



# Cerebral Aneurysms: Enhancing the Performance of Neurovascular Catheters

Advancements in neuroimaging technology have led to an increase in the early detection and treatment of unruptured intracranial aneurysms (UIAs). While minimally invasive catheter-based procedures continue to remain the gold standard of treatment, device makers face critical challenges in developing newer, more capable devices to meet growing market demand.



**Market:** Medical Device

**Sub-Market:** Neurovascular

**Body Part:** Brain

**Condition:** Cerebral Aneurysm

**Device:** Neurovascular Catheters

**Zeus Product:** StreamLiner™ NG



# Cerebral Aneurysms



A cerebral aneurysm, or intracranial aneurysm, is a bulge in an artery or vein caused by a weakness in the blood vessel wall. Left untreated, the weakened and thinned blood vessel can continue to balloon outward, ultimately rupturing and spilling blood into the brain – a condition known as a hemorrhagic stroke.

Worldwide, cerebral aneurysms account for nearly 500,000 deaths annually. In the United States alone, a cerebral aneurysm ruptures every 18 minutes, with nearly 50% of cases resulting in death.<sup>[1]</sup> Treating aneurysms before they rupture, therefore, is of critical importance.

Today, minimally invasive catheter-based procedures are among the most effective methods for treating

unruptured intracranial aneurysms (UIAs). As advancements in neuroimaging modalities have continued to increase the early detection rate of UIAs, so too has the demand for minimally invasive devices capable of better treating these conditions, with the global intracranial aneurysm market projected to grow at a compound annual growth rate (CAGR) of 9.12% from 2024 to 2030.<sup>[2]</sup>

1 cerebral aneurysm ruptures every...

# 18 Min.

in the United States.

Source:  
<https://www.bafound.org/statistics-and-facts>

Global intracranial aneurysm market projected to expand at a CAGR of...

# 9.12%

Source:  
<https://www.grandviewresearch.com/industry-analysis/intracranial-aneurysm-market>



# Neurovascular Constraints

While many options exist for treating cerebral aneurysms, ranging from lifestyle changes and medication to open surgery, the most common approach is via minimally invasive catheter-based procedures such as endovascular coiling.

In these procedures, a series of neurovascular catheters are guided through the vasculature to the opening of the aneurysm where a variety of therapy options may be used to ultimately seal off the aneurysm to prevent it from rupturing.

Perhaps the most critical aspect of the procedure is successfully navigating the catheters to and from the treatment site without failure. The delicate and tortuous vasculature of the brain requires neurovascular catheters to not only be incredibly soft and flexible, but also possess high strength in order to successfully deliver therapies without failure – a difficult engineering feat.

Furthermore, as the need for even smaller and more capable catheters continues to rise, device engineers are faced with progressively more difficult material selection and design dilemmas, often becoming increasingly reliant on the catheter liner itself to shoulder much of the burden of the ever-evolving performance requirements of next-gen designs.

While many neurovascular catheters utilize film-cast PTFE liners due to their desirable mix of ultra-thin walls, lubricity, and flexibility – there are limitations. Inherently, existing film-cast liners are prone to surface imperfections and pinholes as a byproduct of the legacy casting process, which can have a negative impact on mechanical performance and reliability, as well as manufacturing yield. As such, for continued device innovation in this field, it is clear that more advanced film-cast PTFE liners are needed.



## Top Design Challenges & Considerations

- Small Diameter Vasculature
- Tortuous and Delicate Anatomical Pathways
- Need for Soft and Flexible, Yet Strong Catheter Liners

Minimize Defects, Maximize Strength and Performance  
**INTRODUCING STREAMLINER™ NG**

An ultra-thin and flexible film-cast PTFE liner  
 engineered for *maximum strength* with *minimal defects*.

As a result of Zeus' proprietary film-cast process, which minimizes defects and pinholes, StreamLiner™ NG catheter liners take flexibility, mechanical performance, and reliability to the next level while still featuring the exceptional sizing and tolerances that the StreamLiner™ series is known for.

**Remarkable Burst & Yield Strength**

Zeus' proprietary film-cast process results in remarkable burst and yield strength, helping enhance mechanical performance of the finished device.

**Minimal Scrap**

Fewer pinholes, fewer problems. The ultra-low occurrence of imperfections and pinholes in StreamLiner™ NG liners can help improve manufacturing efficiencies and production yields.

**High Concentricity**

StreamLiner™ NG liners feature highly consistent wall thicknesses, helping to provide tighter OD tolerances for the finished device, as well as improved consistency in device performance.

**Exceptional Sizing & Flexibility**

True to the StreamLiner™ name, StreamLiner™ NG catheter liners are available in a wide range of sizes, with IDs as low 0.017" (0.432 mm) and nominal wall thicknesses down to 0.0005" (0.0127 mm).



FEATURES

# StreamLiner™ NG

## Proprietary Film-Cast Process

Zeus' novel film-cast process produces exceptionally consistent liners with minimal defects and pinholes, helping pave the way for lower manufacturing costs and higher production yields.

## Remarkable Strength

The remarkable burst and yield strength of StreamLiner™ NG provides engineers with more options for designing devices capable of successfully delivering therapies deep within the brain.

