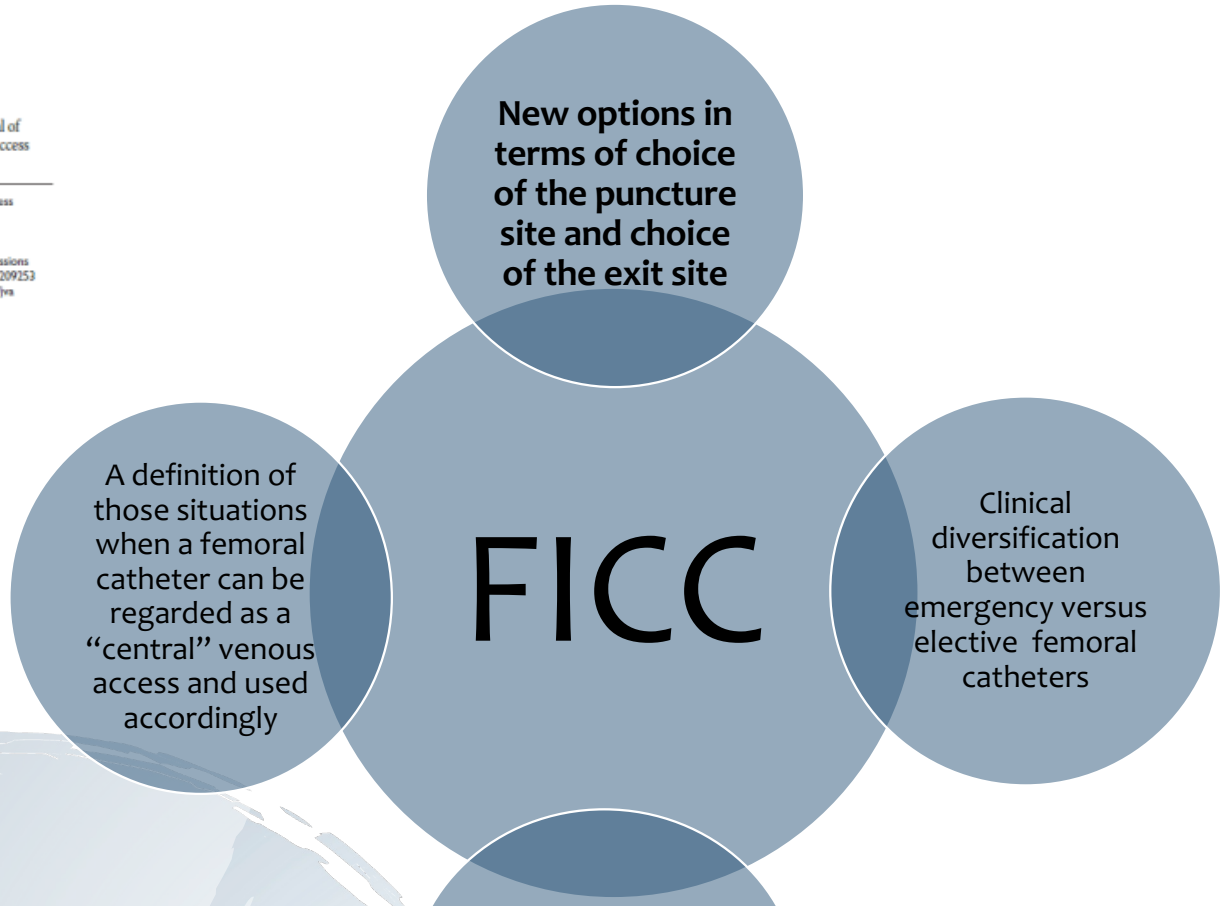
Maria Giuseppina Annetta[1], Stefano Elli[2], Bruno Marche[1], Fulvio Pinelli[3] and Mauro Pittiruti[1]

In the last decade, the evolving scientific evidence in the field of vascular access has yielded several changes in the clinical practice, with dramatic improvement of the outcome of femoral venous access. The most relevant novelties in this field can be summarized in ***four issues.***



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Choice of the vein and of the exit site: New options

- Tunnellizzazione
- Vena femorale superficiale

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Vena femorale comune

Femoral ZIM

Tunnellizzazione

JVA The Journal of Vascular Access

Editorial

The SIF protocol: A seven-step strategy to minimize complications potentially related to the insertion of femorally inserted central catheters

SAGE

Fabrizio Brescia[1], Mauro Pittiruti[2], Matthew Ostroff[3], Timothy R Spencer[4] and Robert B Dawson[5]

