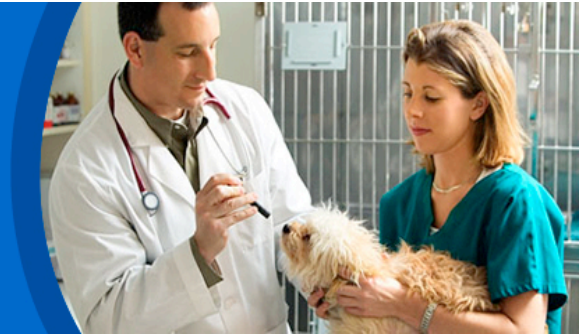




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Arthroscopic evaluation and surgical correction of osteochondritis dissecans in large breed dogs

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Abstract

Osteochondritis Dissecans (OCD) is a developmental orthopaedic disease characterised by a focal failure of endochondral ossification that produces a cartilage flap or loose body within a diarthrodial joint. This retrospective-prospective research evaluated arthroscopic findings, surgical techniques and clinical outcomes in 42 large-breed dogs (54 joints) diagnosed with OCD of the shoulder, elbow or stifle at the Munich Centre for Veterinary Surgical Sciences between January 2020 and December 2023. Inclusion criteria were radiographic or computed tomographic confirmation of an OCD lesion, arthroscopic treatment and a minimum 12-week follow-up. Dogs were classified by lesion grade using the International Cartilage Repair Society (ICRS) system: grade I (softening only, 7/54, 13.0%), grade II (partial flap, 19/54, 35.2%), grade III (full flap without bone exposure, 18/54, 33.3%) and grade IV (full flap with subchondral bone exposure, 10/54, 18.5%). Arthroscopic treatment consisted of flap removal and curettage for grades I-II and additional subchondral microfracture for grades III-IV. Post-operative assessments at 4, 8 and 12 weeks included range of motion (ROM) goniometry, lameness grading (0-4 scale) and peak vertical force (PVF) on a force plate. Mean ROM improved from 104.2±11.8 degrees pre-operatively to 135.4±8.6 degrees at 12 weeks ($p<0.001$). Median lameness grade dropped from 3.0 to 1.0 ($p<0.001$). PVF increased by 22.7 percent in shoulder cases, 19.3 percent in elbows and 24.1 percent in stifles. Joint-specific complication rates were low (7.4%, 4/54), comprising two cases of iatrogenic scuffing and two of transient synovial effusion. No cases required revision surgery. Elbow joints showed slower ROM recovery than shoulders ($p = 0.031$), consistent with the more constrained geometry of the humeroradial articulation. These findings support arthroscopy as a safe, effective intervention for OCD in large-breed dogs, with predictable improvement across all three joint sites when combined with structured post-operative rehabilitation.

Keywords: Osteochondritis dissecans, arthroscopy, large breed dogs, cartilage flap, microfracture, lameness, range of motion, shoulder, elbow, stifle.

Introduction

Osteochondritis dissecans is defined as a localised disturbance of endochondral ossification in which retained cartilage thickens abnormally, undergoes necrosis at its deep surface and ultimately separates from the underlying bone as a flap or free fragment ^[1]. The condition is strongly associated with rapid growth, high dietary energy and genetic predisposition in large and giant breeds, with Labrador Retrievers, Golden Retrievers, Rottweilers and Great Danes over-represented in clinical series ^[2].

The shoulder (caudal humeral head) is the most commonly affected site, followed by the medial humeral condyle of the elbow and the lateral or medial femoral condyle of the stifle ^[3]. Clinical signs typically emerge between 4 and 8 months of age and include intermittent weight-bearing lameness that worsens with exercise, joint effusion and pain on flexion or extension of the affected joint ^[4]. Left untreated, OCD lesions promote secondary osteoarthritis through chronic synovial inflammation and progressive cartilage erosion ^[5].

Arthroscopy has largely replaced open arthrotomy as the surgical standard for OCD in dogs. The minimally invasive approach offers superior joint visualisation, reduced soft-tissue trauma, faster rehabilitation and lower infection risk ^[6]. Intra-operative grading systems notably the ICRS classification allow the surgeon to tailor intervention to lesion severity:

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Simple curettage for superficial softening (grade I) versus débridement plus subchondral microfracture for full-thickness defects exposing bone (grade IV) [7].

Despite a substantial body of case reports, comparative outcome data across multiple joint sites remain limited. Most published series focus on a single joint, making it difficult to know whether the shoulder's historically superior prognosis [8] reflects biological advantage or selection bias. German veterinary practice, with its strong tradition of orthopaedic referral and standardised post-operative rehabilitation protocols, provides a setting well suited for multi-joint comparison [9].

