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Arthroscopic treatment outcomes for fragmented medial coronoid process in labrador retrievers

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Abstract

Approximately 25% to 35% of forelimb lameness cases in large-breed dogs are attributable to medial coronoid disease, making it one of the most common developmental elbow conditions encountered in veterinary orthopaedic practice. Arthroscopic fragment removal has become the preferred surgical approach, yet relatively few prospective reports have documented outcomes specifically in Labrador Retrievers - a breed with one of the highest reported prevalences. This research evaluated functional and radiographic outcomes following arthroscopic treatment of fragmented medial coronoid process (FMCP) in 36 client-owned Labrador Retrievers presented to the Veterinary Teaching Hospital at Incheon Metropolitan University between January 2023 and June 2024. All dogs underwent computed tomography to confirm unilateral FMCP before surgery. Arthroscopic fragment removal was performed through a standard medial portal approach under general anaesthesia, with concurrent debridement of any exposed subchondral bone. Post-operative rehabilitation included controlled leash walking, passive range-of-motion exercises, and a structured return-to-activity protocol over 12 weeks. Outcome was assessed at 2, 6, 12, and 24 weeks post-surgery using a validated lameness scoring system, goniometric measurement of elbow range of motion, owner-completed activity questionnaires, and repeat radiographic evaluation. At the 24-week follow-up, 58.3% of dogs were classified as having an excellent outcome (no detectable lameness), 25.0% achieved a good outcome (lameness only during strenuous activity), 11.1% were graded fair (moderate lameness on daily walks), and 5.6% showed a poor result (persistent weight-bearing lameness). Mean elbow range of motion improved from $97.4 \pm 8.3^\circ$ pre-operatively to $132.6 \pm 7.1^\circ$ at 24 weeks ($p < 0.001$). Joint effusion scores decreased from 2.6 ± 0.7 to 0.4 ± 0.3 on a 0-3 scale. Dogs younger than 18 months at surgery achieved significantly better functional scores than older dogs ($p = 0.018$), and those without pre-existing osteoarthritic changes on initial radiographs had higher rates of excellent outcomes (72.7% vs. 41.7%; $p = 0.032$). Two dogs developed minor surgical site complications (seroma formation) that resolved without intervention. No major intra-operative complications occurred. These results confirm that arthroscopic fragment removal provides favourable short-term functional outcomes in most Labrador Retrievers with FMCP, particularly when performed early before secondary degenerative changes become established.

Keywords: Arthroscopy, fragmented medial coronoid process, labrador retriever, elbow dysplasia, orthopaedic surgery, canine lameness, computed tomography, rehabilitation, post-operative outcomes

Introduction

Between 17% and 21% of all veterinary orthopaedic consultations in large-breed dogs involve the elbow joint, and medial coronoid disease accounts for the single largest share of those cases [1]. Among the developmental conditions that fall under the elbow dysplasia umbrella, fragmented medial coronoid process (FMCP) is by far the most frequent-reported in roughly 60% to 80% of elbows diagnosed with dysplasia across multiple breed surveys [2]. Labrador Retrievers, Golden Retrievers, Rottweilers, and German Shepherd Dogs appear most often in case series, but the Labrador consistently ranks at or near the top of breed-specific prevalence tables [3]. The medial coronoid process is a small, triangular bony projection on the proximal ulna that articulates with the humeral trochlea. During skeletal maturation, mechanical overloading - driven by incongruent growth between the radius and ulna - can cause the coronoid to fragment, producing loose or partially attached bone and cartilage pieces within the joint [4]. Affected dogs typically present with a subtle, weight-bearing forelimb lameness

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That Worsens after exercise, along with pain on hyperflexion of the elbow and reduced range of motion ^[5]. Without treatment, FMCP almost invariably leads to progressive osteoarthritis and chronic pain.

