International Journal of Veterinary Sciences and Animal Husbandry 2025; 10(11): 213-216

International Journal of Veterinary Sciences and Animal Husbandry

ISSN: 2456-2912
NAAS Rating (2025): 4.61
VET 2025; 10(11): 213-216

www.veterinarypaper.com
Received: 08-09-2025
Accepted: 12-10-2025

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Comparative study on the efficacy of joint supplements with and without pentosan polysulfate in the conservative management of canine hip dysplasia

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DOI: https://www.doi.org/10.22271/veterinary.2025.v10.i11d.2728

Abstract
Canine hip dysplasia (CHD) is a progressive orthopaedic disorder that predisposes dogs to osteoarthritis and degenerative joint disease. The present study evaluated the comparative efficacy of oral joint supplements alone and in combination with sodium pentosan polysulfate (NaPPS) for the conservative management of CHD. Twelve dogs (N=12) diagnosed with CHD were divided into two groups. Group I received oral glucosamine-chondroitin sulfate daily for 60 days, whereas Group II received NaPPS (3 mg/kg, subcutaneously on Days 0, 7, 14, and 21) along with the same oral supplementation. Clinical, haematological, biochemical, radiographic, and pain evaluations were performed on Days 0, 15, 30, and Both groups showed progressive improvement in mobility and reduction in pain; however, Group II exhibited earlier and significantly greater improvement (p<0.05) without any adverse effects. Haemato-logical and biochemical parameters remained within normal physiological limits, confirming the safety of both regimens. Radiographic findings indicated joint stability with non-significant structural changes over the 60-day period, possibly due to the short observation duration. The combination of NaPPS with oral supplements produced superior clinical improvement, likely due to synergistic chondroprotective, anti-inflammatory, and analgesic effects. These findings support the use of NaPPS as a safe and effective adjunct in the conservative management of canine hip dysplasia.

Keywords: Canine hip dysplasia, DJD, sodium pentosan polysulfate, glucosamine, chondroitin sulfate, conservative management, osteoarthritis

Introduction

Canine hip dysplasia (CHD) is a non-traumatic, developmental orthopaedic disorder characterized by abnormal formation and laxity of the coxofemoral joint, leading to secondary osteoarthritis and degenerative joint disease. The condition is polygenic and multifactorial, with genetic predisposition, growth rate, body weight, and nutrition playing important roles [1]. Large and giant breeds such as Labrador Retrievers, German Shepherds, and Rottweilers are particularly predisposed.

Conservative management remains the primary approach for early or mild-to-moderate CHD cases, aiming to alleviate pain, reduce inflammation, improve joint mobility, and delay degenerative changes [2]. Among the most widely used therapeutic agents are nutraceuticals such as glucosamine and chondroitin sulfate, which act as building blocks for glycosaminoglycans, promote cartilage matrix repair, and inhibit catabolic enzymes responsible for degradation.

Sodium pentosan polysulfate (NaPPS) is a semi-synthetic polysaccharide possessing anti-inflammatory, fibrinolytic, and chondroprotective actions. It improves subchondral blood flow, stimulates proteoglycan synthesis, and inhibits lysosomal enzymes that degrade cartilage [3]. The present study was therefore designed to compare the therapeutic efficacy of oral joint supplementation alone and in combination with NaPPS in dogs suffering from CHD.

Materials and Methods

Twelve dogs of various breeds, sexes, and age groups, clinically diagnosed with hip dysplasia based on orthopaedic examination and radiographic confirmation, were randomly allocated into two experimental groups. Comprehensive clinical, orthopaedic, haematological, biochemical, and pain assessments were conducted on Days 0, 15, 30, and 60. Radiographic evaluation of the hip joints was performed on Days 0, 30, and 60 using standard ventro-dorsal pelvic projections with extended hind limbs to assess joint congruity and osteoarthritic progression.

Table 1: Treatment groups

Group	No of Dogs (N)	Treatment Protocol
Group I	6	Oral glucosamine + chondroitin sulfate daily for 60 days
Group II	6	Oral glucosamine + chondroitin sulfate daily for 60 days and NaPPS 3 mg/kg S.C. on Days 0, 7, 14 and 21

All dogs were maintained on identical dietary and manage mental conditions. Supportive physiotherapy (passive limb movement and controlled leash walking) was also advised.

