

Brown-Sequard Syndrome Produced by Cervical Disc Herniation : Manual and Exercise Therapy after Operation—Case Studies

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국문요약

경추 추간판탈출증에 의한 브라운-시쿼드 증후군 : 수술 후 도수치료와 운동치료 효과-사례연구

김명준

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목적 : 브라운시쿼드는 대부분 척추손상과 수질의 척추 종양에서 주로 나타난다. 드물게 경추 디스크가 브라운시쿼드의 원인이 된다. 경추디스크에 의한 브라운시쿼드 증세의 수술후 물리치료 및 도수치료 결과를 보고 하기 위함이다. **방법 :** 50세 남자로서 브라운시쿼드 증세로 진단을 받고 수술후 좌측 팔과 다리에 운동신경에 의한 마비증세가 있었으며(팔>다리), 우측으로 감각과 온도감각이 저하된 경우이다(팔>다리). 측정방법은 통증지수(VAS), 근력(Distal PowerTrac II™ test), 지구력(Ergometer) 측정과 심리상태(설문)를 치료전과 후를 비교하였다. 물리치료에서는 기능적 전기자극 치료와 도수치료 및 운동치료 방법을 실시하였다. 도수치료는 통증완화와 근력강화를 위한 MET, MFR, Mobilization 등을 실시하였으며, 운동은 슬링시스템 등을 이용한 운동과 견관절의 불안정을 위해 안정화운동을 실시하였다. **결과 :** 이 케이스는 수술후 이상 징후가 척추압박으로 인하여 보다 넓게 통증이 나타났으며, 운동 및 감각신경이 둔해지고 온도에 대한 감각이 반대편 결손으로 나타났으며, 좌측 어깨, 팔 건갑부의 근육 마비와 우측의 감각이 떨어진 현상이 나타났다. 물리치료 후 단기목표와 장기목표에 있어서 통증과 운동 및 감각 기능이 회복되어 각각 팔 통증에서는 VAS 8 -> 1, 상지 하지의 운동기능은 Trace -> Good 로 평가 회복되었으며, 근력측정에서 모두 유의한 차이를 보였다. 모든 치료과정 결과에서 심리적 상태의 설문에서도 높은 점수를 얻어 긍정적 신뢰가 높아 진 것으로 나타났다. 검사결과 다리의 근력이 증가는 걷기 운동 및 에르고메터의 지구력 및 균형이 레벨1의 10분 수행능력이 레벨 20에서 30분 수행능력으로 향상되어 일상적인 활동이 가능해졌다. **결론 :** 예상하지 못했던 수술 후유증(side effects)에 대한 치료과정이 환자의 심리에 심각한 부정적인 생각이 신체의 기능과 감각의 손상에 영향을 미치기 때문에 체계적이고 장기적인 치료 과정에서 기능적 향상과 더불어 정신적인 심리의 정서 안정이 매우 필요하다고 사료된다.

Keywords ; Cervical disc herniation; Brown-Sequard syndrome; Manual therapy; Exercise Therapy

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I . Introduction

Brown–sequard syndrome involves ipsilateral loss of motor function resulting from corticospinal tract compression, combined with contralateral loss of pain and temperature sensation as a result of spinothalamic tract dysfunction. Brown–sequard syndrome is most commonly seen with spinal trauma and extramedullary spinal neoplasm. A herniated cervical disc has rarely been considered to cause Brown–Sequard syndrome.

In 1928, Stookey reported the Brown–Sequard syndrome. Produced by herniated cervical disc.

II . Case Reports

1. Patient History

The patient was a 50–year–old man who presented left arm and leg weakness (arm>leg) in the left, and diminished sensation to pain in the right side (arm>leg) even after operation C4–5(Fig.1). He was diagnosed with Brown–Sequard syndrome by his private doctor. This patient underwent all sorts of hardships including psychological complaints after he developed his symptoms. He wanted that his limitations disappear completely so he could return to his business and personal interests. He was already underwent disc herniation operation at C5–C6 in another hospital 5 years ago.

The Purpose of a case study is to report a treatment procedure of Manual Therapy and Exercise Therapy to treat a Brown–Sequard Syndrome developed after disc herniation, which was also aggravated after surgery.

