Review and Case Studies of Midthigh Femoral Central Venous Catheter Placement

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Abstract

Background: *Bedside vascular access options have been limited to the short peripheral intravenous, midline catheter, peripherally inserted central catheter, and central venous catheter (CVC) insertion sites such as the jugular, subclavian, and femoral vein. Many patients with limited options for upper extremity, subclavicular, supraclavicular, and cervical limitations have traditionally received a femoral CVC in the inguinal region. This insertion site is considered a high risk for infection because of its location in the inguinal region and associated difficulties with maintaining the dressing integrity. An alternative location was selected for the insertion of a femoral vein central venous catheter in the midthigh to reduce the risk of infection.*

Methods: *After a multiple-year implementation process, midthigh femoral (MTF) insertions were performed on a select group of patients. The case studies that are included in this report outline the indications, procedures, and other pertinent aspects of the MTF placement. Patients at this institution with contraindications to upper extremity and thoracic catheter insertion received a MTF vein CVC in place of a traditional common femoral vein catheter insertion in the inguinal area. All procedural consents include permission for photography of procedure sites.*

Results: *All but a single patient completed their therapy without complication; 1 intentional dislodgement by a patient was recorded. There were no MTF catheter-related bloodstream infections and 2 confirmed central line associated bloodstream infections (*n = *2 of 100) with the second noted as probable contaminated specimen. Outcomes reflected no procedural complications (eg, expanding hematoma or femoral nerve injury or any other femoral artery or vein injuries) and 1 nonocclusive deep vein thrombosis (*n = *1 of 100).*

Conclusions: *The MTF CVC provides an alternative to traditional common femoral vein catheter placement for nonemergent patients with upper extremity and thoracic contraindications to central line placement.*

Introduction

Relocation of the femoral insertion site from the common femoral vein (CFV) to the midthigh femoral (MTF) vein in the region of the medial thigh offers a lower extremity central venous catheter (CVC) solution for patients who may not be candidates for upper extremity devices. Studies have reported that tunneled femoral vein catheters are a safe alternative to tunneled internal jugular vein catheters with low insertion complication rates.[1,2] The introduction of the upper arm peripherally inserted central catheter (PICC) facilitated central venous access through the peripheral vasculature to the central vasculature, eliminating many of the insertion-related risks of supraclavicular and traditional femoral central venous access locations.[3,4] Interventional radiology used the femoral vein for tunneling long-term dwell venous catheters, and vascular surgeons used veins located in the thigh for the creation of femoral arterio-venous fistulas. In 2016, the *Journal of Surgical Oncology* published the results of a study on totally implantable venous access ports via the femoral vein and concluded that this option should be considered related to high success rates, low infection, and infrequent complications.[5]

Lower extremity vein options for catheter placement include the femoral, popliteal, and the saphenous vein. For decades the pediatric population has demonstrated that not only can PICCs be placed in the upper extremities but they can also be placed

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Table 1. **Case Study Demographics and Results**

Case Studies	1	2	3	4	5	6	7
Age	94	26	61	58	71	41	83
Male/Female	Female	Female	Female	Male	Male	Female	Female
Unit	Med-surg	Med-surg	ICU	ICU	ICU	ICU	Telemetry
Right/Left	Left	Right	Left	Left	Right	Right	Left
Lumens	Single	Double	Double	Double	Double	Double	Double
French	3	5.5	5.5	5.5	5.5	5.5	4
Coated/Non	Non	Coated	Coated	Coated	Coated	Coated	Non
Navigation	n/a	n/a	n/a	n/a	n/a	Yes	Yes
CM	40	50	50	50	35	50	55
KUB tip location	IVC	IVC	IVC	IVC	Common iliac	IVC	IVC
Dwell Time (d)	6	7	16	26	17	10	6
Catheter Dysfunction	None	None	None	None	None	None	None
Thrombosis	None	None	None	None	None	None	None
Infection	None	None	None	None	None	None	None

CM = centimeters; ICU = intensive care unit; IVC = inferior vena cava.

in the lower extremity veins terminating in the inferior vena cava (IVC). There are reports as early as 1982 from the Department of Surgery and Pediatrics at the University of California at Los Angeles and 1986 from the American Academy of Pediatrics describing the safety and effectiveness of lower extremity central catheters terminating in the IVC.[6] In 1993, Treiman and Silberman published the largest case series on the use of lower extremity PICCs in pediatric patients and concluded that the results were similar to upper extremity PICCs with 86% of catheters effective until the end of therapy and 69.2% of upper extremity PICCs completing therapy.[7] Thirty years later, through the use of ultrasound guidance, MTF vein cannulation can now be applied to the adult population.