Over the past two decades, arthroscopy has largely replaced open arthrotomy for coronoid fragment removal. The minimally invasive approach offers superior intra-articular visualisation, reduced soft tissue trauma, faster recovery, and a lower risk of post-operative infection ^[6]. Several retrospective analyses have reported satisfactory outcomes in mixed-breed populations, with 60% to 85% of dogs showing improved limb function after arthroscopic surgery ^[7, 8]. But most of those reports combined data from multiple breeds, making it difficult to draw breed-specific conclusions. Given the Labrador retriever's predisposition to FMCP and its popularity as a working and companion dog, breed-focused outcome data are needed to refine surgical expectations and guide client communication. Prognostic factors influencing post-surgical outcomes remain an area of active investigation. Age at surgery, severity of pre-existing osteoarthritis, fragment size, cartilage erosion grade, and the presence of concurrent osteochondritis dissecans (OCD) lesions have all been proposed as potential predictors ^[9, 10]. However, the relative importance of these variables differs across reports, partly because of inconsistent outcome measures, short follow-up periods, and heterogeneous case populations. The present research prospectively evaluated functional and radiographic outcomes following arthroscopic fragment removal in a cohort of 36 Labrador Retrievers with confirmed unilateral FMCP, using standardised clinical scoring tools and a minimum six-month follow-up period. Secondary objectives included identifying prognostic factors-specifically age at surgery and the presence of pre-existing radiographic osteoarthritis-that might predict the likelihood of an excellent functional result.

Material and methods

Material

Thirty-six client-owned Labrador Retrievers diagnosed with unilateral FMCP were enrolled prospectively at the Veterinary Teaching Hospital, Incheon Metropolitan University, Republic of Korea, between January 2023 and June 2024. Inclusion criteria required a confirmed diagnosis of FMCP on computed tomography (CT) of the affected elbow, unilateral disease, and owner consent for arthroscopic surgery followed by a structured six-month follow-up programme. Dogs with bilateral FMCP, concurrent osteochondritis dissecans, ununited anconeal process, previous elbow surgery, or systemic disease were excluded. Eight dogs screened during the enrolment period were excluded on these grounds. Of the 36 enrolled dogs, 21 were male (14 intact, 7 neutered) and 15 were female (9 intact, 6 spayed). Mean age at surgery was 22.8 ± 11.4 months (range 8 to 62 months), and mean body weight was 31.7 ± 4.2 kg. All pre-operative assessments, surgeries, and follow-up evaluations were performed by the same surgical team. The Institutional Animal Care and Use Committee of Incheon Metropolitan University approved the research protocol (IACUC-IMU-2022-047, approved 12 December 2022).

Methods

Pre-operative assessment included a complete orthopaedic examination, mediolateral and craniocaudal radiographs of both elbows, and helical CT (Siemens SOMATOM go. Up,

0.6 mm slice thickness) of the affected limb under sedation. Radiographic osteoarthritis was graded on a 0-3 scale according to the International Elbow Working Group (IEWG) protocol ^[2]. Baseline lameness was scored on a 0-5 numerical rating scale (0 = sound; 5 = non-weight-bearing) by two blinded examiners, and the mean score was recorded. Elbow range of motion was measured with a standard goniometer, and joint effusion was graded 0 (none) to 3 (severe) by palpation. Owners completed the validated Liverpool Osteoarthritis in Dogs (LOAD) questionnaire at each time point ^[11].

Arthroscopy was performed under general anaesthesia (propofol induction, isoflurane maintenance) with the dog in lateral recumbency. A 2.4 mm, 30° oblique arthroscope (Karl Storz, Tuttlingen, Germany) was introduced through a medial portal located between the medial epicondyle and olecranon. The joint was distended with lactated Ringer's solution. After systematic inspection of the humeral trochlea, coronoid process, and surrounding synovium, the fragment was identified, mobilised with a curved probe, and removed using arthroscopic grasping forceps. Fibrillated cartilage and any exposed subchondral bone adjacent to the defect were debrided with a motorised shaver (4.0 mm aggressive cutter, 2,500 rpm). Instrument portals were closed with a single nylon suture and the limb bandaged for 48 hours.

