Check for updates

Received: 3 January 2024 | Accepted: 14 April 2025

DOI: 10.1111/eve.14176

Equine Veterinary Education

CASE REPORT

Medial femorotibial and femoropatellar articular cartilage delamination following intra-articular therapy with triamcinolone and gentamicin in five yearlings

C. P. Beggan[1] | G. C. Quinn[1] | C. W. McIlwraith[2]

[1]Waikato Equine Veterinary Centre, Cambridge, Waikato, New Zealand

[2]C Wayne McIlwraith Translational Medicine Institute, Colorado State University, Fort Collins, Colorado, USA

Correspondence: C. P. Beggan
Email: c.beggan@massey.ac.nz

Summary

Subchondral lucencies (SCLs) of the medial femoral condyle (MFC) are a cause of lameness in young horses, potentially affecting future athletic performance. Due to the widespread use of pre-sales screening radiographs for Thoroughbred weanlings and yearlings, these lesions are frequently identified at various stages of progression without the manifestation of clinical signs. Treatment for horses without lameness or effusion is not recommended as most do not develop clinical signs. Conversely, conservative treatments, such as reduced exercise and the use of non-steroidal anti-inflammatory medications or intra-articular therapies, typically yield suboptimal outcomes in clinically significant SCLs, and these will frequently be presented for surgical intervention. This report documents five yearling horses with MFC SCLs that had received speculative intra-articular (IA) injections of 10 mg triamcinolone acetonide (TCA) and 40 mg of gentamicin sulphate (GS) into the medial femorotibial joint (MFTJ). Treatments had been initiated by the attending veterinarians based on their own circumstantial impressions that treatment might help improve some radiographically observed MFC SCLs detected on weanling screening radiography. All cases in this series became acutely lame on the treated limbs, developing marked effusion of both the MFTJ and the femoropatellar joint (FPJ). Clinical assessment and synovial fluid analysis confirmed that all cases were non-septic. Due to the development of clinical signs, surgical management was advised. Before surgery, affected joints did not show additional radiographic changes compared to initial radiographs. While examining the MFTJ and FPJ using standard arthroscopic techniques, large areas of detached and partially detached cartilage were present on the caudal aspect of the distal patella, the lateral and medial trochlear ridges and the central articular surface of the MFC. These lesions had the appearance of acute delamination of the articular cartilage, exposing an underlying, pale, avascular subchondral bone plate below. This case series is the first to report iatrogenic articular cartilage damage in the MFTJ and FPJ of thoroughbred yearlings treated for early MFC SCLs with recommended therapeutic doses of IA TCA and GS.

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.
© 2025 The Author(s). *Equine Veterinary Education* published by John Wiley & Sons Ltd on behalf of EVJ Ltd.

This case series demonstrated that IA injections of TCA and GS in juvenile horses with MFC SCLs can have negative effects on articular cartilage. We propose that IA corticosteroids should not be used in young horses with MFC SCLs on radiographs but without clinical signs and owners should be apprised of this potential complication. Further research into the potentially negative effects of IA corticosteroids on the cartilage of juvenile horses would be appropriate.

KEYWORDS
horse, subchondral lucencies, triamcinolone injection

INTRODUCTION

Commercial pressures from producers and consumers of young Thoroughbreds have increased the use of pre-sales screening radiographs for Thoroughbred yearlings and yearlings destined for racing. Subchondral lucencies (SCLs) in the medial femoral condyle (MFC) of the stifle are commonly identified at different stages of development, often before the horse shows clinical signs of lameness. Radiographic abnormalities can have a negative effect on both the marketability of the horse as well as its long-term athletic performance (McIlwraith, 1998; Santschi et al., 2020). Because of these apprehensions, some equine veterinarians frequently attempt to treat these clinically silent lucencies despite the lack of evidence that these SCLs can be radiographically improved. Recently, a major study evaluated radiographs from five cohorts of 2-year-old sales with racing follow-up through their 4-year-old year of racing (Peat et al., 2024). Repository radiographs of 2508 Thoroughbred yearlings were evaluated, and SCLs were classified into three grades from least to most severe. The proportion of yearlings with Grade 1 and 2 lesions was equally likely to start a race when compared to their cohorts with no lesions present. However, there was a slight decrease in race starts from those yearlings with Grade 3 lesions (complete round or oval SCLs).

The treatment of SCLs can be split into conservative and surgical management. With asymptomatic cases, conservative management with box rest and systemic nonsteroidal anti-inflammatory drugs is usually prescribed. More controversially, intra-articular (IA) injections have been sporadically used, and some efficacy has been suggested (Trotter, 1996). In cases where SCLs accompany clinical signs, this management strategy has generally yielded poor results, and some form of surgical intervention is recommended. Arthroscopic debridement of lesions has been undertaken for more than 30 years with good results overall, but less so for older horses and those with larger lesions. Various modifications of arthroscopic debridement, including injection of autologous chondrocytes or mesenchymal stem cells (MSCs), have led to improved results (Fortier & Nixon, 2005; McIlwraith, 2010).

