

A Case of Intradiscal Oxygen-ozone Injection Therapy for Cervical Herniated Intervertebral Disc in a Dog

Ha-Young Jang, Jun-Sub Lee, Bora Lee, Kyung-Hee Kim and Soon-Wuk Jeong¹

Department of Veterinary Surgery, College of Veterinary Medicine, Konkuk University, Seoul 143-701, Korea

(Accepted : May 28, 2009)

Abstract : A 6-year-old castrated male Shih-tzu was presented because of a 1-month history of progressive tetraplegia. On the basis of the findings of neurological examination, radiographs and magnetic resonance imaging, herniated intervertebral disc of C4 - C5, C5 - C6 and C6 - C7 compressed spinal cord. The oxygen-ozone was intra-operatively injected into the C4 - C5 and C6 - C7 intervertebral disc and a ventral decompression performed at C5 - C6 intervertebral space. Immediately after the surgery, neck pain was disappeared and three weeks after surgery, there was complete resolution of the neurological deficits with normal gaits. On magnetic resonance images at 2-month after surgery, herniated disc materials of C5 - C6 and C6 - C7 were completely removed and that of C4 - C5 remarkably reduced. Consequently decompression which was performed at all of the three lesions resulted in good clinical outcome without additional internal fixation for minimizing postoperative instability.

Key words : cervical HIVD, dog, intradiscal oxygen-ozone injection.

Introduction

One of the minimal invasive treatment for herniated intervertebral disc (HIVD) is the oxygen-ozone therapy (1-3). The method has been used in cervical and thoracolumbar HIVD in human (1,3). Recently it was reported that oxygen-ozone gas injection into the herniated discs of dogs with thoracolumbar HIVD improved the clinical signs (2). It is based on the action of oxygen-ozone, that is the shrinkage of the herniated disc (3), results in the spinal cord decompression. Cervical HIVD in dogs could be treated by various decompression techniques, include fenestration, ventral slot, and dorsal laminectomy. For cervical multiple HIVD in dogs might be additionally needed intra-operative stabilization to reduce postoperative instability of cervical vertebrae.

In this paper, was described that oxygen-ozone was injected into two cervical herniated discs instead of intra-operative stabilization and a ventral slot performed on the rest cervical intervertebral space in a dog with three cervical HIVDs, and finally a successful outcome. This is first report that oxygen-ozone used for treatment of cervical HIVD in a dog.

Case

A 6-year-old neutered male Shih-tzu dog weighing 6.9 kg was referred to the Veterinary Medical Teaching Hospital of College of Veterinary Medicine at Konkuk University with a history of progressive tetraplegia. Since one month ago,

intermittent left forelimb ataxia was onset and gradually developed despite of medical management. And five days ago, clinical signs were suddenly worsened to parietic condition aggravated from hindlimb to forelimb. At the admission, the patient showed tetraplegia as neck and all four limb rigidity. On neurological examination, mental status was normal and cranial nerve deficits were not founded. But there was no conscious proprioception in all four limbs. Voluntary movement of limb slightly remained only in right forelimb. Muscle tone was spastic. Myotatic reflex was increased in all four limbs. Deep pain perception represented weakly. Based on these clinical signs and neurological examination findings, we suspected cervical intervertebral disc disease. The complete blood count revealed a mild leucocytosis ($21.62 \times 10^3/\mu\text{l}$) with a neutrophilia ($14.81 \times 10^3/\mu\text{l}$) and a monocytosis ($2.50 \times 10^3/\mu\text{l}$). The serum chemistry profiles revealed elevated alkaline phosphatase activity (408 U/l). The survey radiographs showed narrowing of C4 - C5, C5 - C6, and C6 - C7 intervertebral space. Magnetic resonance image (MRI) using a 0.2 T unit (E-scan®; ESAOTE, Genova, Italy) revealed disc extrusion or protrusion that deviated to the left side at C4 - C5, C5 - C6, and C6 - C7 intervertebral space with spinal cord compression (Fig 1A). Spinal cord compression rate (height of herniated disc $\times 100$: diameter of spinal canal) on mid-sagittal MRI views were 37.5% at C4 - C5, 55.6% at C5 - C6 and 44.4% at C6 - C7. The most severely compressed spinal cord lesion was C5 - C6, however it was considered that C4 - C5 and C6 - C7 lesions also related with clinical signs. On cross-sectional MRI views, C4 - C5 and C5 - C6 herniated intervertebral disc were extruded in the vertebral canal, while C6 - C7