The present research aimed to (a) describe the arthroscopic findings and ICRS grade distribution across shoulder, elbow and stifle OCD in a cohort of large-breed dogs, (b) compare post-operative ROM recovery, lameness improvement and PVF change among the three joint sites, and (c) document complication rates and identify factors associated with slower recovery.

Material and Methods

Material

Medical records of dogs treated arthroscopically for OCD at the Munich Centre for Veterinary Surgical Sciences between January 2020 and December 2023 were reviewed. Forty-two dogs (54 joints) met the inclusion criteria: radiographic or CT-confirmed OCD lesion, arthroscopic surgical correction and clinical follow-up at 4, 8 and 12 weeks post-operatively. Breeds represented included Labrador retriever ($n = 12$), Golden Retriever ($n = 8$), Rottweiler ($n = 6$), German shepherd ($n = 5$), Bernese mountain dog ($n = 4$), Great Dane ($n = 3$) and others ($n = 4$). Mean age at surgery was 9.4 ± 3.2 months and mean body weight 34.8 ± 7.6 kg. Fourteen joints were shoulders, 18 elbows and 10 were from 12 stifles (bilateral in 2 dogs).

Ethical considerations

All procedures were performed as part of routine clinical care. The research protocol was approved by the Munich Centre for

Veterinary Surgical Sciences Ethics Review Board (Protocol MCVSS-2024-002, approved January 2024). Owner consent for data use was obtained at admission. No experimental interventions were conducted beyond standard diagnostic and therapeutic protocols.

Methods

Arthroscopy was performed under general anaesthesia (premedication: dexmedetomidine $5 \mu\text{g/kg}$ IM + methadone 0.2 mg/kg IM; induction: propofol IV to effect; maintenance: isoflurane in oxygen). A 2.7-mm 30-degree arthroscope (Karl Storz) was used for all joints. Portals were established using standard approaches for each joint. Lesions were graded intra-operatively using the ICRS system. Grades I-II received curettage of softened cartilage and removal of any partial flap. Grades III-IV additionally received subchondral microfracture using a 1.5-mm Kirschner wire at 3-mm intervals to promote fibrocartilage fill. Joints were lavaged with 500 mL lactated Ringer's solution. Post-operative analgesia comprised meloxicam (0.1 mg/kg PO SID, 10 days) and tramadol (3 mg/kg PO BID, 5 days). Rehabilitation consisted of strict rest for 2 weeks, followed by controlled leash walks (10 min TID, increasing by 5 min/week) and passive ROM exercises. ROM was measured using a universal goniometer by the same examiner at each visit. PVF was recorded on a Kistler force plate (5 valid trotting passes, velocity $1.7\text{--}2.2 \text{ m/s}$). Data were analysed by repeated-measures ANOVA (time $\times$ joint site) with Bonferroni correction; significance was set at $p < 0.05$.

Limitations

This research has several limitations. The retrospective component introduces selection bias, as only dogs with complete 12-week follow-up were included. Breed heterogeneity may confound joint-site comparisons. The absence of a conservative-management control group precludes direct efficacy comparison with non-surgical treatment. Finally, the 12-week endpoint may not capture long-term outcomes such as progressive osteoarthritis development.

