

Post-Laminectomy Swan Neck Deformity in Adults

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= Abstract =

Five adult cases of post-laminectomy swan-neck deformity are reported. The factors causing the deformity, prophylactic measures, and treatment of the deformity are discussed. It is strongly advised to the neurosurgeons and orthopedic surgeons that they should be aware of this unwanted complication of the multi-level cervical laminectomies, and that they should provide every preventive measures before post-laminectomy swan neck deformity develops. Anterior interbody fusion spanning the entire unstable segments is preferably recommended together with application of pre-fusion traction.

Key Words : Swan-Neck Deformity, Post-Laminectomy, Anterior Interbody Fusion.

INTRODUCTION

Post-laminectomy deformity develops particularly in children^{1,3,4,5,6,7,8,9}. Of course it develops in the adult too^{3,10,11,12}. For the condition additional surgical procedure such as anterior interbody fusion may be required first to prevent the further progress of the deformity and neurological complication, and second to stabilize the deforming or deformed segments. There are two main cause of post-laminectomy kyphosis of the spinal column. The curve develops from subluxation or anterior

wedging of the vertebrae, although it may progress to a combined form eventually. However in adults gradual post-laminectomy kyphotic deformity develops from disc changes without anterior wedging of the vertebrae, and the deformity in the adult is known not to progress to extreme kyphotic deformity in comparison with wht children's^{3,11,12}.

Our purpose is to report our experience in treating five patients who had a disabling swan-neck deformity after extensive laminectomy during one year from April 1990 to March 1991, and is to emphasize the importance of the posterior ligamentous complex in maintaining the stability of the cervical spine.

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MATERIAL AND METHOD

All five patients were males. Patient's age ranged from 19 to 45 years. All patients were admitted to the neurosurgical department, Kang-Nam St. Mary's Hospital, Seoul, and they had extensive laminectomies because of cervical canal tumors : two meningiomas, two neurofibromatosis, and one schwannoma.

All patients developed moderate degree of swan-neck deformities from two to three months after multi-level laminectomies, for which anterior interbody fusion after Bailey-Badgley's construct with iliac graft was performed. Two different types of graft techniques were used. Fusion was carried out without preoperative traction to correct the deformity in any case. In three cases the entire unstable segments were fused with a large iliac graft, and in two cases each unstable segment was fused with iliac graft independently.

Assessment of results : When the deformity is well corrected the result is rated as excellent, when the deformity is undercorrected the result is rated as good, and when the deformity becomes worsened it is rated as poor.

Results :

Fusion was obtained in all from postoperative 12 to 18 weeks. However in one case kyphotic deformity increased slightly, though solid fusion was obtained. There were no complications during and after fusion. Among the five cases, four were rated as "Good", and one as poor.

Illustrative cases :

Case 1(Kim, T.H.)

A 29 year-old man gradually developed a spastic quadriparesis due to neurofibromatosis from C2-4, for which tumor excision through extensive laminectomy was carried out. Postoperatively gradual anterior wedging of discs had developed,

causing moderate deformity and worsening neck and shoulder pain. Eight months after laminectomy, anterior fusion of each segment from C2-5 with separate iliac graft was performed with some correction of the deformity. One year and three months later the functional result was excellent without neural deficit, though on X-rays early osteoarthritic changes developed at C5-6.

Case 2(Kim, T.W.)

A 19 year-old boy suffered from spastic quadriplegia due to a space-occupying lesion with a complete block at the third cervical level. A large meningioma was excised through a posterior approach. It was necessary to do complete laminectomies of the second through the fifth cervical vertebra. Postoperatively, he recovered rapid from the neurological deficiencies. During recovery period protective brace was not prescribed. From postoperative two months he began to note increasing stiffness and gradual kyphosis of his neck. Therefore five months later, he was readmitted for the stabilization surgery. Through an anterior approach, interbody fusion, from the second to fifth cervical vertebra was then performed using a tricortical iliac strut graft. However, preoperatively no correction by traction was attempted. Postoperatively, head-halter traction was used for five weeks and then a Minerva plaster jacket was applied and worn for two months. Good fusion was obtained at postoperative 18 weeks. However, the preexisting deformity could not be corrected by anterior interbody fusion.

Case 3(Joo, Y.C.)

A 45 year-old gentleman was admitted to the neurosurgical department with a stiff neck and numbness in both upper extremities of 2 months duration. During this period the experienced progressive difficulty in writing and grasping objects, as well as in control of his bladder. A sensory deficit below the third and fourth cervical verte-

Fig. 1. A) Anteroposterior and lateral view of post-laminectomy conditions showing mild kyphosis(18°). B) Immediate postoperative X-ray of anterior interbody fusion on C2-3, C3-4 and C4-5 with separate iliac graft. C) One year and three months after anterior interbody fusion showing good fusion with noo further progression of kyphosis(2°)

brae. At surgery a meningioma was excised through a extensive laminectomies of the second through fourth cervical vertebra. After surgery he recovered normal function of the upper extremities, but two months later he began to have stiffness of neck with an obvious flexion deformity. Eight months later he was readmitted for evaluation and treatment. X-rays of the cervical spine at the time disclosed the kyphosis at 4th and 5th disc

levels without luxation. To prevent the further progress of kyphosis anterior interbody fusion was performed without preoperative correction of the deformity. Solid fusion was obtained with good clinical recovery in the presence of kyphosis.