Examination of the fibrous lining of surgically debrided SCLs has shown upregulation of interleukin-1ß, interleukin-6, neutral metalloproteinases, prostaglandin E2 and increased osteoclastic activity (Von Rechenberg, Guenther, et al., 2000; Von Rechenberg, McIlwraith, et al., 2000). These findings have led to the development of a technique involving the intralesional injection of triamcinolone acetonide (TCA), usually 18–20 mg, into the cystic lining (Wallis et al., 2008). This technique's initial reported success rate was 90% in unilateral cases and 70% in bilateral cases. However, a subsequent follow-up study comparing intralesional corticosteroids to intralesional mesenchymal stem cells and surgical debridement revealed that 67–77% of horses returned to racing, but it did not delineate between unilateral and bilateral treatments (Klein et al., 2022). Recently, a novel surgical approach, which involves the insertion of a cortex screw in lag-fashion at a proximodistal oblique angle across the MFC SCL, has been proposed to enhance local bone density to promote healing of the SCL. This procedure has gained popularity amongst surgeons, with a resolution of lameness in over 75% of cases (Calero et al., 2022; Santschi et al., 2015). Currently, the administration of TCA into the SCLs under arthroscopic guidance or the transcondylar screw techniques are regarded as the standard of care for the treatment of Grade 3 SCLs of the MFC associated with clinical signs (Peat et al., 2024).

This report aims to describe five non-clinical horses that underwent speculative IA injection of 40 mg TCA and 40 mg GS into the MFTJ for the treatment of MFC SCLs, which developed lameness post-injection. Subsequent arthroscopic examination of the stifle revealed large areas of detached cartilage in all joints, with consistent localisation across cases (caudal aspect of the distal patella, medial trochlear ridge [MTR] and lateral trochlear ridge [LTR]), although the severity varied.

CASE REPORTS

Five Thoroughbred yearlings were referred to the Waikato Equine Veterinary Centre from December 2020 to January 2023 for treatment of stifle lameness. Previously, all cases were initially examined, radiographed and treated by several referring clinicians prior to referral. During presales radiographs (lateromedial, caudocranial and caudolateral craniomedial oblique views), MFC SCLs were identified (Figure 1) in the right stifle of five Thoroughbred yearlings. No additional radiographic abnormalities were noted. In each yearling, the treating veterinarian administered an IA injection of 10 mg TCA and 40 mg GS into the medial femorotibial joint (MFTJ), followed by box rest and 10 minutes of daily hand-walking for 8 weeks. In Case 1, radiographs repeated 4 weeks later showed no change in MFC SCLs, leading to another IA injection of 10 mg TCA and 40 mg GS;

20423292, 0, Downloaded from https://beva.onlinelibrary.wiley.com/doi/10.1111/eve.14176 by Massey University Library, Wiley Online Library on [31/07/2025]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

no clinical abnormalities were noted at this time. Case 4 underwent repeat radiographs 4 weeks later due to lameness with increased effusion in the MFTJ and femoropatellar joint (FPJ); no additional radiographic changes were noted, and management recommendations were not changed.

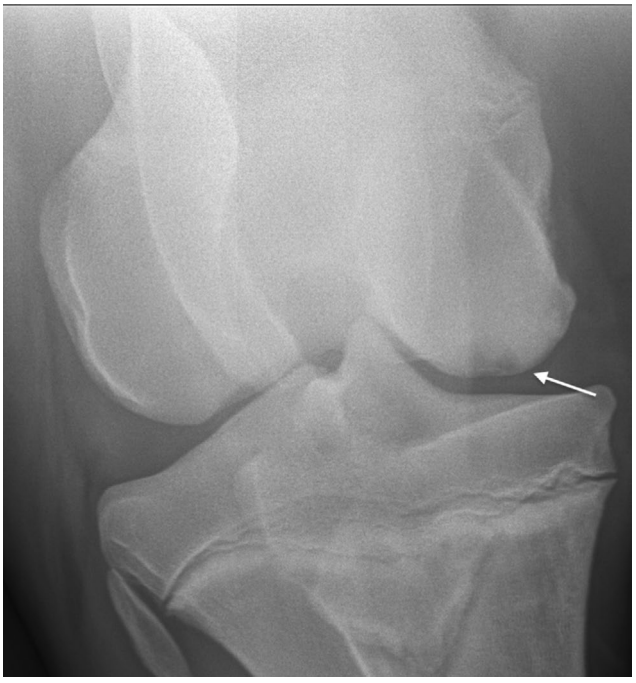

FIGURE 1 Caudocranial radiographic view of the right stifle of Case 2 showing a wide-necked medium-sized Grade 2 MFC SCL prior to any treatment.

By 8 weeks after initial treatment, all horses developed a right stifle lameness and effusion of the MFTJ and FPJ. Repeat radiographs showed no changes in the appearance of the MFC SCLs, and joint arthrocentesis did not indicate infection. In Case 5, the attending veterinarian also performed an ultrasound examination of the stifle, which revealed a cartilage defect on the axial aspect of the medial trochlear ridge (MTR) consistent with a cartilage flap (Figure 2). Arthroscopic examination of the MFTJ and FPJ was recommended and conducted by a boarded specialist in equine surgery (ECVS;GQ) in the same manner in all cases (McIlwraith et al., 2014).

For Case 1, large areas of cartilage detachment were present on the caudal aspect of the distal patella, MTR and LTR. The worst affected area was the MTR, with a large area of delaminated cartilage exposing a denuded area of subchondral bone below. There was also a large (25-30 mm) flap of detached cartilage on the weight-bearing surface of the MFC. Attempts were made to pin the cartilage down with PDS pins but were unsuccessful. Due to the poor prognosis for sale, the owner elected to euthanise this case while still under general anaesthesia.

