

Your key to Vascular Access



Prolonged catheter survival with GamCath® Dolphin® Protect Technology

Catheters with antibacterial and antithrombogenic properties are important in the management of patients with acute kidney insufficiency. Recent advances in catheter technology have resulted in the development of catheters with either of these properties and very few catheters have both features. Gambro's Dolphin® Protect is an innovative technology which enhances catheter survival time due to its state of the art coating technology offering both antibacterial and antithrombogenic properties, with no release of pharmaceuticals into the blood stream.¹ As a prominent nephrologist and leading expert in the field of transplantation and nephrology, Dr Pascal Meier provided an update on developing research in this area. He focused on the benefits provided by Gambro's Dolphin® Protect innovative coating technology in the clinical setting.

Introduction

The ability to reduce infections and thrombotic events in invasive medical devices, such as catheters for vascular access, can lead to extended device survival periods.² The innovative micropatterned-coating technology in GamCath® catheters with Dolphin® Protect coating marks a major advancement in catheter survival as it improves biocompatibility³ and reduces the risk of infection.¹ In a randomized, crossover, single-blinded study, the GamCath® Dolphin® Protect coated catheter resulted in a significant increase in catheter survival time and a decrease in the incidence of catheter failure.^{4,5}

Acute kidney insufficiency and vascular access

Continuous renal replacement therapy (CRRT) is increasingly required for critically-ill patients with acute kidney insufficiency.⁴ Thrombus formation in catheters remains a major problem that compromises dialysis adequacy, shortens the lifespan of an access and results in frustration for both the patients and medical staff.⁶ Bacterial adhesion and biofilm formation on invasive medical devices are additional causes for concern, as they may lead to bloodstream infections, prolonged hospitalization and high mortality rates.⁷

Catheter surface micropatterning can moderate interaction between cells, plasma proteins and the catheter surface which enhances biocompatibility and can avoid catheter occlusion.⁸ The presence of a functional antibacterial access system reduces the risk of bacterial colonization and catheter-related bloodstream infection.⁹

Therefore, Gambro's Dolphin® Protect coating provides a significant improvement in vascular-access therapy, due to its **patented antibacterial and antithrombogenic protective coating**, as demonstrated in Figure 1.

Antibacterial and antithrombogenic protection with GamCath® Dolphin® Protect coated catheter

Highlights of Gambro's Dolphin® Protect innovative coating technology^{4,10}

A randomized, crossover, single-blinded study in CRRT patients with acute kidney injury (n=236) showed that patients using a

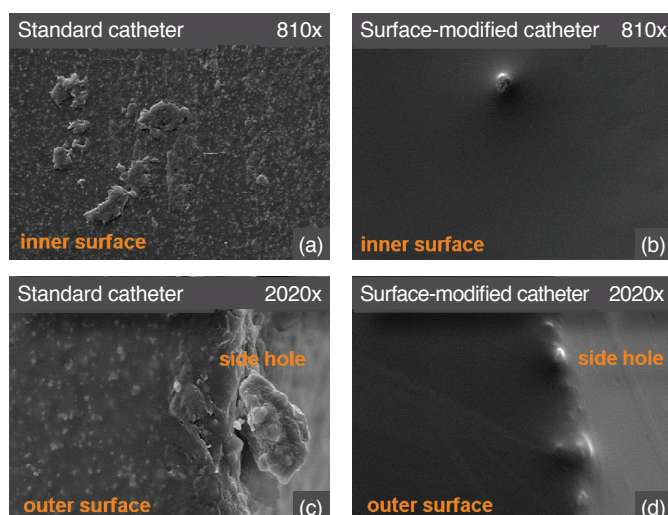


Figure 1: Structure of the surface modified polyurethane catheters. (a) Standard catheter inner surface (810x), (b) surface-modified catheter with inner smooth surface due to coating (810x), (c) standard catheter outer surface (2020x) and (d) surface-modified catheter with smooth outer surface due to coating (2020x).

surface-modified double lumen catheter (smDLC; n = 118) had increased catheter survival periods (116 ± 38 hours versus 92 ± 27 hours; $P = 0.004$)⁴ compared with patients using a standard double-lumen catheter (sDLC; n = 118) in whom the catheter change was more frequent ($P = 0.03$).¹⁰ Compared with standard catheters, surface-modified catheters demonstrated significantly higher blood flow rates (Figure 2a),^{4,10} higher patency rates at various time points (Figure 2b)¹⁰ and lower thrombosis episodes per 1,000 days (Figure 2c).^{4,10} Both types of catheters resulted in reduced recirculation rates (as measured by the Transonic device) but further reduced recirculation was achieved using the surface-modified catheters (Figure 2d).¹⁰