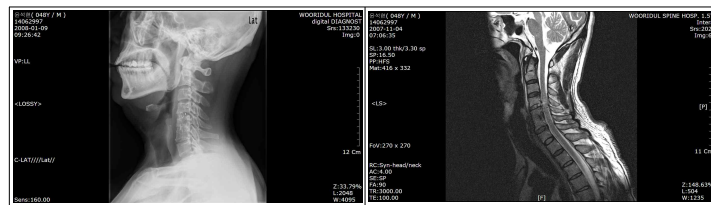


Fig. 56 MRI after operation of PCD Cx4–5

III. Method

The patient had applied various manual techniques. That is such as Muscle Energy Technique, PNF, Muscle & Nerve Mobilization, Muscle Release, Active–assistive exercise for function, and Sling Exercise and stabilization Training for shoulder joint were performed for this patient, also stiff muscle of the lower extremity released by applied muscle energy technique.

IV. Results

This case revealed contralateral deficit in sensation of pain and temperature of more than a few levels

below the cord compression, and showed weakness of left shoulder girdle and arm. After the treatment, his motor and sensory function returned gradually.

When this patient first started physical therapy, his main symptom was Lt. side motor nerve deficit (upper extremity>Lower extremity) and Rt. sensory nerve deficit (upper = Lower). Especially, his elbow and shoulder joint flexion didn't move at all(Grade–trace). In addition, he was mentally very unstable and sensitive after the surgery. The patient was very anxious to recover from his neurologic deficits (table 1).

Fortunately, after manual therapy with therapeutic exercise, as shown in table 2, patient demonstrated some recovery which gave him hope.

Table 1. Physical Examination

SOAP	Note
Subjective Test	muscle weakness on upper and lower extremity of left side(UE>LE), He said could not move Lt. shoulder and arm but the sensation was normal. And the sensation of Re. Arm and leg was no good with a little weakness. He had a pain on Lt. extremity. History ; He was underwent the operation of ACDF on Cx5-6 n other hospital 5 years ago and last year PCD and ACDF Cx4-5.
Objective Test	weakened finger muscle could slowly grip but no strength at all. Left side leg muscle power was weakened more than right side. It showed the function deficit of a motor nerve as paresthesia due to loss of sensation(U/E > L/E). Particularly, he had severe pain on Lt. forearm. His diagnosis is the cervical disc with spondylotic radiculopathy and myelopathy.
Assessment	Muscle weakness was a zero grade on all of the shoulder and elbow movement, and only showed poor grade on finger flexion. And he might have a kind of bad emotions after operation.
Treatment Plan	Short term goal diminish pain of Lt. arm and prevent against dislocation of the shoulder. Long term goal strength of the muscle power and facilitate proprioceptive neuromuscular system with senso-motor nerve system. Increase the stabilization of shoulder instability and muscle function. Will be going to treat therapeutic exercise programs for the efficient conduct of his favorite sports.

Table 2. Manual therapy techniques with therapeutic exercise

Region	Aim	Therapy Technique	Periods
Lt. Forearm, brachium	-release pain -recover muscle strength	-Fascial release technique on skin for pain & swelling	~ 3 Weeks
Lt. Wrist, elbow	-recover muscle strength	-PNF, Assistive ex. & resistance ex.	~ 15 Weeks
Lt. Shoulder joint	-prevent shoulder joint dislocation -recover muscle strength -prevent stiffed and limited	-Assistive & Active ex. or resistive ex. -Mobilization, Gliding	~ 26 Weeks 15 ~ 26 Weeks
Lt. Scapular	-prevent muscle stiffness -improve ROM of shorted scapular muscle	-MET, Muscle mobilization & distraction -Muscle release	10 ~26 Weeks
Lumbar movement	-improve ROM of flexion, extension, rotation	-MET, Facet jt. Mobilization -Torso muscle release for shortened muscle	10 ~26 Weeks
Both hip joint	-Increase ROM of hip flexion, int. ext. rotation	-MET, jt. Mobilization	10 ~26 Weeks
Upper extremity	-aerobic exercise -balance muscle function	-Fluid cycle [®] (upper limb ergometer)	6 ~ 26 Weeks
Lower extremity	-aerobic exercise	-Fluid cycle [®] (upper limb	6 ~ 26 Weeks