For Case 2, large flaps of partially detached cartilage were observed on the LTR and MTR (Figure 3). An area of absent cartilage was also observed on the MFC. The caudal aspect of the distal patella also had areas of detached cartilage present. The subchondral bone underlying these lesions was hard and covered with tissue consistent with immature fibrocartilage. The areas of loose or partly detached

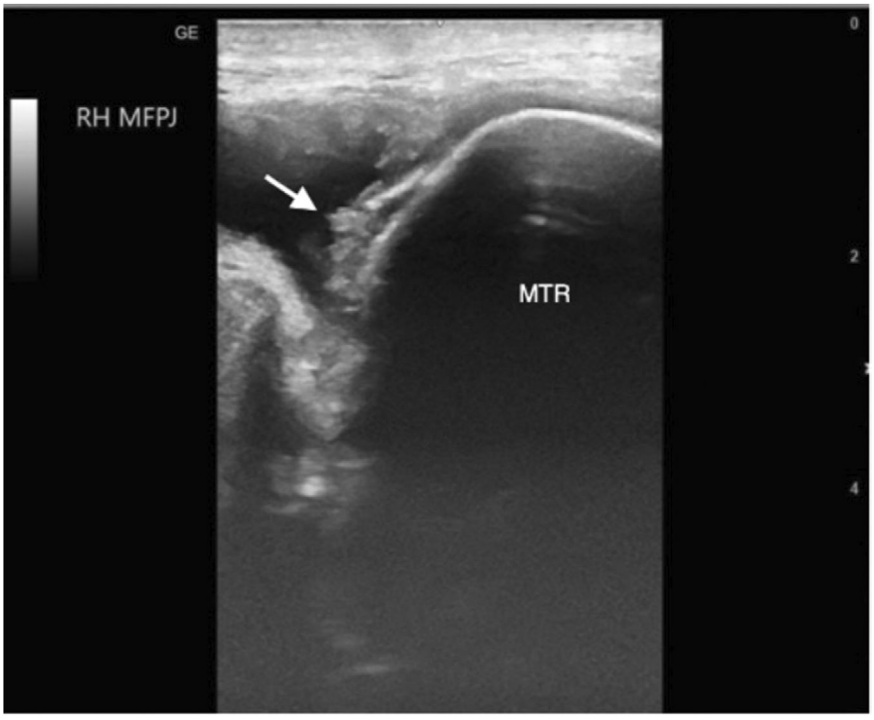

FIGURE 2 Image from ultrasonographic examination of the right stifle of the yearling in Case 5 using a linear transducer in a transverse plane. The axial medial trochlear (MTR) shows an area of detached cartilage displaced medially (arrow) and joint effusion of the femoropatellar joint.

20423292, 0, Downloaded from https://beva.onlinelibrary.wiley.com/doi/10.1111/eve.14176 by Massey University Library, Wiley Online Library on [31/07/2025]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

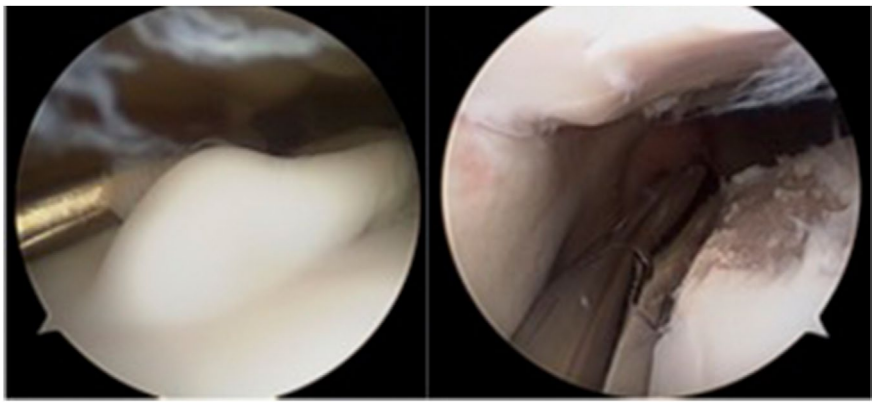

FIGURE 3 Intraoperative arthroscopic image of the femoropatellar joint of the yearling in Case 2. The initial appearance of the cartilage flap on the proximal medial trochlear ridge (left) and the appearance of the same location after debridement (right).

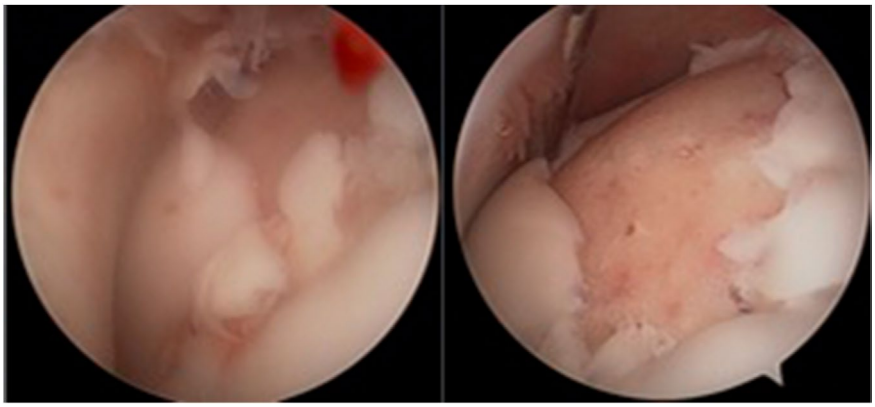

FIGURE 4 Intraoperative arthroscopic image of the femoropatellar joint of the yearling in Case 3. The initial appearance of the cartilage flap on the proximal medial trochlear ridge (left) and the appearance of the same location after debridement, showing an area of denuded bone (right).

