Duration of Patency of Jugular Vein Catheters Attached to **Transcutaneous Buttons in CD1 Mice without Maintenance**

Venkateswarlu Karicheti, Amber Kang, Cris Ortiz, M. Fayaz Koubaitary, Evelyn B. Ashford, Dianna L. Denton, Yiying Luo, Allison Williams

INTRODUCTION

Central venous access in conscious mice for repeated blood sampling in pharmacokinetic studies is achieved using chronically implanted jugular vein catheters (JVCs). One factor that affects catheter patency is the catheter maintenance schedule which sets practical limits on its uses. We have previously shown that the use of transcutaneous buttons kept the catheters patent longer than the standard externalized catheters (Mallette et al. Journal of the American Association for Laboratory Animal Science, Vol 56, No 5, P65, 2017).

We conducted a study to determine the duration of blood collection patency and infusion-only patency of JVCs attached to transcutaneous buttons in mice without catheter maintenance. All catheters remained patent for infusion, but not blood withdrawal through week 5 post surgery. This data showed that without catheter maintenance, bidirectional catheter patency for blood collection is relatively short-term in comparison to catheter patency for infusion-only JVCs attached to transcutaneous buttons in mice.

Definitions:

Fully Patent : Successful blood withdrawal on first attempt Patent on Flush : Successful blood withdrawal after infusion of saline **Partially Patent** : Unsuccessful blood withdrawal but patent for infusion **Non-Patent** : Unsuccessful blood withdrawal and infusion

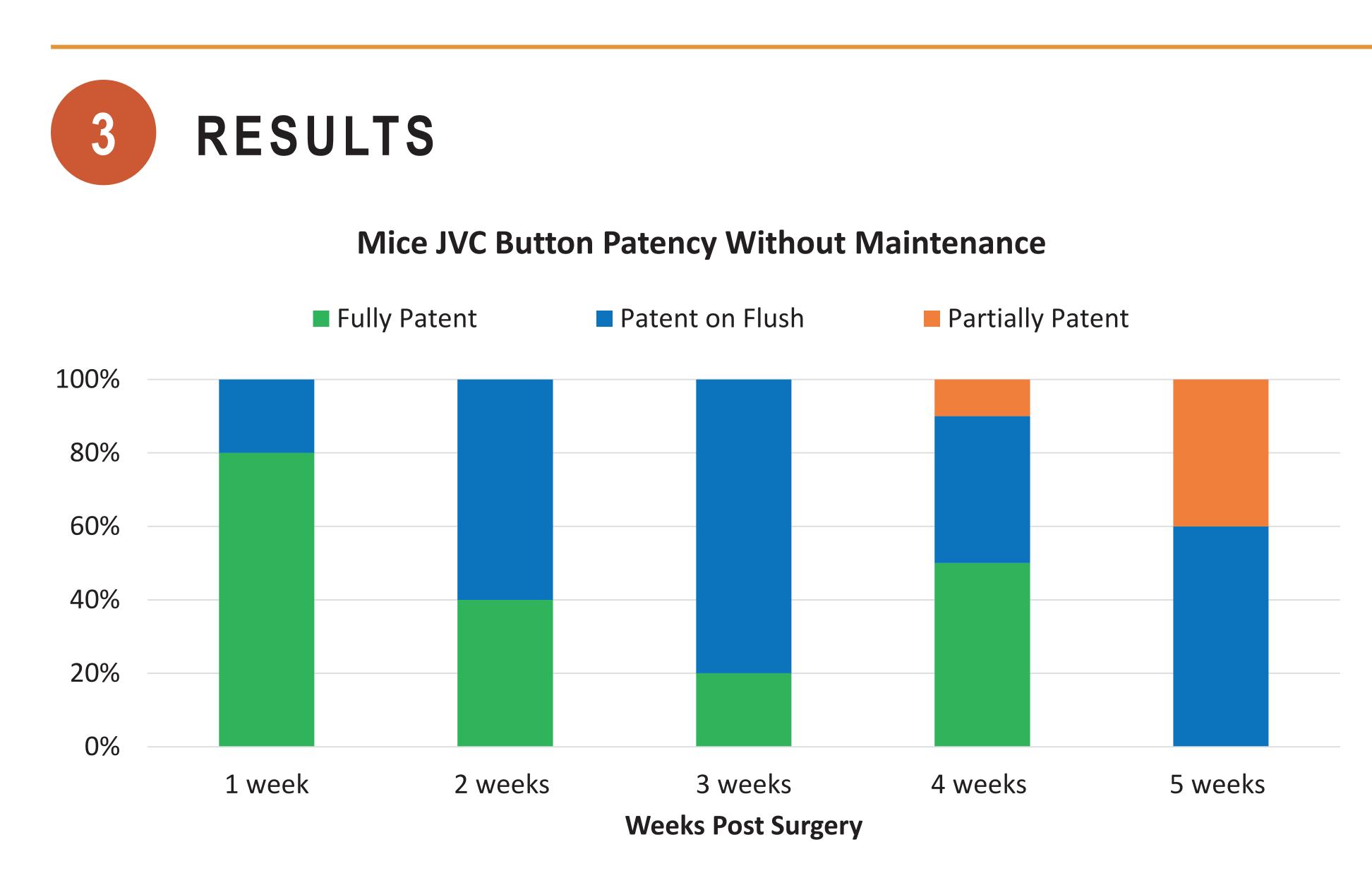


Figure 1. Patency of mice JVC button without weekly maintenance. Data is expressed as percent patent. N = 10 for each week.



