pISSN 1598-298X / eISSN 2384-0749
J Vet Clin 35(3) : 88-92 (2018)
http://dx.doi.org/10.17555/jvc.2018.06.35.3.88

Journal of Veterinary Clinics
www.ksvc.or.kr

Arthroscopy for Treating Osteochondroma of Distal Radius in 68 Thoroughbred Horses

Mingeun Song, Masaaki Tagami*, Fumiki Kato*, Tsukasa Suzuki*, Takashi Yamaga*, Tae-Young Kang and Jong-pil Seo[1]

College of Veterinary Medicine and Veterinary Medical Research Institute, Jeju National University, Jeju 690-756, Republic of Korea
**Shadai Horse Clinic, Shadai Corporation, Tomakomai, Hokkaido 059-1361, Japan*

(Received: January 08, 2018 / Accepted: June 06, 2018)

Abstract : Osteochondroma (OC) is a cartilage-capped exostosis. In horses, OC commonly develops on the caudal distal metaphysis of the radius (CDMR). The purpose of study was to describe the outcomes of arthroscopy for the treatment of OC on CDMR. Diagnosis was based on clinical signs (lameness and distention of carpal sheath), radiography (location and size of OC), and ultrasonography (location of OC, torn deep digital flexor tendon, fibrin, and effusion of carpal sheath). Arthroscopy was performed on 68 Thoroughbred horses with OC on CDMR. Sixty of the 68 cases showed deep digital flexor tendinitis as a result of sharp protuberances of the OC. All horses survived, and 62 of the 68 cases returned to athletic function (racing) after arthroscopy. The present study demonstrated that arthroscopy is useful for treating OC of CDMR in horses.

***Key words* :** arthroscopy, osteochondroma, deep digital flexor tendinitis, horse.

Introduction

Osteochondroma (OC) is a cartilage-capped exostosis (6, 12,16). OC commonly develops on the caudal distal metaphysis of the radius (CDMR) in horses (2,7,9,12,13,16). Rarely, OC may be located on nasal bone, tibia, or on the cranial distal metaphysis of the radius (11,13,14). Typically, OC has a single, sharp protuberance, resulting in deep digital flexor tendinitis (2,9,10,11,16) via tearing of the deep digital flexor tendon (DDFT). The length and depth of DDFT tearing varies (9,16). OC diagnosis is based on clinical signs, radiography, and ultrasonography (2,3,7,11,12,16). Clinical signs of OC include various degrees of effusion of the carpal sheath and lameness (2,3,7,11,16). Radiography can provide information on the location and size of an OC (11,16). Ultrasonography can indicate OC location and can reveal DDFT damage, fibrin clotting, and effusion of the carpal sheath (3,16). Arthroscopy of the carpal synovial sheath permits visual evidence of OC and tendinitis (3,9,11,12). In addition, advanced diagnostic techniques, such as computed tomography and nuclear scintigraphy, can be used to diagnose OC (11,12). Arthroscopy is a minimally invasive surgery with visualization (15) and is useful in the removal of OC and fibrin, debriding torn DDFT, and performing lavage of the proximal carpal sheath. The purpose of this study was to describe the clinical signs, diagnosis, treatment, and prognosis of OC when treated by arthroscopy in horses.

[1]Corresponding author.
E-mail : jpseo@jejunu.ac.kr

Case

Herein, we review 68 OC cases treated by arthroscopy at the Shadai Horse Clinic from May 2010 to June 2016. OC was diagnosed based on clinical signs, radiography, and ultrasonography. Clinical signs of OC were lameness and effusion of the carpal sheath. Radiography showed the location and condition of the OC. Radiographically, the OC shape appeared as a cone-like, bony protuberance (Fig 1); the sizes of the 68 OCs varied. Deep digital flexor tendinitis was determined via ultrasonography (Fig 1B, 1C). OC-related tears of the DDFT were longitudinal (Fig 2C), resulting in deep digital flexor tendinitis (Fig 2C).

