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Redefining venous access device-associated fibroblastic sleeves: Improving terminological accuracy by replacing the misnomer "fibrin sheath"

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Abstract

The connective tissue that develops around vascular access devices has traditionally been referred to as a "*fibrin sheath*." Although this term has remained entrenched in the vascular access literature and across related clinical specialties including nephrology, interventional radiology, oncology, critical care, and cardiology, contemporary pathophysiological evidence indicates that it lacks biological accuracy and does not adequately reflect the nature of this pathophysiological phenomenon. This inaccuracy creates confusion within the scientific community and may erroneously lead to the consideration of this condition as a specific type of catheter-related thrombosis, and to be treated accordingly. As a joint statement of the World Congress on Vascular Access (WoCoVA), the Italian Vascular Access Society (IVAS), and the Vascular Access Society (VAS), this position paper, developed consistently with current evidence, recommends discontinuing the use of the term *fibrin sheath* in favor of the more appropriate term *fibroblastic sleeve*. The latter more precisely describes the lesion's biological composition and morphological structure, for the purposes of better clarity and correct management.

Keywords

Vascular access devices, fibrin sheath, fibroblastic sleeve, central venous catheter, hemodialysis, terminology

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Background

Vascular access devices (VADs) are fundamental to contemporary healthcare delivery and have significantly advanced the provision of intravascular therapies across diverse clinical settings worldwide. They facilitate the safe and effective administration of life-sustaining treatments to support millions of patients globally.[1,2]

A common phenomenon associated with all these devices—both arterial and venous—is a peculiar pathophysiological response that occurs at the blood–material interface. One manifestation of this response is the development of a peri-catheter connective tissue, which may contribute to catheter dysfunction, impaired performance, and eventually device failure. Most importantly, this structure is very often erroneously interpreted as a catheter-related thrombosis and treated with anticoagulants, exposing patients to unnecessary risks and determining additional costs.[3] This lesion has historically been termed *fibrin sheath*, although its composition is now recognized to be more complex.[4,5] Therefore, a more accurate terminology in needed.

Without standardized terminology, the interpretation and synthesis of research in this area remain challenging. Historically, the terms *fibrin sheath* and *thrombosis* have been used interchangeably to describe a cause of device dysfunction, which complicates interpretation of the study, and hinders appropriate meta-analysis. Use of standardized terminology will assist in collecting registry data and harmonizing reporting standards.

Pathogenesis and histological nature

The term *fibrin sheath* emerged in the 1960s and 1970s, when anatomical observations of explanted central venous catheters revealed a sleeve-like material surrounding the catheters' external surfaces. Initially, this was believed to be a thrombotic phenomenon, primarily due to *fibrin* accumulation.[6,7] Subsequent histopathological studies[8–10] have demonstrated that the sleeve is predominantly composed of collagen, smooth muscle cells, fibroblasts, endothelial cells, extracellular matrix proteins, and inflammatory cells, whereas *fibrin* is only an early, often transient component during the development of the lesion.

For this reason, this biological structure should be more correctly referred to as a *fibroblastic sleeve (FBS).* FBS forms around an indwelling vascular catheter as part of the host response to a foreign body. Despite the early development stages of this structure remaining uncertain, the formation of the FBS is most likely to begin immediately after catheter insertion, with endothelial injury and exposure of blood to the foreign catheter surface.[11] This triggers adsorption of plasma proteins, platelet activation, and deposition of fibronectin on the catheter. According to the prevailing hypotheses,[12] this provisional matrix promotes recruitment of macrophages and fibroblasts, which initiate extracellular matrix production. Over days to weeks, the sleeve matures into a complex connective tissue—enveloping the catheter along part or the entire length—containing fibroblasts, smooth muscle cells, collagen, extracellular matrix proteins, inflammatory cells, wrapped by endothelial cells.[8,9] As a foreign body reaction, FBS occurs in 100% of vascular devices, at least at the microscopic level, and remains silent in most cases. For reasons that remain unclear, in certain cases the sleeve becomes excessively thick and/or extended, which may adversely contribute to catheter dysfunction or difficulty with device removal.[5]

Justification for standardized terminology

As highlighted above, the term *fibrin sheath* is biologically inaccurate and does not adequately reflect the underlying pathophysiology. This mischaracterization may lead to considering this condition as a specific type of catheter-related thrombosis, which has important therapeutic implications.[13] Preventive strategies, including anticoagulation and antiplatelet therapies, have been largely unsuccessful in preventing sheath formation, yet they continue to be used in clinical practice.[14] Furthermore, the use of thrombolytic therapies to manage catheter dysfunction addresses only the secondary consequence of luminal obstruction rather than the underlying lesion, thereby limiting the effectiveness of treatment and failing to target the primary pathological process. Clinically, this can result in the use of ineffective therapeutic strategies, with persistent and recurrent device dysfunction being a common consequence, and patient exposure to unnecessary anticoagulant treatments. Distinguishing thrombosis from *fibrin sheath* formation is also essential for correct imaging interpretation and accurate incident reporting in clinical practice. Finally, standardized terminology is fundamental for interpretation and synthesis of research in this area.

Recommendations

Historically, the terms *fibrin sheath* and thrombosis have been used interchangeably and incorrectly to describe causes of vascular access device dysfunction. This has led to inconsistent outcome classification, hindered the correct interpretation of study findings, and limited the validity of pooled analyses and appropriate meta-analysis. Standardized terminology will assist in collecting registry data and harmonizing reporting standards.