¹Corresponding author.
E-mail : swjeong@konkuk.ac.kr

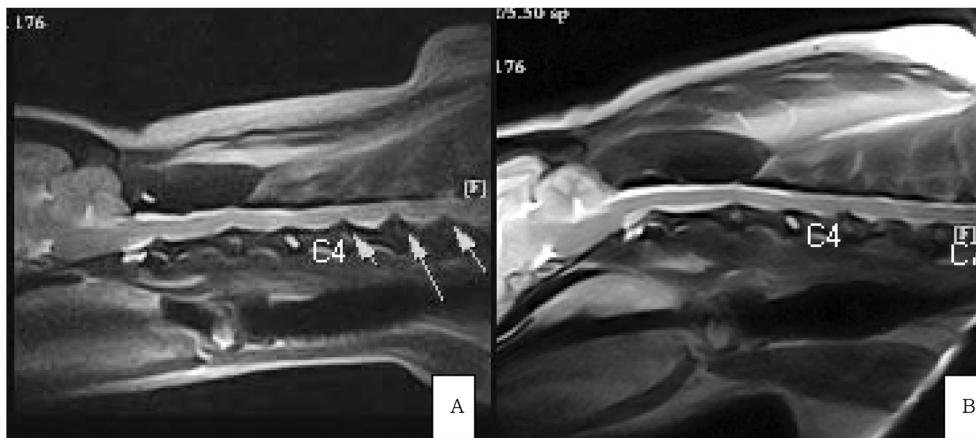


Fig 1. T2-weighted sagittal MRI views of before (A) and after (B) surgery. There are herniated discs at C4-C5, C5-C6 and C6-C7 intervertebral space (A). At two months after surgery, the disc materials in the spinal canal are definitely eliminated at C5-C6 and at C6-C7, markedly reduced at C4-C5 (B).

was protruded. Thus all three lesions were required to decompression, but we should consider about suitable surgical decompression to reduce postoperative vertebral instability in this multiple caudal cervical HIVD. After all, we decided to perform that oxygen-ozone intradiscal injection at C4 - C5 and C6 - C7 intervertebral disc and a ventral slot decompression had gone at C5 - C6 intervertebral space, without intraoperative stabilization. The dogs were premedicated with 0.04 mg/kg atropine sulfate (Atropine sulfate, Jell Pharm, South Korea) subcutaneously and 0.4 mg/kg butorphanol (Butorphan, MyungMoon Pharm, South Korea) intravenously. General anesthesia was induced with 6 mg/kg propofol (Anepol, Hana Pharm Co., South Korea) intravenously. Anesthesia was maintained with 0.5%~2.5% isoflurane (Rhodia Organique Fine Ltd., South Korea) in 100% oxygen. The dog had operated a ventral slot decompression at C5 - C6 intervertebral space (4). The width of the ventral slot was made less than 30% of the vertebral body width to prevent postoperative instability or subluxation. The herniated disc material was removed which was massively extruded in the vertebral canal.

Spinal needles were inserted into the intra-operatively exposed C4 - C5 and C6 - C7 intervertebral disc under fluoroscopic guidance, respectively. Spinal needle was inserted to a height of one third of the intervertebral disc space. Ozone generator (Ozone generator model-Lab I, Ozone tech Co., Ltd. Korea) and syringe and spinal needle were connected by teflon tube and three-way cock. Generated oxygen-ozone gas mixture (ozone concentration 25 µg/ml) collected 2 ml of injecting dosage into a syringe and it was directly injected into the disc. After surgery, the neck stabilized with a padded neck brace, strict cage confinement enforced and antibiotics prescribed. The next day after surgery, the dog's cervical pain had disappeared and two days after surgery, the dog's neurological condition improved as possible as standing up and ambulation with himself, but persisted motor

weakness of the forelimb. At three weeks after surgery, motor weakness of the forelimb disappeared and the dog's neurological condition were almost normal. Neck brace removed four weeks after surgery and thereafter complication did not occur. Two months after surgery, MRI was repeated to evaluate the decompression efficacy. At the same time, the dog showed normal gait without neurological signs. MRI revealed that the disc materials in the spinal canal were definitely eliminated at C5 - C6 and C6 - C7 intervertebral space (Fig 1B). There were small disc materials remained in the vertebral canal at C4 - C5, but disc shrunk as enough as possible to disappeared clinical signs and on T2-weighted sagittal images, compression rate at a C4 - C5 herniated intervertebral disc was reduced more than half of herniated disc materials in the spinal canal (37.5% changed to 14.2%).