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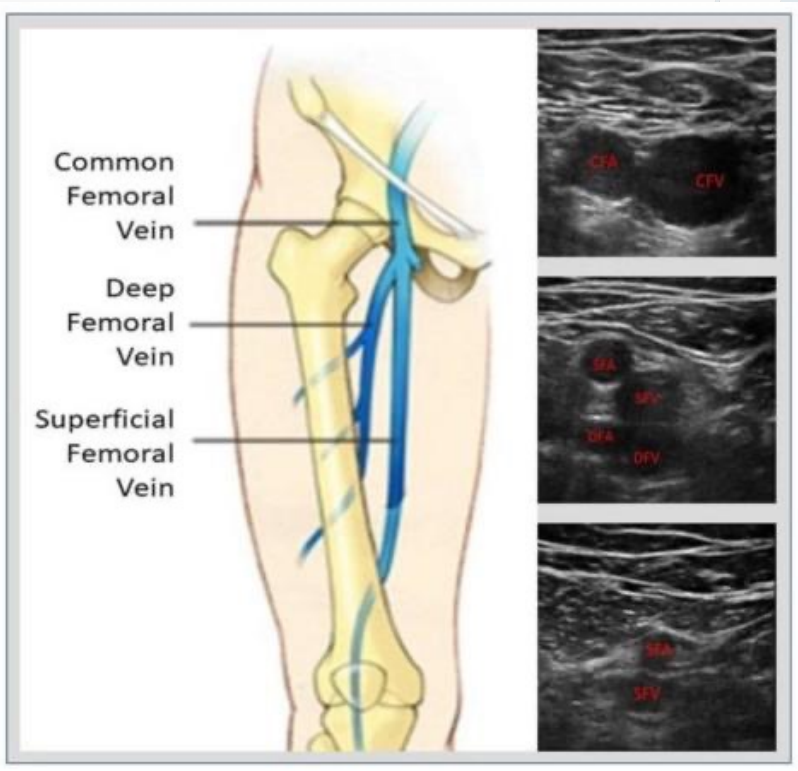
Vena femorale superficiale



Editorial

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Rapid Femoral Vein Assessment (RaFeVA): A systematic protocol for ultrasound evaluation of the veins of the lower limb, so to optimize the insertion of femorally inserted central catheters

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Vena femorale superficiale

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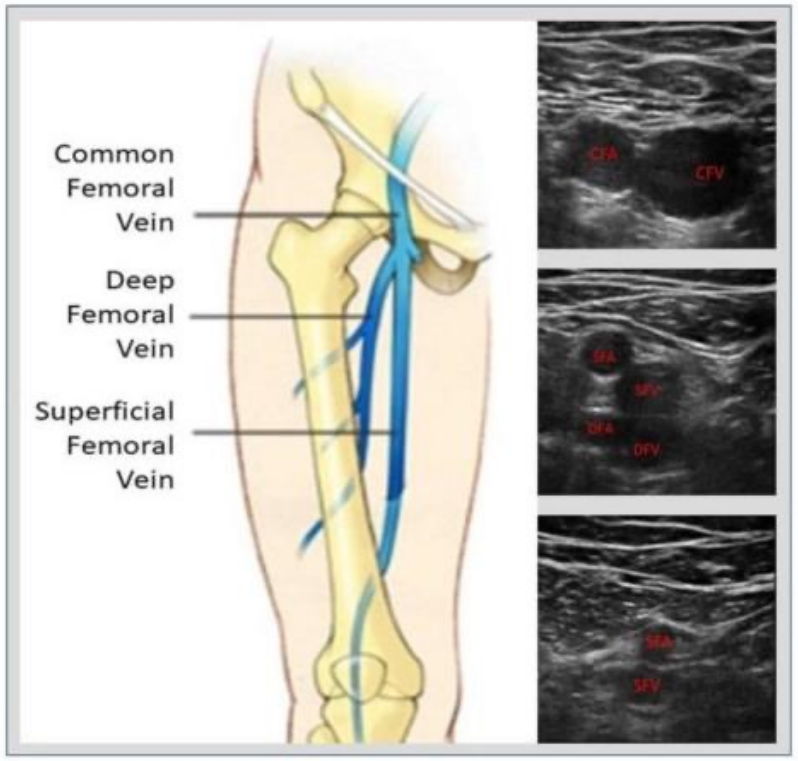

The seven steps of the Rapid Femoral Vein Assessment (RaFeVA).

	Vascular structures to be assessed	Visualization of the vein
Step 1	Common femoral artery Common femoral vein	Short axis
Step 2	Common femoral vein External iliac vein	Long axis
Step 3	Common femoral artery Common femoral vein Saphenous vein	Short axis
Step 4	Superficial femoral artery Deep femoral artery Common femoral vein	Short axis
Step 5	Superficial femoral artery Deep femoral artery Superficial femoral vein Deep femoral vein	Short axis
Step 6	Superficial femoral artery Superficial femoral vein	Short axis
Step 7	Superficial femoral artery Superficial femoral vein	Oblique axis