We see the concept of vascular access inserted in the femoral vein repeated in 1998 when anesthesiologists documented its use for 20 patients undergoing neck, facial, and brain surgeries.[8] Insertions of these femoral catheters were performed in the inguinal region under sterile conditions. In 2001, Merrer et al published the results of a randomized controlled trial reporting outcomes of femoral vein catheters.[9] In this study, the common femoral site was associated with a high level of infectious complications in comparison with the subclavian catheter (19.8% vs 4.5%; $P < .001$; incidence density of 20 vs 3.7 per 1000 catheter days). In 2015, Zhao published a report on a lower leg location using the saphenous vein advanced through the femoral vein for a group of 43 patients with superior vena cava (SVC) syndrome.[10] This noninguinal location demonstrated no complications of thrombosis or infection with dwell time up to 32 days.

There is little research available on the incidence of complications associated with femoral vein insertion relocation from the inguinal fold to the MTF placement. One publication by Wan et al in 2018 reports use of a PICC via the superficial femoral vein, concluding midthigh placement is a new modified technique with low complications and is feasible and safe as an alternative form of venous access.[11] Despite evidence dating from the 1980s on the use of a noninguinal femoral vein insertion site for catheters in patients with contraindications to traditional routes to the SVC, the MTF location has still not been fully adopted into practice. The following are case reports from this cohort, which are summarized in Table 1 and assessment parameters represented in Table 2. The case studies included in this report were approved by the Institutional Review Board at the hospital.

Case Report

Case 1

A 94-year-old woman presented to the emergency department with severe dehydration and altered mental status. Multiple attempts to gain vascular access were performed in the emergency department. The vascular access team was called and placed an ultrasound-guided 22-gauge peripheral to the right brachial vein. This peripheral intravenous catheter (PIV) infiltrated a few hours later at 11PM. A PICC line order was placed by the physician. Physical assessment revealed left upper arm amputation, contracted cervical region, and contractures to the lower extremities. Ultrasound assessment of the right upper extremity did not reveal a viable vein for PICC insertion. Despite

Table 2. **Assessment Parameters for Femoral Placement**

Assessment of location	Common Femoral	Distal Femoral
Caliber	Large	Varies
Depth	1.5-3 cm	0.4 cm-1.10 cm
Rapid emergent placement	Yes	No
Compressibility	Yes	Yes
Proximity to urethra and anal region	In pelvic region, high risk for contamination	Far from pelvic region
Entry under skin fold	Obese patient or high entry	Flat insertion area
Difficulty applying dressing	Pubic hair, skin folds, moisture-rich area	Flat surface to apply dressing
Removal complications	Compressible vessel, high stick can cause bleeding into pelvis	Compressible vessel
Ease for care and maintenance	Difficult to visualize, surrounded by contaminants	Visualization of insertion site with no surrounding risks

contractions, the legs were able to be positioned gently with a Coban wrap for catheter insertion, and a 3 French Bard catheter was trimmed to 40 cm and placed, under ultrasound guidance, in the left MTF vein with an abdominal kidney, ureter, and bladder (KUB) film demonstrating the distal tip location in the IVC. The catheter remained patent for 6 days until completion of therapy and patient discharge, with no complications such as catheter dysfunction, infection, or thrombosis.

Case 2

A 26-year-old woman presented with a hypoxic brain injury, repeat cardiac arrest, and an eroding right chest subcutaneous implanted port, with severely contracted upper extremities and tracheostomy (Figure 1). The patient required vascular access for antibiotic administration as well as a bridge to port removal and replacement. The decision was made to proceed with a double lumen 5.5 French antimicrobial/antithrombogenic Arrow catheter placed under ultrasound guidance to the right MTF vein at 50 cm with the abdominal KUB demonstrating the terminal tip location to be in the IVC. This catheter remained in for 7 days and was removed after port removal and subsequent replacement on day 6 without any complications such as catheter dysfunction, infection, or thrombosis.