Arthroscopic surgery was performed to treat OC of CDMR in the 68 study horses. The horses underwent preanesthesia with detomidine hydrochloride (10 μg/kg, i.v., Domitor®, Nippon Zenyaku Kogyo, Fukushima, Japan). Anesthesia was induced with ketamine hydrochloride (2.2 mg/kg, i.v., Ketalar 100, Sankyo, Tokyo, Japan) and diazepam (0.1 mg/kg, i.v., Horizon®, Astellar Inc., Tokyo, Japan) and was maintained with isoflurane (Isoflu®, Dainippon, Sumitomo Pharmaceutical, Tokyo, Japan) in oxygen. The horses were positioned in dorsal recumbency. The carpus is positioned in slight (15-20 degree) flexion. The lateral side of the carpal joint was aseptically prepared (Fig 2A). Synovial fluid for bacterial culture and synovial fluid analysis was collected before arthroscopy from the proximal pouch of the carpal sheath by using an 18 gauge needle. The carpal sheath was distended with lactated Ringer's solution. Arthroscopy was performed by using a 4 mm arthroscope. The arthroscopic portal was made in the proximal one-third of the lateral aspect of the carpal sheath, between the ulnaris lateralis tendons and the

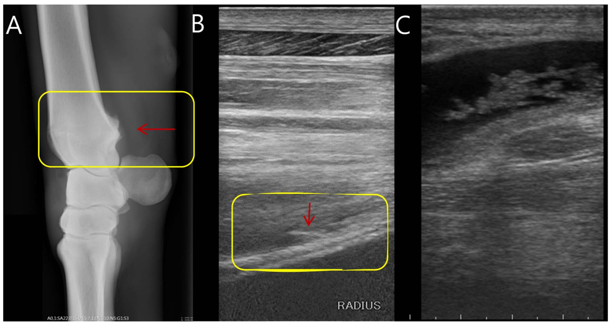

Fig 1. Radiographic and ultrasonographic findings. A bony protuberance was detected at the caudal and distal metaphysis of radius in a lateromedial radiographic image of the carpal joint (A, red arrow), and on longitudinal ultrasonography of the region indicated in A and B with yellow rectangles. Fibrin, secondary to tearing of the deep digital flexor tendon by the protruding osteochondroma, was detected in the proximal carpal sheath on ultrasonographic examination (C).

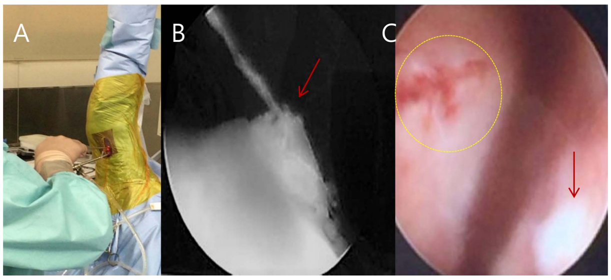

Fig 2. Surgical approach and arthroscopic findings. Lateral approach for arthroscopic surgery (A). The arthroscopic portal was made in the proximal one-third of the lateral aspect of the carpal sheath, between the ulnaris lateralis and the tendon of lateral digital extensor. The instrument portal was located 2-3 cm distal of arthroscopic portal on the same side. Osteochondroma (B, red arrow) and a torn deep digital flexor tendon (C, yellow circle) resulting from the cartilage-capped osteochondroma (C, red arrow) were detected by arthroscopy.

lateral digital extensor. The instrument portal was located 2 cm distal of the arthroscopic portal on the same side (Fig 2A). The conditions of the DDFT, OC, and the proximal pouch of the carpal sheath were checked via arthroscopy (Fig 2). An arthroscopic rongeur was used to remove the OC and fibrin. The torn DDFT was cleaned by arthroscopic rongeur or shaver (Stryker Endoscopy, San Jose, CA, USA). Then, the carpal sheath underwent lavage with lactated Ringer's solution. An 18 gauge needle was located correctly in the carpal sheath under arthroscopy for hyaluronic acid (HA; 20-40 mg) injection after skin suture. Skin was closed by using 2-0 or 3-0 monofilament polypropylene materials and a compression bandage was applied. The bandage was changed postsurgically every day for 2-3 weeks. A non-steroidal anti-inflammatory drug (flunixin meglumine; 1 mg/kg, i.v., BID, Banamine, Dainippon Sumitomo Pharmaceutical, Tokyo, Japan) and an antibiotic (cefalothin sodium: 20 mg/kg, i.v., BID, Coaxin, Tobishi Pharmaceutical, Tokyo, Japan) were administered postsurgically every day for 1-2 weeks. Walking exercise started 5-7 days after surgery.