cartilage were removed and the remaining defect was debrided back to healthy margins. Post-operatively, the yearling showed resolution of stifle effusion and lameness without recurrence. This yearling was not presented for sale as a yearling but was presented and sold a year later as a two-year-old at the ready-to-run sales. At the time of writing, the horse was 4 years old and had been unplaced in seven race starts.

In Case 3, an area of cartilage detachment from the caudal aspect of the distal patella and areas of poorly integrated cartilage on the LTR with an area of denuded bone below was found (Figure 4). A shallow cartilage defect was also observed on the weight-bearing surface of the MFC medially. These areas of poorly attached cartilage were removed, and the cartilage defects were then debrided back to healthy margins. The subchondral bone at each site was curetted and debrided back to hard, healthy tissue to encourage neovascularisation. Post-operatively, the lameness and joint effusion resolved with no reported recurrence. This yearling was not presented to sales. It was then prepared to be sold at the ready-to-run sales as a 2-year-old but was again withdrawn from the sale. At the time of writing, the horse was a four-year-old and had been unplaced in four race starts.

In Case 4, areas of partially detached cartilage from the caudal aspect of the distal patella and the MTR (Figure 5) were observed. Cartilage delamination of the LTR was also seen. The areas of partially detached cartilage were removed and the cartilage defects were then debrided back to healthy margins. The subchondral bone at each site was curetted and debrided back to firm, healthy tissue. In the first week postoperatively, the yearling's stifle effusion and lameness resolved; however, at one week postoperatively, the yearling re-developed stifle effusion in both the MFTJ and FPJ with a 2/5 right hindlimb lameness (AAEP lameness scale). Arthrocentesis was performed and results ruled out joint sepsis but indicated an ongoing inflammatory process within the joints. The filly was restricted to a prolonged period of box rest, with follow-up visits carried out by the referring vet. The joint effusion and lameness slowly reduced over 3 months before returning to normal, and the horse then entered a training program. Due to the prolonged post-operative period, the yearling was withdrawn from the yearling sales, but at the time of writing, the horse was 2 years old and was being prepared for ready-to-run sales.

In Case 5, large areas of partially detached cartilage on the caudal aspect of the distal patella (Figure 6) LTR and MTR were observed. The underlying subchondral bone was firm with a layer of immature fibrocartilage overlaying it. A small cartilage defect was also observed on

20423292, 0, Downloaded from https://beva.onlinelibrary.wiley.com/doi/10.1111/eve.14176 by Massey University Library, Wiley Online Library on [31/07/2025]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

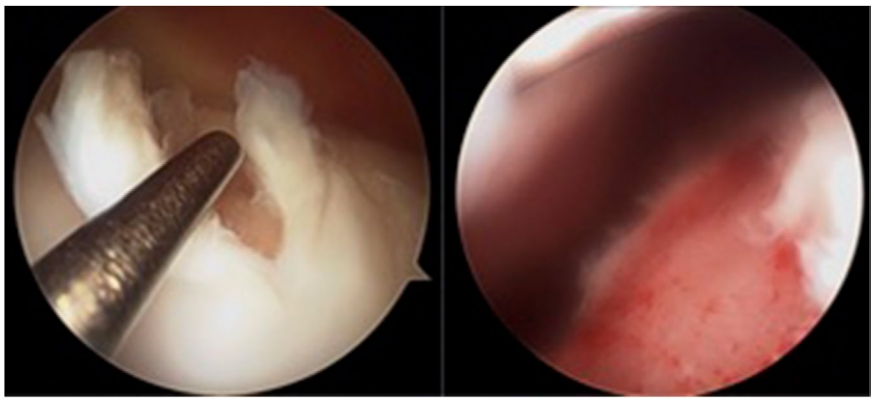

FIGURE 5 Intraoperative arthroscopic image of the femoropatellar joint of the yearling in Case 4. The initial appearance of the cartilage flap on the proximal medial trochlear ridge, with the extent of the pathology being probed (left) and the appearance of the same location after debridement, showing the denuded bone (right).