Figure 1. **Severly contracted patient with MTF.**

Case 3

A critically ill 61-year-old morbidly obese woman (ie, 270 pounds) in the intensive care unit (ICU) required central venous access replacement to place a tunneled hemodialysis catheter (Figure 2). The patient had an existing right subclavian triple lumen with an extensive deep vein thrombosis (DVT) to the right jugular and subclavian veins and pre-existing DVT to the left upper extremity. The patient received dialysis via a left femoral hemodialysis (Shiley) catheter. The vascular surgeon intended to place the tunneled catheter to the right jugular vein; therefore, the right triple lumen acute care catheter required relocation prior to this procedure. The decision was made to proceed with a double lumen MTF catheter. Ultrasound assessment of the right lower extremity did not reveal a viable femoral vein in the midthigh. Ultrasound assessment of the left lower extremity revealed a patent femoral vein in the midthigh region. A double lumen 5.5 French antimicrobial/anti-thrombogenic catheter was placed, under ultrasound guidance, in the left femoral vein and thread to 40 cm, with abdominal KUB radiograph demonstrating the terminal tip location to be in the IVC. After tip confirmation, the right subclavian triple lumen catheter and the left femoral Shiley catheter were removed, and the patient was taken to special procedures for a tunneled catheter placement. The catheter was removed after 16 days because of completion of IV therapy with no complications such as catheter dysfunction, infection, or thrombosis.

Figure 2. **Indication of morbid obesity.**

Figure 3. **Position is everything: note ileostomy bag.**

Case 4

A 58-year-old man in the ICU on continuous veno-venous hemofiltration with a left arterial venous fistula (AVF) and a right-sided tunneled catheter with right upper extremity vessel preservation requiring central venous access for critical care medication. A double lumen 5.5 French antimicrobial/anti-thrombogenic Arrow catheter was placed, with ultrasound guidance, in the left MTF vein with an abdominal KUB radiograph demonstrating the terminal tip location to be in the IVC at 50 cm. The patient was transferred to the step-down ICU, and on day 26 all intravenous (IV) medication had been completed. The MTF catheter was removed intact with no noted complications such as catheter dysfunction, infection, or thrombosis and was replaced with an ultrasound-guided Becton Dickinson Nexiva peripheral intravenous line to the right forearm because a requirement for patients on the step-down ICU floor to have vascular access.

Case 5

A 71-year-old man presented with history of heart transplant in 2001, chronic renal failure, and current diagnosis of gastrointestinal hemorrhage requiring central venous access for total parenteral nutrition (TPN). The patient received hemodialysis via right-sided hemodialysis catheter with newly created left-sided AVF. Both nephrology and cardiology teams requested right upper extremity preservation and ordered MTF catheter to be placed for TPN administration. Ultrasound assessment revealed a patent right femoral vein in the midthigh. Under ultrasound guidance, a double lumen 5.5 French antimicrobial/anti-thrombogenic catheter was placed in the right femoral vein and unable to thread beyond 35 cm, with the postabdominal KUB radiograph demonstrating the terminal tip location to be in the right common iliac vein. TPN was administered until the patient completed therapy with catheter removal on day 17. There were no reported complications such as catheter dysfunction, infection, or thrombosis.

Case 6

A 41-year-old woman in the ICU with hypoxic brain injury and septic shock required relocation of present right femoral triple lumen catheter, which was located under a leaking ileostomy bag (Figure 3). The patient had a tracheostomy, ileostomy, and was contracted to all 4 extremities. Ultrasound assessment revealed a patent right MTF vein and, under ultrasound guidance, a 5.5 antimicrobial/anti-thrombogenic Arrow catheter was placed and threaded with electrocardiogram (ECG) and Doppler guidance to the location of the IVC, which was then confirmed on an abdominal KUB radiograph at 50 cm. The right femoral triple lumen catheter was then removed. The patient completed therapy and discharged on day 10, and the catheter was removed intact without reports of complications such as catheter dysfunction, infection, or thrombosis.

Case 7

An 83-year-old morbidly obese woman (ie, 255 pounds) required central access for frequent blood draws and amiodarone administration. The patient had a history of chronic obstructive pulmonary disease, obstructive sleep apnea, atrial flutter, seizure disorder, diabetes mellitus type 2, chronic kidney disease, hypertension, right arm DVT, and left-sided implanted defibrillator and pacemaker. Peripheral IV catheters required frequent replacement. The medical team requested avoidance of the jugular vein and ordered a MTF catheter. Ultrasound assessment of the left lower extremity demonstrated a femoral vein at 6 cm depth. Under ultrasound guidance, a 4 French double lumen Bard 55 cm catheter was placed to the left femoral vein and navigation with

ECG and Doppler demonstrated the catheter to be in the IVC, which was confirmed with abdominal KUB radiograph at 55 cm. On day 6 the patient was discharged and the catheter was removed intact without any reports of complications such as catheter malfunction, infection, or thrombosis.