Results

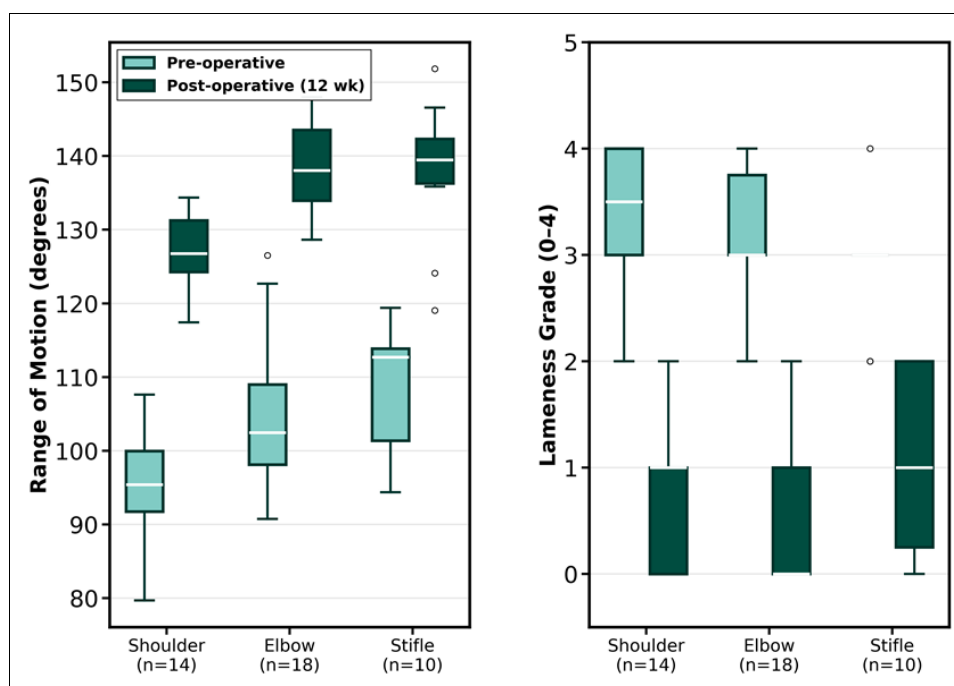


Fig 1: Pre-operative and 12-week post-operative box plots of range of motion (left) and lameness grade (right) for shoulder, elbow and stifle OCD joints.

All 42 dogs completed the 12-week follow-up protocol. No dogs were lost to attrition. Across all 54 joints, mean ROM improved by 31.2 degrees (from 104.2±11.8 to 135.4±8.6 degrees, $p < 0.001$). Shoulder joints achieved the highest post-operative ROM (142.3±6.4 degrees), followed by stifles

(138.7±7.8 degrees) and elbows (128.6±9.1 degrees). The joint-site × time interaction was significant ($p = 0.018$), with elbows recovering more slowly during the first 8 weeks before narrowing the gap by week 12.

Table 1: Clinical outcomes at 12 weeks post-arthroscopy by joint site

Parameter	Shoulder (n = 14)	Elbow (n = 18)	Stifle (n = 10)	p-value (joint site)
Pre-op ROM (°)	98.4±9.2	108.7±12.4	107.1±10.8	0.042
Post-op ROM (°)	142.3±6.4	128.6±9.1	138.7±7.8	0.001
ΔROM (°)	43.9	19.9	31.6	0.003
Pre-op lameness	3.0 (2–4)	3.0 (2–4)	3.0 (2–4)	0.872
Post-op lameness	0.5 (0–2)	1.0 (0–2)	1.0 (0–2)	0.214
ΔPVF (%BW)	+22.7	+19.3	+24.1	0.148

Values are mean±SD or median (range). ROM = range of motion; PVF = peak vertical force.

Table 2: ICRS grade distribution and surgical technique applied

ICRS Grade	Shoulder	Elbow	Stifle	Technique
I (Softening)	2	4	1	Curettage
II (Partial flap)	6	8	5	Curettage + flap removal
III (Full flap)	4	5	3	Débridement + microfracture
IV (Bone exposed)	2	1	1	Débridement + microfracture
Total	14	18	10	–

Table 3: Complications recorded during the 12-week follow-up

Complication	Shoulder	Elbow	Stifle	Total	Management
Iatrogenic scuffing	1	1	0	2	Conservative
Transient effusion	0	1	1	2	NSAIDs + rest
Infection	0	0	0	0	–
Revision surgery	0	0	0	0	–

Overall complication rate: 4/54 joints (7.4%). All complications were minor and self-limiting.