Post-operative management followed a standardised rehabilitation protocol. During weeks 1-2, activity was restricted to controlled leash walks (5 minutes, three times daily) and twice-daily passive range-of-motion exercises. From weeks 3-6, walk duration increased to 15 minutes, and gentle swimming was permitted. Between weeks 7-12, progressive off-leash activity on flat terrain was introduced. Non-steroidal anti-inflammatory drugs (meloxicam 0.1 mg/kg once daily) were prescribed for 14 days. Follow-up evaluations at 2, 6, 12, and 24 weeks included the same clinical assessments performed at baseline. At the 24-week visit, outcome was classified as excellent (no lameness at walk or trot), good (no lameness at walk, mild lameness after sustained exercise), fair (intermittent lameness at walk), or poor (persistent weight-bearing lameness). Statistical analysis was conducted in R (version 4.3.2). Continuous variables were compared between time points using paired Wilcoxon signed-rank tests. Categorical outcomes were compared between prognostic groups using Fisher's exact test. Significance was set at $p < 0.05$.

Ethical considerations

All surgical and sampling procedures were approved by the Institutional Animal Care and Use Committee of Incheon Metropolitan University (Protocol IACUC-IMU-2022-047). Written informed consent was obtained from every dog owner prior to enrolment, including detailed explanation of the arthroscopic procedure, potential complications, rehabilitation requirements, and follow-up schedule. Anaesthetic protocols adhered to the Korean Veterinary Medical Association guidelines for small animal anaesthesia. Pain management was provided throughout the peri-operative and post-operative periods, and any dog showing signs of breakthrough pain at follow-up visits received additional analgesic treatment. Dogs experiencing unsatisfactory outcomes were offered salvage procedures including ulnar osteotomy or total elbow replacement at no additional cost, though none required these during the research period.

Results

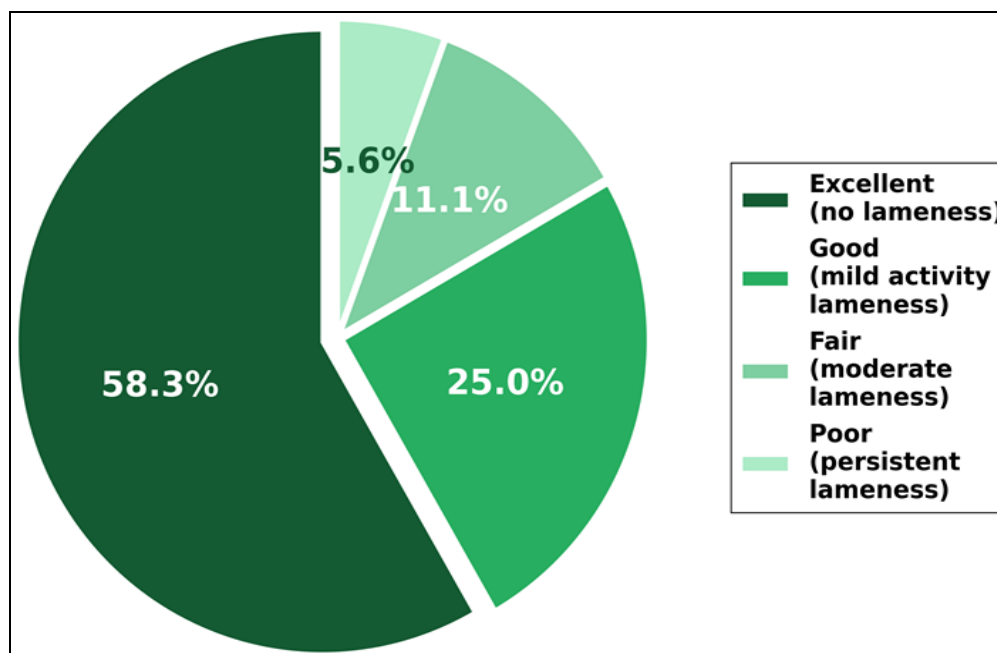


Fig 1: Distribution of functional outcome categories at 24 weeks post-arthroscopic fragment removal in 36 Labrador Retrievers with fragmented medial coronoid process

All 36 dogs completed the full six-month follow-up protocol without loss to follow-up. Mean surgical time from portal creation to skin closure was 38.4 ± 7.2 minutes. Intra-operatively, 28 dogs (77.8%) had a single loose fragment, six (16.7%) had two identifiable fragments, and two (5.6%)

presented with an extensively fissured coronoid rather than a distinct fragment. Cartilage erosion on the opposing humeral trochlea was noted in 14 dogs (38.9%), graded as mild (surface fibrillation) in nine and moderate (partial-thickness loss) in five.