Discussion

Relocation of insertion sites from an area of high risk to an area of low risk is not a new concept, as demonstrated with PICCs and subclavian catheters.[12-14] When applied to femoral catheters, the objective was to reduce complications commonly associated with femoral catheters inserted in the inguinal region (Table 2). Modification of CVCs with the SC insertion site relocated laterally to the axillary vein in the deltopectoral groove lowered the risk of pneumothorax, SC arterial puncture, and contamination from endotracheal tubes or other high-humidity devices.[14] Insertion site modification in PICC insertion relocation from the antecubital region to the middle of the upper arm, with the aid of ultrasound, demonstrated reduced dislodgement and phlebitis.[3] This PICC relocation was further refined through application of the Zone Insertion Method (ZIM).[15]

Zone insertion areas indicate insertion or catheter exit locations based on risk factors of bacteria distribution, ability to secure on a flat surface and cover with dressing, optimal vein size, and configuration for access. Applying the ZIM from the upper arm to the lower extremity, recommended green (ie, safe zone), yellow (ie, cautious zone), and red (ie, avoid zone) regions (Figure 4) are established. Zones of the lower extremity begin at the pelvic crease and extend to the patella. The yellow zone is applied from the pelvic crease to the upper third of the thigh. The green zone, or area of recommended insertion, sits in the middle third of the thigh between the inguinal fold and the patella. The red zone is avoided because of the proximity to the area of flexion, depth of the femoral vein, and length of catheter required to reach the IVC. Applying the ZIM allows inserters focus on the green zone designed to promote optimal success with insertion, securement, care, and maintenance.

The femoral catheter, inserted in the yellow zone or inguinal region, is avoided in the central-line bundle infection prevention practices as it is associated with a higher risk of infection, central line associated bloodstream infections.[12] Dressings are extremely difficult to position and maintain in this inguinal region. Dressing disruption contributes to more than a threefold increase in the risk of catheter related bloodstream infections.[16] Assessment of the insertion site is hampered by clothes, skin folds with high body mass index, and patient modesty. When examining body mass index and its effect on jugular and femoral insertion, 1 study found that 66% of the femoral catheter dressings were affected, but no effect was seen on jugular catheters.[17] A low jugular catheter insertion site has improved supraclavicular dressing challenges for adherence by placing the catheter in the final position down on the chest. The midthigh exit location provided a flat surface to secure and dress the catheter, aiding in the ability to visualize and protect the area. Application of cutaneous catheter securement with MTF is used for nonambulatory patients, and subcutaneous-engineered securement devices are used for mobile patients to prevent catheter dislodgement (Figure 5). In addition to infection, other MTF CVC complications include catheter malposition, DVT, and accidental arterial puncture.[18]

Malposition of femoral catheters often go undiagnosed. A retrospective review of abdominal CT scans for 1 year revealed 44 patients had femoral CVCs with the catheter in the ascending lumbar vein in 2 cases (4.5%).[19] Variability of femoral terminal tip locations is represented in the literature and not often recognized in practice since the femoral catheter placement