Innovation in the field is long overdue, and accurate terminology aligns biological targets with device development.

1. The term *fibroblastic sleeve* should become the preferred terminology.
2. The term *fibrin sheath* (or *fibrin sleeve*) should not be used and must be considered a historic, outdated term.

Proper definitions

(a) The *fibroblastic sleeve* (FBS) is a collagen-rich fibro-cellular sheath that forms around an intravascular device as part of the foreign-body response. Formation begins with fibronectin deposition on the catheter surface, followed by recruitment of macrophages, smooth muscle cells, and fibroblasts, which produce collagen and other extracellular matrix components, resulting in mature connective tissue.

(b) Catheter-related thrombosis (CRT) is the formation of a thrombus within or adjacent to a blood vessel containing an intravascular catheter, resulting from the interaction among endothelial injury, altered blood flow, and catheter-induced activation of coagulation pathways.

Conclusion

The evidence is now overwhelming that the tissue surrounding chronic intravascular devices is not primarily composed of fibrin. Rather, it represents an organized fibro-cellular foreign-body response consisting of collagen, smooth muscle cells, fibroblasts, endothelial cells, and extracellular matrix.

The term *fibroblastic sleeve* therefore provides a more accurate and biologically meaningful description than the historical term *fibrin sheath*.

VAS, WoCoVA, and IVAS collectively advocate for the adoption of standardized, evidence-based terminology that accurately reflects the underlying pathophysiology of vascular access device complications. Our societies encourage clinicians, researchers, scientists, journal editors, industry partners, other professional societies, and clinical guideline committees to consistently use precise terminology, including the appropriate designation of the *fibroblastic sleeve*, in future scientific publications, clinical practice documents, educational materials, and professional communications.

Consistent application of this precise nomenclature is expected to improve clarity, facilitate the correct interpretation and comparability of research findings, and support evidence-based clinical decision-making across the vascular access community, thereby ensuring accurate description of the *fibroblastic sleeve*.

Standardizing terminology to describe *fibroblastic sleeve* will lead to safer, more rational management of this condition, provide a greater understanding of device-tissue interactions, enhance research quality, and accelerate the development of next-generation, truly biocompatible intravascular devices.

The time has come to finally retire the term *fibrin sheath* and replace it with terminology that accurately reflects biological reality: *fibroblastic sleeve*.

Author note

A Joint Position Statement from the World Congress of Vascular Access (WoCoVA), the Italian Vascular Access Society (IVAS), and the Vascular Access Society (VAS).

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Informed consent

All authors and co-authors give full consent to this manuscript submission and publication of this position statement.

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References

1. Carr P, Higgins N, Cooke M, et al. Vascular access specialist teams for device insertion and prevention of failure. *Cochrane Database Syst Rev* 2018; 3: CD011429.
2. Pinelli F, Firenzuoli F, Romagnoli S, et al. Appropriate selection of vascular access devices in the hospitalized patient: a prospective observational pilot study. *J Anesth Analg Crit Care* 2026; 6: 53.

3. Pinelli F, Balsorano P, Mura B, et al. Reconsidering the GAVeCeLT Consensus on catheter-related thrombosis, 13 years later. *J Vasc Access* 2021; 22(4): 501–508.
4. Passaro G, Pittiruti M and La Greca A. The fibroblastic sleeve, the neglected complication of venous access devices: a narrative review. *J Vasc Access* 2021; 22(5): 801–813.
5. Trezza C, Califano C, Iovino V, et al. Incidence of fibroblastic sleeve and of catheter-related venous thrombosis in peripherally inserted central catheters: a prospective study on oncological and hematological patients. *J Vasc Access* 2021; 22(3): 444–449.
6. Motin J, Fischer G and Evreux J. Importance of the subclavicular route in prolonged resuscitation (apropos of 154 cases). *Lyon Med* 1964; 212: 583–593.
7. Hoshal VL, Ause RG and Hoskins PA. Fibrin sleeve formation on indwelling subclavian central venous catheters. *Arch Surg* 1971; 102(4): 353–358.
8. Xiang DZ, Verbeken EK, Van Lommel AT, et al. Composition and formation of the sleeve enveloping a central venous catheter. *J Vasc Surg* 1998; 28(2): 260–271.
9. Xiang DZ, Verbeken EK, Van Lommel AT, et al. Sleeve-related thrombosis: a new form of catheter-related thrombosis. *Thromb Res* 2001; 104(1): 7–14.
10. Forauer AR, Theoharis CG and Dasika NL. Jugular vein catheter placement: histologic features and development of catheter-related (fibrin) sheaths in a swine model. *Radiology* 2006; 240(2): 427–434.
11. Sylvia CJ Jr, Wagel MA, Giare-Patel K, et al. Chlorhexidine-coated peripherally inserted central catheters reduce fibroblastic sleeve formation in an in vivo ovine model. *J Vasc Access* 2018; 19(6): 644–650.
12. Wilson CJ, Clegg RE, Leavesley DI, et al. Mediation of biomaterial–cell interactions by adsorbed proteins: a review. *Tissue Eng* 2005; 11(1–2): 1–8.
13. Ben Z, Wang J, Zhan J, et al. Ultrasonic characteristics of inserted central catheter related fibroblastic sleeve. *Sci Rep* 2025; 15(1): 4319.
14. King HL, Padilla-Lazos T, Chitkara A, et al. Unveiling the complexities of catheter-related thrombosis: risk factors, preventive strategies, and management. *J Thromb Thrombolysis* 2025; 58(3): 443–457.