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The multiple arterial pore structures of hemodialysis catheters reduces suction towards a vessel wall

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Event Website: <https://www.globalcea.org/icehtmc>



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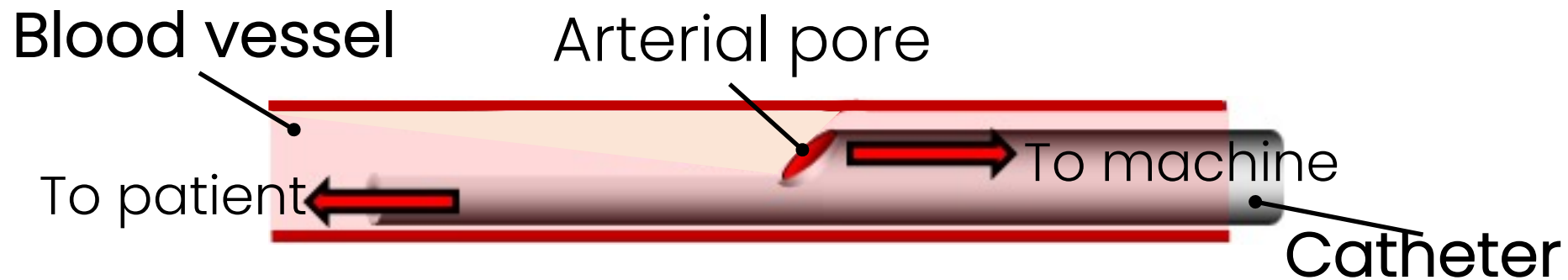
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Description

Vessel wall suction caused by hemodialysis catheter



- ✓ The catheter's arterial pore often exerts suction towards the vessel wall.

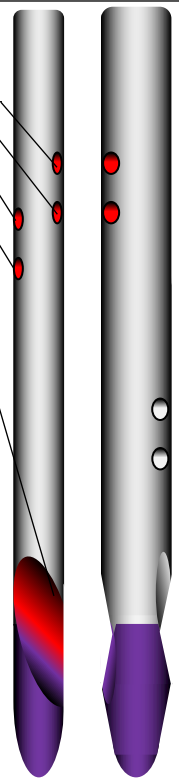
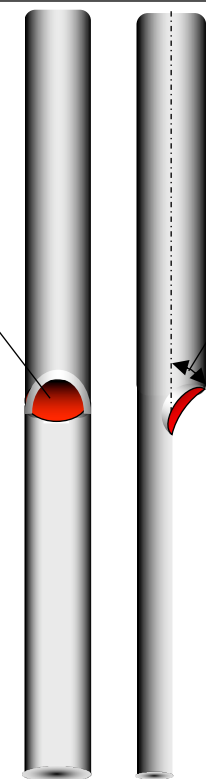
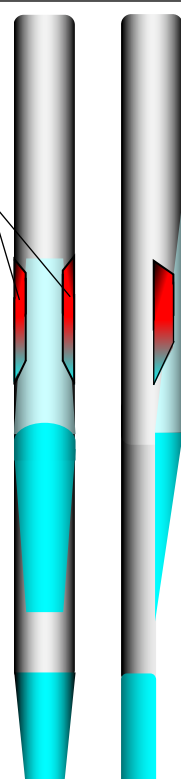
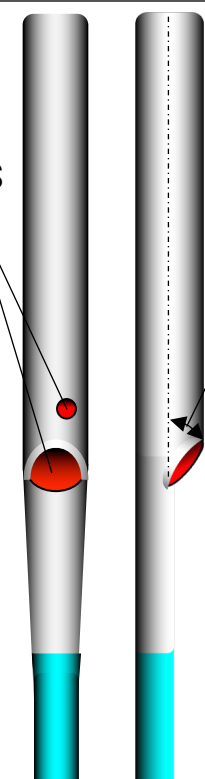
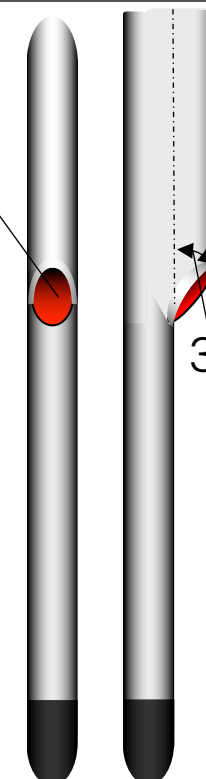
Van Canneyt K, et al. Int J Artif Organs, 36, 17-27, 2013.