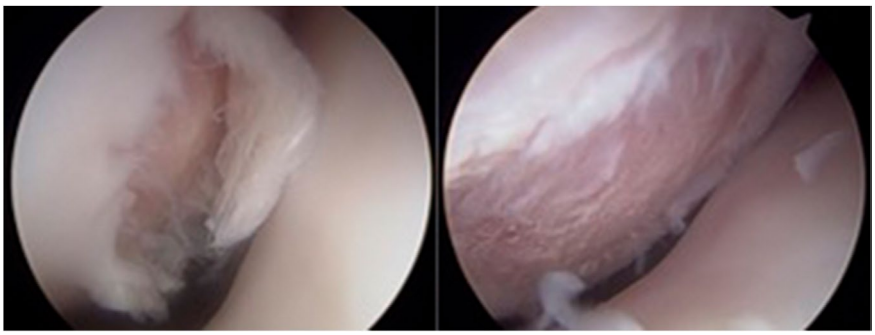

FIGURE 6 Intraoperative arthroscopic image of the right femoropatellar joint of the yearling in Case 5. The initial appearance of the cartilage flap on the medial aspect of the caudal aspect of the distal patella (left) and the appearance of the same location after debridement (right).

the medial aspect of the MFC. The areas of detached cartilage were removed, and the cartilage defects were then debrided back to healthy margins. The subchondral bone at each site was curetted and debrided back to hard, healthy tissue. Resolution of lameness and joint effusion was seen post-operatively, with no reports of recurrence. The yearling had an uneventful recovery from anaesthesia; resolution of lameness and joint effusion was seen post-operatively, with no reports of recurrence. At the time of writing, the horse was 4 years old and had been unplaced in nine race starts (Table 1).

Postoperatively, all cases were maintained on a course of oral phenylbutazone at 2.2 mg/kg twice daily for 7 days. The yearlings were kept on strict box rest for two full weeks, at which point arthroscopic portal sutures were removed. It was recommended that the yearlings be kept on small flat paddock rest for a further 3 months, with re-examinations to be performed by the referring vets.

DISCUSSION

The radiographic appearance of the equine stifle in the first 12 months of life is considered to be dynamic (Santschi et al., 2020). By identifying clinically significant lesions early, attempts to correct or reduce present pathologies are recommended (Santschi et al., 2015). A mainstay in the initial management of MFC SCLs is exercise restriction via box rest; this is to reduce the cyclic mechanical trauma which, along with developmental failure during the ossification of the osteochondral unit (OCU), is theorised to be the cause of SCLs (Jeffcott, 1982). Recent research has suggested that osteochondrosis may not cause or be the only cause of SCLs, further supporting the concept that trauma might have a significant role in their development (Lemirre et al., 2022; Ray, 1996). In some cases, spontaneous healing is observed. However, if the SCLs persist, corticosteroids have been used but with very limited success (Trotter, 1996).

It has been demonstrated that inflammatory mediators are upregulated in the fibrous tissue content of the SCLs and could be responsible for the expansion of the SCLs (Von Rechenberg, Guenther, et al., 2000). By injecting corticosteroid into the lesion directly, their anti-inflammatory effects can be targeted at the source rather than diffusely in the entire joint with limited access to the cystic lesion itself (Goodrich & McIlwraith, 2008). Therefore, injecting corticosteroids intra-lesionally is recommended as a potential first-line treatment of SCLs, with non-responding lesions having a screw placed across the SCLs in a lag fashion (O'Brien, 2019).

20423292, 0, Downloaded from https://beva.onlinelibrary.wiley.com/doi/10.1111/eve.14176 by Massey University Library, Wiley Online Library on [31/07/2025]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

TABLE 1 Summary of key information on findings, initial medical treatment, surgical findings and treatment and post operative care.

Case	Sex	Affected limb	Age- First Injection	TCA Injection		Pre-operative synoviocentesis and culture	Pre-operative radiographic findings	Pre-operative ultrasound findings	Placement of screw	Severity of cartilage delamination				Outcome
				1st injection	2nd injection					MFC	MTR	LTR	Distal patella	
1	Colt	Right hind	10 months	Yes	Yes (1 month after 1st injection)	Negative	Grade 2 MFC SCL present. No evidence of progression on post TCA Rads. No changes to lateral or MTR	–	Yes	+++	+++	++	++	Euthanised
2	Colt	Right hind	9 months	Yes	No	Negative	Grade 2 MFC SCL present. Evidence of progression of SCL on repeat rads 1 month post TCA No evidence of lateral or MTR	–	Yes	++	++	++	+	Recovered from surgery. No recurrence of effusion or lameness. Has not raced
3	Colt	Right hind	9 months	Yes	No	Negative	Grade 2 MFC SCL present. No evidence of changes to lateral or MTR. No evidence of progression of SCL on repeat rads 1 month post TCA	–	Yes	+	++	++	+	Recovered from surgery, no recurrence of effusion or lameness. Was not raced
4	Filly	Right hind	10 months	Yes	No	Negative	Grade 2 MFC SCL present. No evidence of changes to lateral or MTR. No evidence of progression of SCL on repeat rads 1-2 months post TCA	–	No	–	++	+	++	Recurrence of joint effusion and lameness 7 days post-op. Synoviocentesis ruled out sepsis. Resolved with prolonged box rest. Has not raced
5	Filly	Right hind	11 months	Yes	No	Negative	Grade 2 MFC SCL present. No evidence of changes to lateral or MTR. No evidence of progression of SCL on repeat rads 2 months post TCA	Large cartilage defect on the axial aspect of the MTR consistent with a cartilage flap	No	–	++	++	++	Recovered from surgery, no recurrence of effusion or lameness. Was not raced

Note: Severity of cartilage delamination: –, None observed; +, mild; ++, moderate; +++, severe.

Abbreviations: MFC, medial femoral condyle; MTR, medial trochlear ridge; LTR, lateral trochlear ridge.