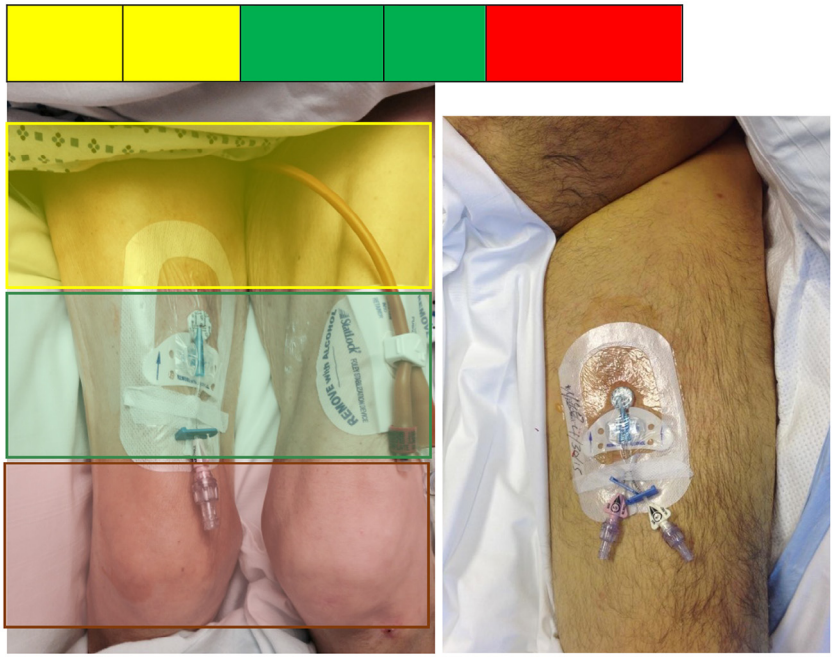

Figure 4. **Zone insertion for MTF. MTF = midthigh femoral.**

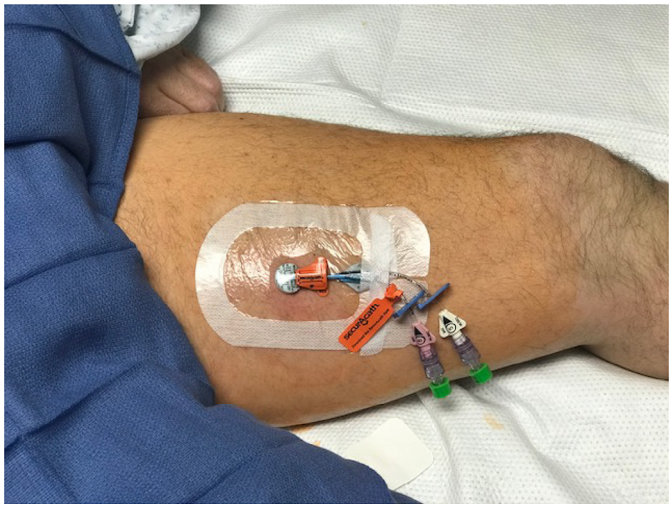

Figure 5. **MTF subcutaneous securement for mobile patient. MTF = midthigh femoral.**

confirmation with X-ray or ECG is not routinely included in the procedure.[8,9,20] Femoral catheters, specifically triple lumen acute care catheters, inserted at this institution by other clinicians were without final confirmation after insertion and, with further investigation, were found to terminate in the common iliac vein (CIV). Indications for CIV terminal tip position with regards to the MTF include the existence of an IVC filter, distance to IVC exceeds catheter length, and the presence of a contralateral tunneled catheter into the IVC. More research is needed to determine if the CIV, with its large vein size, has sufficient hemodilution to avoid complications with central medication infusions.

Malposition outside of the IVC supports the need for femoral vein catheterization tip confirmation with abdominal radiograph or ECG tip confirmation.[20,21] When inserting catheters from veins of the lower extremities, the optimal central tip location is the middle portion of the IVC above the iliac junction and below the renal veins.[9,11] ECG and Doppler catheter technology (VPS Teleflex, Raleigh, NC) were used in this institution for intraprocedure tip positioning of CVC as indicated for femoral placement with terminal tip in the IVC, followed by a confirmatory radiograph.

The following are warning signs of malposition with terminal tip location outside of the IVC:

1. Difficulty advancing the guidewire for more than 15-20 cm
2. Loss of blood return on aspiration and increased resistance while flushing
3. Catheter path directly overlying the vertebral column rather than right of midline, as for a catheter in the IVC, may indicate arterial placement
4. Signs of unexplained acute respiratory distress, lethargy, seizure, or neurologic deficits may indicate placement in the lumbar venous plexus.[22]

Literature reporting DVT with femoral catheters is focused on the insertion site of the CFV with the majority of terminal tip placement in the CIV.[9,17] Signs of symptomatic DVT include edema, pain, swelling, extremity cyanosis, collateral circulation in the affected extremity, and catheter dysfunction.[11,23] Reported rates of femoral catheter–related thrombosis range from 6.6%-25%,[20] while SC and internal jugular rates are between 10-17%.[9,24] The most dangerous complication of lower extremity DVT is a pulmonary embolism.