## Extremely Thin & Uniform Walls

Nominal wall thicknesses as low as 0.0005" (0.0127 mm). These ultra-thin walls enable catheter designs to maintain a minimal outer diameter to successfully traverse the complex vasculature of the brain, or a maximized inner diameter for improved delivery performance of therapies in the brain.

## Tight Tolerances

Wall thickness tolerance of  $\pm 0.00025''$  (0.00635 mm). Our state-of-the-art processes allow us to manufacture film-cast PTFE liners to tight tolerances, enabling device engineers to create catheters to exact specifications for use in specialized neurovascular scenarios.

## Biocompatible

StreamLiner™ liners are manufactured from USP Class VI materials, giving OEMs important assurance that these liners are safe for use within the body.

## High Lubricity

PTFE's low coefficient of friction allows devices, such as embolic coils, to slide through the delivery system more easily, helping them reach the treatment location without failure.





AVAILABLE SIZES

# StreamLiner™ Series

All PTFE StreamLiner™ catheter liners are produced based on customer specifications and the table below is a general capability guide. All material can be etched on the OD to enhance adhesion. For even greater jacket-to-liner adhesion, a tie layer coating may also be applied.

PTFE StreamLiner™			
	StreamLiner™	StreamLiner™ OTW	StreamLiner™ NG
MATERIAL	PTFE	PTFE	PTFE
PROCESS	Free-Extruded	Extruded Over-The-Wire	Proprietary Film-Cast
MANDREL	None	Silver-plated copper, Stainless steel	Silver-plated copper, Stainless steel
INSIDE DIAMETER (ID)	0.004" – 0.120" (0.102 mm – 3.048 mm)	0.013" – 0.0915" (0.330 mm – 2.3241 mm)	0.017" – 0.0915" (0.432 mm – 2.3241 mm)
ID TOLERANCE	± 0.0005" – 0.001" (± 0.0127 mm – 0.025 mm)	± 0.0005" (± 0.0127 mm)	± 0.0005" (± 0.0127 mm)
NOMINAL WALL THICKNESS	0.0005" – 0.00075" (0.0127 mm – 0.01905 mm)	0.0004" – 0.00075" (0.0102 mm – 0.01905 mm)	0.0005" – 0.00075" (0.0127 mm – 0.01905 mm)
WALL TOLERANCE	± 0.00025" (± 0.00635 mm)	± 0.0002" – 0.00025" (± 0.0051 mm – 0.00635 mm)	± 0.00025" (± 0.00635 mm)
CUT LENGTH	86" Max.* (2184.4 mm Max.)	86" Max. (2184.4 mm Max.)	86" Max. (2184.4 mm Max.)
SURFACE TREATMENTS	Etched, Tie Layer	Etched	Etched, Tie Layer
STERILIZATION METHODS	Autoclave, EtO	Autoclave, EtO	Autoclave, EtO
STRENGTH	●●●●○	●●●●○	●●●○○
FLEXIBILITY	●●●●○	●●●●●	●●●●●

\* Liners with a Tie Layer have a maximum cut length of 78" (1981.2 mm).

StreamLiner™ and StreamLiner™ OTW may be shipped with product labels that feature VT, XT, or UT size designations. VT represents a standard nominal wall thickness of 0.00075" (0.01905 mm). XT represents a standard nominal wall thickness of 0.0005" (0.0127 mm). UT represents a standard nominal wall thickness of 0.0004" (0.0102 mm)



## Advancing Aneurysm Outcomes

Cerebral aneurysms remain a major cause of death and disability worldwide, with nearly 50% of all ruptured aneurysms resulting in death. Of those who do survive a ruptured aneurysm, roughly 66% face permanent neurological damage as a result<sup>[1]</sup>

As advancements in imaging modalities such as MRIs, CT scans, and angiograms continue to detect UIAs earlier, the demand for corrective procedures to address the potentially fatal condition will continue to rise.

While minimally invasive catheter-based procedures remain an effective treatment option for many UIAs in various anatomical locations, the desire to improve the efficacy in harder-to-reach diseased areas of the brain remains a critical challenge for medical device OEMs – one that requires advanced catheter componentry to achieve.

Existing film-cast PTFE liners face inherent strength limitations as a byproduct of the legacy casting process, potentially limiting their effectiveness in certain applications. StreamLiner™ NG catheter liners help engineers overcome these limitations.

By embracing StreamLiner™ NG, engineers can design stronger and more effective neurovascular catheters capable of advancing further into the brain than ever before to deliver these critical lifesaving therapies.



# References

[1] Statistics and Facts - Brain Aneurysm Foundation. Brain Aneurysm Foundation. Published January 3, 2025. Accessed February 14, 2025. <https://www.bafound.org/statistics-and-facts>

[2] Intracranial Aneurysm Market Size & Share Report, 2030. Grand View Research. Published 2023. Accessed February 14, 2025. <https://www.grandviewresearch.com/industry-analysis/intracranial-aneurysm-market>



[zeusinc.com](http://zeusinc.com) | [info@zeusinc.com](mailto:info@zeusinc.com)

Americas: +1 803 268 9500 | Europe: +353 74 9109700 | Asia-Pacific: +(86)20 38254906