20423292, 0, Downloaded from https://beva.onlinelibrary.wiley.com/doi/10.1111/eve.14176 by Massey University Library, Wiley Online Library on [31/07/2025]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

The combination of TCA and GS injected IA could exert toxic effects on juvenile cartilage cells involved in endochondral ossification or on their molecular signalling in the distal femoral epiphysis at the osteochondral junction. These cells include chondrocytes, osteoclasts and MSCs, any of which could be affected by these drugs (Fortin-Trahan et al., 2022; Lemirre et al., 2020). Although previous work in the horse suggests that the majority of endochondral ossification is complete at the MFC by 7 months, ossification at the LTR of the stifle could potentially persist until later (Dik, 1999; Lemirre et al., 2020). Intra-articular toxicity due to antimicrobials has previously been reported, with aminoglycosides having higher levels of cytotoxicity than other antimicrobials (Pezzanite et al., 2022). The dose of gentamicin in these cases of the present series is unlikely to have caused sufficient damage as a sole treatment based on in vitro and in vivo studies (Pezzanite et al., 2022). In vitro, the cytotoxic effects of another aminoglycoside (amikacin sulphate) were reduced when combined with TCA (Bolt et al., 2008). It is more likely that the corticosteroids themselves played a larger part in disrupted metabolism and dramatic failure at the osteochondral junction in the present series. More research is required to determine what role antimicrobials might have in the development of cartilage at different stages of development. Extensive studies on the potential deleterious effects of IA corticosteroids in horses have shown a negative effect on synovial tissue metabolism. However, this is often time and dose dependent, with some corticosteroids having more deleterious effects than others (Boorman et al., 2023). It is these studies that have led to the development of safe therapeutic doses for IA corticosteroids (Parker, 2014). A potential, and relevant, drawback to these clinical trials is their use of adult horses with healthy cartilage. To the author's knowledge, there are no studies on the effects of IA corticosteroids on juvenile equine cartilage.

Recent human studies into the effects of repeated IA corticosteroid injections on young patients with juvenile idiopathic arthritis resulted in a high incidence of osteochondral lesions in atypical locations post-treatment, leading to the conclusion that repeat IA corticosteroid injections are a risk factor for the development of osteochondral lesions in juvenile patients (Heidt et al., 2021). Rat foetal models have shown that prenatal maternal administration of dexamethasone downregulates a key pathway in cartilage formation and maintenance, the TGF-β signalling pathway and inhibits extracellular matrix synthesis function in articular cartilage (Chen et al., 2018). Another rodent model showed that reduction in chondrocytes, decreased cartilage matrix, thinner cartilage and poorer quality cartilage were observed post-prenatal maternal dexamethasone treatment in the subjects (Liu et al., 2022). These observations have been shown in other species and cannot be directly extrapolated to equine patients. However, these raise questions about the safety of corticosteroids on developing or compromised cartilage.

The OCU of the equine stifle joints matures at different rates depending on the biomechanical forces exerted at each location, for example, the weight-bearing forces at the MFC or the shearing forces at the trochlea. It is hypothesised that the MFC OCU is susceptible to focal trauma due to findings of increased hypertrophic chondrocytes undergoing expansion alongside enzymic digestion of the cartilage matrix before replacement by osteoid (Lemirre et al., 2022). These mechanisms, although normally involved to a lesser degree in endochondral ossification, are believed to weaken the cartilage at this zone, leaving it susceptible to injury. This could explain the high occurrence of SCLs seen in yearling Thoroughbred stifles (Lemirre et al., 2020). In the present case series, the presumed toxic effects of the IA injections at the osteochondral junction were based on the observed cartilage delamination at specific sites that were consistent across all cases. Lesions were located on the caudal aspect of the distal patella, the LTR and MTR, and the load-bearing surface of the MFC. To definitively confirm that these sites were subject to the toxic effects of the IA injections, histology would be required. There are similarities between the clinical findings in the cases described here and those described with fluoroquinolone-associated arthropathy in neonatal foals (Gough et al., 1992). Following systemic treatment with enrofloxacin, foals presented with acute disease of multiple weight-bearing joints with fissures in the articular cartilage, loss of chondrocytes and cartilage erosion. Histological analysis of the lesions revealed chondrocyte necrosis, cleft and vesicle formation in the intermediate zone of the articular cartilage with surrounding proteoglycan loss (Vivrette et al., 2001). No histological analysis was carried out on articular cartilage samples in any of the cases described in the present series. In future studies, histological samples would be crucial to investigate these lesions further. Further studies are required to assess the potential negative effects of corticosteroids on already compromised equine cartilage.

The authors believe that the delamination appearance suggests a failure in the endochondral ossification at the osteochondral junction with separation of cartilage from the subchondral bone plate. However, without histological samples from these sites, this theory cannot be confirmed. One of the authors (CWM) has seen similar cartilage delamination in yearlings with tarsocural OCD lesions that were previously treated with IA corticosteroids for synovial effusion. In one of those cases, the horse had an underlying OCD lesion of the distal intermediate ridge of the tibia. Speculative treatment with IA corticosteroids had been undertaken by the attending veterinarian based on the synovial effusion alone. Lameness was not observed at initial examination, but within a few weeks of treatment, acute lameness and sanguinous joint fluid were detected during clinical evaluation. Arthroscopy subsequently showed extensive stripping of cartilage from the medial and lateral trochlear ridge of the talus, similar to the lesions described in the present report. Although there is no current published data on such lesions occurring secondary to corticosteroid administration, the authors speculate that corticosteroids could have a degenerative effect on the OCU in young horses where articular cartilage maturation is still ongoing or where there is already disruption of the OCU due to pre-existing pathology, such as SCLs.

