

Minimally Invasive Approaches to Carotid Artery Stenting: Enhancements in Safety and Efficacy

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DESCRIPTION

Carotid artery stenosis, the narrowing of the carotid arteries typically due to atherosclerosis, is a major cause of ischemic stroke. It occurs when plaque builds up in the arteries that supply blood to the brain, increasing the risk of blood clots and reducing cerebral blood flow. However, in recent years, Carotid Artery Stenting (CAS), a minimally invasive procedure, has become an increasingly viable alternative, providing several advantages in terms of safety, efficacy, and recovery times.

Carotid artery stenting

Carotid artery stenting involves the insertion of a stent a small mesh tube into a narrowed or blocked carotid artery to hold it open and improve blood flow to the brain. The procedure is typically performed under local anesthesia with sedation, making it significantly less invasive than the traditional open surgery, carotid endarterectomy.

Enhancements in safety

One of the major advantages of minimally invasive carotid artery stenting is its lower complication rate compared to traditional carotid endarterectomy, especially in high-risk patients. However, like any procedure, carotid stenting carries inherent risks, such as stroke, periprocedural complications, and vascular injury. Recent innovations have significantly enhanced the safety profile of carotid artery stenting.

Advanced stent design: The design of carotid stents has evolved considerably over the past two decades. Early stents were often rigid and difficult to deploy, which increased the risk of complications like arterial dissection or restenosis (re-narrowing of the artery). Today's flexible, self-expanding stents are designed to conform more naturally to the shape and size of the carotid artery. They offer better radial force, meaning they can open the artery more effectively without causing damage to the arterial walls.

Improved imaging and navigation: Modern imaging technologies, such as high-resolution Intravascular Ultrasound (IVUS) and fluoroscopy, allow for better real-time visualization during the procedure. IVUS provides detailed images of the artery's inner walls, enabling the interventionalist to assess plaque composition and arterial wall characteristics with unprecedented accuracy. This allows for more precise stent placement and reduces the risk of procedural complications.

Enhanced access and technique: In the past, carotid stenting required large access incisions, but with advances in percutaneous access techniques, the procedure can now be performed through a small incision, typically in the groin. Radial artery access has also become increasingly popular, allowing for less trauma, reduced risk of infection, and quicker recovery times. This less invasive approach contributes to a shorter hospital stay and faster patient recovery compared to traditional surgery.

Enhancements in efficacy

Carotid artery stenting has been shown to be an effective treatment for carotid stenosis, with studies demonstrating similar or superior outcomes compared to endarterectomy in certain patient groups. While the procedure carries some inherent risks, recent innovations have helped improve its overall efficacy.

Personalized patient selection: One of the key advances in the efficacy of carotid artery stenting is improved patient selection. Not all patients with carotid artery disease are suitable candidates for stenting, and careful patient selection is essential to achieving optimal outcomes. Factors such as the degree of stenosis, plaque composition, and patient comorbidities (such as diabetes or hypertension) are now more thoroughly assessed, ensuring that stenting is performed in those most likely to benefit from the procedure.

Enhanced stent development techniques: The advent of robotic-assisted stenting and advanced catheter technology has

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Received: 26-Nov-2024, Manuscript No. AOA-24-35878; **Editor assigned:** 29-Nov-2024, PreQC No. AOA-24-35878 (PQ); **Reviewed:** 13-Dec-2024, QC No. AOA-24-35878; **Revised:** 20-Dec-2024, Manuscript No. AOA-24-35878 (R); **Published:** 27-Dec-2024, DOI: 10.35841/2329-9495.24.12.534

Citation: Antony C (2024). Minimally Invasive Approaches to Carotid Artery Stenting: Enhancements in Safety and Efficacy. Angiol Open Access. 12.534.

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significantly improved the precision and control during stent deployment. These innovations help ensure that the stent is accurately positioned within the carotid artery, optimizing the potential for successful outcomes and reducing the risk of complications such as dissection or incomplete stent expansion.

Post-procedure management: Post-procedure management, including the use of antiplatelet therapy and careful monitoring for complications, has improved significantly. Dual Antiplatelet Therapy (DAPT), which involves the use of aspirin and clopidogrel, is routinely prescribed following stent placement to prevent thrombosis and reduce the risk of stroke.

CONCLUSION

Minimally invasive carotid artery stenting has emerged as a valuable alternative to carotid endarterectomy, especially for

high-risk patients and those with complex arterial anatomy. The evolution of stent design, the refinement of imaging techniques, and improvements in patient selection have significantly enhanced the safety and efficacy of the procedure. With continued advancements in technology and technique, carotid artery stenting is poised to become an even more effective and accessible treatment for carotid artery stenosis, providing patients a safer and faster route to recovery with favorable long-term outcomes. As these innovations continue to optimise the field of interventional cardiology, carotid stenting holds the potential to drastically reduce the risk of stroke and improve the quality of life for many patients.