

CMTC/AMTC Toy Manchester Terrier Heart Study

Cardiovascular Function of Producers

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Summary

As indicated in the heart study update prepared for the Canadian Manchester Terrier Club Annual General Meeting (March 2009), the study team recently proposed to perform a complete cardiovascular work-up on a Toy Manchester who had produced a confirmed case of cardiomyopathy as part of its ongoing investigation into all avenues of potential testing (i.e., genetic testing and manual screening). The purpose of this exercise was to begin the process of establishing a cardiac profile for the breed so that we can determine what is normal for Toy Manchester hearts and what measurable characteristics might indicate individuals at risk for producing Juvenile Cardiomyopathy (JCM). The discovery of such an anomaly could help researchers identify effective screening tools for Toy Manchester breeders (i.e., physical screening of breeding stock as opposed to genetic screening). Testing of a single individual raised several interesting questions and led to subsequent testing of an additional five dogs.



While lying on a padded table, a Toy Manchester Terrier is gently restrained by Elaine Reveler, AHT, and has its face and ears stroked by a student (hands) as Dr. Etienne Côté performs the echocardiogram.

Budget

The Canadian Manchester Terrier Club graciously provided an initial \$1000.00 grant to fund testing of the first two animals tested. Total costs for testing of these two dogs was \$1000.00 (not including travel) thanks to a partial grant in kind (discounted services) offered by the University of Prince Edward Island. This grant was made possible again to the full limit of a total of 6 dogs. To offset these costs, the Canadian Manchester Terrier Club donated an additional \$500.00, Carolyn Horowitz donated \$400.00 and the balance of costs, including associated travel, was covered by Wendy & Amanda Kelly. The study team extends thanks to all those who contributed to seeing this initiative completed including our cardiologist, Dr. Etienne Côté, who generously donated his services and the team at UPEI's cardiology department.

Implementation

Testing was conducted by Dr. Etienne Côté and Elaine Reveler AHT, and took place in April, May and July 2009 at the University of Prince Edward Island. The Study Liaison traveled to Prince Edward Island twice to facilitate and observe testing. The following tests were performed on each of the six dogs:

- Echocardiogram/cardiac ultrasound (includes complete 2D, M-mode, spectral and colour Doppler and calculation of left ventricular volume and mass)
- 10-lead electrocardiogram
- Chest X-Ray
- Complete blood count, serum biochemistry profile, urinalysis
- Serum cardiac troponin-I levels
- Exercise testing consisting of repeated portable ECG monitoring periods during stair climbing

While the majority of tests are standard for cardiac screening, the exercise test represented an experimental approach to measuring heart rate and rhythm normally obtained through more time-consuming Holter monitoring. In order to measure the heart's function under a variety of circumstances, each dog wore a portable EKG monitor and ran up and down six flights of stairs. Cardiac rate and rhythm (EKG) were measured before exercise, during exercise and for several minutes afterwards, giving a complete look at the heart's rhythm and heart rate dynamics at rest, under stress, and during its return to normality.

Complete cardiovascular work-ups were completed on six dogs, beginning with a bitch confirmed to have produced cardiomyopathy and a male littermate to a puppy who died of cardiomyopathy. We then moved on to include four additional dogs of varying ages, sexes and degrees of relationship to the first dogs tested (ranging from closely related to unrelated).

Results

On physical examination, all six dogs' cardiovascular parameters were found to be within normal limits in all respects. While two interesting characteristics were seen alone or together in several individuals, it is important to note that neither had a significant effect on the heart function of the dogs at this time and may not have ever been noted or detected without benefit of the full cardiac work-up performed for the purposes of the study.

The first interesting characteristic noted was the presence of an occasional pause in the heartbeat of 3 dogs after exercise. This pause was intermittent and is a type of arrhythmia called second degree atrioventricular (AV) block. It is a normal finding in dogs that are physically fit, but usually occurs when the heart rate is slower than was true of the Manchesters tested. While this may represent a normal finding that is an individual variant of no consequence, it could also be a clue to a cardiovascular disturbance that is mild in this case but could be more significant in serious cases.

The second interesting characteristic noted was the presence of hyperechogenicity (a small bright area) in the muscle tissue of the hearts of 4 individuals during cardiac ultrasound. This bright spot is sometimes found to indicate scar tissue of some type, though the cause is unknown. While initial observations pointed to a possible relationship between this scar tissue and the scar tissue noted as a defining characteristic in the autopsies of puppies who have died as a result of JCM, further investigation has cast some doubt on this. After reviewing information collected through autopsies, the team noted that scar tissue in deceased puppies appears in a different area of the heart and at a different tissue level, making the relationship (if any) between the two unclear. Again, the presence of this scar tissue did not appear to affect overall cardiac performance.