20423292, 0, Downloaded from https://beva.onlinelibrary.wiley.com/doi/10.1111/eve.14176 by Massey University Library, Wiley Online Library on [31/07/2025]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

CONCLUSIONS

The authors speculate that corticosteroids could have a disruptive effect on the OCU in young horses where articular cartilage maturation is still ongoing or where there is already disruption of the OCU due to pre-existing pathology such as SCLs or OCDs. If corticosteroids are considered for use in the management of MFC SCLs, then they should be restricted to those cases causing clinical lameness and should only be administered intra-lesionally and ideally under arthroscopic guidance.

AUTHOR CONTRIBUTIONS

C. P. Beggan: Writing – review and editing; writing – original draft; investigation; methodology. **G. C. Quinn:** Conceptualization; methodology; writing – review and editing; project administration; supervision; resources; validation; visualization. **C. W. McIlwraith:** Writing – review and editing; validation; supervision; visualization.

ACKNOWLEDGEMENTS

Open access publishing facilitated by Massey University, as part of the Wiley - Massey University agreement via the Council of Australian University Librarians.

FUNDING INFORMATION

There are no funders to report for this submission.

CONFLICT OF INTEREST STATEMENT

No conflicts of interest have been declared.

ETHICS STATEMENT

Not applicable for this case series.

ORCID

C. P. Beggan https://orcid.org/0009-0007-2309-5208

C. W. McIlwraith https://orcid.org/0000-0002-7302-2265

REFERENCES

Bolt, D.M., Ishihara, A., Weisbrode, S.E. & Bertone, A.L. (2008) Effects of triamcinolone acetonide, sodium hyaluronate, amikacin sulfate, and mepivacaine hydrochloride, alone and in combination, on morphology and matrix composition of lipopolysaccharide-challenged and unchallenged equine articular cartilage explants. *American Journal of Veterinary Research*, 69(7), 861–867.

Boorman, S., McMaster, M.A., Groover, E. & Caldwell, F. (2023) Review of glucocorticoid therapy in horses: intra-articular corticosteroids. *Equine Veterinary Education*, 35(6), 327–336.

Calero, M.I., Herthel, T., Rick, M., Foland, J. & Santschi, E. (2022) Medial femoral condyle subchondral cysts treated with transcondylar lag screw: outcome in 58 quarter horses. *Proceedings of the American Association of Equine Practitioner*, 68, 457.

Chen, Z., Zhao, Z., Li, Y., Zhang, X., Li, B., Chen, L. et al. (2018) Course-, dose-, and stage-dependent toxic effects of prenatal dexamethasone exposure on fetal articular cartilage development. *Toxicology Letters*, 286, 1–9.

Dik, K. (1999) Radiographic development of osteochondral abnormalities, in the hock and stifle of Dutch warmblood foals, from age 1 to 11 months. *Equine Veterinary Journal*, 31, 9–15.

Fortier, L.A. & Nixon, A.J. (2005) New surgical treatments for osteochondritis and subchondral bone cysts. *Veterinary Clinics of North America. Equine Practice*, 21, 673–690.

Fortin-Trahan, R., Lemirre, T., Santschi, E., Janes, J., Richard, H. & Fogarty, U. (2022) Osteoclast density is not increased in bone adjacent to radiolucencies (cysts) in juvenile equine medial femoral condyles. *Equine Veterinary Journal*, 54, 989–998. Available from: https://doi.org/10.1111/evj.13530

Goodrich, L.R. & McIlwraith, C.W. (2008) Subchondral bone cysts-not always an easy diagnosis. *Equine Veterinary Education*, 20(10), 521–524.

Gough, A., Kasali, O., Sigler, R. & Baragi, V. (1992) Quinolone arthropathy—acute toxicity to immature articular cartilage. *Toxicologic Pathology*, 20, 436–449.

Heidt, C., Grueberger, N., Grisch, D., Righini-Grunder, F., Rueger, M. & Ramseier, L. (2021) The assessment of steroid injections as a potential risk factor for osteochondral lesions in children with juvenile idiopathic arthritis. *Cartilage*, 13, 894–899.

Jeffcott, L. (1982) Clinical and radiological aspects of stifle bone cysts in the horse. *Equine Veterinary Journal*, 14(1), 40–46.

Klein, C.E., Bramlage, L.R., Stefanovski, D., Ruggles, A.J., Embertson, R.M. & Hopper, S.A. (2022) Comparative results of 3 treatments for medial femoral condyle subchondral cystic lesions in thoroughbred racehorses. *Veterinary Surgery*, 51(3), 455–463.

Lemirre, T., Santschi, E., Girard, C., Fogarty, U., Chapuis, L., Richard, H. et al. (2020) Maturation of the equine medial femoral condyle osteochondral unit. *Osteoarthritis and Cartilage Open*, 2(1), 100029.