Goals of the project and final users that will benefit

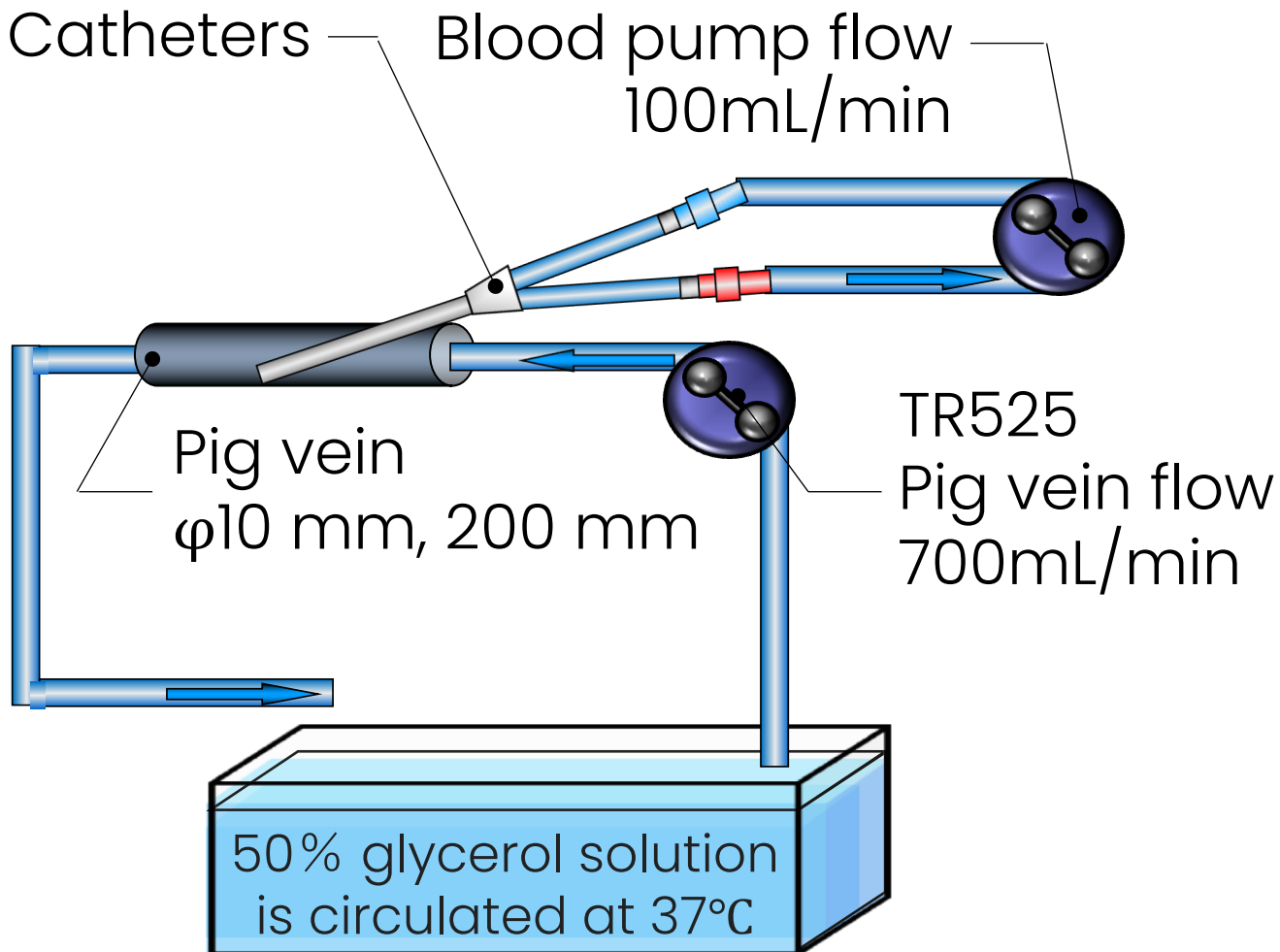
To investigate whether the arterial pore structure on the catheter's end influences vessel wall suction.

We believe that we can supply trouble-free catheters to patients and medical staff.

