Evaluation of Three Catheter Maintenance Schedules on Patency of Jugular Vein Catheters in CD Rats

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Abstract
Surgical placement of jugular vein catheters (JVCs) in rats is a common procedure to allow central venous access in conscious animals. Recommendations for catheter maintenance in rats, such as frequency of catheter flushing and types of lock solution used, are variable between institutions and are generally based on anecdotal evidence. We conducted a study investigating the optimum maintenance schedule for rats with JVCs. Sixty male Crl:CD(SD) rats weighing 225-250 g were used; 30 with polyurethane (PU) JVC catheters and 30 with PU-sialastic (Blended) JVC catheters originating from two different catheter manufacturers. Prior to the commencement of the study, catheter material, and maintenance frequency (i.e. flushing with physiologic saline and replacement of catheter tip over time) were considered patent if blood was successfully aspirated. After successful aspiration, the catheter was flushed with sterile saline to verify patency. The distal end of the catheter was then tunneled subcutaneously to the dorsal scapular region where it was exteriorized. Catheter patency was then closed with wound clips.

Introduction
Pharmacokinetic studies in rats are efficiently and humanely performed using chronically surgically implanted catheters that allow repeated blood sampling from a single animal. The amount of time a catheter remains patent determines the practical usefulness of a catheter. Patency of catheters is affected by many factors including growth of the animal and resulting positional change of the catheter tip over time, occlusion, flushing regime, catheter material, and type of locking solution. Recommendations for catheter maintenance in rats, such as selection of locking solution and frequency of catheter flushing, are variable between institutions, often adopted from other species, and generally based on anecdotal evidence. This study was designed to compare patency rates of two common commercially available catheter materials: polyurethane (PU) and PU-sialastic (blended) catheters, surgically implanted in the jugular vein of CD rats maintained at three different flushing frequencies.

Materials and Methods
Animals
Sixty CD rats (Crl:CD(SD) weighing 225-250 g were used; 30 each from commercial barrier facility sources. Animals were randomly assigned to one of six groups (n = 10). The study was approved by the Charles River Laboratories facility in Wilmington, MA for the remainder of the study. Animals were provided a commercial diet, water ad libitum. Sixty CD rats (Crl:CD(SD)) weighing 225-250 g were used; 30 each from commercial barrier facility, n = 20.

Surgical Procedure
The rats were anesthetized with ketamine (43 mg/kg BW) and xylazine (8.5 mg/kg BW) administered intraperitoneally and propofol (0.02 mg/kg) subcutaneously.

Catheter Patency Assessment
Thirty rats with each catheter type were randomly assigned to one of three maintenance schedules (n = 10 animals per catheter material). Catheters were used; 30 each from commercial barrier facility, n = 20.

Conclusions
• Catheter material, i.e. PU or blended PU-sialastic, performed similarly and showed an inconsistent affect on catheter patency rates. Catheter patency rates between the two catheter materials were not significant for the Q5day and Q7day treatment groups. Data not shown.

Results
Comparison of Catheter Patency Rates
Catheter patency rates, as defined by patency and fully patent (flushing) with saline solution for 20 days. Data represents PU (n = 10) and blended catheters (n = 10), total catheterized animals assessed, n = 20.

Comparison of Catheter Materials
Comparison of patency rates for the two catheter materials indicated that in for the Q3day treatment, the PU catheter patency rate was significantly greater than the blended catheter (p = 0.007). Differences in patency rates between the two catheter materials were not significant for the Q5day and Q7day treatment groups. Data not shown.

Catheter Patency Classifications:

• Fully Patent: Successful withdrawal on the first attempt.

• Non-Patent: Unsuccessful withdrawal with and without attempted instillation of saline.

Statistical Analysis
P values of differences in patency rates were 0.05.

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