Palindrome™
Precision Chronic Dialysis Catheter Family
Confidence is Essential

Palindrome™ Precision Family of Catheters

Increased tip visualization to aid in preserving access with initial placement. Promoting optimized patient care. From their patented design to their innovative coatings and precision tip technology, the Palindrome™ precision family of chronic haemodialysis catheters reflect the Covidien legacy of performance and confidence in innovation.

Dialysis is Critical...

High Flow Rates

The Palindrome™ precision dialysis catheter – with its internal lumen design, 14.5Fr diameter, and durable Carbothane™ material – is able to deliver high flow rates.1, 2

- High tensile strength material and internal lumen design optimise inner diameter integrity without compromising flexibility or kink resistance.1, 2

Dependable Patency

Symmetric tip design and laser-cut side slots promote catheter patency.7

- Specifically designed side slots reduce the likelihood of positional occlusion.6
- Laser-cut surfaces designed to discourage clot formation and minimise debris attachment.
- Tip design promotes continuous flow between dialysis treatments.2, 9

Reduces Recirculation

The Palindrome™ precision catheter reduces recirculation rates to meet KDOQI guidelines when in forward or reverse flow.4

- Studies show that dialysis lines are frequently reversed.11
- When lines are reversed, blood recirculation increases.12

Reduced Intervention Rate

In one clinical study, Palindrome™ SI—silver ion antimicrobial dialysis catheter had statistically significant results showing lower instances of surgical re-intervention due to thrombosis as compared to a split-tip catheter design. (Palindrome™ catheter = 5, Split Tip = 32, n = 200, p < .001)2, 4, 5, 14

Tal VenaTrac™ Insertion Stylets

Given the wire insertion technique, creating a staggered tip effect for smoother left sided or subclavian catheter placements and eliminates the need to use a pull apart sheath. When compared to the subclavian insertion, this design:

- Reduces risk of air embolism.13
- Reduces blood loss.13
- Promotes over the wire catheter exchanges.2
- Allows for sheathless catheter insertions.2

Effective Performance and Durability Designed for the Patient

Covidien’s dialysis catheter back-end design has been setting the standard of quality for over twenty years:

- Halkey-Roberts™* clamps and Ultem™* adapters are composed of durable materials
- Silicone extensions minimise kinking or crimping.3, 4

Testing is based on Pre-clinical animal data.
Covidien’s Palindrome™ precision dialysis catheter facilitates increased tip visualisation and accurate tip placement.¹

The Clinical Challenge
Early Catheter Failure

- Poor tip position accounts for 20% of early catheter removals.¹
- Performance and durability of the catheter have been shown to improve by positioning the catheter tip within the right atrium.¹
- Post-insertion, early cause of low catheter blood flow rate include catheter malposition and other mechanical problems.¹
- Paying careful attention to catheter tip position could reduce the early failure rate.¹

The Solution: Palindrome™ Precision Dialysis Catheter

Palindrome™ precision dialysis catheter allows the inserting physician to distinguish the functional tip of the catheter and visualise the accurate placement of the tip into the right atrium using fluoroscopy and x-ray.¹

The tungsten marker band is securely attached to the catheter using a heat bonded process. Product testing demonstrates a robust attachment to the catheter with no detectable delamination in vitro.¹, ⁴, ⁵

Increasing tip visualisation

Technology in practice

1) Palindrome™ precision dialysis catheter
Radiopaque tungsten marker band allows the inserter to distinguish the functional tip of the catheter and visualise the placement of the tip in the right atrium on fluoroscopy and x-ray.¹

2) Enhanced laser-cut side slots
In a computational model, the laser cut side slots have been enhanced to reduce total shear stress on the inflow side slot: adding an additional benefit to the laser cut side slots of the Palindrome™ family of catheters.²

3) Optimised tip geometry
Aids in reduction of insertion force when using the Tal VenaTrac™ insertion stylets to place a catheter.²

Covidien’s Palindrome™ precision dialysis catheter facilitates increased tip visualisation and accurate tip placement.¹
Covidien’s non-eluting heparin coating reduces the likelihood of clot formation on the catheter surface.2, 3, 14, 15

1) Decreases likelihood of clot formation
In vivo testing demonstrated an 82% reduction in thrombus accumulation.2, 5, 14 In vitro testing showed a 60% reduction in platelet adhesion on the surface as compared to non-coated catheters.14

2) Inhibits fibrin sheath propagation
Supported by in vivo data, the non-eluting heparin coating has been shown to inhibit fibrin sheath propagation as compared to non-coated catheters.4