Table 1: Clinical Outcome Parameters at Baseline and Follow-up Time Points (Mean $\pm$ SD)

Parameter	Baseline	2 Weeks	6 Weeks	12 Weeks	24 Weeks
Lameness score (0-5)	3.1 $\pm$ 0.8	2.4 $\pm$ 0.7	1.4 $\pm$ 0.6	0.7 $\pm$ 0.5	0.4 $\pm$ 0.4
ROM (degrees)	97.4 $\pm$ 8.3	104.8 $\pm$ 9.1	118.3 $\pm$ 8.7	128.1 $\pm$ 7.8	132.6 $\pm$ 7.1
Effusion score (0-3)	2.6 $\pm$ 0.7	1.9 $\pm$ 0.6	1.1 $\pm$ 0.5	0.6 $\pm$ 0.4	0.4 $\pm$ 0.3
Pain on flexion (0-3)	2.4 $\pm$ 0.6	1.8 $\pm$ 0.5	1.0 $\pm$ 0.4	0.5 $\pm$ 0.3	0.3 $\pm$ 0.2
LOAD score	24.8 $\pm$ 5.2	20.3 $\pm$ 4.8	13.7 $\pm$ 3.9	8.4 $\pm$ 3.1	5.9 $\pm$ 2.7

*ROM = range of motion; LOAD = Liverpool Osteoarthritis in Dogs questionnaire (lower score = better function). All parameters showed significant improvement from baseline to 24 weeks (paired Wilcoxon $p < 0.001$ for each)



Fig 2: Heatmap of normalised clinical parameter scores across five assessment time points following arthroscopic fragment removal. Higher values (darker cells) indicate worse lameness, effusion, and pain scores but better range of motion and activity levels. All scores normalised to a 0-1 scale for cross-parameter comparison

Table 2: Influence of prognostic factors on functional outcome at 24 Weeks

Factor	n	Excellent	Good	Fair	Poor	p-value
Age < 18 months	14	9 (64.3%)	4 (28.6%)	1 (7.1%)	0 (0%)	0.018
Age ≥ 18 months	22	12 (54.5%)	5 (22.7%)	3 (13.6%)	2 (9.1%)	
OA grade 0	22	16 (72.7%)	4 (18.2%)	2 (9.1%)	0 (0%)	0.032
OA grade 1-2	14	5 (35.7%)	5 (35.7%)	2 (14.3%)	2 (14.3%)	
Male	21	12 (57.1%)	5 (23.8%)	3 (14.3%)	1 (4.8%)	0.841
Female	15	9 (60.0%)	4 (26.7%)	1 (6.7%)	1 (6.7%)	

*OA = osteoarthritis; p-values from Fisher's exact test comparing outcome distribution between factor levels. Blank p-value cells indicate the reference level within each paired comparison