Structure of the catheter's tip

	Power Trialysis [®]		Gam Cath [®]		Gentle Cath [™]		Twin End		Niagara [™] Slim	
Outer diameter [mm]	3.6	5.2	4.2	4.2	3.9	3.9	3.9	3.9	3.9	5.1
										
Number of side holes	4		none		2		1		none	
Number of end holes	1		1		none		1		1	

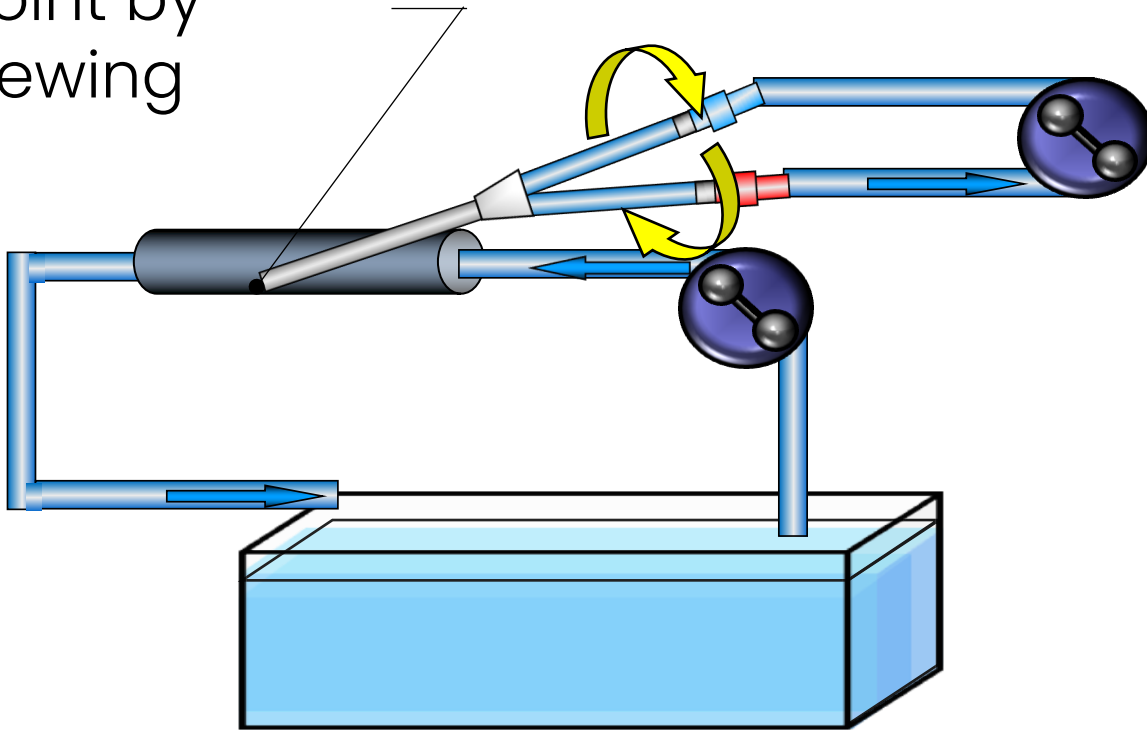
Catheter's evaluation system



- ✓ A two-blood pump was used as blood purification machine.
- ✓ The blood pump flow rate was set at 100 mL/min.
- ✓ Catheters were connected to the blood circuit.
- ✓ Extracted pig vein was used.
- ✓ Catheters were inserted into an *ex-vivo* pig vein.
- ✓ The pig vein was connected to the blood circuit and filled with a 50% glycerol solution circulating at 700 mL/min.