3) Long-lasting effectiveness
Tested in a shear flow model, the heparin coating remained intact after 720 hours of continuous flow, simulating thirteen months of dialysis treatment.21

The Clinical Challenge: Clotting
- As many as 40% of catheter failures are attributed to venous thrombosis and fibrin sheath formation.17
- Approximately 17%-30% of catheter removals are attributed to thrombosis.18
- Complications from thrombosis result in inadequate flow rates, longer dialysis times and increased costs.19

The Solution: Non-Eluting Heparin Coating Technology
Covidien’s non-eluting heparin coating covers the external surface of the catheter from tip to cuff, and internally from tip to adapters, to provide protection.

The heparin coating has a triple-action formula:
Heparin: Anti-Thrombogenic
Negative Charge: Non-Thrombogenic
Hydrophilicity: Non-Thrombogenic

In vivo testing demonstrated an 82% reduction in thrombus accumulation.2, 5, 14 In vitro testing showed a 60% reduction in platelet adhesion on the surface as compared to non-coated catheters.14

Supported by in vivo data, the non-eluting heparin coating has been shown to inhibit fibrin sheath propagation as compared to non-coated catheters.4

Tested in a shear flow model, the heparin coating remained intact after 720 hours of continuous flow, simulating thirteen months of dialysis treatment.21

Decreasing the likelihood of clot formation. Inhibiting fibrin sheath propagation.
The Clinical Challenge: Catheter Colonisation

- The skin surrounding the catheter insertion site is one of the most common sources of microbes that colonise central venous catheters.
- Central venous catheters colonised by skin organisms may develop biofilms and ultimately catheter-related infections.
- The removal rate of catheters with exit-site infections is greater than 50%, and in instances of tunnel tract infections, the rate of removal is as high as 70%.

The Solution: Silver Ion Antimicrobial Sleeve

Covidien’s silver ion antimicrobial sleeve, situated between the cuff and the hub, is permanently bonded to the catheter surface to ensure durability.
- Antimicrobial silver ions work to reduce the colonisation of clinically relevant microbes in the subcutaneous tissue.
- Silver-polymer system delivers a controlled release of silver ions specifically designed for the dialysis catheter environment.

Reducing microbial colonisation with antimicrobial technology.

Technology in practice

1) Reduces microbial colonisation on catheter surface in the tunnel tract

In vitro testing demonstrated a reduction of microbial colonisation by 99.2%-99.999% compared to catheter without sleeve.

In vivo testing resulted in a reduction of microbial colonisation by 99.7%-99.999% as compared to catheters without the sleeve.

2) Effective against a broad spectrum of micro-organisms

Protects against Gram Positive and Negative Bacteria, Yeast and Fungi, including Staphylococcus aureus, Coagulase-negative Staphylococci, Candida albicans and Escherichia coli as compared to catheters without the sleeve.

3) Proven durability

The antimicrobial sleeve utilises a controlled release mechanism that delivers a sustained elution of silver ions below daily tolerable intake levels.

††When compared to catheter without antimicrobial sleeve
The Clinical Challenge: Clotting and Catheter Colonisation

- As many as 40% of catheter failures are attributed to venous thrombosis and fibrin sheath formation.
- Approximately 17%-33% of catheter removals are attributed to thrombosis.
- The skin surrounding the catheter insertion site is one of the most common sources of microbes that colonise central venous catheters.
- Central venous catheters colonised by skin organisms develop biofilms and ultimately catheter-related infections.

The Solution: Combining Technologies

Covidien’s ultimate catheter.
- The first chronic catheter to combine antimicrobial and antithrombogenic technologies to preserve access.
- Dual protection against clotting and microbial colonisation on the catheter surface.

Combining innovative technologies. Providing Covidien’s ultimate catheter.

Technology in practice

1) Decreases likelihood of clot formation
   - In vivo testing demonstrated an 82% reduction in thrombus accumulation.\textsuperscript{2, 5, 14}
   - In vitro testing showed a 60% reduction in platelet adhesion on the surface as compared to non-coated catheters.\textsuperscript{14}

2) Inhibits fibrin sheath propagation
   - In vivo data demonstrated the non-eluting heparin coating has been shown to inhibit fibrin sheath propagation as compared to non-coated catheters.\textsuperscript{4}

3) Reduces microbial colonisation
   - In vitro testing demonstrated a reduction of broad spectrum microbial colonisation on the catheter surface in the tunnel tract by 99.2%-99.999% compared to non-coated catheter.\textsuperscript{24}

Reduces microbial colonisation and reduces the likelihood of clot formation on the catheter surface.\textsuperscript{2, 5, 14, 24}

When compared to uncoated catheter.
The Clinical Challenge: Precise Catheter Placement

- Poor tip positioning accounts for 20% of early catheter removals.
- Post-insertion, early causes of low catheter blood flow rates include catheter malposition and mechanical problems such as kinking.
- Successful catheter performance depends on accurate catheter tip positioning.