	-strengthen muscle power & endurance	ergometer)	
C, L spine	-spinal stabilization ex.	-Centaur 3D [®] space rotation exercise	5 ~ 20 Weeks

- * PNF : Proprioceptive neuromuscular Facilitation
- * MET : Muscle Energy Technique
- * Fluid Cycle : Italy, 2008, resistive exercise cycle utilize the water
- * Centaur : Germany, 2005, 3D space rotation exercise for spinal stabilization on Cx, Lx.

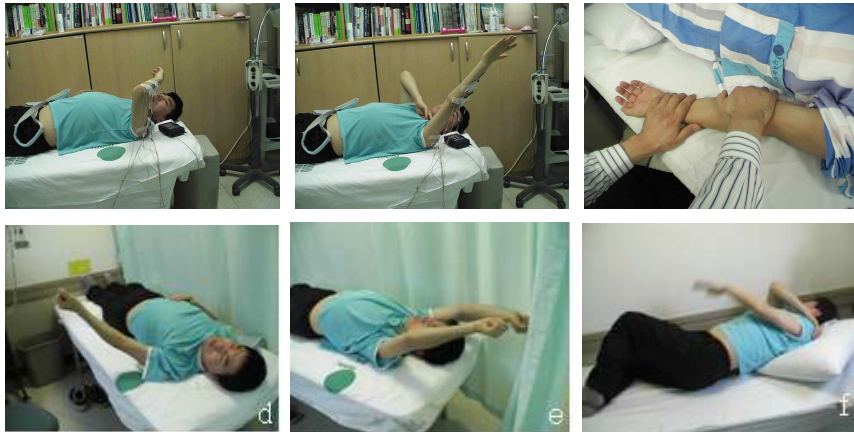


Fig. 2 a,b; FEST(Functional Electrical Stimulation Therapy)with active exercise in forearm and shoulder flexor weakness region. c; Wrist and Elbow Manual Therapy of PNF approach and assistive exercise. d; Shoulder Joint Manual Therapy of PNF approach and assistive active exercise. e; Both shoulder Manual Therapy. above; a, b, c below; d, e, f



Fig. 3 MET for the release of upper body (Motion of the Shoulder, Scapular) **Fig. 4** Fluid Cycle XT exercise for arm and upper body. **Fig. 5** Using program of Sling SET ex. of therapy for a muscle of arm and shoulder

While the treatment went on, his upper arm and forearm's pain diminished. In the 3rd week of treatment VAS 8 decreased to VAS 1 and the patient showed an active and hopeful attitude towards the treatment(Fig.3).

However, while he was hospitalized, bed rest times

got longer and it made the patient's muscular strength weaken. Unstablensness of gait due to the Brown-sequard syndrome made the patient fall into psychologic depression.

In the 4th week, the patient started fluid cycle XT and aerobic exercise which greatly helped strengthen

his muscles(Fig.4). Slowly increasing the time and intensity of the exercise and in the 5th week the exercise progressed to climbing stairs. Through various manual therapies, the patient showed fast recovery and soon his finger grips got better and he could button up his own shirts and pick up his cell phone. In the 6th week, after PNF and Assistive exercise therapy, the patient was able to lift his arm from supine position to upper extremity 90 degrees and keep it perpendicular steady so he started exercising drawing circles with his arm(Fig.2). In the 7th week the patient was able to flex his left shoulder up to 90 degree against gravity from supine position. Now he is very happy that he could use his left hand and pick up his cell phone to call his family.

After leaving the hospital and while the therapy went on, the patient gained confidence and hope that he could recover. In the 15th week we tried injection to the shoulder joint but the fixation, to prevent shoulder dislocation, was kept for too long, which

limited the shoulder flexion to about 135 degrees. In the present, he recovered shoulder flexion about 160 degrees after shoulder joint mobilization techniques and releasing and stretching techniques. The results of the total 26 week program are in table 3. In the 16th week, he was doing business actively and couldn't find any awkwardness movement of the shoulder when wearing a suit. Although he is able to do only 60 degrees shoulder abduction standing, many scapular motions are shown. We are trying various exercise therapies but still the deltoid muscle volume is small and weak(Fig5).