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Vena femorale superficiale

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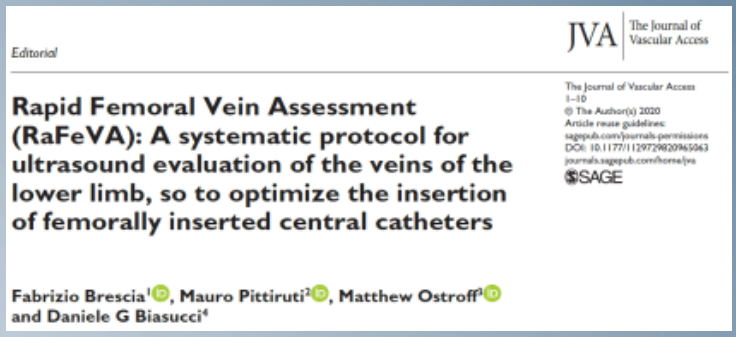

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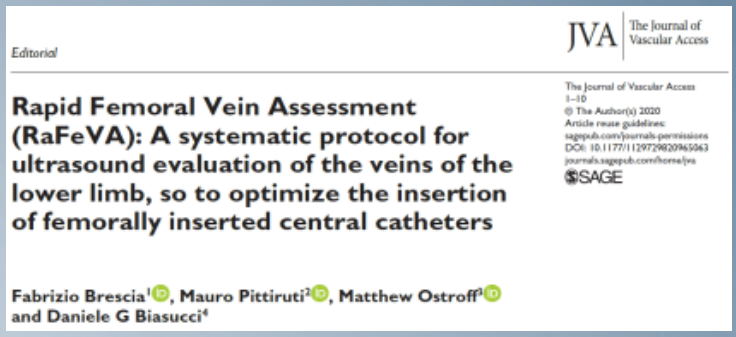

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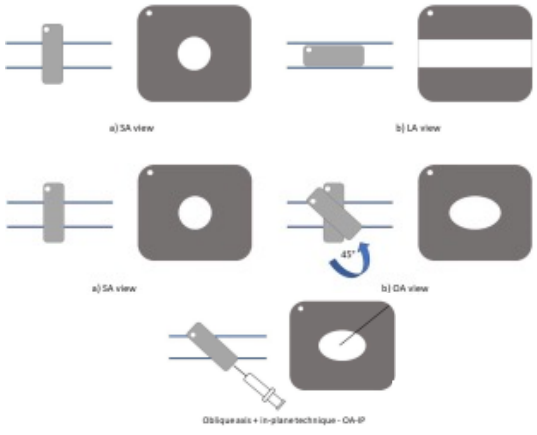
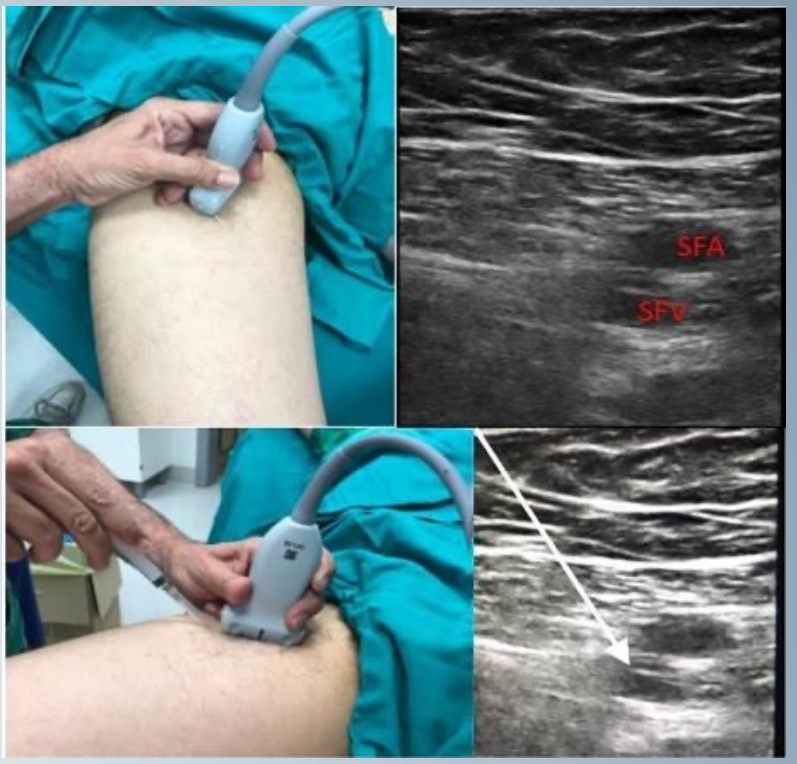
	Superficial femoral vein	





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The feasibility and safety of PICCs accessed via the superficial femoral vein in patients with superior vena cava syndrome