Results and Discussion Clinical Observations

Both groups tolerated the therapeutic regimens well, without any adverse effects. Progressive clinical improvement was observed in all dogs, reflected by normal smoother gait, reduced stiffness, improved weight-bearing, and restoration of mobility. Dogs in Group II, receiving NaPPS along with glucosamine-chondroitin supplementation, showed noticeable improvement as early as day 15; whereas, Group I exhibited gradual improvement evident by Day 30. Enhanced ease in rising, better postural balance, and reduced pain response during hip manipulation were more prominent in Group II.

Marked improvement in lameness and mobility was observed within two to three weeks of NaPPS therapy in canine osteoarthritis [4]. Early gains in joint flexibility following polysulfated glycosaminoglycan treatment were noted, underscoring its synergistic chondroprotective and anti-inflammatory effects when combined with nutraceuticals [5].

Fig 1: Sloppy sitting posture in osteoarthritic dog (Group I)

Fig 2: Improved sitting posture after treatment (Group I)

Fig 3: Sloppy sitting posture in osteoarthritic dog (Group II)

Fig 4: Improved sitting posture after treatment (Group II)

Haematological Parameters

Haemoglobin concentration, total erythrocyte count, total leukocyte count, platelet count, and differential leukocyte count remained within established canine reference ranges throughout the study. Variations between groups and intervals were statistically non-significant, confirming the haematological safety of both protocols. Group II exhibited slightly better stability and mild recovery trends by Day 60 [6], and minimal haematological changes following polysulfated glycosaminoglycan therapy in dogs were observed. Consistent haematological values were noted during chondroprotective treatment [7, 8].

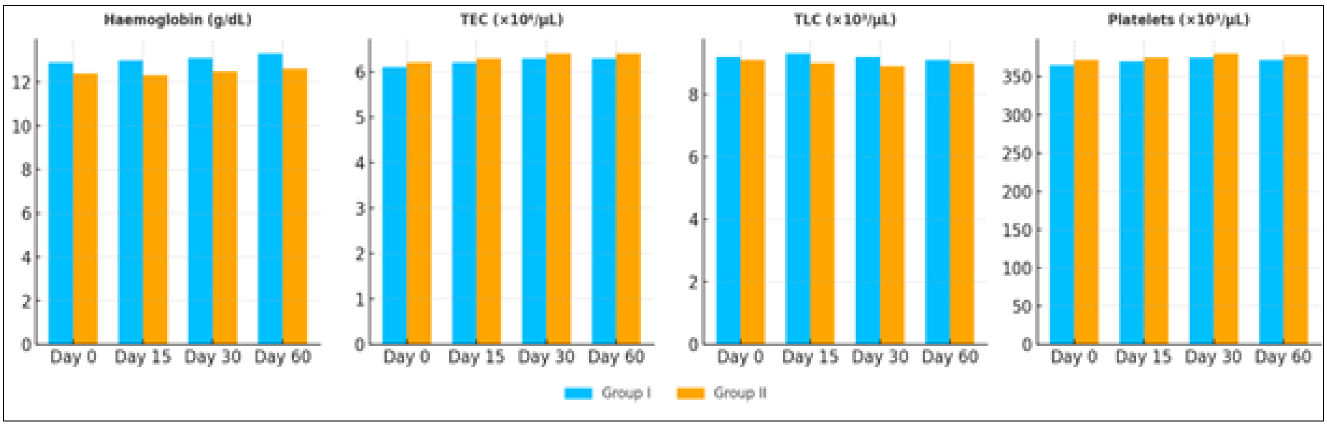

Fig 5: Bar graphs depicting the haematological values at intervals of Day 0, 15, 30 and 60

Biochemical Parameters

Serum biochemical evaluation revealed that SGOT, SGPT, BUN, creatinine, ALP, and calcium values remained within normal physiological limits throughout the study period. The variations observed were statistically non-significant between the two groups, confirming that both treatment regimens were safe and well tolerated. Transient mild elevations in hepatic transaminases noted on Day 30 subsided by Day 60, suggesting adaptive metabolic adjustment rather than hepatocellular distress. The maintenance of stable renal biomarkers (BUN, creatinine) further supported the absence of nephrotoxic influence.