DISCUSSION

Multiple cervical HIVD, especially being in caudal lesions are difficult to handle. There are some options for reducing postoperative instability, which is dorsal laminectomy and several ventral slots with bone graft, distraction or fixation. (4). This study applied oxygen-ozone intradiscal injection instead of surgical decompression to minimize the postoperative complication and instability. Direct effect of ozone on the nucleus pulposus is rupture of water molecules and shrinkage of the disc (3). As minimally invasive procedure, intradiscal oxygen-ozone injection was performed for treatment of lumbar disc disease and developed to offer good clinical results (2). However this noninvasive procedure is not possible percutaneously to approach to cervical intervertebral disc because of complex anatomical structures (3). And oxygen-ozone gas mixture injected into the cervical discs during surgery. In addition, the effect of ozone is limited when very large extrusion of disc materials are present (3). So, this procedure was used combined with a ventral slot. Consequently

decompression performed at all three lesions resulted in minimizing postoperative instability, reducing operation time and less invasive other techniques and finally it could be lead to good clinical outcome. Previous study reported various degree of herniated disc shrinkage ranging from 2.69% to 13.89% after oxygen-ozone intradiscal injection (2). But in this study, almost of herniated disc materials shrunk and there was little or no remnants in spinal canal at C6 - C7. Herniated disc of C4 - C5 was remarkably shrunk and the spinal cord compression ratio decreased by 37.5%, to 14.2%. Although ventral slot decompression required all of three lesions in this case, based on the UMN abnormalities on neurological examination and spinal cord compression ratio on MR imaging, oxygen-ozone injected into discs at two HIVD lesions and ventral decompression performed only at C5 - C6 intervertebral space. It was referred to the treatment of the thoracolumbar HIVD that surgical decompression recommend for paraplegia with urinary dysfunction or severe spinal cord compression include more than 50% of spinal cord compression ratio (4). However, diameter of the cervical spinal canal was relatively wider than thoracolumbar spinal canal, therefore oxygen-ozone treatment is possible to apply in cervical HIVD with more than 50% of spinal cord compression ratio. It is presumed that shrinkage rate of the herniated disc materials have an influence upon the type of the disc herniation after oxygen-ozone

intradiscal injection, such as the shrinkage rate is increase in protrusion than extrusion, based on the degree of shrinkage of the C4 - C5 extruded disc was less than C6 - C7 protruded disc after the treatment. This study demonstrated that combined ventral decompression and oxygen-ozone treatment were led to excellent recovery in dogs with multiple caudal cervical HIVD, thus it provides possibility that oxygen-ozone treatment is able to treat cervical multiple HIVD which require multiple ventral decompression with additional internal fixation.

REFERENCES

1. Alexandre A, Corò L, Azuelos A, Buric J, Salgado H, Murga M, Marin F, Giocoli H. Intradiscal injection of oxygen-ozone gas mixture for the treatment of cervical disc herniations. *Acta Neurochir Suppl* 2005;92:79-82.
2. Han HJ, Kim JY, Jang HY, Lee B, Yoon JH, Jang SK, Choi SH, Jeong SW. Fluoroscopic-guided intradiscal oxygen-ozone injection therapy for thoracolumbar intervertebral disc herniations in dogs. *In Vivo* 2007;21:609-614.
3. Muto M, Andreula C, Leonardi M. Treatment of herniated lumbar disc by intradiscal and intraforaminal oxygen-ozone injection. *J Neuroradiol* 2004;31:183-189.
4. Sharp NJH, Wheeler SJ. *Small animal spinal disorders*, 2nd ed. London: Mosby. 2005: 121, 106-117.

개에서 탈출된 경추디스크에 대한 디스크내 오존가스 주입 치료

장하영 · 이준섭 · 이보라 · 김경희 · 정순욱¹

건국대학교 수의과대학 수의외과학교실

요 약 : 사지마비를 보이는 6년령 시쥬 숫컷이 내원하였다. 신경검사소견 및 영상진단소견에서 경추 4번과 5번 사이, 경추 5번과 6번 사이 및 경추 6번과 7번 사이의 디스크가 탈출되어 척수를 압박하고 있는 것으로 나타났다. 오존가스를 경추 4번과 5번 사이 디스크 및 경추 6번과 7번 사이 디스크에 주입하고 경추 5번과 6번 사이는 복측 감압술로 탈출된 디스크를 제거하였다. 환축은 수술후 목 통증이 사라지고 수술후 3주경 정상보행을 나타냈다. 수술후 2개월째 자기공명영상에서 경추 5번과 6번 사이 디스크와 경추 6번과 7번 사이 디스크의 탈출된 소견이 사라졌고 경추 4번과 5번 사이의 디스크는 탈출된 정도가 현저히 줄어든 소견을 보였다.

주요어 : 경추디스크탈출, 오존가스, 개