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Clinical, computed tomography scan and MRI evaluation of osteodisc allograft impregnated with mesenchymal stem cells for replacement of normal cervical disc in dog

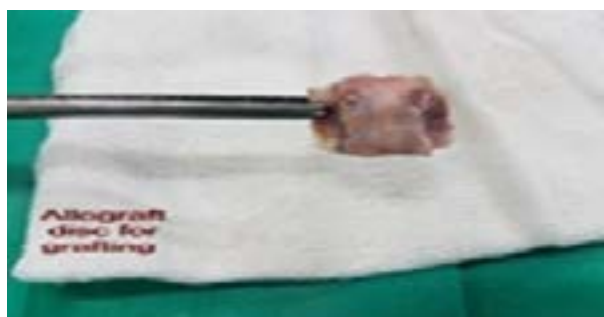
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Statement of the problem: Spinal arthroplasty offers an exciting alternative to fusion for the treatment of degenerative disc disease. Currently, the main indication for disc prosthesis in small animals is the treatment of disc-associated cervical spondylomyelopathy in dogs, also known as Disc-Associated Wobbler Syndrome (DAWS). The objective of this study was to evaluate the immediate postoperative recovery and the short- and intermediate-term follow-up of dogs treated with Allograft osteodisc cervical disc replacement over 6 months being evaluated with CT Scan and MRI.

Methodology & Materials: The complete cervical vertebrae from two medium size mongrel dogs cadaver free from systemic diseases, freshly were collected. The total of 3 discs along with end-plate and either side vertebral bodies were removed from each cadaver and transplanted to 3 other adult – large male mixed breed (25 ± 30 Kg,bw) after removal of 2nd normal vertebral disc in each one under restricted aseptic condition and stabilized with double 2.7 mm cancellous screw. Allograft osteodisc was impregnated with 1 ml broth of autologous mesenchymal stem cells before replacement (10-10) in first 3 dogs whereas the rest of 3 dogs used as control one. CT Scan and MRI were done before and after replacement of allograft osteodisc and at end of study in 6 months. Five main CT Scan and MRI parameters including, moderate dehydration rate, mild rate of resorption of replaced disc materials, decreased signal of replaced disc materials in T₁-T₂ images, rate of protrusion of replaced disc, osteodisc density, osteophytes & calcification of allograft osteodisc, dislocation and distance of grafted disc beside complications and tracing infection & facture.

Findings: All dogs had immediate postoperative recovery with good degree of distraction in the Immediate postoperative CT Scan. In the majority of dogs, the amount of distraction decreased slightly over-time; this except for one dog was not clinically relevant. In this one dog CT Scan data showed one grafted osteodisc displacement due to dislocation of tissue grafted. But it plays a role in reconstruction or maintenance of intervertebral functional spinal unit, clinical outcomes indicated that using osteodisc allograft for cervical disk replacement is reliable. Heterogenous density with one fracture complication with variable changes in disc distance were prominent MRI and CT Scan findings.

Conclusion & Significance: Cervical disc arthroplasty appears to be a well-tolerated surgical technique; Short- and Intermediate-term results are promising. Long-term follow-up studies are underway. We feel this surgery provides a better outcome for dynamic CSM; it is less invasive, requires minimal post-op care and hospitalization, reduces post-op pain and discomfort, has a lower mortality rate and a lower cost to the owners.



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Recent Publications

1. Bergknut N, Rutges J P, Kranenburg H J, Smolders L A, Hagman R, Smidt H J and et al (2012) The dog as an animal model for intervertebral disc degeneration? Spine (Phila Pa 1976). 37(5):351–8.
2. Lam S K, Xiao J, Ruan D, Ding Y, Lu W W, Luk K D (2012) The effect of remodeling on the kinematics of the malpositioned disc allograft transplantation. Spine (Phila Pa 1976). 37(6):E357–66.
3. Guehring T, Omlor G W, Lorenz H, Engelleiter K, Richter W, Carstens C and et al (2006) Disc distraction shows evidence of regenerative potential in degenerated intervertebral discs as evaluated by protein expression, magnetic resonance imaging, and messenger ribonucleic acid expression analysis. Spine. 31(15):1658–65.

Biography

Davood Sharifi has completed his Veterinary Graduation (B.V.Sc & A.H, M.V.Sc & PhD) from PAU & HAU in year 1990, India. He joined as an Assistant Professor at the University of Tehran in year 1991 and was promoted to full Professor in year 2007. His master-plan was focused in orthopedic and spine surgery, lameness, physiotherapy and experimental surgery. He was selected as a distinguished and eminent researcher in year 2007 and 2009 at the University of Tehran. He has published three surgery books and having 119 publications. He has participated in 62 national and international congresses with 109 research papers. He directly supervised 98 undergraduates and 30 post-graduate students. He has 41 applied research projects. He is an expert in PRT and PDC intervertebral disc treatment via CT Scan. Presently he is acting as a Director of Research at the Faculty of Veterinary Medicine, University of Tehran, Iran.

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