The signalment, clinical signs, treatments, and prognoses related to OC in the 68 horses are summarized in Table 1. The age range of the horses was from 2 to 5 years old (mean 2.44 years old). Fifty-two of the 68 horses were male, 14 horses were female, and 2 horses were gelding. Obvious lameness was present in 4 cases, while no lameness was detected in 5 cases. Distinct proximal carpal sheath effusion was observed in 59 horses and no effusion in one horse. The OC lesion was located on right front limb (36 horses), left front limb (27 horses), on front limbs on both sides (4 horses), and on an unknown front limb (1 horse). The OC lesions were single or multiple in all but 2 horses for which there was no relevant data recorded. Deep digital flexor tendinitis was present in 60 of the 68 cases and there were 2 cases with no tendinitis information recorded. In Table 1, horse numbers 10 and 34 are the same horse in which the OC occurred on different legs. Similarly, horse numbers 52 and 66 in Table 1 are the same horse but the OC occurred on the same leg. For horse 52, the operation completely removed the OC, but an OC recurred on the same leg (i.e., horse 66: resurgery). All horses survived and 62 of 68 cases returned to athletic function (racing) after arthroscopy.

Discussion

Clinical signs of radial OC and distal radial exostosis are similar (3,9,12): lameness and synovial effusion of the carpal sheath. OC is an exostosis continuous with the cortex of the bone and is differentiated from exostosis by covered cartilage (2,12,16). The location where OC grows in the caudal radius is different from exostosis. OC most frequently develops on the caudomedial border of the distal radial metaphysis typically 2-4 cm proximal to the distal radial metaphysis (11,12). OC on the caudal distal radius has been diagnosed based on clinical signs, radiography, ultrasonography, and arthroscopy in many previous papers (3,7,11,12,16). In the present study, OC was diagnosed according to clinical signs (lameness and distention of carpal sheath), radiography (location and size of OC), and ultrasonography (location of OC, torn deep digital flexor tendon, fibrin, and effusion of carpal sheath).

Arthroscopy is an effective method for the diagnosis and treatment of OC in horses. Arthroscopy provides exceptional visualization of the carpal sheath and allows effective removal of protruding OC and fibrin. In addition, it is easy to debride a torn DDFT and perform lavage of the proximal carpal sheath via arthroscopy. In addition, arthroscopic surgery has advantages in reducing postoperative complications such as swelling and surgical site infection, and in shortening recovery time compared with that using incision-based surgery (1,15). Therefore, we choose the arthroscopic method to treat OC in horses with CDMR; there were no complications related to the arthroscopic surgeries in the present study.

When arthroscopic surgery is performed on the carpus region, a lateral approach is preferred over a medial approach since a medial approach increases the risk of median artery and nerve injury (12,16). Previous study has shown that a lateral approach decreases swelling on the carpal sheath after

Table 1. Summary of 68 osteochondroma cases

NO.	Sex	Age	Lameness	Effusion	Lesion	Surgery		Racing after surgery
						OC	DDFT	
1	Male	2	+	+	R	O	O	O
2	Male	3	+	+	NO data	O	O	O
3	Male	2	+	+	R	O	O	O
4	Male	3	-	+	L	O	O	O
5	Male	2	+	+	R	M	X	O
6	Male	2	+	+	R	M	O	O
7	Gelding	4	+	+	R	O	O	O
8	Male	2	-	+	L	O	O	O
9	Male	3	+	+	L	O	O	O
10	Male	2	+	No test	L	O	O	O
11	Male	2	+	+	R	O	O	O
12	Male	2	+	+	L	O	O	O
13	Male	2	+	+	R	O	O	O
14	Female	2	-	+	R	O	O	O
15	Female	2	+	+	R	O	O	X
16	Male	2	+	+	R	M	O	O
17	Male	2	+	+	L	O	X	O
18	Male	4	+	+	L	O	O	O
19	Male	2	+	+	R	O	O	O
20	Male	4	+	+	R	M	O	O
21	Male	5	+	+	L	NO data	NO data	O
22	Female	2	+	+	L	NO data	NO data	O
23	Female	1	-	+	L	O	O	O
24	Male	1	+	+	L	M	O	O
25	Male	3	+	+	L	O	O	O
26	Female	2	+	+	R	O	O	O
27	Male	2	-	+	L	O	O	O
28	Male	2	+	+	R	M	O	O
29	Female	3	+	No test	B	O/L:M	O	O
30	Male	5	+	No test	R	O	O	O
31	Male	3	+	+	R	O	O	O
32	Female	2	+	-	R	O	X	O
34	Male	3	+	+	R	M	O	O
35	Male	3	+	+	L	M	X	O
36	Male	2	+	+	R	O	O	X
37	Male	2	+	+	L	O	O	O
38	Male	4	+	+	R	M	O	O
39	Male	2	-	+	L	O	O	O
40	Male	3	+	No test	L	O	O	X
41	Male	2	+	No test	R	O	O	O
42	Male	2	+	+	R	O	O	X
43	Female	2	-	+	R	O	O	O
44	Female	2	+	+	R	M	O	O