MATERIALS AND METHODS

Animals

50 VAF/Plus[®] adult male CD-1[®] IGS mice [Crl:CD1(ICR); Charles River Laboratories, Raleigh, NC], weighing between 37 - 39 grams, were randomly assigned to five groups (n = 10 each). Mice were anesthetized and surgically instrumented. Following surgery, mice were singly housed in polycarbonate cages, maintained at 21 ± 2 °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 injected intraperitoneally with ketamine (75 mg/kg) and xylazine (6 mg/kg); subcutaneously with buprenorphine (0.05 mg/kg); and implanted with a jugular vein catheter (JVC) attached to a transcutaneous button (Instech model # VABM1B/25). 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 intrascapular incision to place the button. The vein was isolated and ligated distally using non-absorbable suture material. A nick was made in the jugular vein and a polyurethane catheter 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. The felt of the button was placed subcutaneously in the intrascapular region and the incision closed with a simple interrupted pattern using monofilament suture. The catheter and button were locked with heparinized (500 IU/mL) 50% dextrose. Animals were monitored closely and recovered in a cage with supplementary heat before they were returned to their home cages.

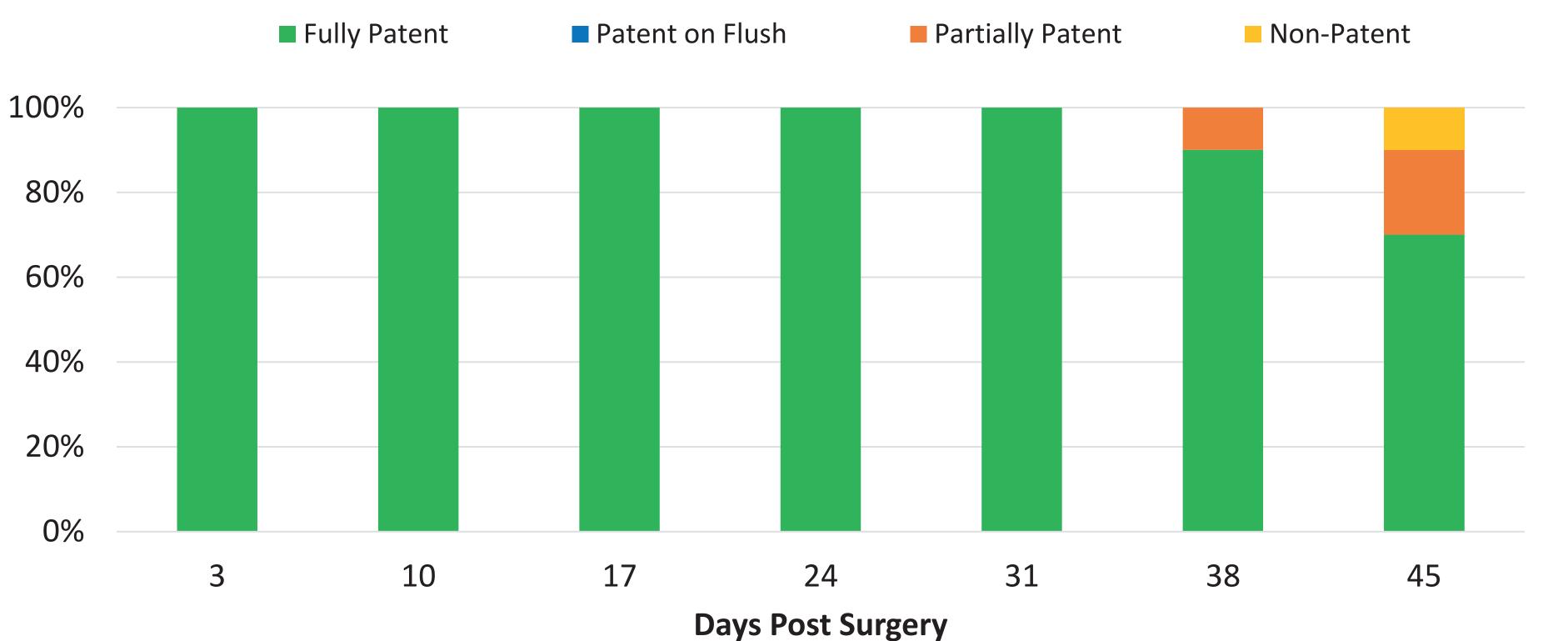
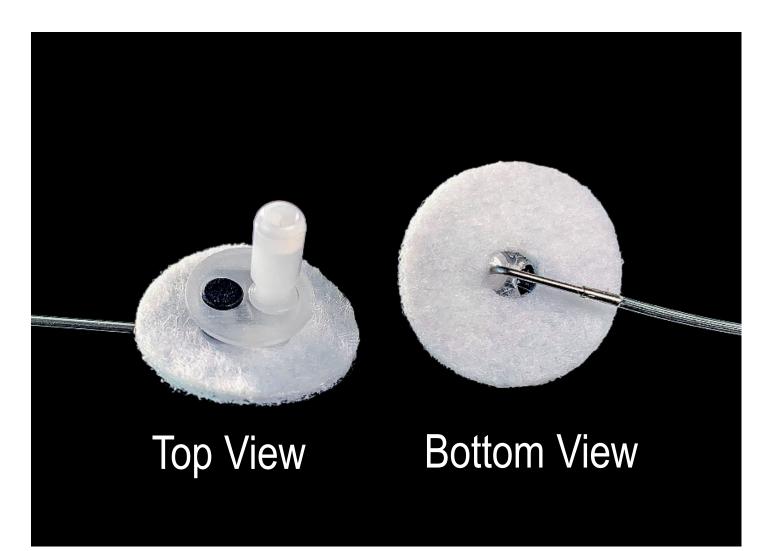