Yonghui Wan, Yuxin Chu, Yanru Qiu, Qian Chen, Wei Zhou, Qibin Song

Oncology Center, Renmin Hospital of Wuhan University, Wuhan - China

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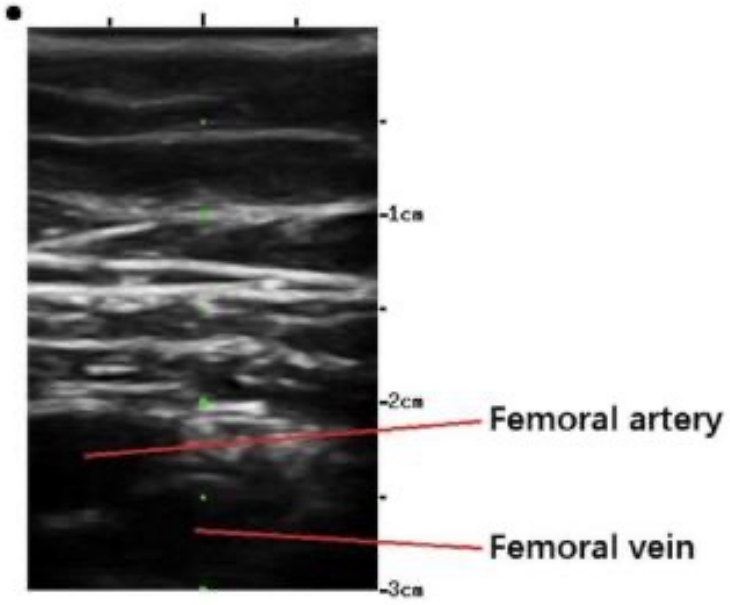

Patients' enrollment

The study was conducted between October 2010 and December 2014 in our single oncology center and approved by the Ethical Committee of Wuhan University. Patients who were diagnosed with SVCS and required venous infusions as chemotherapy or parenteral nutrition were naturally enrolled in the FICC group. In total, 221 cancer patients with SVCS received real-time ultrasound-guided femoral vein catheterization at the mid-thigh using PICC. Exclusion criteria included: history of radiotherapy, deep venous thrombosis, trauma or surgery from which anatomic defect may preclude catheterization at either site. As control, 2604 cancer patients without SVCS who received upper extremity veins PICCs in the same period were also enrolled.

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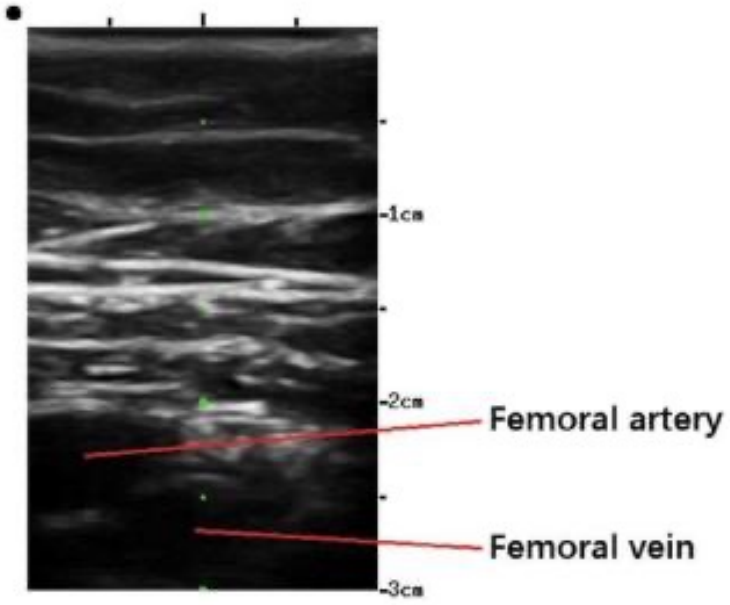

TABLE II - Comparing the risk of complications between groups

Complications	FICCs (n = 221)	Upper limb PICCs (n = 2604)	χ^2 (p)
Exudation	12 (5.43%)	94 (3.61%)	1.87 (0.172)
Skin allergy	11 (4.98 %)	196 (7.53%)	1.95 (0.163)
Catheter-related infection	8 (3.62%)	69 (2.65%)	0.72 (0.395)
Catheter occlusion	8 (3.62%)	88 (3.38%)	0.04 (0.850)
Unplanned catheter withdrawal	6 (2.71%)	76 (2.92%)	0.03 (0.863)
Venous thrombosis	5 (2.26%)	46 (1.77%)	0.28 (0.595)
Mechanical phlebitis	3 (1.36%)	56 (2.15%)	0.63 (0.429)
Catheter malposition	0 (0.00%)	56 (2.15%)	(0.020*)

*p<0.05. Fisher's exact test was used.
FICC = femoral vein inserted central catheter; PICC = peripherally inserted central catheter; χ^2 = chi-square.

Conclusions

The real-time ultrasound-guided PICC accessed via femoral vein at the mid-thigh is a new modified technique with low complications, which can be a feasible and safe alternative venous access for patients with SVCS.