Higher CRRT dose delivered

The use of surface-modified catheters resulted in a large percentage of the patients achieving $\geq 79\%$ of the prescribed CRRT dosage compared with patients using a non-surface-modified catheter (79% versus 66%; $P = 0.02$).¹⁰ Malfunction of temporary catheters (blood flow rates <150 mL/min) after

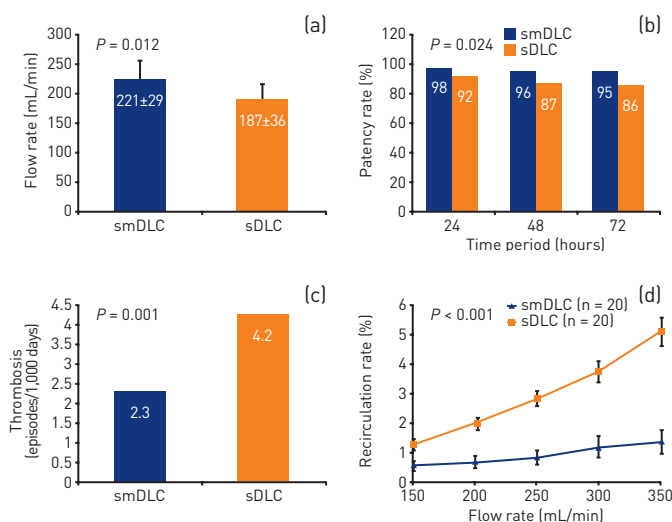


Figure 2: (a) Higher blood flow rates, (b) higher patency rates, (c) lower thrombosis rates and (d) lower recirculation rates with GamCath® Dolphin® Protect coated catheter (smDLC).^{4,10}

72 hours of CRRT occurred in 5% and 14% of the smDLC and sDLC respectively ($P = 0.001$) and premature removal was required due to blood flow problems in 3.1% and 12.4% of patients respectively.¹⁰

Higher CRRT dosage delivered with GamCath® Dolphin® Protect coated catheter

Cost-effectiveness due to prolonged catheter life

Cost-analysis has shown that frequent catheter change due to dysfunction or thrombosis can result in a higher cost to the patient. A 3-year study has shown that non-modified catheters are changed twice as frequently as surface-modified catheters, resulting in increased duration of hospital stay to achieve the same number of treatment hours. The mean cost for a temporary catheter exchange is 755.80 CHF (equivalent to 707.38 USD), resulting in higher costs of treatment with sDLC catheter compared with smDLC (15,116 ± 735 CHF versus 6,065 ± 403 CHF respectively)¹⁰ [equivalent to 14,147 USD versus 5,676 USD; based on forex rates on 3 March 2010].

Improved cost benefits with GamCath® Dolphin® Protect coated catheter

Innovative coating reduces infection risk

The innovative GamCath® Dolphin® Protect coating avoids complications and eases costs associated with catheter-related bloodstream infections.¹¹ The microdomain structure of the GamCath® Dolphin® Protect coated catheter reduces interaction between cells, plasma proteins and the surface of the catheter, thus preventing biofilm formation.³ Additionally, the antibacterial bismuth additive in the GamCath® Dolphin® Protect coating impairs bacterial adhesion and proliferation.¹ The occurrence of catheter-related bloodstream infection or local bleeding due to all organisms are less frequent with a GamCath® Dolphin® Protect coated catheter compared with a standard catheter (129 versus 43), resulting in reductions in the number of episodes per 1,000 temporary catheter days (3.4 versus 9.3; $P = 0.008$).¹⁰

Table 1: Catheter-related blood stream infection or local bleeding¹⁰

Complications	Number of cases with smDLC	Number of cases with sDLC	P-value
All organisms	3	9	0.012
Coagulase-negative <i>Staphylococcus</i>	2	3	0.068
<i>S. aureus</i>	1	3	0.016
Gram-negative bacteria	0	2	0.013
Other Gram-positive cocci	0	1	0.032
Bleeding	2	1	0.69

Conclusion

The micropatterned antibacterial surface coating of the GamCath® Dolphin® Protect coated catheter significantly prolongs catheter survival time and reduces the incidence of catheter failure due to lower thrombosis rates and reduced bacterial colonization. This makes the GamCath® Dolphin® Protect coated catheter beneficial for critically ill patients needing CRRT.

Gambro's Dolphin® Protect innovative coating technology on the catheter results in:

- prolonged catheter survival
- higher patency rates for the catheter
- improved blood flow rates
- reduced thrombosis rates
- lower incidence of catheter malfunction
- less frequent premature removal of the catheter
- impaired bacterial colonization
- enhanced cost savings
- no release of pharmaceuticals into the blood stream

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For more information

<http://www.gambro.com>

Speaker biography



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