When Statistics Go Bad

Type II errors, or false negatives, occur in clinical trials when no observable difference is noted in the study but there is, in fact, a difference. This study looked at key methodologies associated with type II errors in small animal clinical trials. Journals (n = 11) were searched from 2005 to 2012 for eligible randomized controlled trials (RCTs). Over this time, 240 RCTs met study inclusion criteria and 165 were classified as having negative results. Seventy-seven of the RCTs (32%) had a specified clinical outcome, power calculations were reported in 52 (22%), and confidence intervals (CIs) were reported in 22 (9%). Both RCTs with negative results and those with positive results had few subjects enrolled and were not likely to specify primary outcome, include sample size calculation, or give CIs around the effects of treatment. Only 2 of 238 studies explicitly reported all 3 of these methodologies. Of 103 2-group trials, only 14 (14%) and 39 (40%) had enough power to detect 25% and 50% differences in treatment outcomes, respectively. The study identified 2 important issues: 1) small animal studies with negative results were frequently underpowered to detect moderate to large differences in treatment groups, and 2) readers were not easily able to detect underpowered studies because of missing data.

Commentary

For many veterinarians, the gold standard for drug decision making is RCTs. When a major trial produces a negative result, the days of prescribing this drug may be over. Unfortunately, false negatives (type II errors) can occur, in which the null hypothesis is accepted even though the study had inconclusive or statistically inadequate data. This may well result from poorly powered, designed, or executed trials. Of the 165 negative studies reviewed, many published incomplete data or did not report sample size or power calculations. In some reports, a 50% improvement with the trial drug could not be detected. Many studies lacked statements concerning statistical error and some argued for a positive outcome in the face of a negative result. Although it is popular to blame sample size for lack of power, study design and power calculations as well as adherence to the Consolidated Standards of Reporting Trials (CONSORT) statement should help to eliminate major deficits in clinical trials. This article underscored the need to critically assess results before following recommendations. It also asserted the need for further reform in study reviews. When referring a client for a clinical trial, consider a chat with the local coordinator about study design.— Ewan Wolff, DVM, PhD

Source

Type II error and statistical power in reports of small animal clinical trials. Giuffrida MA. JAVMA 244:1075-1080, 2014.

Bracing Patients for Carpal Injury

Treatment of canine carpus injury traditionally involves rest and immobilization via a cast or, in chronic cases, arthrodesis. Extended cage rest can be difficult, and joint immobilization can have long- and short-term adverse effects. This case study retrospectively evaluated the use of a novel custom brace in athletic dogs with unilateral nondissociative carpal ligament injuries. All dogs (n = 14) had forelimb lameness and a carpal valgus or varus instability that failed to improve significantly after forced inactivity. Assessment included a subjective lameness scale, goniometry, and plain radiography. Treatment consisted of a custom-made neoprene carpal brace that prevented varus or valgus movement while providing limited flexion and extension of the carpal joint (135°–180°). Braces were placed for a minimum of 8 weeks; clients performed passive flexion/extension exercises q2h on all forelimb joints. Exercise was limited to leash walks for the first 2 weeks, after which strength exercises and low-impact off-leash activity was instituted. Brace use was gradually reduced over 4 weeks as normal activities resumed, amounting to a 12-week recovery. Normal function returned in 11 dogs; all but 1 agility dog returned to competition status. Carpal valgus and varus measurements improved to where no significant differences were found between the affected and unaffected limbs. Lameness scores were significantly lower at initial brace removal and treatment end. Application of a carpal brace along with gradual rehabilitation is a reasonable treatment for carpal varus and valgus injury in dogs.

Commentary

Written by one of the leaders in sports medicine, this retrospective study provided a template for using carpal braces to treat injuries in active dogs. A Thera-Paw brace (therapaw.com) was used to treat joints with measurable goniometric carpal laxity. Goniometric measurements and lameness scores improved in all dogs, although 3 still had intermittent lameness. The described technique appears to be useful for carpal sprains in high-activity, medium-sized dogs (mean weight, 34 lb). Arthrodesis, however, remains the treatment of choice for more severe carpal hyperextension injuries.— Jonathan Miller, DVM, MS, DACVS

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