In the adult population, the femoral vein has been widely used for emergent access with a 7 French catheter or an 11 or 12 French catheter for dialysis with the exit site in an area of flexion. These large bore catheters have traditionally been placed by physicians without assessment of catheter-to-vessel ratio before the implementation of ultrasound, which would suggest a catheter ratio of 0.7 cm, 1.10 cm, and 1.20 cm respectively. Evidence of the need to measure vein diameter in relation to catheter size and incidence of thrombosis is growing.[25-27] Careful measurement and catheter size selection may be a contributing factor to this hospital's MTF rate of 0 patients with symptomatic DVT. Therefore, the current data surrounding thrombosis with the femoral vein relates to these large bore catheters and has not been assessed with small-caliber catheters, 3 to 6 French sizes. Vigilance is necessary in application of evidence-based practices to reduce complications associated with VADs and especially CVCs.

Precautions that may reduce the risk of DVT include the following:

1. Evaluation of catheter-to-vessel ratio (1:4 catheter to vein)
2. DVT prophylaxis
3. Sequential compression devices
4. Use of antithrombogenic catheter material

Vascular access specialists have a proven track record of reducing the number of insertion-related complications, increasing first attempt success, and increasing patient satisfaction.[28-31] Although few teams have been trained to insert femoral venous catheters, the positive results of specialty team training and performance may result in a growing trend to include MTF catheters as an option by insertion teams for patients with an indication for this device. At this hospital, the vascular access team has achieved a 97% first-attempt success rate over 4 years for catheters inserted in neonates to adults. In a 2015 study examining the use of the modified Seldinger technique when placing femoral venous catheters in critically ill infants, it was stated that "[c]omplications such as thrombosis and sepsis can be avoided by adhering to asepsis protocols and the risks for major complications are low when femoral venous catheters are inserted by clinicians who are experts in this procedure."[32] Training and maintaining a group of individuals to insert CVCs has become a quality measure for many hospitals.[33-37]

Appropriateness for MTF is an individualized decision based on patient factors and availability of trained staff. Evaluation of patients for appropriateness prior to insertion includes assessment criteria of duration of intended therapy, medication, patient history to evaluate specific device indications, and risk-benefit consideration. At this time, the MTF insertion site is not listed as an option in the Michigan Appropriateness

Table 3. **Indications and Contraindications for MTF Patients**

Indications	Relative Contraindications
SVC syndrome	History of lower extremity DVT on ipsilateral side of intended insertion, thrombosis of IVC
DVT to other upper extremity veins (eg, axillary, subclavian, jugular, brachiocephalic)	Above the knee amputation, circulatory impairment such as peripheral venous and peripheral arterial disease
Paresis, contractures, amputation, or circulatory impairment to upper extremities; certain neurology patients, advanced Parkinson's, multiple sclerosis, amyotrophic lateral sclerosis	Ultrasound assessment revealing venous stenosis via vessel non-compressibility, discovery of echogenic material intended insertion site location to CVC, or known iliac or IVC occlusions
Arteriovenous fistula to upper extremity	Depth of femoral vein and size or location of the vein, artery, or nerve, which impairs ultrasound-guided needle access
Trauma, surgery, or tumors with impairment or limitations to circulation	IVC filter (not absolute—see case 4)
Cervical or neck trauma or upper extremity abnormal venous anatomy	Impaired skin integrity of the lower extremity
High-risk coagulopathy, hemophilia, or thrombocytopenia	History of radiation to thigh
Bilateral mastectomy	Renal transplant
Pacemaker, acute or tunneled catheter subcutaneously implanted port, defibrillator, or SVC filter	
Inability to lie supine for supraclavicular insertion	
Claustrophobia under full-body drape	
Skin conditions or infection impairing upper extremities	
Chronic conditions where no veins in upper extremities are suitable as in sickle cell and cystic fibrosis	
Inadequate upper extremity vein size	

CVC = common femoral vein; DVT = deep vein thrombosis; IVC = inferior vena cava; SVC = superior vena cava.

Guide Intravenous Catheters or in the European Society of Parenteral and Enteral Nutrition guidelines.[38,39] The use of the MTF vein could potentially be indicated in circumstances where the routes to the SVC are unavailable, the venous routes are being preserved, or the risks of supraclavicular insertion outweigh the benefits.[40] Patients meeting the inclusion criteria are further evaluated with ultrasound to determine suitability of vein pathway, size, and position. Candidates for MTF are often high-risk, chronically ill patients who fall into certain indication categories.