While individual results are considered private, the following overview of test results may be helpful in illustrating the distribution of traits over the six dogs tested:

- Dog #1 (cardio producer): AV block
- Dog #2 (cardio littermate): AV block and small area of bright heart muscle tissue
- Dog #3: AV block and small area of bright heart muscle tissue
- Dog #4: AV block and small area of bright heart muscle tissue
- Dog #5: Small area of bright heart muscle tissue
- Dog #6: No abnormalities

Next Steps

While the testing of these six individuals has increased our understanding of cardiac function in Toy Manchesters, the results of these tests alone do not offer enough information upon which to base any concrete theories or recommendations. The presence of AV block and small areas of bright heart muscle tissue are interesting, there is no obvious relationship between either characteristic and the circumstances leading to TMT deaths as a result of JCM. With these preliminary findings, it is impossible to conclude that either is directly related to appearance of the disease. A baseline of information has been established with these six dogs, however, and future testing of other dogs should in all cases include monitoring using the tests described in order to identify a trend if one exists. As noted, these findings may represent normal heart abnormalities found in the Toy Manchester population and could prove entirely unrelated to JCM. Because of this, it is important that breeders not attach undue significance to observations noted in this report. None of the findings noted have a measurable effect on the cardiac output or function of the individual dogs tested and we have not established any correlations between their presence and JCM deaths. It is important that no breeding decisions be made based on these results as the protection of diversity in the breed's gene pool must remain a priority.



In the same position, a Toy Manchester Terrier lies on the padded ultrasound table for a 10-lead electrocardiogram (ECG). All tests are conducted with the dogs awake, unsedated, and using plenty of reassuring talk and contact.

At the same time, we cannot completely discount that these results could be important. This was the purpose of testing in the first place, and it may turn out that these findings are significant. Unfortunately, without further testing of the broader Toy Manchester population it is impossible to tell. As a result, in addition to securing necropsies and DNA samples from puppies who have died of JCM, one of the key objectives of the study going forward must be to secure additional cardiac testing in order to establish as large a collection of reference data as possible. By accumulating information about cardiac function in both TMTs related (whether closely or distantly) to individuals who have died of JCM as well as those who have no relationship to JCM cases we will build a profile of normal cardiac function in the breed. Simply put, the more individuals tested across the breed the better able we will be to determine what is normal for TMTs and what may be an indicator we can use as a screening tool. Without a wide picture of heart function for the breed we are unable to determine the significance, if any, of the interesting characteristics noted in our initial tests.

Obviously not all testing can be performed at the University of Prince Edward Island for logistical reasons; however, a *board certified cardiologist* can perform these tests on behalf of any individual wishing to take part. Unfortunately, no funding is available to assist with testing at this time; though, we are hoping to undertake some fundraising projects that may change this in the year to come (volunteers needed!!). In the meantime, individuals wishing to undertake cardiac testing as part of the study should have all of the following tests performed*:

- Echocardiogram/cardiac ultrasound (including complete 2D, M-mode, spectral and colour Doppler and, if possible, calculation of left ventricular volume and mass)
- 10-lead electrocardiogram
- Chest X-Ray
- Complete blood count, serum biochemistry profile, urinalysis
- Serum cardiac troponin-I levels
- 24-hour Holter Monitor

Please ask your cardiologist to share for the dog tested directly with Dr. Etienne Cote. All test results submitted will be kept confidential by Dr. Côté and only unidentifiable (anonymous, coded) results will be shared with other team members. This is true for both Toy Manchesters and Standard Manchester Terriers. Though we have only seen JCM deaths in Toy Manchesters, given the degree of relation between the two populations any information that increases our knowledge of cardiac function in the breed as a whole may prove important. For a complete list of board certified cardiologists, visit www.acvim.org click “Search for a Specialist” and then choose cardiology from the “Specialty drop-down menu.

Conclusion

While the immediate results of the testing performed do not answer every question we have about cardiomyopathy, this exercise has substantially increased our knowledge of heart function in Toy Manchesters. If we are successful in testing a substantial number of additional dogs we may find that a useful screening tool can be developed. Once identified, our goal is for breeders to be able to perform just that one, individual test at a relatively low cost. So, while the initial financial burden of testing dogs today may seem significant, its long-term benefits may not only save Manchester breeders money but—more importantly—may save MT lives.

For answers to frequently asked testing questions, please check the study’s website at www.canadamt.com/health/heart/ For additional information on how to take part in or contribute to the heart study, please contact Amanda Kelly (902-864-4157 | amandakelly@ns.sympatico.ca). Dr. Cote is currently on sabbatical, returning to UPEI in Summer 2010. In the interim, test results using the protocol outlined can be submitted privately to Dr. Cote directly through your board certified cardiologist who will have all contact information required.