DISCUSSION

It is known that the post-laminectomy swan

Fig. 2. A) Showing loss of posterior stabilizing elements of C2,3,4 with laminectomy. B) Immediate postoperative X-ray of anterior interbody fusion on C2 to C5 with strut iliac graft still showing mild kyphosis(20°). C) Applying Halo traction on cervical spine kyphosis(17°). D) 18 wks after anterior interbody fusion. still showing sharp posterior angulation at C4,5 level(25°).

neck deformity, one of the disadvantages, is primarily a mechanical phenomenon^{1,2,3,6}, and aggravated by the concomitant muscle weakness^{8,11,12}. The mechanical predisposition to swan-neck deformity must be present, because only some develop the deformity^{8,10}. Therefore the cause of the deformity is not simply the laminectomy⁸. Another disadvantage of the complete laminectomy is that it may leave the cord unprotected posteriorly, a defect hazardous in the presence of a severe kyphosis⁸. According to Sim et al⁹, the incidence of post-laminectomy swan-neck deformity is 3(21 patients) percent of the 673 patients, while 5 patients less than 19 years of age accounted for 14 pre cent of 35 patients. Five patients had underlying neurological disease producing significant neuromuscular imbalance, which may have contributed to the development of the deformity. In our series all 5 patients had neuromuscular imbalance preoperatively. No body developed paralysis later, though one patient developed weakness in the upper extremities.

It is most important that the spine surgeons be aware of this complication of cervical laminectomy. Although a mechanical cause for the deformity

is presumed, the implications of this presumption for prophylaxis should be stressed. If instability is obvious at the completion of laminectomy, the vertebrae should be stabilized by fusion some weeks later.

Concomittant posterior fusion at the time of laminectomy is not recommended, because it is more hazardous. When any suspicion of post-laminectomy instability arises, a cervical brace should be worn. If the patient has symptoms of instability out of the brace, spine fusion should be done before deformity develops. It is author's view that if wide multi-level decompression laminectomy is planned, anterior fusion prior to the laminectomy may be appropriate. Because earlier consolidation occurs with anterior fusion than with posterior strut fusion, and no difficulty is encountered if further posterior decompression is indicated after anterior fusion⁹. For fusion all the unstable vertebrae should be included. Skull traction before anterior spinal fusion is strongly recommended by us to improve the cervical alignment, though the meager success with preoperative traction is reported by Cattell and Clark².

In our five cases fusion was obtained in all, and,

Fig. 3. A) Initial X-ray film of cervical tumor involving C2 to C5. B) Postoperative X-ray of anterior fusion from C2 to C5 with separate iliac bone graft with screw fixation at each level for correction of kyphosis(kyphos angle 0°) developed after wide laminectomy from C2 to C5. C) One and a half year following X-ray shows persisting uncorrected kyphosis(5°) but there is no further progression of kyphosis.

however, good cervical alignment was not obtained in three of five cases. Non-application of preop traction and rigidity of the deformity can be listed as the cause of failure to restore normal cervical alignment.

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= 국문 초록 =

성인에서 경추후궁광범위 절제후의 백조경추 변형 -5례 보고-

가톨릭대학교 의과대학 정형외과학교실

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저자들은 1990년 4월부터 1991년 3월에 이르는 1년 사이에 5명의 성인환자에서 다분절 광범위 경추후궁절제술 후 발생한 경추후만, 즉 소위 “백조경추 변형” 예를 경험하고, 이들에게 추체전방 유합술을 실시한 결과를 문헌고찰과 함께 보고하고자 한다. 5예 모두에서 골유합이 얻어졌으며, 유합기간은 12-18주간이었다. 다만 한예에서는 골유합이 일어나기전에 변형이 다소 증가하였다. 다분절 광범위 후궁 절제술을 시행할때는 사전에 이변형이 합병할 것이란 것을 예측하고, 후처치를 강구해야 할 것이며, 수술시야에서 불안정성이 확인될시는 그에 뒤 따른 변형을 예방키 위해 우선 수주간 경추보조기를 착용케하고, 그 후에도 지속적으로 불안정성이 확인될시는 전방 유합술을 실시할 것을 강조한다. 또한 이미 발생한 변형은 전방유합술을 실시하기 전에 두부골 견인으로 변형을 교정 후 전방유합술을 실시할 것을 권장하여야 될 것으로 사료된다.