Lemirre, T., Santschi, E., Girard, C., Fogarty, U., Janes, J. & Richard, H. (2022) Microstructural features of subchondral radiolucent lesions in the medial femoral condyle of juvenile thoroughbreds: a microcomputed tomography and histological analysis. *Equine Veterinary Journal*, 54, 601–613. Available from: https://doi.org/10.1111/evj.13486

Liu, L., Li, B., Li, Q., Han, H., Zhou, S., Wu, Z. et al. (2022) Transforming growth factor-β receptor 1: an intervention target for genetic poor cartilage quality induced by prenatal dexamethasone exposure. *Journal of Advanced Research*, 47, 123–135.

McIlwraith, C.W. (1998) Subchondral bone cysts in the horse: aetiology, diagnosis and treatment options. *Equine Veterinary Education*, 10, 313–317.

McIlwraith, C.W. (2010) Management of subchondral cystic lesions of medial femoral condyle–an evolution based on research and clinical evidence. *Pferdeheilkunde*, 26(4), 591.

McIlwraith, C.W., Nixon, A.J. & Wright, I.M. (2014) Diagnostic and surgical arthroscopy of the femoropatellar and femorotibial joints. In: *Diagnostic and surgical arthroscopy in the horse*. New York: Elsevier Health Sciences, pp. 212–256.

O'Brien, E. (2019) What is the best treatment for medial femoral condylar subchondral bone cysts? *Equine Veterinary Education*, 31(9), 501–504.

Parker, R. (2014) Current therapeutic options for intra-articular medication in horses. *Livestock*, 19(4), 243–247.

Peat, F.J., Kawcak, C.E., McIlwraith, C.W., Keenan, D.P., Berk, J.T. & Mork, D.S. (2024) Subchondral lucencies of the medial femoral condyle in yearling and 2-year-old thoroughbred sales horses: prevalence, progression and associations with racing performance. *Equine Veterinary Journal*, 56(1), 99–109. Available from: https://doi.org/10.1111/evj.13945

Pezzanite, L.M., Hendrickson, D.A., Dow, S., Stoneback, J., Chow, L., Krause, D. et al. (2022) Intra-articular administration of antibiotics in horses: justifications, risks, reconsideration of use and outcomes. *Equine Veterinary Journal*, 54(1), 24–38.

20423292, 0, Downloaded from https://beva.onlinelibrary.wiley.com/doi/10.1111/eve.14176 by Massey University Library, Wiley Online Library on [31/07/2025]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

Ray, C. (1996) Development of subchondral cystic lesions after articular cartilage and subchondral bone damage in young horses. *Equine Veterinary Journal*, 28(3), 225–232.

Santschi, E.M., Prichard, M.A., Whitman, J.L., Batten, C.A., Strathman, T.A., Canada, N.C. et al. (2020) Stifle radiography in thoroughbreds from 6 to 18 months of age. *Equine Veterinary Education*, 32, 78–84.

Santschi, E.M., Williams, J.M., Morgan, J.W., Johnson, C.R., Bertone, A.L. & Juzwiak, J.S. (2015) Preliminary investigation of the treatment of equine medial femoral condylar subchondral cystic lesions with a transcondylar screw. *Veterinary Surgery*, 44(3), 281–288.

Trotter, G.W. (1996) Chapter 14: Intra-articular corticosteroids. In: McIlwraith, C.W. & Trotter, G.W. (Eds.) *Joint disease in the horse*. Philadelphia: W.B. Saunders Company, pp. 237–256.

Vivrette, S.L., Bostian, A., Bermingham, E. & Papich, M.G. (2001) Quinolone-induced arthropathy in neonatal foals. *Proceedings of the American Association of Equine Practitioners*, 47, 376–377.

Von Rechenberg, B., Guenther, H., McIlwraith, C.W., Leutenegger, C., Frisbie, D.D., Akens, M.K. et al. (2000) Fibrous tissue of subchondral cystic lesions in horses produce local mediators and neutral metalloproteinases and cause bone resorption in vitro. *Veterinary Surgery*, 29(5), 420–429.

Von Rechenberg, B., McIlwraith, C.W., Akens, M.K., Frisbie, D.D., Leutenegger, C. & Auer, J.A. (2000) Spontaneous production of nitric oxide (NO), prostaglandin (PGE2) and neutral metalloproteinases (NMPs) in media of explant cultures of equine synovial membrane and articular cartilage from normal and osteoarthritic joints. *Equine Veterinary Journal*, 32(2), 140–150.

Wallis, T.W., Goodrich, L.R., McIlwraith, C.W., Frisbie, D.D., Hendrickson, D.A., Trotter, G.W. et al. (2008) Arthroscopic injection of corticosteroids into the fibrous tissue of subchondral cystic lesions of the medial femoral condyle in horses: a retrospective study of 52 cases (2001–2006). *Equine Veterinary Journal*, 40, 461–467. Available from: https://doi.org/10.2746/042516408X258843

How to cite this article: Beggan, C.P., Quinn, G.C. & McIlwraith, C.W. (2025) Medial femorotibial and femoropatellar articular cartilage delamination following intra-articular therapy with triamcinolone and gentamicin in five yearlings. *Equine Veterinary Education*, 00, 1–9. Available from: https://doi.org/10.1111/eve.14176

20423292, 0, Downloaded from https://beva.onlinelibrary.wiley.com/doi/10.1111/eve.14176 by Massey University Library, Wiley Online Library on [31/07/2025]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License