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Techniques in vascular access

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Cannulation of the superficial femoral vein at mid-thigh when catheterization of the superior vena cava system is contraindicated

Linfang Zhao, Xiuzhu Cao and Yapping Wang

The Journal of Vascular Access
2020, Vol. 21(4) 524–528

DOI: 10.1177/1129729819896473
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Study population

The present study was approved by the Medical Ethics Committee of Sir Run Run Shaw Hospital in Hangzhou of the People's Republic of China. Patients with limited catheterization of the superior vena cava system were selected. The inclusion criteria were as follows: age > 14 years, infusion of total parenteral nutrition (TPN) or vesicant or irritant drugs, infusion therapy duration > 2 weeks, the indications of femoral vein catheterization were fulfilled, as were the doctor's orders. Exclusion criteria were as follows: radiotherapy history at the insertion area, a vascular anatomic anomaly caused by trauma or surgery, insertion site infection or BSI, and patients who did not return to our hospital for maintenance after discharge. A total of 121 cases were enrolled: 71 cases of chemotherapy, 24 cases of continuous infusion of TPN, 8 cases of infusion vasoactive drugs, and 18 other cases. All patients signed informed consent. A total of 2094 cases with PICC in the upper arm during the same period were also enrolled: 1689 cases of chemotherapy and 405 cases of infusion of TPN or vesicant or irritant drugs.

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The CRT and infection of FICC were significantly different from conventional catheterization via the femoral vein in the groin.[8,9] The mid-thigh as the puncture site avoids the majority of the risk factors. As the catheter moved along with the joint movement while it was inserted in the groin region, it caused vessel intima injury that led to thrombosis. Moreover, the groin area is damp with a high temperature near the perineum. Such a physiological environment is optimal for bacterial growth and can be easily contaminated by excreta, which is a significant obstacle to maintenance.[9]

Table 2. Complications during the period of indwelling.

Object	Puncture site	Example/total	Rate	p value
Dislodgment	Upper limb	209/2094	9.98	0.051
	Thigh	5/121	4.13	
Infection	Upper limb	134/2094	6.40	0.042
	Thigh	2/121	1.65	
Occlusion	Upper limb	53/2094	2.53	0.002
	Thigh	9/121	7.44	
Bleeding	Upper limb	21/2094	1.00	1.000
	Thigh	1/121	0.83	
Catheter-related thrombosis	Upper limb	12/2094	0.57	1.000
	Thigh	1/121	0.83	
Catheter-related skin problem	Upper limb	17/2094	0.81	1.000
	Thigh	1/121	0.83	
Primary malposition	Upper arm	126/2094	6.02	0.045
	Thigh	2/121	1.65	

Techniques in vascular access

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Maria Giuseppina Annetta, Bruno Marche, Laura Dolcetti, Cristina Taraschi, Antonio La Greca, Andrea Musarò, Alessandro Emoli, Giancarlo Scoppettuolo and Mauro Pittiruti

Methods

We have reviewed retrospectively all the FICCs recently inserted via SFV puncture by our Vascular Access Team, a multi-professional, multi-disciplinary team which inserts approximately 7000 central lines per year (including short, medium, and long term central venous access devices) in our University Hospital. Though our experience with SFV puncture started approximately 1 year ago, we have considered only the catheters inserted in the last 6 months (from June 1st, 2020 to December 31st, 2020).

Results

Between June 1st, 2020, and December 31st, 2020, we inserted 98 non-tunneled FICCs using an ultrasound-guided approach to the superficial femoral vein (SFV).

Indications to FICC insertion included patients requiring central venous access but with absolute or relative contraindications to both CICC and PICC insertion:

As regards to the venipuncture, the short axis out of plane technique was most commonly used (52 pts); the oblique axis in plane technique was adopted in 46 pts.

The vast majority of insertion were on the right thigh (81%): the left SFV was accessed mainly in patients with paresis or previous femoral venous thrombosis of the right lower limb.

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All procedures were successful. Most veins (95%) were punctured at the first attempt. No major immediate/early complication was recorded. There were three minor immediate/early complications:

- one accidental puncture of SFA (followed by successful SFV puncture at cannulation during the second attempt); no significant local hematoma was detected at the ultrasound examination of the soft tissues at the end of the procedure and in the subsequent days;
- one catheter was not properly functioning soon after insertion, probably due to kinking of the tip inside the veins; the catheter function was restored by jet lavage with normal saline;
- one catheter was not functioning properly the day after insertion (inability to both aspiration and infusion); an over-the-guide replacement was performed: we found out that the catheter was kinked in the intravascular tract, at about 8 cm from the exit site.

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The long-term follow-up was not possible in all cases, as late complications potentially occurring in the patients referred to nursing facilities ($n=27$, 27.5%) were not consistently reported to our team. Though, in the patients who stayed hospitalized ($n=71$, 72.5% of cases), no major late catheter-related complications were reported: in particular, we had no catheter-related blood stream infection, no irreversible lumen occlusion, and no catheter-related venous thrombosis. There was only one case of accidental dislodgment, in an agitated, non-collaborative patient (though the catheter was secured by subcutaneous anchorage). In one patient, there was a suspect of asymptomatic catheter-related venous thrombosis, which was finally diagnosed as a fibroblastic sleeve at closer ultrasound examination. In one patient with suspected catheter-related infection, paired blood cultures showed a catheter colonization (peripheral blood culture was negative, while a *Staph. hominis* was isolated by the catheter blood sample).