+ in Effusion: existent, R: right leg, L: left leg, B: both legs, M in surgery: multiple osteochondroma, O in surgery: Do arthroscopy to treatment, X in surgery: Not do arthroscopy to treatment, O in racing after surgery: Return to athletic function (racing), and X in racing after surgery: Not return to athletic function (racing).

Table 1. (Continued) Summary of 68 osteochondroma cases

NO.	Sex	Age	Lameness	Effusion	Lesion	Surgery		Racing after surgery
						OC	DDFT	
45	Male	2	+	+	R	O	O	O
46	Female	2	+	+	L	M	O	O
47	Male	2	+	+	L	M	O	O
48	Male	2	+	+	B	O/L:M	O	O
49	Female	2	+	+	B	O/L:M	O	O
50	Female	2	+	+	R	M	O	O
51	Male	2	+	No test	R	O	O	O
52	Male	2	+	+	B	O/O	O	O
53	Male	2	+	+	R	O	O	O
54	Female	2	+	+	R	O	O	O
55	Male	2	+	+	R	O	O	O
56	Male	2	+	+	L	O	O	O
57	Male	2	+	No test	R	O	O	O
58	Male	2	+	+	L	O	O	X
59	Male	2	+	+	L	O	O	O
60	Female	3	+	+	L	O	O	O
61	Male	2	-	+	L	O	X	O
62	Male	2	+	+	R	O	O	O
63	Male	4	+	+	L	O	X	O
64	Gelding	4	+	+	R	M	O	O
65	Male	2	+	+	R	O	O	X
66	Male	3	+	No test	L	M	O	O
67	Male	3	+	No test	R	O	O	O
68	Male	3	+	+	L	M	O	O

+ in Effusion: existent, R: right leg, L: left leg, B: both legs, M in surgery: multiple osteochondroma, O in surgery: Do arthroscopy to treatment, X in surgery: Not do arthroscopy to treatment, O in racing after surgery: Return to athletic function (racing), and X in racing after surgery: Not return to athletic function (racing).

surgery (16). In addition, the lateral approach provides for effective manipulation of the arthroscopic instrument and scope without interference from the opposite limb. In the present study, arthroscopy was performed by using the lateral approach, and there were no resulting complications such as swelling or median artery and nerve injury.

For OC diagnosis, radiographic and ultrasonographic examination are needed (3,11,16). In radiography, OC is obvious and observed as a protruding shape (11,16). Therefore, it is possible to understand its position accurately by performing radiography from various angles. Ultrasonography can reveal OC, deep digital flexor tendinitis, and effusion of the carpal sheath (3,16). A protruding OC can result in DDFT injury in many cases, but deep digital flexor tendinitis may not be confirmed by radiography. We confirmed tendinitis of the DDFT by detecting fibrin and fluid accumulations in the carpal sheath via ultrasonography. Therefore, radiography and ultrasonography should be used together during diagnosis of OC. Ultrasonographic examination on the OC region is somewhat difficult because of the narrow and uneven surface; however, practice can help provide good ultrasonographic images.

Adhesion can result in restraint of joint movement (8). Therefore, adhesion prevention is important for a horse to return to its intended use. We removed fibrin, performed lavage, and administrated HA to prevent adhesion during recovery. HA is a substance that helps healing the damage of tendon and joint (4,6) and is commonly administrated to improve tendon sheath status and reduce intratendinous hemorrhage. In addition, HA can reduce tendon injury recurrence by helping to prevent adhesion (5). The prognosis of OC depends on tendon injury and adhesion formation (12). In the present study, 62 of 68 cases horses returned to athletic function (racing), indicating that adhesion prevention can be helpful in the treatment of DDFT injury resulting from OC.