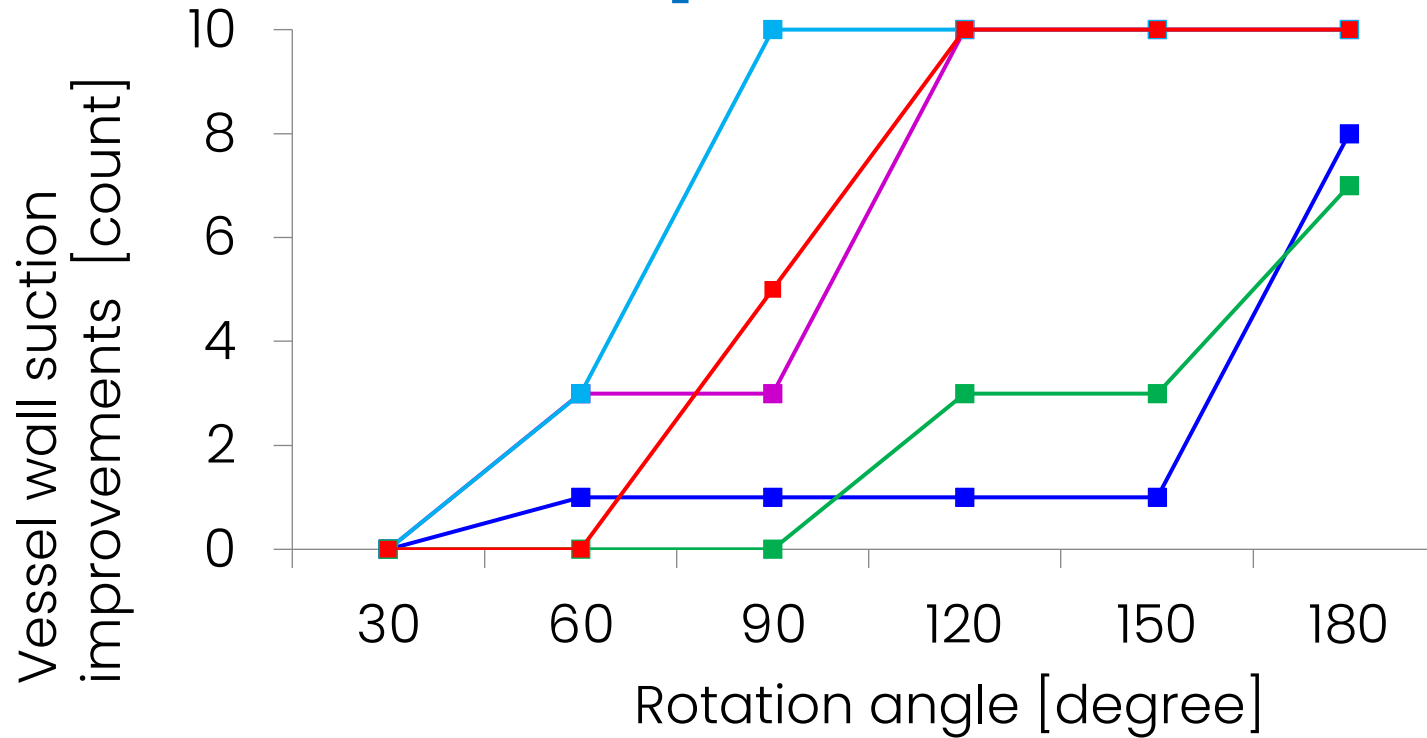
Reducing vessel wall suction

Observation point by viewing

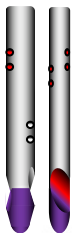


- ✓ The catheter's arterial pore was positioned near the vein's wall.
- ✓ When the catheter's pore was suctioned toward the vessel wall, we tried to reduce the direction by 30 degrees/sec.
- ✓ The number of vessel wall suction improvements was counted.
- ✓ These results were evaluated in 10 experiment replications.

