Bidirectional Patency Duration in LVG Golden Syrian Hamsters

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INTRODUCTION

Repeated blood sampling and dosing required in pharmacokinetic studies in hamsters is challenging without an indwelling venous catheter. Jugular vein catheters (JVCs) have been used in hamsters with limited duration of catheter patency (e.g., less than 15 days post-surgery).

We conducted a study to determine the duration of blood-collection and infusion-only patency of JVCs using two different catheter exit options – transcutaneous button and exteriorized port. Blood-withdrawal patency is limited to two weeks for button and one week for port after surgery. All catheters remained patent for infusion, but not blood withdrawal through week eight post-surgery.

MATERIALS AND METHODS

Animals

Twelve male, seven-week-old LVG Golden Syrian Hamsters weighing 100-110 grams were allocated into two groups of six. Hamsters were anesthetized and a polyurethane catheter was surgically inserted into the right jugular vein. Following surgery, hamsters were transported in divided, wiped shipping containers to Charles River Laboratories. Sponsonenke, Dtt for evaluation of patency. Following surgery, hamsters were singly housed in polywire-steel cages, maintained at 23 ± 3 °C with relative humidity of 30-70% and a 12:12 hour light/dark cycle, and given commercially produced feed and water ad libitum. All procedures were conducted in accordance with recommendations set forth in the Guide for the Care and Use of Laboratory Animals (National Research Council, 2011) and performed in an AAALAC International-accredited facility.

Surgical Procedure

Animals were anesthetized using isoflurane (induction 2.5%-maintenance 1.5%-submaintenance 0.05-0.15% by volume) and implanted with a jugular vein catheter (JVC) attached to a transcutaneous button (Instech model # VABM1B/22) or port (Instech model # PNP3F32). The skin overlying the right jugular vein and intrascapular area were shaved and prepared using chlorhexidine and alcohol. A cranial-caudal incision was made to expose the right jugular vein and a dorsal incision was made to place the button or port. The vein was isolated and ligated distally using non-absorbable suture material. A cut was made in the jugular vein and a polyurethane catheter was inserted. A ligature was placed around the cannulated vessel to secure the catheter in place. The skin incision over the jugular vein was closed with a U-tie using monofilament suture. In six hamsters the catheter was connected transcutaneous to a button and locked using heparinized (500 IU/mL) 50% dextrose solution. In six hamsters the catheter was connected to an exteriorized port and locked using heparinized (500 IU/mL) glycine solution. In all the animals, the dorsal incision was closed with a simple interrupted pattern using monofilament suture. Animals were monitored closely and recovered in a cage with supplementary heat before they were returned to their home cages.

Animals were clinically healthy throughout the study and gained body weight normally. Animals were monitored for rest of the study. However, in JVC port animals, the infusion patency was 100% in all animals until week two post-surgery when it dropped to 83% at week three and stayed at this rate for rest of the study. This data suggests that bidirectional catheter patency for infusion is longer with use of the transcutaneous button as a catheter exit option, compared to the exteriorized port. This patency data should be considered when planning studies depending on the intended use of the model.

Catheter Patency Testing

Weekly body weights, detailed physicals, and catheter patency checks were performed. For patency checks, animals were manually restrained, the port septum was cleaned with a 70% alcohol wipe, and the catheter was accessed using an injector (Instech model # PNP3M) attached to a 1 cc syringe. The catheter was aspirated to determine the ability to withdraw the locking solution and blood. If the first aspiration failed, an attempt was made to inject saline into the catheter. The catheter was considered fully patent if withdrawal of blood was successful. The catheters were re-locked using heparinized (100 IU/mL) solution after patency checks.

RESULTS

Definitions:

- **Fully Patent:** Successful blood withdrawal on first attempt.
- **Partially Patent:** Unsuccessful blood withdrawal but patent for infusion.
- **Non-Patent:** Unsuccessful blood withdrawal and infusion.

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<thead>
<tr>
<th>Male Hamster JVC with Button Patency with Weekly Maintenance</th>
<th>Male Hamster JVC with Port Patency with Weekly Maintenance</th>
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<tbody>
<tr>
<td><strong>Weeks Post-Surgery</strong></td>
<td><strong>Weeks Post-Surgery</strong></td>
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<td>1</td>
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<tr>
<td>Fully Patent</td>
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**Figure 1.** Patency of male LVG Syrian hamsters (n = 6) JVC button with weekly maintenance by flushing once every seven days. Data expressed as percent patent.

**Figure 2.** Patency of male LVG Syrian hamsters (n = 6) JVC port with weekly maintenance by flushing once every 7 days. Data expressed as percent patent.

SUMMARY AND CONCLUSIONS

Blood withdrawal patency was 100% up through week two post-surgery in all JVC button animals and week one post-surgery in all JVC port animals. In JVC button animals, catheters remained patent for infusion through week four post-surgery, when it decreased to 83% at week five and stayed at this rate for rest of the study. However, in JVC port animals, the infusion patency was 100% in all animals until week two post-surgery when it dropped to 83% at week three and stayed at this rate for rest of the study.

Animals were clinically healthy throughout the study and gained body weight normally.