Biochemical stability following NaPPS and polysulfated glycosaminoglycan administration in canine osteoarthritis was reported [8, 9].

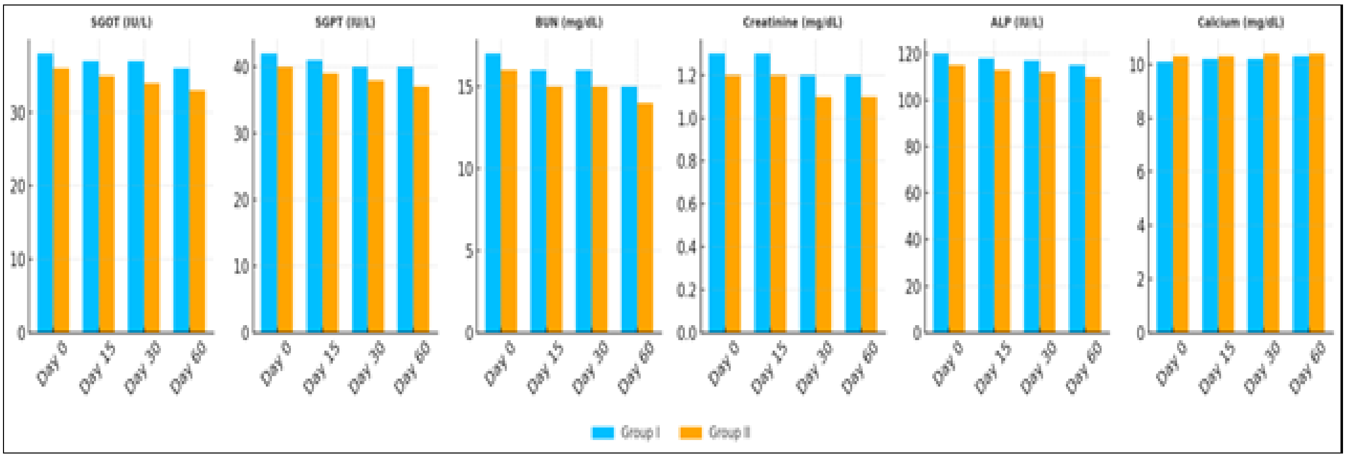

Fig 6: Bar graphs depicting the serological values such as SGOT, SGPT, BUN, Creatinine, ALP and Calcium at intervals of Day 0, 15, 30 and 60

Radiographic Evaluation

Radiographic grading of hip joints was performed [10, 11]. Standard ventro-dorsal pelvic radio-graphs on Days 0, 30, and 60 showed no significant osteoarthritic progression in either group.

Group I exhibited stable joint morphology; whereas, Group II showed mild improvement in fem oral head-acetabular alignment and a slight reduction in periarticular opacity by Day 60. Subtle acetabular filling and enhanced subchondral definition in Group II may indicate early chondroprotective response and matrix stabilisation associated with NaPPS therapy. Structural preservation and delayed degenerative progression following early chondroprotective intervention in canine CHD was recognised [3, 10, 11].

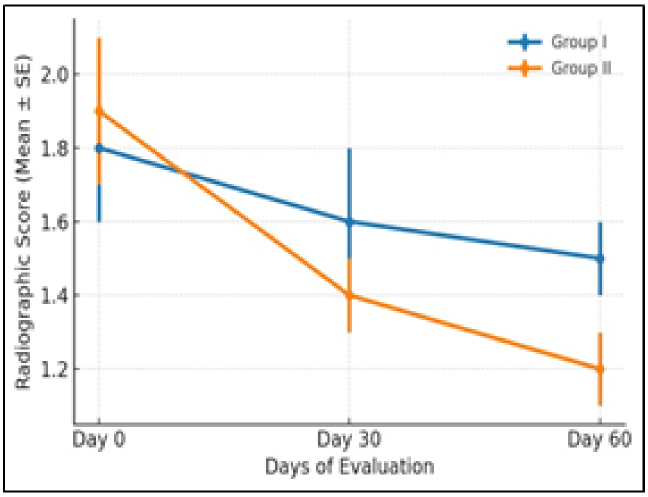

Fig 7: Line graph depicting the Radiological score (Mean +-SE) of both groups on day 0, 30 and 60

