

Outcome of Non-surgical and Surgical Treatments in Dogs with Cervical Intervertebral Disc Disease: 60 cases

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Abstract : Outcomes of non-surgical and surgical treatments for thoracolumbar intervertebral disc disease (IVDD) are well-reported. However, little is known regarding the outcome for treatments of cervical IVDD. This study systematically reviewed the outcomes in dogs with cervical IVDD that were managed non-surgically and surgically. Clinical success rates for surgical treatment were significantly higher (100%) than for non-surgical treatment (51.4%). In the non-surgical treatment group, clinical success rates were negatively correlated with spinal cord compression rates. Based on the results of this study, surgical treatment is deemed more effective than non-surgical treatment for dogs with cervical IVDD. Also, the degree of spinal cord compression on computed tomography or magnetic resonance imaging is a useful prognostic indicator before non-surgical treatment

Key words : cervical, intervertebral disc disease, treatments, dog.

Introduction

Intervertebral disc disease (IVDD) is a common neurological disease in dogs (1). Cervical IVDD accounts for approximately 15% of all IVDD, especially in dachshunds, beagles, and toy poodles, which represent about 80% of the cases (2,4,5,6,16,21).

Severe cervical hyperesthesia is the most common clinical sign associated with cervical spinal cord compression, although root signature, tetraparesis, tetraplegia, and respiratory compromise may also occur (19,22). The most common site for cervical disc herniation is the second (C₂) to third (C₃) intervertebral disc space in small breed dogs, and the sixth (C₆) to seventh (C₇) intervertebral disc space in large breed dogs (2). The duration of compression, the amount of herniated disc material, and the force of the extrusion or protrusion all contribute to the severity of neurological deficits (7,8,17).

Both non-surgical and surgical managements can be used in the treatment of cervical disc disease in dogs (19,22). Non-surgical management is selected for dogs with neck pain, or both neck pain and mild neurological dysfunction. Dogs that do not respond to conservative treatment, or have severe neurological deficits or unremitting pain, are usually addressed surgically (13,19).

Outcomes of non-surgical and surgical treatments for thoracolumbar IVDD are well-reported. However, little is known

regarding outcome for treatments of cervical IVDD. The present study systematically reviewed the outcomes in dogs with cervical IVDD that were treated non-surgically and surgically.

Materials and Methods

Case selection criteria

Medical records of the Seoul National University Hospital for Animals from June 2005 to February 2010 were searched to identify cases of patients with cervical IVDD. Dogs were included in the study if the diagnosis had been made on the basis of results of magnetic resonance imaging (MRI) or computed tomography (CT); the dog had been treated non-surgically or surgically at the Seoul National University Hospital for Animals; a complete medical record was available; and long-term follow-up information (minimum, 6 months) was available. Dogs with congenital malformations and traumatic, infectious, or neoplastic lesions were excluded from the study population.

Medical records review

Information obtained from the medical records consisted of breed, age, weight, sex, pre-treatment grade of myelopathy, duration of clinical signs, methods of diagnosis (CT or MRI), location of the main lesion, methods of treatment (non-surgical or surgical), and surgical techniques. The neurological grades were divided into the following four categories based on neurological status according to a previous study with minor modification (6,10): Grade I, normal ambulation with neck pain; Grade II, mild ataxia with motor function adequate for weight bearing;

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Grade III, severe ataxia with motor function inadequate for weight bearing; Grade IV, non-ambulatory tetraparesis.

Transverse T2-weighted MR images or transverse CT images were used to trace the spinal cord at its site of maximal compression. The percentage of spinal cord compression (SCC) was calculated using the previously reported method of measurement (12,14). If the number of affected disc spaces is more than one in a certain patient, it is recognized that the main lesion is considered the site that displays the highest calculated percentage of SCC. The degree of SCC was divided into the following three categories based on MRI or CT-estimated SCC: 1-25%; 26-50%; 51-100%.

Treatment

The dogs with failure of non-surgical treatment or severe (grade III or IV neurological grade) neurological deficits were recommended surgical treatment by clinicians, but treatment option was decided by owners.

Non-surgical treatment consisted of strict cage rest (at least 6 weeks), administration of prednisolone (0.5 mg/kg, PO, q 12 h for 3 days; followed by 0.5 mg/kg, PO, q 24 h for 4 to 11 days) and physical rehabilitation. The risks of recurrence were also discussed. If neurologic signs worsened, surgical treatment was suggested.

Surgeries were performed using ventral slot or dorsal laminectomy depending on the preference of the surgeon. Ventral slot was performed using a published technique, which refers to the creation of a bony defect in the ventral aspect of a cervical intervertebral space to gain entrance and visualization of the ventral vertebral canal (17,18,20). Dorsal laminectomy was performed as previously (6,17), which is removal of dorsal spinous processes, lamina, and portions of the pedicles to expose the dorsal aspect of the spinal cord and nerve roots. All patients were discharged from the hospital on the fourteenth postoperative day. Postoperative management of ambulatory patients included strict cage rest, and avoidance of stair for 6 weeks. Postoperative management of non-ambulatory patients included intensive nursing care and physical therapy that consisted of frequent turning, passive range of motion, bedding and massage.