Indications for MTF include SVC syndrome, upper extremity DVT, paresis to upper extremities, extremity contractures or amputation limiting upper extremity veins, and inadequate upper extremity vessel caliber. Certain neurologic diagnoses may benefit from this insertion site—such as advanced Parkinson's disease, amyotrophic lateral sclerosis (ie, ALS), or multiple sclerosis—by avoiding upper extremity involvement, depending on the individual patient needs. AVFs; patients with vascular limitations from renal, head, neck, or chest neoplasms or tumors; trauma with cervical collar; trauma or surgery to neck (cervical or tracheostomy), face, or brain; bilateral mastectomy; existing devices such as subcutaneously implanted port, defibrillator, pacemaker, or dialysis tunneled catheter; inability to lie supine for supraclavicular insertion (eg, congestive heart failure or chronic obstructive pulmonary disease); claustrophobia under the drape; skin conditions or infection impairing upper extremities; chronic conditions where no veins in upper extremities are suitable such as with sickle cell disease and cystic fibrosis; or inadequate upper extremity vein size (Table 3) all could be indications for femoral placement based on the individual patient needs. Despite meeting criteria under the above listed indications, certain patient factors may limit the use of MTF as listed in Table 3 second column of relative contraindications. Patients at high-risk due to coagulation disorders, hemophilia, or thrombocytopenia patients may be better managed with femoral access CVC related to the safety with ability to digitally compress the vessel in the case of

accidental femoral arterial access, or bleed. This location also provides for better catheter stabilization reducing movement that can promote bleeding at the insertion site.

Relative contraindications for the use of the MTF vein include patient history of lower extremity DVT, above-the-knee amputation, circulatory impairment found in peripheral vascular and peripheral arterial disease that may increase the risk of thrombosis, and evidence of echogenic material present in the femoral or CFV. Relative contraindications may also include stenosis or known iliac or IVC occlusions; the depth of the femoral vein exceeding needle access; vein caliber or relation to the femoral artery or nerve precluding ultrasound-guided needle access to the vein; presence of an IVC filter (not absolute); skin impairment at the desired insertion location; history of radiation to the thigh; or renal transplant necessitating avoidance of ipsilateral femoral vein because of the risk of thrombosis impairing
venous outflow from the transplant.[2] Any of these relative contraindications may increase patient risk and limit the option of a lower extremity CVC.

For MTF catheters inserted, as part of this case review, success was defined by the ability to advance guidewire and catheter, verify terminal tip location, draw blood, and infuse. Successful placement of an MTF catheter was performed in over 100 patients with a mean dwell time of 12 days; to date, the shortest dwell was 2 days and the longest was 39 days. There were no insertion related bloodstream infections with the MTF, but 2 post insertional confirmed infections with one of the confirmed noted as probable contaminated specimen. Outcomes reflected no procedural complications (eg, expanding hematoma or femoral nerve injury or any other femoral artery or vein injuries) and 1 nonocclusive DVT. The nonocclusive DVT was discovered on line-day 30, when the bedside nursing assessment revealed swelling to the left thigh. A duplex ultrasound of the left lower extremity was ordered and revealed a nonocclusive DVT. The catheter was subsequently removed and the patient was placed on anticoagulants.

Conclusion

Femoral catheters, inserted in the inguinal region, have long been used for acute insertion for critically ill patients with removal once stable because of the high risk of infection. Results of this case study review provide suggestive evidence that insertion of femoral catheters, performed in the midthigh region, decrease the risks associated with the CFV central catheter insertion. Further study is needed to examine the comparative relationship between MTF and other CVC locations for infection, DVT (before catheter removal, throughout treatment, and after catheter removal), dressing securement, and maintenance of the MTF vein. The MTF catheter demonstrates a new option for nonemergent patients requiring central catheter insertion when upper extremity insertion is not indicated.

Disclosures

Matthew Ostroff serves as a speaker for Becton Dickinson, Teleflex, 3M, and Access Scientific.

Nancy Moureau, owner of PICC Excellence, Inc., serves as a speaker and educational consultant for 3M, Access Scientific, Chiesi, Entrotech, Linear Health Sciences, Parker Laboratories, Echonous, and Nexus Medical; as a researcher at Griffith University in Queensland, Australia, research grants were received from 3M, Cook Medical, and Entrotech.

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