Figure 2. Patency of mice JVC button with weekly maintenance by flushing every 7 days. Data expressed as percent patent (n = 10). *This figure was extracted from Mallette et* al., JAALAS, Vol 56, No 5, P65, 2017.

Catheter Patency Testing

50 mice were surgerized by any of 4 trained surgeons and then randomly allocated into 5 groups consisting of 10 mice each for patency testing at 1, 2, 3, 4, and 5 weeks post surgery. Patency was tested for in each group without any other manipulation. Animals were manually restrained, button port septum was cleaned with a 70% alcohol wipe, and catheters accessed using an injector (Instech model # PNP3M) attached to a 1 cc syringe. The catheter was aspirated to determine the ability to withdraw the lock solution and blood. If the first aspiration failed, an attempt was made to inject saline into the catheter. If flush solution failed to infuse, a second aspiration was attempted to withdraw blood. Patency was classified as fully patent, patent on flush, partially patent, or non-patent.



Button (Instech # VABM1B/25)



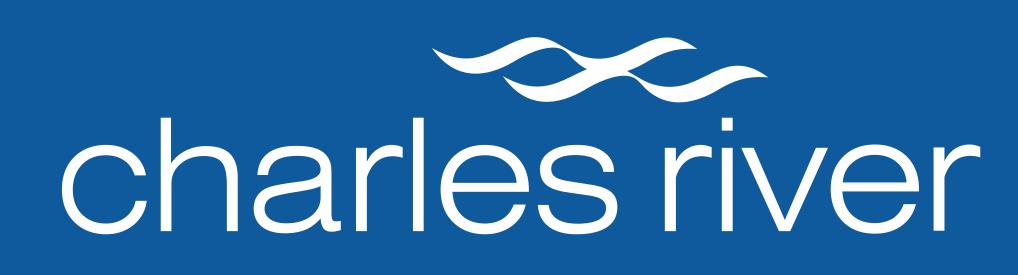
Animals were clinically healthy throughout the study and gained body weight normally.

Number of animals	Patency test	Blood withdrawal	Infusion
10	1 week after surgery	100%	100%
10	2 weeks after surgery	100%	100%
10	3 weeks after surgery	100%	100%
10	4 weeks after surgery	90%	100%
10	5 weeks after surgery	60%	100%

Blood withdrawal patency was 100% up through week 3 post surgery without catheter flushing maintenance. Patency rates decreased to 90% and 60% at week 4 and week 5, respectively. All catheters remained patent for infusion, but not blood collection through week 5 post surgery. This data shows that bidirectional catheter patency for blood collection is relatively short-term in comparison to catheter patency for infusion only of JVCs attached to transcutaneous buttons in mice without catheter maintenance. This should be a key consideration when planning studies. Depending on the intended use of the model, resource allocation for catheter maintenance may or may not be required.

Reference: Sera Mallette, Tessa Murray, Venkateswarlu Karicheti, Yiying Luo, Allison Williams, Dawn Decker, Tiffany A. Weller. Patency of Jugular Vein Catheters in CD-1 Mice: Evaluation of Three Catheter Maintenance Schedules in Standard External Catheter and Transcutaneous Buttons, Journal of the American Association for Laboratory Animal Science, Vol 56, No 5, P65, 2017

Mice JVC Button Patency With Weekly Maintenance





Injector (Instech # PNP3M)

SUMMARY AND CONCLUSIONS

Table 1. Summary of blood withdrawal and infusion patency without weekly maintenance.