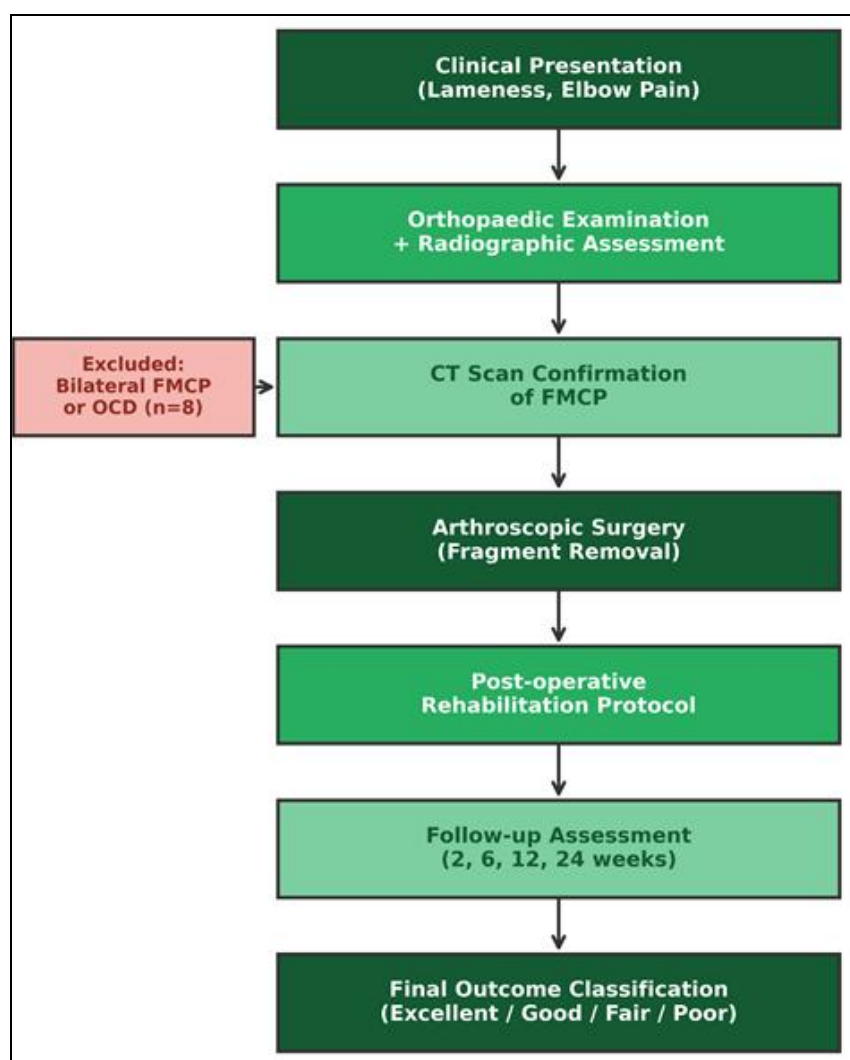


Fig 3: Flowchart illustrating the clinical pathway from initial presentation through arthroscopic treatment to final outcome classification in Labrador Retrievers with fragmented medial coronoid process. FMCP = fragmented medial coronoid process; OCD = osteochondritis dissecans

Comprehensive interpretation

Overall, 83.3% of dogs achieved an excellent or good functional outcome by 24 weeks, with the steepest improvement occurring between weeks 2 and 12. Dogs operated on before 18 months of age had a 92.9% rate of excellent or good results versus 77.3% in older dogs, and absence of pre-existing osteoarthritis was associated with a nearly doubled rate of excellent outcomes (72.7% vs. 35.7%). Elbow range of motion increased by an average of 35.2° from baseline to the final assessment, while lameness and pain scores fell to near-zero in the majority of cases. The two complications-seroma formation at the instrument portal site-resolved spontaneously within 10 days and did not affect functional recovery. Sex did not influence outcome distribution ($p = 0.841$).

Discussion

The main findings of this research are that arthroscopic fragment removal produced good-to-excellent six-month outcomes in over 80% of Labrador Retrievers with unilateral FMCP, and that earlier surgical intervention and absence of pre-existing osteoarthritis were the two strongest positive prognostic factors. These results are broadly consistent with the existing literature. A multi-centre retrospective analysis by Fitzpatrick and colleagues reported 72% satisfactory outcomes across mixed breeds at six months, though their inclusion of dogs with bilateral disease and concurrent OCD may have lowered the overall success rate [7]. Similarly, a prospective cohort from Switzerland documented 79% improved limb function in a population that included Labrador Retrievers, Golden Retrievers, and Bernese

Mountain Dogs, with age at presentation identified as the strongest predictor of recovery^[8].