Fig 8: DV radiograph of a canine hip depicting advanced osteoarthritis

Fig 9: DV radiograph of a canine hip showing normal hip joint

Pain Assessment

Pain was assessed using the University of Melbourne Pain Scale (UMPS) and the Glasgow Composite Pain Scale (GCPS) at predetermined intervals. Both groups demonstrated a consistent decline in pain scores, indicating clinical improvement.

Group II exhibited a significant reduction as early as day 15, which persisted throughout the study period. The UMPS more effectively reflected chronic behavioural modulation of pain, whereas the GCPS was more sensitive to acute nociceptive variations. The complementary role of these scales in evaluating both behavioural and sensory aspects of pain in dogs was recognised [12, 13]. Comparable reductions in pain scores after NaPPS therapy was observed, supporting its multimodal analgesic and chondroprotective potential [3].

Conclusion

Both treatment groups exhibited favourable therapeutic outcomes, reflected in pain reduction, improved mobility, and radiographic joint stability. However, combined administration of oral glucosa-mine-chondroitin sulfate and sodium pentosan polysulfate (NaPPS, 3 mg/kg S.C. weekly for four weeks) produced superior results compared to nutraceutical supplementation alone.

The combination therapy provided greater pain alleviation and enhanced mobility without inducing any haematological or biochemical alterations. These results suggest that NaPPS, when used concurrently with oral chondroprotective agents, serves as a safe and effective adjunctive therapy for the conservative management of mild to moderate canine hip dysplasia.

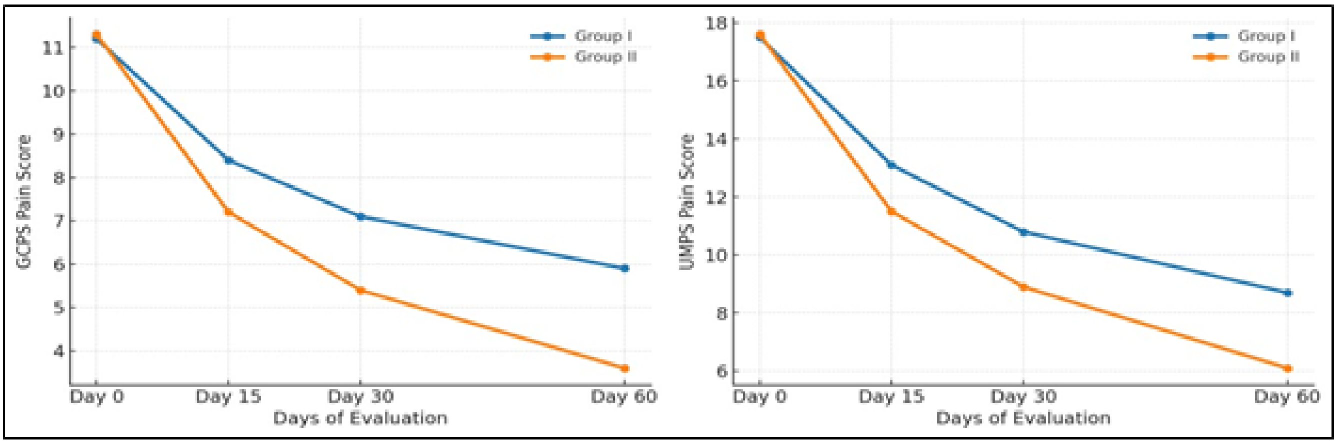

Fig 10: Line graph depicting the GCPS and UMPS of both groups on day 0, 30 and 60

Conflict of Interest
Not available

Financial Support
Not available

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How to Cite This Article
Patel UD, Akhare SB, Upadhye SV, Bhadane BK, Fiske GA, Kaore MP. Comparative study on the efficacy of joint supplements with and without pentosan polysulfate in the conservative management of canine hip dysplasia. International Journal of Veterinary Sciences and Animal Husbandry. 2025;10(11):213-216.