**Introduction:** A non-destructive test method was developed to assess mechanical stability of postmortem retrieved acetabular components that would be amenable to small canine acetabular components. A postmortem canine THR retrieval program was established to provide long-term performance data (i.e., up to 11.7 years) of cemented THRs in clinical canine patients. Retrospective studies [1-6] have shown the incidence of aseptic loosening of canine acetabular components requiring revision surgery was 5.5% (26 of 473 cases) with follow-up times ranging from 1 to 72 months. No postmortem retrieval studies had been performed on clinical cases to examine mechanical stability of canine acetabular components retrieved postmortem. The hypothesis was that mechanical stability would correlate with the incidence of clinical aseptic loosening found in the retrospective studies.

**Materials and Methods:** Demographic data (e.g., breed, weight, surgery date) were retrieved from the clinical chart. Due to the small component size (maximum outer diameter of 29 mm), the presence of the “fire hydrant” cut-out (See Figure 1), and the difficulty in mounting several of the retrievals that included only fragments of the hemipelvis, test methods used in human THR retrieval studies could not be easily adapted. A novel test method, using two lasers reflected off laser mirrors mounted to the test specimen onto a laboratory wall 3.5 m from the specimen, was based upon a simple test method [7] (See Figure 2). The PE mirror (See Figure 2) was mounted to a bone pin that 0.11, p = 0.042). The VWRs measured in dogs were an order of magnitude lower than that seen in humans; thus the UHMWPE wear debris load is lower in the dog, possibly due to the peak joint reaction magnitude lower than that seen in humans: thus UHMWPE wear debris. Future histological analysis of the retrievals; thus, the hypothesis was not supported. Volumetric wear and acetabular component was alarmingly high in the canine postmortem retrievals; thus, the hypothesis was not supported. Volumetric wear and wear grading were performed previously on the 38 specimens used in this study [8,9]. Total volumetric wear (TVW) and volumetric wear rate (VWR) of the acetabular components did not correlate with the results of the mechanical testing: however, the total UHMWPE damage score was positively correlated with loosening of the acetabular component ($R^2 = 0.11$, $p = 0.042$). The VWRs measured in dogs were an order of magnitude lower than that seen in humans; thus the UHMWPE wear load is lower in the dog, possibly due to the peak joint reaction force being a much smaller proportion of the body weight in the dog versus the human [10-11]. By contrast, the incidence of loosening was much greater than expected from the retrospective studies [1-6]. The correlation of loosening with UHMWPE damage indicates that loosening in the dog may not be due to a biological response to UHMWPE wear debris. Future histological analysis of the retrievals needs to be performed to confirm this finding.

**Results:** Thirty-eight implants with hemipelvises and femora were retrieved from 29 dogs (9 bilateral) at necropsy and stored at −20°C until testing began. Two designs of implants were retrieved. Both designs had an ultrahigh molecular weight polyethylene (UHMWPE) acetabular component. The earlier design was manufactured by Smith & Nephew Richards (Memphis, TN), and the second design was manufactured by BioMedtrix (Allendale, NJ). The dogs ranged in weight from 18 to 66 kg. The implant duration ranged from 8 months to 11 years and 8 months. Twenty (52.6%) acetabular components tested as loose, six (15.8%) tested as borderline, and 12 (31.6%) were classified as firmly implanted. There was no significant correlation between implant duration and movement of the acetabular component.

**Figure 2** – Schematic drawing (not to scale) of mechanical testing set-up in the laboratory.

**Discussion:** This is first report of long-term acetabular implant stability in clinical canine THR. The incidence of aseptic loosening of the acetabular component was alarmingly high in the canine postmortem retrievals; thus, the hypothesis was not supported. Volumetric wear and wear grading were performed previously on the 38 specimens used in this study [8,9]. Total volumetric wear (TVW) and volumetric wear rate (VWR) of the acetabular components did not correlate with the results of the mechanical testing: however, the total UHMWPE damage score was positively correlated with loosening of the acetabular component ($R^2 = 0.11$, $p = 0.042$). The VWRs measured in dogs were an order of magnitude lower than that seen in humans; thus the UHMWPE wear debris load is lower in the dog, possibly due to the peak joint reaction force being a much smaller proportion of the body weight in the dog versus the human [10-11]. By contrast, the incidence of loosening was much greater than expected from the retrospective studies [1-6]. The correlation of loosening with UHMWPE damage indicates that loosening in the dog may not be due to a biological response to UHMWPE wear debris. Future histological analysis of the retrievals needs to be performed to confirm this finding.

**References:**


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