One horse (case 52) underwent OC resurgery as case 66 because an OC regrew at the same location as that in the initial surgery. Incomplete removal of the OC during the first surgery could be the reason for the regrowth of the OC. Radiography following arthroscopy should be effective in determining whether an OC has been completely removed (12). Therefore, it is recommended that radiographic examination be performed to confirm the OC has been completely removed prior to terminating arthroscopy.

Conclusion

The present study has demonstrated the clinical signs, diagnostic method, and treatment of OC in 68 horses. Based on the results, arthroscopy is recommended for the treatment of OC of CDMR in horses.

Acknowledgments

This research was supported by the 2018 scientific promotion program funded by Jeju National University.

References

1. Cauvin ERJ. Tenoscopy and Bursoscopy. In: Diagnosis and management of lameness in the horse, 2nd ed. Missouri: Elsevier Saunders. 2011: 263-264.
2. Dyson SJ. The carpal canal and carpal synovial sheath. In: Diagnosis and management of lameness in the horse, 2nd ed. Missouri: Elsevier Saunders. 2011: 779-780.
3. Dyson SJ. The deep digital flexor tendon. In: Diagnosis and management of lameness in the horse, 2nd ed. Missouri: Elsevier Saunders. 2011: 727-723.
4. Frisbie DD, McIlwraith CW, Kawcak CE, Werpy NM. Efficacy of intravenous administration of hyaluronan, sodium chondroitin sulfate, and N-acetyl-d-glucosamine for prevention or treatment of osteoarthritis in horses. Am J Vet Res. 2016 Oct; 77: 1064-1070.
5. Gaughan EM1, Nixon AJ, Krook LP, Yeager AE, Mann KA, Mohammed H, Bartel DL. Effects of sodium hyaluronate on tendon healing and adhesion formation in horses. Am J Vet Res. 1991 May; 52: 764-773.
6. Jann HW1, Hart JC2, Stein LE3, Ritchey J4, Blaik M5, Payton M6, Fackelman GE7, Rezabek GB8, Mann BK9,10. The Effects of a Crosslinked, Modified Hyaluronic Acid (xCMHA-S) Gel on Equine Tendon Healing. Vet Surg. 2016 Feb; 45: 231-239.
7. Kawcak C. The carpus. In: Adams & Stashak's Lameness in horses, 6th ed. West Sussex: John Wiley & Sons Ltd. 2011: 762-764.
8. Kenneth ES. The tarsus and tibia. In: Adams & Stashak's Lameness in horses, 6th ed. West Sussex: John Wiley & Sons Ltd. 2011: 847.
9. McIlwraith CW, Nixon AJ, Wright IM. Tenoscopy. In: Diagnostic and surgical arthroscopy in the horses. Mosby Elsevier. 2015: 359-366.
10. Minshall GJ1, Wright IM. Tenosynovitis of the carpal sheath of the digital flexor tendons associated with tears of the radial head of the deep digital flexor: observations in 11 horses. Equine Vet J. 2012 Jan; 44: 76-80.
11. Nixon AJ1, Schachter BL, Pool RR. Exostoses of the caudal perimeter of the radial physis as a cause of carpal synovial sheath tenosynovitis and lameness in horses: 10 cases (1999-2003). J Am Vet Med Assoc. 2004 Jan 15; 224: 264-270.
12. Ruggles AJ. Carpus. In: Equine Surgery, 4th ed. Missouri: Elsevier Saunders. 2012: 1358-1360.
13. Russell JW1, Hall MS1, Kelly GM1. Osteochondroma on the cranial aspect of the distal radial metaphysis causing tenosynovitis of the extensor carpi radialis tendon sheath in a horse. Aust Vet J. 2017 Jan; 95: 46-48.
14. Secombe CJ1, Anderson BH. Diagnosis and treatment of an osteochondroma of the distal tibia in a 3-year-old horse. Aust Vet J. 2000 Jan; 78: 16-18.
15. Southwood LL1, Stashak TS, Fehr JE, Ray C. Lateral approach for endoscopic removal of solitary osteochondromas from the distal radial metaphysis in three horses. J Am Vet Med Assoc. 1997 Apr 15; 210: 1166-1168.
16. Wright IM1, Minshall GJ. Clinical, radiological and ultrasonographic features, treatment and outcome in 22 horses with caudal distal radial osteochondromata. Equine Vet J. 2012 May; 44: 319-324.