Outcome

Follow-up data was obtained during a telephone interview conducted 6 months or more following treatment. Dogs were classified into two outcome groups (clinical success and treatment failure) on their response to treatment. Dogs with clinical

success were completely normal or substantially improved after therapy, and lacked evidence of recurrence of clinical signs. Treatment failure was defined as decline or lack of improvement after treatment or recurrence of clinical signs.

Statistical analyses

Statistical analysis was performed using a commercially available statistical software program (SPSS version 18, SPSS, Chicago, IL). Fisher's exact test was used to determine whether duration of clinical signs, the degree of SCC, sex, age, breed, weight, or the neurological grade before treatment was associated with the outcome. Spearman's correlation test was used to examine the association between the degree of SCC and the grade of myelopathy or outcome. Values of $p < 0.05$ were considered significant.

Results

Sixty cases met the criteria for inclusion in the study. The non-surgical treatment group consisted of 35 dogs (20 males and 15 females) that included Miniature Dachshund ($n = 6$), Shih Tzu ($n = 5$), Cocker Spaniel ($n = 4$), Pekingese ($n = 4$), Mixed-breed ($n = 3$), Maltese ($n = 3$), Miniature Schnauzer ($n = 3$), Beagles ($n = 2$), Yorkshire Terrier ($n = 1$), Chihuahua ($n = 1$), Pug ($n = 1$), Pomeranian ($n = 1$), and Toy poodle ($n = 1$). Mean age was 7.5 years (range 3-12 years), mean weight was 6.1 kg (range 2-10.7 kg), mean duration of clinical signs was 17.1 days (range 2-150 days) and mean follow-up time was 25.9 months (range 6-50 months).

The surgical treatment group consisted of 25 dogs (14 males and 11 females) that included Cocker Spaniel ($n = 7$), Miniature Dachshund ($n = 5$), Pekingese ($n = 5$), Shih Tzu ($n = 4$), Pomeranian ($n = 2$), Maltese ($n = 1$), Miniature Schnauzer ($n = 1$), and Yorkshire Terrier ($n = 1$). Mean age was 7.1 years (range 4-11 years), mean weight was 7.1 kg (range 3-14 kg), mean duration of clinical signs was 14 days (range 2-65 days) and mean follow-up time was 22 months (range 6-56 months). Twenty dogs underwent ventral slot and five dogs underwent dorsal laminectomy at the site(s) of SCC.

Among the 60 dogs, 41.7% ($n = 25$) had the main lesion at C₂-C₃, 16.7% ($n = 10$) at C₃-C₄, 8.3% ($n = 5$) at C₄-C₅, 6.7% ($n = 4$) at C₅-C₆, and 11.7% ($n = 7$) at C₆-C₇. The location of the main lesion was not determined in the remaining nine (15%) dogs because two or more lesions of similar severity were observed. Overall, 33% ($n = 20$) dogs appeared to have

Table 1. The degree of Spinal cord compression (SCC) and the neurological grade before treatment for 60 dogs with cervical intervertebral disc disease (IVDD)

Degree of SCC	Neurological grade before treatment				Population
	Grade I	Grade II	Grade III	Grade IV	
1-25%	4	4	0	1	9 (15%)
26-50%	9	18	2	10	39 (65%)
51-100%	2	4	1	5	12 (20%)
Total	15	26	3	16	60 (100%)

Table 2. The degree of Spinal cord compression and long-term clinical outcome for 60 dogs with cervical intervertebral disc disease (IVDD) treated non-surgically (n = 35) or surgically (n = 25)

Group [§]	Degree of Spinal cord compression	Long-term clinical outcome	
		Clinical success	Treatment failure
Non-surgical [‡]	1-25%	88.9% (8/9)	11.1% (1/9)
	26-50%	50% (10/20)	50% (10/20)
	51-100%	0% (0/6)	100% (6/6)
	Total	51.4% (18/35)	48.6% (17/35)
Surgical	26-50%	100% (20/20)	0% (0/20)
	51-100%	100% (5/5)	0% (0/5)
	Total	100% (25/25)	0% (0/25)

[§] Clinical outcome was significant different exist between groups. ($p < 0.05$ by Fisher's exact test)

[‡] Negative correlation exists between the degree of SCC and clinical success rates in non-surgical group. ($r = -0.57$, $p < 0.05$ by Spearman's correlation)

more than one lesion on CT or MRI.

Most dogs (88.9%, 8/9) with 1-25% of SCC had neurological grades I or II (Table 1). However, dogs with over 25% of SCC had variable neurological grades.

The clinical success rate for surgically-treated dogs (25/25, 100%) was significantly ($p < 0.05$) higher than for non-surgically treated dogs (18/35, 51.4%, Table 2). Breed, age, sex, weight, and duration of clinical signs were not significantly associated with outcome.

In the non-surgical group, the clinical success rates of dogs with SCC of 1-25%, 26-50%, and 51-100% were 88.9%, 50%, and 0%, respectively. The degree of SCC was negatively associated with clinical success rates ($r = -0.57$, $p < 0.05$).