Vena femorale superficiale

Venipuntura

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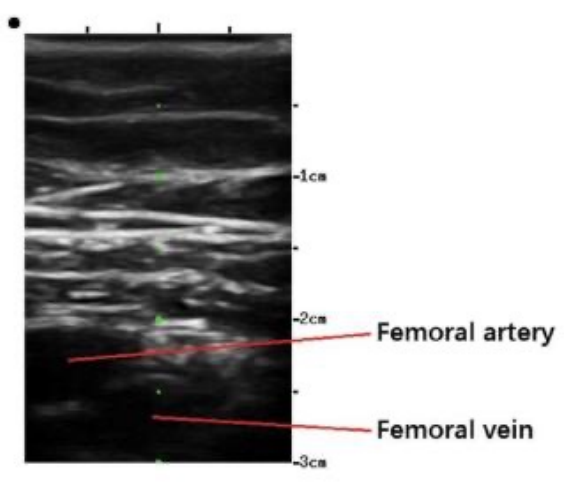

Venipuntura ecoguidata della VFS a metà coscia

Short axis – out of plane technique

The cannulation technique described by Wan and by Zhao consists in the ultrasound-guided puncture (short axis, out of plane) of the superficial femoral vein at mid-thigh, so that the exit site is 10–20 cm away from the groin. In both studies, the procedure was performed mostly in patients with superior vena cava syndrome, mediastinal tumors, bilateral breast cancer, or renal failure. In a non-randomized comparison with PICCs, both studies reported less risk of dislodgment, of primary malposition and of infection, a similar duration of the line, as well a similar risk of thrombosis, bleeding, and skin problems. Ostroff et al.[25] have reported seven cases of

Vena femorale superficiale

Venipuntura

Venipuntura ecoguidata della VFS a metà coscia

Oblique axis – in plane technique

Techniques in vascular access

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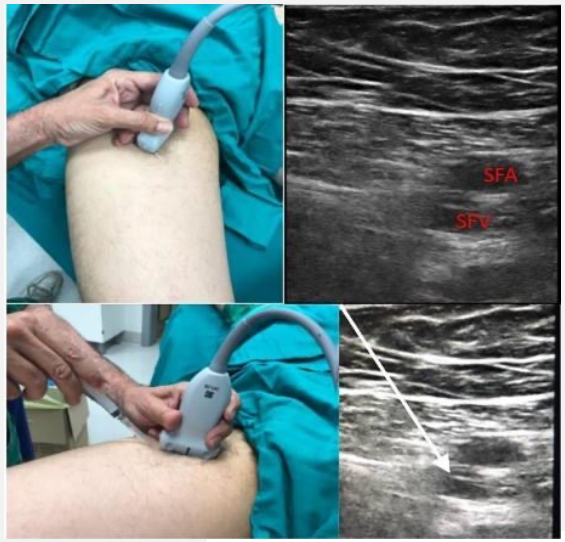
When the SFV was located laterally or medially to the superficial femoral artery (SFA), a short axis visualization with "out-of-plane" puncture was adopted; when the SFV was located below the SFA, an oblique axis visualization with "in-plane" puncture was preferred.

All 5 Fr catheters were inserted in SFV with inner diameter equal or superior to 5 mm, and all 4 Fr catheters in SFV with inner diameter equal or superior to 4 mm. The mean diameter of SFV was 6 (range 4–8 mm), and the mean depth was 4 cm from the skin (range 3–6 cm).

As regards to the venipuncture, the short axis out of plane technique was most commonly used (52 pts); the oblique axis in plane technique was adopted in 46 pts.

The vast majority of insertion were on the right thigh (81%): the left SFV was accessed mainly in patients with paresis or previous femoral venous thrombosis of the right lower limb.



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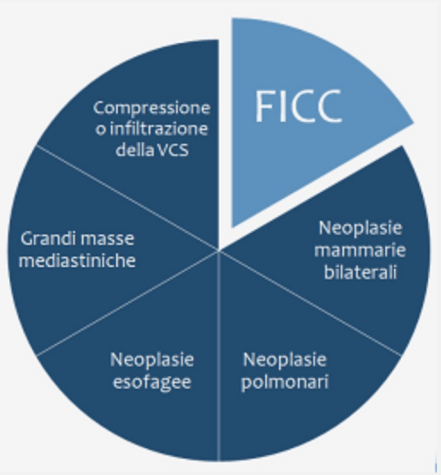
Vena femorale superficiale

Indicazioni



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Indications to FICC insertion included patients requiring central venous access but with absolute or relative contraindications to both CICC and PICC insertion:

- non-collaborative patients at high risk of dislodgment of the central line due to delirium and agitation ($n=40$, 41%); many patients of this group had previous history of accidental removal of PICCs and CICCs;
- bedridden patients with abnormal postures due to physical disability and/or spasticity of the limbs ($n=27$, 27.5%), candidate to extra-hospital treatment in long term health care facilities;
- obstruction/infiltration of SVC due to mediastinal malignancy ($n=19$, 19.3%) (patients with lymphoma, thyroid cancer, ENT cancer);
- four patients with liver failure and severe coagulopathy (less than 5000 platelets), thus with contraindication to CICC insertion, and no arm veins available for PICC insertion (4%);
- two septic patients with helmet for non-invasive ventilation, secured by underarm straps (2%);
- two chronic renal failure patients with dialysis catheters in the right supraclavicular area and concomitant pacemaker on the left side (2%);
- two chronic renal failure patients with arteriovenous fistulas, who did not give their consent to CICC insertion (2%);
- one patient with severe vasculopathy and no evident accessible deep vein for PICC or CICC insertion (the patient had had previous leg amputations on both sides: below the knee on the left site and above the knee on the right side);
- one patient with paralysis of both arms due to amyotrophic lateral sclerosis, who did not consent to CICC insertion but only to SFV cannulation.

Vena femorale superficiale

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restrained.[9] Subcutaneous anchored securement[20,21] may reduce but not completely avoid the risk of accidental dislodgment in this population of patients. We decided to use the SFV approach in confused, agitated patients after repeated episodes of removal of CICCs and PICCs, even if such catheters were secured by subcutaneous anchorage. In such patients, we assumed that the exit site in the inferior third of the thigh—sometimes very close to the knee and covered with elastic band—would make more difficult for the patients to reach the catheter and pull it away (Figure 7). In this area of the thigh, the SFV is particularly deep and typically located below the artery, so that we had to use an oblique axis/in-plane approach and a longer micro-introducer-dilator (7 cm rather than 5 cm).

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Vena femorale superficiale

Rischio di trombosi venosa catetere-correlata

Recent studies have shown that FICCs inserted by cannulation of the superficial femoral vein at mid-thigh in non-paretic lower limbs carry a low risk of thrombosis or infection.[2,3] Though, there are no clinical studies on the incidence of thrombosis when FICCs are inserted by cannulation of the superficial femoral vein in patients with paraplegia or tetraplegia, such as ALS patients.

Original research article

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Central venous catheter-related thrombosis in patients with amyotrophic lateral sclerosis

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Maria Giuseppina Annetta[1], Giulia Barbato[2], Erika Pisciaroli[2], Bruno Marche[3], Mario Sabatelli[2] and Mauro Pittiruti[4]

neled CICC is inserted in this area. Femorally inserted central catheters (FICC) are often an alternative option in ALS patients, when insertion of a PICC or a CICC is potentially challenging or overtly contraindicated.[2]

The primary endpoint of the study was to evaluate the incidence of symptomatic CRT in all CVADs, either PICC, CICC, or FICC. The secondary endpoint was to evaluate the incidence of other non-infective catheter-related complications. We included all patients admitted to our ALS

Vena femorale superficiale

Rischio di trombosi venosa catetere-correlata

exclusion criteria. All CVADs were inserted by two trained operators of the hospital Vascular Access Team; the insertion technique followed the hospital policies and more specifically the insertion bundles developed by the GAVeCeLT (the Italian Group for Long Term Venous Access Devices), published as "SIC protocol" (SIC = Safe Insertion of CICCs),[4] "SIP protocol" (SIP = Safe Insertion of PICCs),[5] and "SIF protocol" (SIF = Safe Insertion of FICCs).[6]

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Each of the aforementioned insertion bundles included seven sequential steps: (a) pre-procedural ultrasound evaluation of the veins, with appropriate choice of the vein (adopting a 3:1 ratio between internal diameter of the vein and external diameter of the catheter) and appropriate choice of the exit site according to the RAVESTO protocol (RAVESTO = Rapid Assessment of Venous Exit Site and Tunneling Options)[7]; (b) hand hygiene, skin antisepsis with 2% chlorhexidine in alcohol and maximal barrier precautions (full body drape sterile covering the whole patient, cap, mask, sterile gown sterile gloves, long sterile cover for the ultrasound probe); (c) ultrasound-guided venipuncture with micro-puncture kits; (d) ultrasound-based tip navigation; (e) intra-procedural tip location using intracavitary ECG (IC-ECG) and/or ultrasound-based tip location according to previously published protocols[8,9]; (f) securement of the catheter with sutureless device (preferably, subcutaneous anchorage); (g) protection of the exit site with cyanoacrylate glue and semipermeable transparent membrane.

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Vena femorale superficiale

Rischio di trombosi venosa catetere-correlata

One hundred and fifteen CVADs were analyzed: 29 CICCs (25.2%), 11 PICCs (9.5%), and 75 FICCs (65.2%; see Table 1). Most of the catheters were single lumen: 20/29 in the CICC group, 10/11 in the PICC group, and 74/75 in the FICC group. PICCs were inserted only in 10 ALS patients with movement of the arms still preserved, and in one patient with Duchenne disease.

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Table 1. Central venous access devices inserted in the study period.