The Solution: Palindrome™ Precision RT–Reverse-Tunnelled Catheter

Covidien’s unique self-flushing symmetric tip has a compact functional end versus other competitor tip designs. This affords the inserter greater real estate in the right atrium, allowing more flexibility in positioning the catheter tip within the mid-right atrium as recommended by NKF KDOQI Guidelines.

Facilitating precise tip placement and defined tunnel tract creation.

Technology in practice

1 Precise tip placement
   Compact symmetric catheter tip can be placed precisely in the right atrium with increased flexibility for positioning.
   Combined reverse-tunnelled technique and the Palindrome™ precision RT-reverse-tunnelled catheter tip design increases the opportunity to maintain catheter tip location within the right atrium.

2 Defined tunnel trajectory
   Reverse-tunnel technique allows for precise placement of the catheter cuff in the tunnel tract after the tip has been placed.
   Proper tunnel and arc creation demonstrate model insertion techniques essential for optimal catheter placement.

3 Easy “click” hub connection assembly
   Snap lock hub assembly facilitates easy attachment of the catheter to the back-end extensions, reduce catheter manipulation post-tip placement.

Covidien’s reverse-tunnelled catheter with symmetric tip design and precision tip technology facilitates precise tip placement and increased tip visualisation.

†††When compared to uncoated catheter
Components
Palindrome™ Precision RT
Palindrome™ Precision HSI
Palindrome™ Precision H
Palindrome™ Precision
– Heparin Coated and Silver Ion Antimicrobial Catheter
– Silver Ion Antimicrobial Catheter
– Heparin Coated Dialysis Catheter
Base Catheter
Palindrome™ Tunnelled Catheter
Palindrome™ Antimicrobial Sleeve
SI – Silver Ion
Palindrome™ Insertion Stylets with Tal VenaTrac™

Product Codes

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Overall Qty</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>8888145066CP</td>
<td>55cm</td>
<td>72cm</td>
</tr>
<tr>
<td>8888146144CP</td>
<td>44cm</td>
<td>61cm</td>
</tr>
<tr>
<td>8888146044P</td>
<td>44cm</td>
<td>61cm</td>
</tr>
<tr>
<td>8888541033P</td>
<td>33cm</td>
<td>53cm</td>
</tr>
<tr>
<td>8888145050CP</td>
<td>33cm</td>
<td>50cm</td>
</tr>
<tr>
<td>8888145065CP</td>
<td>33cm</td>
<td>50cm</td>
</tr>
<tr>
<td>8888145046CP</td>
<td>33cm</td>
<td>50cm</td>
</tr>
<tr>
<td>8888145017P</td>
<td>33cm</td>
<td>50cm</td>
</tr>
<tr>
<td>8888145064CP</td>
<td>28cm</td>
<td>45cm</td>
</tr>
<tr>
<td>8888145041P</td>
<td>28cm</td>
<td>45cm</td>
</tr>
<tr>
<td>8888145040P</td>
<td>23cm</td>
<td>40cm</td>
</tr>
<tr>
<td>8888541023P</td>
<td>23cm</td>
<td>43cm</td>
</tr>
<tr>
<td>8888145057CP</td>
<td>19cm</td>
<td>36cm</td>
</tr>
<tr>
<td>8888145043CP</td>
<td>19cm</td>
<td>36cm</td>
</tr>
<tr>
<td>8888145039P</td>
<td>19cm</td>
<td>36cm</td>
</tr>
</tbody>
</table>

Components

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Overall Qty</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>8888540055</td>
<td>55cm</td>
<td>8888541155</td>
</tr>
<tr>
<td>8888541044</td>
<td>44cm</td>
<td>8888541144</td>
</tr>
<tr>
<td>8888541033</td>
<td>33cm</td>
<td>8888541133</td>
</tr>
<tr>
<td>8888541028</td>
<td>28cm</td>
<td>8888541128</td>
</tr>
<tr>
<td>8888541019</td>
<td>19cm</td>
<td>8888541119</td>
</tr>
</tbody>
</table>