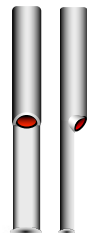
Vessel wall suction improvement



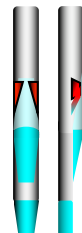
 Trialysis



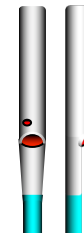
 Gam Cath



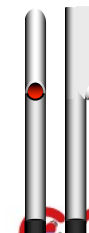
 Gentle Cath



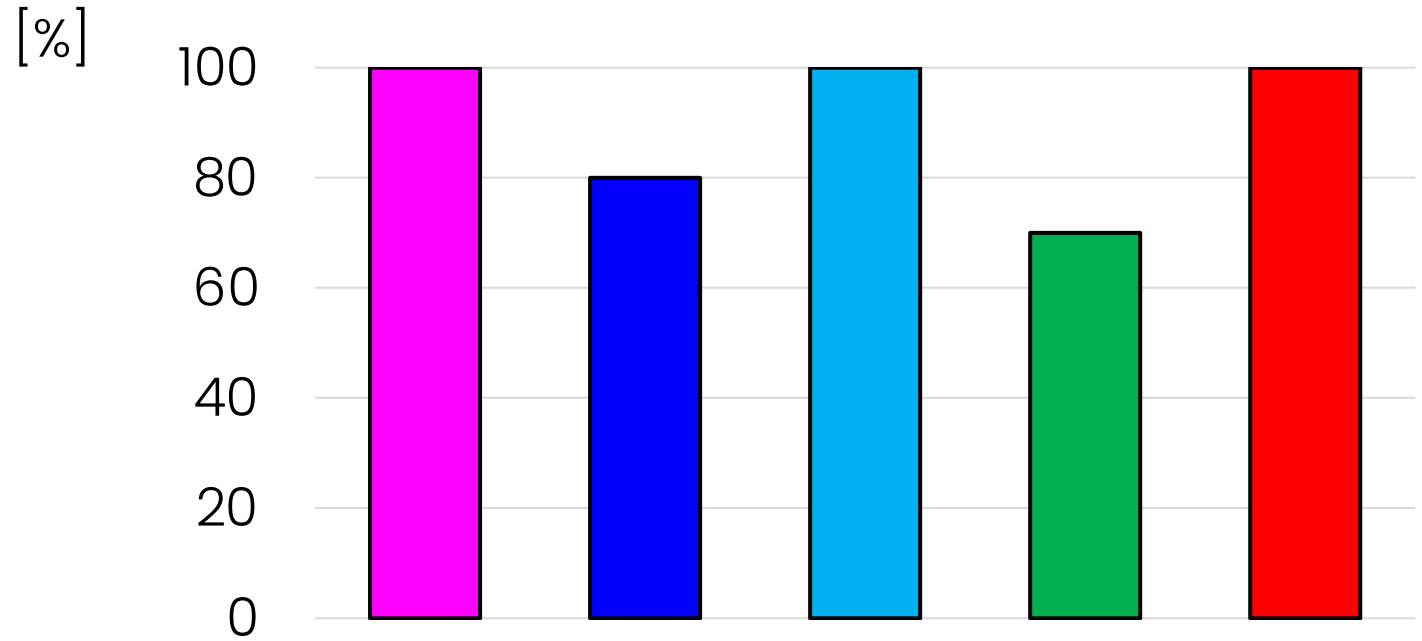
 Twin End



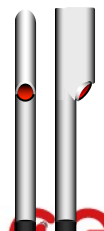
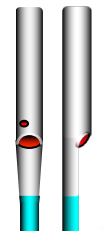
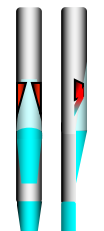
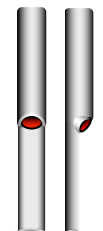
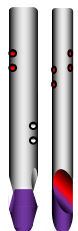
 Niagara Slim



Ratio of vessel wall suction improvement following 180 degrees rotation

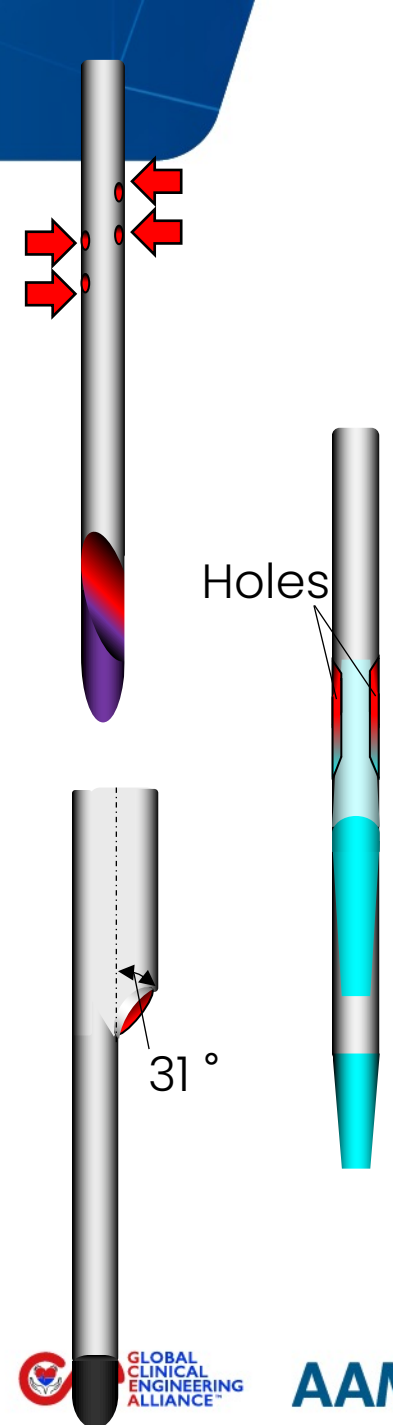


 Trialysis  Gam Cath  Gentle Cath  Twin End  Niagara Slim



Discussion

- ✓ Vessel wall suction were well improved with the use of Trialysis, Gentle Cath, and Niagara Slim.
- ✓ Trialysis has four side holes on different sides and a screw-shaped end-hole.
- ✓ Gentle Cath has two long holes on different sides
 - ⇒ Vessel wall suction was easily improved by these structures, particularly by side holes on different sides.
- ✓ Niagara Slim lacks some side holes and presents an oval end-hole structure with the largest angle.
- ✓ It was therefore considered that the catheter structure as well as the side holes are important.



Conclusion

Our results suggest that the structure of the catheter's tip significantly influences vessel wall suction and a careful tip design may improve the catheter's performance.

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