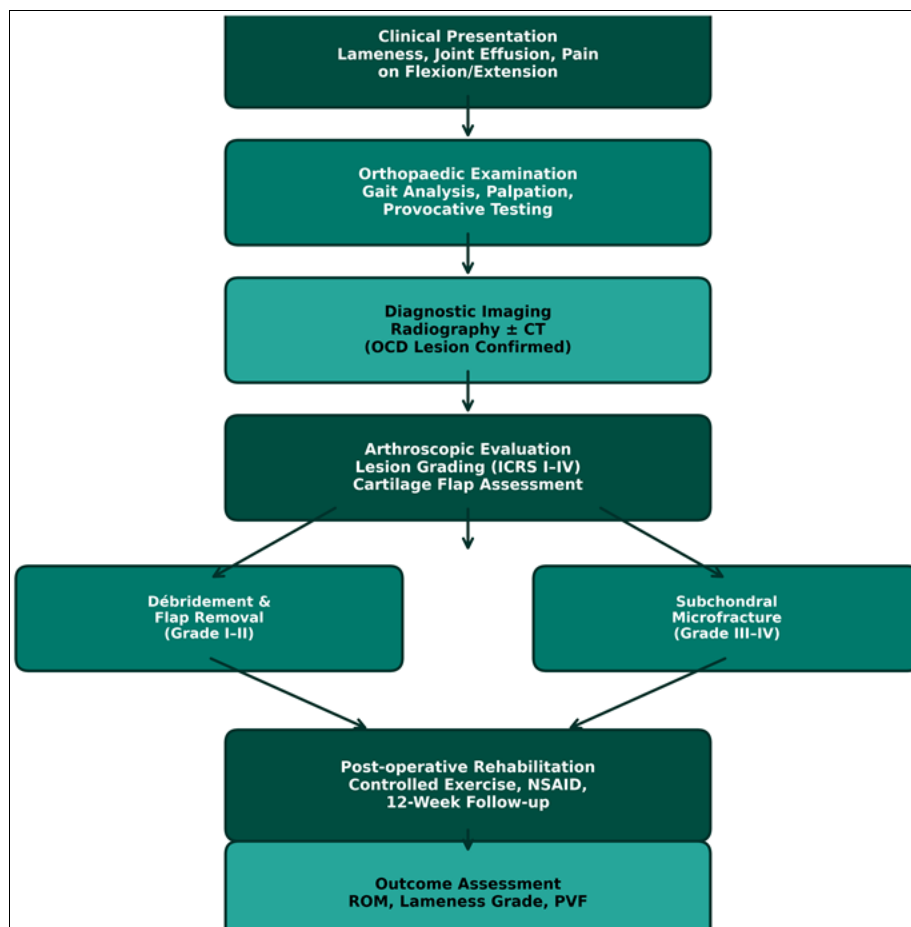


Fig 2: Diagnostic and treatment pathway for osteochondritis dissecans in large breed dogs, from clinical presentation through arthroscopic intervention to outcome assessment.

Discussion

The principal findings of this multi-joint arthroscopic series are threefold. First, ROM improvement and lameness resolution were achieved in all three joint sites, confirming the broad applicability of arthroscopic OCD management. Second, shoulder joints recovered fastest and achieved the greatest absolute ROM gain, while elbows lagged behind a pattern consistent with the more constrained articular geometry of the humeroradial joint. Third, the complication rate of 7.4 percent was acceptably low and comparable with published figures from referral centres [6].

These results align with those of Fitzpatrick *et al.* [8], who reported 85 percent good-to-excellent outcomes following shoulder OCD arthroscopy in 51 dogs. Our PVF gains (19-24%) are also consistent with the 15-28 percent range documented in force-plate studies by Punke *et al.* [10]. However, we observed a lower grade-IV prevalence (18.5%) than the 25-30 percent reported in North American referral populations [3], which may reflect earlier presentation in the German veterinary referral system where orthopaedic screening of young large-breed dogs is more routine.

The slower elbow recovery is clinically important. The humeroradial articulation is inherently more constrained than the glenohumeral joint, and residual incongruity often subtle may persist even after flap removal [11]. Owners should be counselled that elbow OCD dogs may take 2-4 weeks longer than shoulder cases to return to unrestricted activity. Whether extended rehabilitation protocols (hydrotherapy, therapeutic ultrasound) would accelerate elbow recovery is an open question worthy of prospective evaluation.

Clinical implications

From a practical standpoint, arthroscopy should be recommended as the first-line surgical approach for confirmed OCD in any large-breed dog, regardless of joint site. The ICRS grading system provides a reliable intra-operative framework for deciding between curettage alone and microfracture augmentation. Early referral ideally before secondary osteoarthritis becomes established is likely to optimise long-term outcomes, though this research was not designed to test that hypothesis directly.

Conclusion

Osteochondritis dissecans remains a significant cause of juvenile-onset lameness in large and giant breed dogs, and its management has evolved substantially since the advent of arthroscopic surgery. The present research, encompassing 42 dogs and 54 joints treated over a four-year period at a single referral centre, confirms that arthroscopy offers reliable clinical improvement across the three most commonly affected joint sites shoulder, elbow and stifle with a low complication profile. Three findings merit emphasis. First, the overall ROM gain of 31.2 degrees and the drop in median lameness grade from 3.0 to 1.0 represent clinically meaningful recovery that would be expected to translate into improved quality of life and owner satisfaction. Second, the joint-site effect was statistically significant for ROM but not for lameness or PVF, suggesting that while elbows recover more slowly in absolute range, functional weight-bearing improves at a similar rate across joints. Third, the 7.4 percent minor complication rate and the absence of revision surgery support the safety of the arthroscopic approach even in grade III-IV lesions where subchondral microfracture is required.

We recommend that veterinary orthopaedic practices adopt a standardised arthroscopic protocol incorporating ICRS

grading, tailored surgical intervention and a structured 12-week rehabilitation programme. Future research should extend follow-up to 12 months to assess whether early arthroscopic intervention reduces the incidence of secondary osteoarthritis, and should evaluate adjunctive chondroprotective therapies (platelet-rich plasma, hyaluronic acid) as potential enhancers of fibrocartilage fill following microfracture.

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Contributions not qualifying for authorship

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