THE SCIENCE WORLD
A Monthly e Magazine
ISSN:2583-2212
August, 2022; 2(8), 1495-1497

Success Story

Successful treatment of clinical cases of Hip Dysplasia in dogs with uncultured autologous bone marrow mono nuclear cells and activated platelets.

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https://doi.org/10.5281/zenodo.7037352

Hip dysplasia (HD) is an inherited, non-congenital orthopedic disease with the highest incidence and heritability of up to 95% in the canine species that is particularly prevalent in large and giant breeds of dogs. It is characterized by a degenerative joint disease that can progressively trigger the development of osteoarthritis (OA) of the affected joints. It is characterized by articular cartilage lesions, bone remodeling with the presence of osteophytes, and inflammation in the hip joint. The most common symptom of OA is joint pain, and gait abnormalities, such as stiffness, the reduced height of the step, shortened stride length, bunny hopping, difficulty in rising, climbing stairs or jumping over obstacles. The condition is mainly noticed at the age of 4 months to 2 years of age and once it happened it is an ongoing process and situation aggravated with the advancement of age. The animal required treatment for the rest part of its life, sometimes a few dogs reluctant of taking regular oral medication, the major disadvantage of this treatment is, that it slows down the progression of diseases but there is no permanent cure.

The treatment aim is to reduce or eliminate pain, thereby improving or restoring limb function to normal. Two approaches to canine HD management have been described: conservative management and surgery. In dogs, one of the principal conservative therapeutic approaches involves oral administration of nutraceuticals, whose formulation is primarily composed of glucosamine and chondroitin sulfate together with the use of nonsteroids anti-inflammatory drugs (NSAIDs). However, prolonged use of NSAIDs can be associated with side effects, especially in the digestive system and kidneys. Bone marrow mononuclear cells and cultivated bone marrow stromal cells represent a phenotypically and functionally heterogeneous population of mesenchymal precursors and contribute to the physiological regeneration of bone.

It could be a valid alternative to the more invasive traditional techniques to correct large bone defects. Cartilage has limited capacity for regeneration, and when lesion is limited to the articular cartilage only and does not extend to the underlying bone, it fails to heal spontaneously leading to the osteoarthritis, lameness, and permanent disability. Intra-articular implantation of uncultured bone marrow derived nucleated cells

Platelet-rich plasma (PRP) is an autologous product that concentrates a large number of platelets in a small volume of plasma. PRP accelerates endothelial, epithelial, and epidermal regeneration, stimulates angiogenesis, enhances collagen synthesis, promotes soft tissue healing, decreases dermal scarring, enhances the hemostatic response to injury, and reverses the inhibition of wound healing caused by glucocorticoids. The high leukocyte concentration of PRP has an added antimicrobial effect and carries no risk of transmitting infectious disease. PRP is obtained following the centrifugation of whole blood, yielding a product highly concentrated with platelets. The α-granules within the concentrated platelet solution contain growth factors and proteins vital to the coagulation cascade which, upon activation, may aid in the regeneration of tissues. To combat the catabolic environment of joints affected by OA, PRP counteracts cartilage erosion by inhibiting the catabolic cytokines of IL-1β and TNF-α and by promoting factors associated with cartilage matrix synthesis including fibroblast growth factor, transforming growth factor-β (TGF-β), insulin-like growth factors and others cytokines.

Based on above existing problems of hip dysplasia and the role of uncultured bone marrow mono-nucleated cells (BMNCs) and activated platelets a total of ten clinical cases of dogs diagnosed for mild to moderate form of hip dysplasia were one time treated with a combination of (4.5 ± 0.07) x 10^6) autologous BMNCs and activated platelets mixed together and implanted under ultrasound guidance in the affected hip joint as therapy in canine hip dysplasia. The BMNCs were isolated in 5ml bone marrow isolated from the iliac crest and mono-nuclear cells were isolated from bone marrow by centrifuging on lymphocyte isolation density gradient media. This protocol for treatment was planned with the hypothesis that bone BMNCs contain mesenchymal stem cells and activated platelets have growth factors that may further help in the proliferation and differentiation of BMNCs cells implanted in the joint. So, one-time treatment of such conditions with cell therapy may be useful to overcome the complications related to conventional treatment. All treated cases were recovered completely and the last two years of follow-up, not showed any complications, further no supplementation and treatment related to hip dysplasia have been given to the animals.

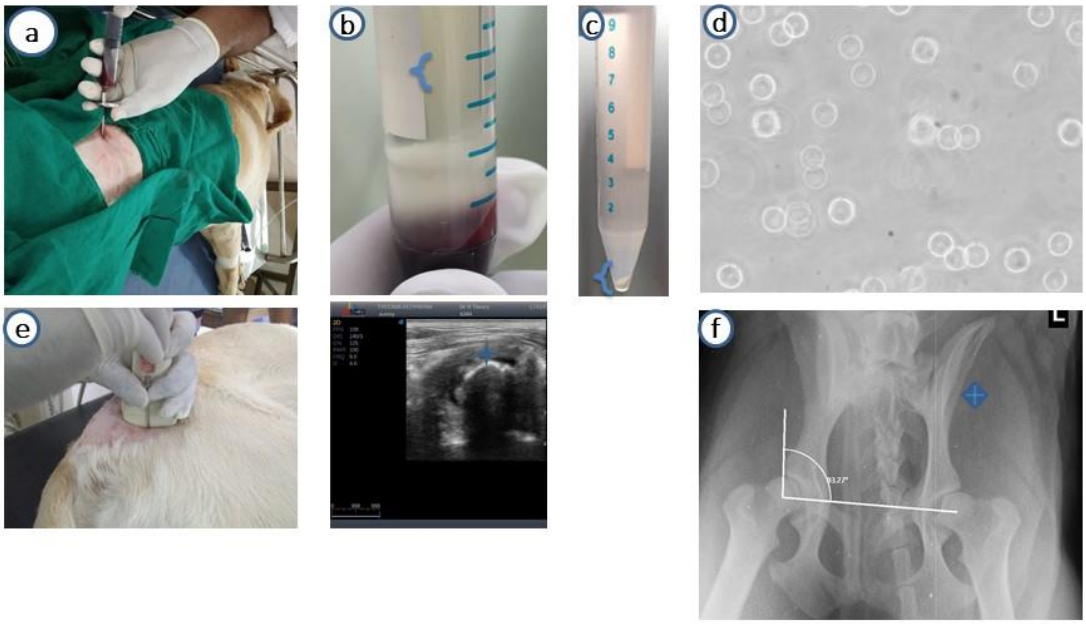

Fig. Bone marrow mono-nuclear cells (BMNCs) isolation (a) Bone marrow collection from iliac crest of a dog with Jamshidi biopsy needle, (b), Translucent ring showing BMNCs after centrifugation, (c) BMNCs pellets ready for implantation, (d) Isolated uncultured BMNCs under microscope 40x (e) Ultrasound guided implantation of BMNCs in hip joint( ) (f) Radiographic image of ilium the site for bone marrow collection