

Harness versus Button Device with Automated Blood Sampler

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Introduction

How do you make an in-vivo device even better?!

- Improve animal welfare
- Decrease stress on the animal
- Minimize open surgical sites and possible infection
- Eliminate animal entanglement and skin reactions
- Reduce technician intervention

Objective

The objective of the button device is to allow less intervention of the technician, improve animal welfare and reduce device incidents. The button satisfies this because it does not require a harness around the animal. No longer needing to adjust for growth, removing it from the animals mouth or resetting limbs into the proper section of the harness. Reducing to near elimination the possible skin irritation/reactions or possible infections due to an open surgical site under the harness.



Example of caught limb. Requiring technician intervention.



Example of skin irritation from the harness device. Requiring technician intervention.



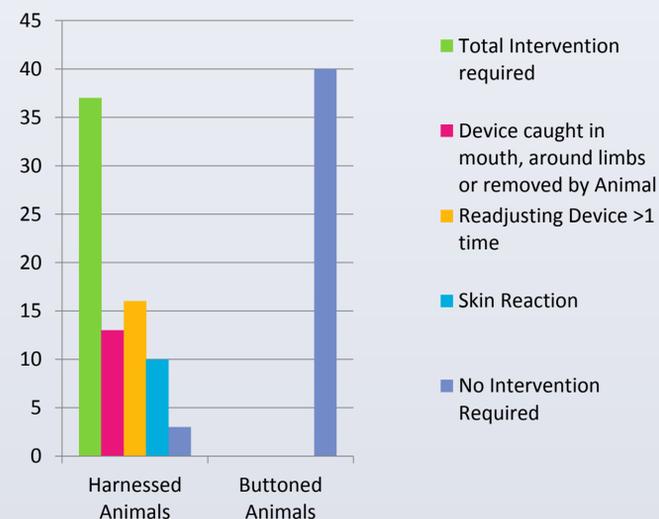
Example of harness trapped in a rats mouth. Requiring technician intervention.

Methods

Two groups, 40 of the harnessed animals and 40 of the buttoned animals whereas each group consisted of n=4 at a time were evaluated over a period of 6 non-consecutive months, with 4-weeks observation for each smaller group. A total of 10 groups for each device; buttoned and harnessed.

All animals were treated in the same manor. All were weighed, cannula flushed, locked and handled in the same fashion. All animals were observed and monitored daily for behavior and welfare. All animals were used with an automated blood sampling machine with equal time points and quantity of blood collected for pharmacokinetic studies.

It was noted during this time that >50% of the animals in the harness group had issues requiring intervention and extra care beyond what would normally be required. All harnessed animals required at least one harness adjustment to allow for growth, but that was considered normal and considered "no intervention" in this data set. Buttoned animals exhibited normal behavior and did not display any discomfort or require additional care to maintain the device. Additionally, in 25% of the animals, the harness caused abrasion related skin reactions, which did not recover by the end of the study. Additional harness adjustments did not alleviate skin irritation. Button groups were not observed with any skin irritations, recovering to near naïve state.



Graph illustrating degrees of intervention.

Out of a total of 40 harnessed animals 37 needed care beyond one harness adjustment.

- 13 animals had the harness caught in their mouth, around limbs or was removed by the animal.
- 16 animals had >1 harness adjustment (2 from this group also had skin reactions)
- 10 animals had skin irritations (including the 2 from the harness adjustment group)
- 3 animals were considered as no intervention, only needing one harness adjustment to allow for growth.

Out of a total of 40 buttoned animals, zero needed additional care and required no intervention.

Materials

The button is made from medical-grade polyester felt with a septum to create a closed loop system, it includes polarized magnets to provide a strong keyed connection with the tether and the button can be capped to permit group housing when not in a study. It is subcutaneously implanted in the animal and does not require a harness to keep it in place. Implanted at the time of catheterization; this secures the device to the animal and completely closes the surgical site. The pin ports at the top of the device allow access to the CAC/JVC connections. Due to the construction of the device it allows for an increase in comfort to the animal without anything impeding the movement or normal activities. In addition the button device did not have any negative effects in our experiment and all outcomes were positive.



Example of buttoned animal.



Example of capped button on animal for group housing.



Example of tether, cap and button device



Example of harness device.

Discussion

CRITICAL ISSUES

- Harness caught in animals mouth
- Resetting caught limbs
- Replacing chewed and broken harnesses
- Multiple adjustments over time
- Skin irritations
- Animal stress

The solution to these issues associated with the harness is the button device. The button is subcutaneously implanted and does not require a harness to keep it in place. This allows the animal unimpeded movement and eliminates many of the issues seen with the harness. It minimizes handling and restraint required to "fix" any issues, thus reducing stress on the animal. Patency is maintained in the same way as the harness system and the metal cap allows for group housing.

The transition from the harness to the button device is as simple as swapping out the tether and correcting for the tether tube volume in the ABS system software. Thus, the button device alleviates the common harnesses related issues while allowing the animals to return to behavior as close as to that of a naive animal as possible.

Conclusions

In conclusion, the animals with the buttoned device exhibited improved animal welfare as judged by reduced technician time/handling.

Reduced incidents observed in the harnessed animals to a non-existent level.

KEY POINTS

- Improved animal welfare
- Decreased stress on the animal
- Eliminated animal entanglement and skin reactions
- Reduced technician intervention
- Opportunity to group house surgically altered animals

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