Patency of Jugular and Femoral Vein Catheters Attached to Transcutaneous Buttons in Sprague Dawley Rats with Weekly Maintenance

Venkateswaru Karicheti, Laura Luciano, Suzette G Camaya, M. Fayaz Koubaitary, Marquita C. Pledger, Teresa R. Gleason, Amy J. Evans, Shelby E. Gledhill, Penny M. Sparks

INTRODUCTION

Vascular access in conscious rats for repeated blood sampling in pharmacokinetic studies is achieved using chronically implanted jugular vein catheters (JVCs) or femoral vein catheters (FVCs). One factor that affects patency is the blood vessel used in addition to catheter maintenance schedule. We conducted a study to determine the duration of blood-collection and infusion-only patency of JVCs and FVCs attached to transcutaneous buttons with weekly catheter maintenance up to nine weeks.

MATERIALS AND METHODS

Animals

Forty adult CD® rats (Crl:CD[SD]), 20 males at 200-225 grams and 20 females at 175-200 grams, were allocated into four groups of 10 each. Rats were anesthetized and surgically instrumented. Following surgery, rats were transported in divided, filtered shipping containers to Charles River Laboratories in Ashland, OH for evaluation of patency. While in Ashland, rats were socially housed in polycarbonate cages using Pure-o’Cel® bedding and maintained at 21 ± 2 °C with relative humidity of 30-70% and a 12:12 hour light dark cycle. Feed and water were provided ad libitum. Animal health was evaluated weekly with body weights and detailed physicals as well as catheter patency checks. 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

Anesthesia/Analgesia: Ketamine (75 mg/kg) and xylazine (6 mg/kg) injected intraperitoneally, buprenorphine (0.02 mg/kg) intramuscularly.

Implantation of Catheter: Twenty animals (10 males, 10 females) were implanted with a jugular vein catheter (JVC) and 20 animals (10 females, 10 males) were implanted with a femoral vein catheter (FVC). For all the animals, the catheter was attached to a transcutaneous button (Instrtech model # VABR1B/22) and locked using heparinized (600 IU/ml) 50% dextrose solution. Animals were monitored closely and recovered in a cage with supplementary heat before they were returned to their home cages.

Patency Testing (Flushing):

Animal health was evaluated weekly with body weights and detailed physicals as well as catheter patency checks. For patency checks, animals were manually restrained, and catheters accessed using a button adaptor injector (Instrtech model # PNP3M). The catheter was aspirated to confirm the ability to withdraw blood. It was considered fully patent if withdrawal of blood was successful. The catheter and transcutaneous buttons were re-locked using heparinized (20 IU/ml) saline after patency checks.

Definitions:

Fully Patent: Successful blood withdrawal
Non-Patent: Unsuccessful blood withdrawal and infusion.

RESULTS

Blood withdrawal patency was 100% up through week two post-surgery in all JVC and FVC animals. PVC catheter blood withdrawal patency rates maintained at 85% up to seven weeks post-surgery. However, JVC catheter blood withdrawal patency decreased to 65% in males and 50% in females. At conclusion of day 63-64 in this study, patency rates varied from 20-70% between groups. However, 90% of FVCs and 70% of JVCs were patent for infusion. This data suggests that transcutaneous catheter patency for blood collection is longer in FVCs compared to JVCs attached to transcutaneous buttons with weekly catheter maintenance. This patency data should be considered when planning studies depending on the intended use of the model.

SUMMARY AND CONCLUSIONS

Animals were clinically healthy throughout the study and gained body weight normally. Blood withdrawal patency was 100% up through week two post-surgery in all JVC and FVC animals. PVC catheter blood withdrawal patency rates maintained at 85% up to seven weeks post-surgery. However, JVC catheter blood withdrawal patency decreased to 65% in males and 50% in females. At conclusion of day 63-64 in this study, patency rates varied from 20-70% between groups. However, 90% of FVCs and 70% of JVCs were patent for infusion. This data suggests that transcutaneous catheter patency for blood collection is longer in FVCs compared to JVCs attached to transcutaneous buttons with weekly catheter maintenance. This patency data should be considered when planning studies depending on the intended use of the model.