	Jan-Dec 2021	Jan-Dec 2022	Jan-Oct 2023	Total
Total admissions	268	297	244	809
Total CVADs	30	33	52	115
Mean age (year)	60	61	64	61
Anti-thrombotics	24/30	22/33	25/52	71/115
CICC	18 (60%)	6 (18%)	5 (9%)	29 (25.2%)
PICC	6 (20%)	1 (3%)	4 (8%)	11 (9.5%)
FICC	6 (20%)	26 (79%)	43 (83%)	75 (65.2%)

Treatment with anti-thrombotic drugs (direct oral anti-coagulants or low molecular weight heparin) was overall reported in 71 patients out of 115 (61.7%), somehow less frequently in the FICC subgroup (37 patients out of 75: 49.3%).

Vena femorale superficiale

Rischio di trombosi venosa catetere-correlata

Interestingly, in this retrospective study including 75 consecutive FICCs in patients with different degrees of paresis, the femoral approach—which is often regarded at high risk for CRT—was not associated with any symptomatic thrombotic event; this may be explained by the systematic adoption of SFV cannulation at mid-thigh rather than cannulation of common femoral vein at the groin, considering that recent clinical studies suggest that the SFV approach is not associated with high risk of CRT.[2]

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The most interesting result of the present study is the absence of any event of symptomatic CRT in 115 CVADs inserted in a span of almost 3 years. This might be explained by several factors:

- all CVADs were inserted according to insertion bundles which already include the main strategies for prevention of CRT (choice of a vein with an internal diameter at least three times the external diameter of the catheter; ultrasound-guided venipuncture with micro-puncture kits; accurate intra-procedural tip location by IC-ECG and/or ultrasound; proper securement of the catheter);
- PICCs were inserted only in ALS patients with preserved movements of the upper limbs;
- anti-thrombotic prophylaxis might also have played a role, though it was used in only in 61.7% of patients.

Vena femorale superficiale

Rischio di trombosi venosa catetere-correlata

The importance of an appropriate insertion bundle, designed to minimize all catheter-related complications, including CRT

- *Use of ultrasound for the choice of the vein*
- *Adoption of a vein to catheter ratio of 3:1 or more*
- *Appropriate choice of exit site through the tunneling technique*
- *Intraprocedural tip location and adequate stabilization*

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This study strongly supports the importance of an appropriate insertion bundle, designed to minimize all catheter-related complications, including CRT. In a recent systematic review and meta-analysis on 5914 PICCs inserted with ultrasound guidance for venipuncture,[14] catheter tip location and a catheter size selection strategy, the rate of symptomatic PICC-related venous thrombosis was of 2.4% in the general population, 2.2% in oncologic patients, and 5.9% in hematologic patients. The importance of adhering to appropriate insertion bundle to minimize CRT was also confirmed by another recent meta-analysis[15] which reported an incidence of PICC-related thrombosis of 2.3%. Use of ultrasound for the choice of the vein, adoption of a vein to catheter ratio of 3:1 or more, appropriate choice of exit site through the tunneling technique, intraprocedural tip location and adequate stabilization are of paramount importance in reducing the risk of thrombosis, and they are all included in the GAVeCeLT insertion bundles. Adherence to the GAVeCeLT bundle in a cohort of 486 CVADs (both CICC and PICC) in a neurological intensive care unit resulted in zero incidence of symptomatic thrombosis.[16]

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Vena femorale superficiale

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Another interesting information derived from this retrospective analysis is the shift from a prevalence of CICCs in 2021 (60%) to a prevalence of FICC in 2023 (65%; Table 1). In our NeMO ward, FICCs have become the first choice CVAD in ALS patients, also because of the increasing experience of our vascular access team in the technique of SFV puncture at mid-thigh and in the ultrasound-based method of tip location. The SFV approach has some specific advantages in ALS patients:

- similarly to PICCs (which are often contraindicated in ALS patients), FICCs inserted by SFV puncture can be regarded as a non-invasive procedure: they can be safely inserted even in patients receiving anti-thrombotic drugs,[17] and they are not associated with cardiopulmonary complications that may occur during CICC insertion (pneumothorax, hemothorax, cardiac arrhythmias, air embolism);
- due to the reduced muscle mass of the thigh, the SFV is less deep in ALS patients (2–4 cm) if compared with the general population (3–6 cm),[2] and thus easier to puncture and cannulate (Figure 1); its caliber is quite large (6–8 mm), and thus appropriate for the adoption of 4 Fr or 5 Fr venous catheters;
- ultrasound-based intra-procedural tip location using the trans-hepatic window with visualization of the catheter inside the inferior vena cava (Figure 2) is easy and consistently feasible, even in patients with spastic lateral decubitus, while a subxiphoid window may be very difficult in ALS patients due to the presence of gastrostomy, or air in the stomach secondary to non-invasive ventilation[18];
- the exit site at mid-thigh is far from the tracheal secretions, and also far from the groin area, which is contaminated by bacteria; also, dressing is quite stable and easy to manage (Figure 3).

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FICC non tunnellizzato
Vena Femorale Superficiale

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Grazie

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