After the 20th week, he finished his physical treatment in this hospital and is working out at a fitness club around his home, now he his able to swim breaststroke(Table3).

He regained confidence in his business and I suggested a new program for him. Now he is occasionally practicing putting(golf). From next month he is planning to practice chip shots.

Table 3. Treatment Results Procedure and Functional Activity of Muscle

Function Test	Before	2 months	4 months	6 months	
Lt. Wrist flexion /extension	T / T	P / P	F / F	G / N	
Lt. Forearm supination/pronation		T / T	P / P	F / F	G / G
Lt. Elbow flexion /extension	T / F	F / G	F / G	F / N	
Lt. Shoulder flexion /extension	T / F	P / F	P / G	P / G	
Lt. Shoulder flexion in supine	P	F	G	G	
Lt. Shoulder abduction /adduction	T / F	P / F	P / G	P / G	
Lt. Shoulder ext. rot. /int. rot.	P / P	P / F	F / F	F / G	
Lt. Shoulder elevation	F	F	G	G	
Lt. Shoulder circumduction in supine	P	F	G	G	
Lt. Finger grip	P	G	G	N	
Turn the door handle of Lt. hand	Z	G	G	N	
Pulling a thera-bend of Lt. hand	P	F	G	N	
Ascend upstairs	P	F	G	N	
Lt. Upper, Forearm skin pain	VAS 8	VAS 3	VAS 0	N	
Rt. Arm & leg sensation	Numbness	P	F	G	

* The Grade of Muscle function = Z; Zero, T; Trace, P; Poor, F; Fair, G; Good, N; Normal

V. Discussion

Brown-Sequard syndrome is usually observed as a presenting feature of spinal trauma and

extramedullary spinal neoplasmas, discogenic cause of this syndrome is rare. Stookey first identified a cervical disc herniation as the etiology of Brown-Sequard syndrome in 1928(Stookey. B. 1928).

The frequency of this syndrome produced by herniated cervical discs has been reported as 2.6% by Jomin et al(1986). However, details were not mentioned in this report. Jabbari et al. in 1977 alluded to one case caused by herniated cervical disc; no details for this case were given. To our knowledge, only 16 cases have been detailed in the English language literature, with our cases increasing the number to 18(Antich PA et al., 1999).

The spinothalamic tract crosses the midline of the spinal cord one to two segments rostral of entry level(McBride DQ, 1993). Relevant cervical trauma as a part of patient history was demonstrated in two cases of intradural herniation(Boerm W, Bohnstedt T, 2000). The intradural herniation may be caused by adhesion between the dura mater and the posterior longitudinal ligament. On the other hand, Schneider et al(1988).

The outcome may be related to the appearance of the MRI. Surgical approach and type of cervical disc herniation. Contemporary reports of Brown-Sequard syndrome produced by cervical disc herniation are increasing because of the ease of diagnosis by contemporary MRI. Earlier, more accurate diagnosis has made rapid operation possible. The anterior approach is commonly performed, and most outcomes are favorable. On the other hand, outcomes of extradural disc herniation were better than those of intradural disc herniation. Complete recovery occurred in six of the seven extradural causes and three of the eight intradural cases. Intradural disc herniation may have a worse effect on the spinal cord than extradural disc herniation. Holtas et al 1987 have reported that on T2-weighted MRI, an area which increased signal intensity is seen surrounding the intradural herniation. However, preoperative diagnosis of transdural perforation is difficult(Epstein NE et al. 1990). Surgery may be required to achieve certain diagnosis. After surgery these patients should be needed physical therapy as Manual therapy and Exercise therapy.

VI. Conclusion

He participated in all procedures with confidence; he got a good walking balance and increased muscle strength of left shoulder and arm. In first stage of physical therapy, his despair drove him to think negatively, but after 3-months of treatment results gave him satisfaction and hope.

Now he makes his own exercise plan with the hope that he will be able to play golf again. He is still doing his therapeutic exercises these days to recover his shoulder functions.

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