The neurological grade before treatment was not significantly associated with outcome.

Discussion

Beagle and Dachshund have been described as the breeds most commonly affected with cervical IVDD (2,3,4,5,6). In our study, over-representation of cervical IVDD was recorded in Dachshund and Cocker Spaniel. In addition, the age at first presentation was in agreement with previous reports (7.4-8.2-years-of-age; 2,4,5,6). There were more males than females in this study, similar with some previous studies (2,13). The most commonly affected cervical disc space in this study was the second to third cervical intervertebral space (41.7%), which agrees with other studies (2,4,10).

Previous studies have suggested that dogs with caudal cervical intervertebral disc protrusion had a more severe perioperative neurological status (4,22). Conversely, a recent study reported that the site of herniation did not influence the outcome of dogs with cervical IVDD (9). In this study, the location of the main lesion was not found to be associated with the treatment outcome or with the neurological status before treatment.

In the present study, no significant association was evident between the degree of SCC and the neurological grades before treatment, but the dogs with 1-25% SCC had a lower neurological grade before treatment. Another study similarly observed no association between the degree of thoracolumbar SCC and the neurological grade at presentation (14). This is probably because the severity of spinal injury was due to a combination of concussion and compression, giving rise to multiple secondary injury mechanisms (14,16).

The degree of SCC was negatively correlated with clinical success rates in the non-surgical group. It was suggested that the degree of SCC is a useful prognostic indicator before non-surgical treatment. Also, this result suggests that with more severe spinal cord compression, treating vasogenic edema by glucocorticosteroids results in only modest clinical improvement (11).

In the non-surgical group, dogs with grade I and II had higher clinical success rate (57.1%) than dogs with grade III

Table 3. The grade of myelopathy before treatment and long-term clinical outcome for 60 dogs with cervical intervertebral disc disease (IVDD) treated non-surgically (n = 35) or surgically (n = 25)

Group	Neurological grade before treatment	Long-term clinical outcome	
		Clinical success	Treatment failure
Non-surgical	Grade I	66.7% (6/9)	33.3% (3/9)
	Grade II	52.6% (10/19)	47.4% (9/19)
	Grade I + II	57.1% (16/28)	42.9% (12/28)
	Grade III	0% (0/1)	100% (1/1)
	Grade IV	33.3% (2/6)	66.7% (4/6)
	Grade III + IV	28.6% (2/7)	71.4% (5/7)
	Total	51.4% (18/35)	48.6% (17/35)
Surgical	Grade I	100% (6/6)	0% (0/6)
	Grade II	100% (7/7)	0% (0/7)
	Grade III	100% (2/2)	0% (0/2)
	Grade IV	100% (10/10)	0% (0/10)
	Total	100% (25/25)	0% (0/25)

and IV (28.6%), but the difference was not significant. Other reports similarly observed no association between the outcome and the neurological status before surgical or non-surgical treatment (9,13,16).

The prognosis after cervical disc surgery is favorable (22). A recent study reported that 188 out of 189 dogs with cervical pain experienced resolution of symptoms and the dogs were able to walk after surgery (2). Conversely, non-surgical management has a higher rate of recurrence and failure than surgical management for cervical IVDD (15). In this study, all (25/25) dogs in the surgical group had clinical success.

Based on the results of this study, surgical treatment is deemed to be more effective than non-surgical treatment for dogs with cervical IVDD. Also, the degree of SCC appears to be a useful prognostic indicator before non-surgical treatment.

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개에서 경추 추간판 탈출증의 비수술적 치료와 수술적 치료의 결과 : 60 증례

성규진 · 류학현 · 박성수 · 강병재 · 임성준 · 김용선 · 이승훈 · 조성호 · 김준영 · 윤정희* · 김완희 · 권오경¹

서울대학교 수의과대학 수의 외과학 교실, *수의 영상의학 교실

요 약 : 추간판 탈출증은 개에서 일반적인 신경학적 질병이다. 수의 신경학 임상에서 흉요추 추간판 탈출증의 비수술적 치료 또는 수술적 치료의 결과는 잘 보고되어 있다. 그러나 경추 추간판 탈출증의 비수술적 치료 또는 수술적 치료의 결과에 대해서는 상대적으로 적게 알려져 있다. 우리의 목적은 경추 추간판 탈출증을 가진 개에서의 수술적 치료와 비수술적 치료후의 결과에 대해 체계적으로 조사하는 것이다. 수술적 치료를 실시한 개의 치료 성공률(100%, 25/25) 이 비수술적 치료를 실시한 개의 치료 성공률(51.4%, 18/35) 에 비해 유의적으로 높았다. 비수술적 치료군에서 치료 성공률과 척수 압박률과는 부정적인 상관관계가 있음을 확인하였다. 본 연구에서는 경추 추간판 탈출증을 가진 개에서의 수술적 치료는 비수술적 치료에 비해 더 효과적이었다. 또한 CT 또는 MRI 상에서 확인된 척수압박의 정도는 비수술적 치료에서 유용한 예후의 지표가 되었다.

주요어 : 경추, 추간판 탈출증, 치료, 개