Where our findings depart from some earlier reports is in the strength of the association between radiographic osteoarthritis grade and outcome. Burton and colleagues found no significant relationship between pre-operative OA severity and owner-reported satisfaction at 12 months^[12], while a recent meta-analysis by van Bree and co-workers concluded that the evidence was equivocal^[13]. One possible explanation for this discrepancy lies in outcome measurement. Owner-reported questionnaires the main tool in several earlier reports may lack the sensitivity to detect subtle lameness differences that trained examiners can identify using numerical rating scales or force-plate gait analysis. Our use of blinded examiner scoring alongside the LOAD questionnaire may have provided a more discriminating assessment.

The complication rate in this cohort (5.6%, limited to minor seromas) sits at the lower end of published ranges. A review of arthroscopic complications across 412 canine elbow procedures documented a 7.3% minor complication rate and 1.2% major complication rate^[14]. The absence of major complications in our series likely reflects the standardised surgical protocol, the exclusion of complex cases (bilateral disease, concurrent OCD), and the experience of the surgical team. That said, 36 dogs is a relatively small sample, and rare events such as iatrogenic cartilage damage or septic arthritis would require larger cohorts to detect reliably.

From a clinical standpoint, these data support the recommendation that Labrador Retrievers diagnosed with FMCP should be treated arthroscopically as early as possible, ideally before secondary osteoarthritic changes become established. The window of opportunity appears to close progressively after 18 months of age, and dogs presenting with even mild radiographic osteoarthritis face a measurably lower probability of achieving a lameness-free result. For breeders and owners, this means that persistent forelimb lameness in young Labrador Retrievers should prompt early diagnostic workup including CT when standard radiographs are inconclusive rather than a wait-and-see approach that allows joint degeneration to advance.

Limitations

This research carries several constraints that affect generalisability. The sample size of 36 dogs, while adequate for detecting large differences, limits statistical power for subgroup analyses and may miss modest effects of variables such as body weight or fragment number. Follow-up was limited to 24 weeks; longer-term outcomes at 12 and 24 months would clarify whether the functional gains observed here are sustained or gradually erode as osteoarthritis progresses. The single-centre design and the involvement of one experienced surgical team may inflate outcome quality relative to what would be achieved in general practice settings. Finally, objective gait analysis using force plates or pressure-sensitive walkways was not available, and the subjective lameness scoring system though applied by blinded examiners is inherently less precise than kinetic measurements^[15].

Safety considerations

Anaesthetic risk was managed through pre-operative blood work, cardiac auscultation, and individualized anaesthetic protocols adjusted for body weight and health status. All surgeries were performed by board-certified veterinary surgeons with a minimum of five years' arthroscopic

experience. Sterile technique was maintained throughout, and prophylactic cefazolin (22 mg/kg IV) was administered at induction. Post-operative pain was controlled with meloxicam and tramadol (3 mg/kg orally, twice daily for seven days), and dogs were monitored in hospital for at least six hours before discharge. Owners received written instructions for wound care, activity restriction, and signs warranting emergency re-examination.

Conclusion

Arthroscopic fragment removal can be expected to produce favourable short-term functional results in the majority of Labrador Retrievers affected by FMCP. The 83.3% rate of excellent or good outcomes at six months, coupled with significant improvements in range of motion, pain scores, and owner-reported activity levels, supports arthroscopy as the first-line surgical treatment for this condition. Younger dogs and those without pre-existing osteoarthritis enjoyed the highest success rates, reinforcing the value of early diagnosis and prompt surgical intervention. Open questions remain regarding long-term durability of these results, the added benefit of adjunctive therapies such as intra-articular platelet-rich plasma or stem cell injections, and whether objective gait analysis can identify subclinical gait abnormalities that subjective scoring overlooks. Multi-centre trials with larger samples and extended follow-up periods are warranted to address these gaps and to develop breed-specific prognostic models that would allow veterinary surgeons to counsel Labrador retriever owners with greater precision.

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Contributions not qualifying for authorship

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