

Surgical Treatment and Outcome of Cervical Myelopathy in Rheumatoid Arthritis Patients: Report of Two Cases

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✓ Involvement of the cervical spine is a well-known complication of rheumatoid arthritis. Rheumatoid synovitis leads to ligamentous laxity and subsequent joint instability. Severe cervical spine deformities caused by rheumatoid arthritis may lead to serious complications, such as quadriplegia, cerebral infarction, chronic hydrocephalus, and even sudden death.

We report surgical outcomes of two cases with rheumatoid arthritis characterized by severe myelopathy, and believe that surgical morbidity and mortality rates could be reduced with careful perioperative care, convenient anesthesia techniques, complete investigation for cervical spinal pathology, and proper surgical techniques. Surgical treatment can ensure satisfying improvements if adequate decompression and vertebral realignment could be achieved.

Key words: Rheumatoid arthritis, cervical myelopathy, surgical treatment

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Romatoid Artritli Hastalarda Servikal Myelopatinin Cerrahi Tedavisi ve Sonuçları: İki Olgu Sunumu

✓ Servikal omurganın romatoid artritli tutulumu iyi bilinen bir komplikasyondur. Romatoid sinoviyal ligament laksitesi oluşurarak eklem instabilitesine yol açar. Romatoid artritli hastaların servikal omurga deformiteleri tetraparezi, serebral enfarkt, kronik hidrosefali ve ani ölüm gibi ciddi komplikasyonlara yol açabilir.

Biz ileri derecede myelopatisi olan romatoid artritli iki olgunun cerrahi sonuçlarını bildirmekte ve dikkatli operasyon öncesi dikkatli bakım, uygun anestezi teknikleri, servikal spinal patolojinin tam araştırılması ve uygun cerrahi teknikle cerrahi morbidite ve mortalite oranlarının düşürülebileceğine inanmaktayız. Cerrahi tedavi eğer yeterli dekompresyon ve vertebral dizilim başarılabılırsa tatmin edici iyileşme sağlayabilir.

Anahtar kelimeler: Romatoid artrit, servikal myelopati, cerrahi tedavi

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As a chronic systemic disease characterized by synovitis, rheumatoid arthritis (RA) might lead to pannus formation

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with damage of articular ligaments and destruction of joints. Involvement of the cervical spine is a well-known complication: Cervical spine is affected in an estimated 36-86 % of the patients with rheumatoid arthritis ⁽¹²⁾. Rheumatoid arthritis frequently affects craniovertebral junction. Atlantoaxial subluxation has been reported to be the most frequent rheumatoid abnormality of the

cervical spine with a prevalence of 19-70 percent ⁽⁷⁾. Atlantoaxial impaction (i.e., vertical atlanto-axial subluxation) and subaxial subluxations have been reported to occur with a frequency of 4-35 % and 7-29 %, respectively ⁽⁷⁾. Atlantoaxial joint is prone to luxation in three directions. Anterior luxation of the atlas is the most common type, while lateral luxation occurs less frequently. Both types can cause entrapment of the C2 nerve root, which might lead to occipital neuralgia ⁽¹²⁾. Patients with anterior atlantoaxial subluxation reportedly have a high risk of spinal cord compression. Furthermore, subaxial changes can cause compression of the nerve or spinal cord ⁽⁷⁾. Therefore, severe cervical spine deformities might lead to serious complications, such as quadriparesis, cerebral infarction, chronic hydrocephalus, and even sudden death ^(1,7).

Mikulowski et al. ⁽⁵⁾ reported a higher incidence (10 %) of fatal medulla compressions in a series of inpatients with rheumatoid arthritis. Further-more, several authors have recommended prophylactic operative management of severe cervical subluxations to avoid the risk of irreversible neurological deficit, and even death caused by spinal cord compression ^(1,7). The life expectancy of patients with RA has been reported to be shorter than that of the general population ⁽¹⁾. Clinical symptoms and signs depend on the location of the lesion(s) and the degree of instability. Clinical manifestations include radiculopathy, myelopathy, quadriplegia, and sudden death in extreme cases ^(3,6,11,12). The natural course of conservatively treated RA patients with myelopathy has a poor prognosis. A recent report indicated that all conservatively treated patients were bedridden within three years after the onset of myelopathy, and after seven years all patients had died ⁽¹¹⁾.

Treatment of the cervical myelopathy caused by cervical dislocation in rheumatoid arthritis

is a challenge to spinal surgeons. This paper discusses surgical therapy and its outcomes in two rheumatoid arthritis patients with severe cervical myelopathy.

PATIENTS and METHOD

Case 1

The patient was a 51-year-old man diagnosed as rheumatoid arthritis 25 years ago. The complaints of the patient were quadriparesis, dysesthesia, walking disorder and fall incidents during the previous two and half years. The patient had been hospitalized several times by rheumatologists, who had underestimated his complaints. As the patient's complaints worsened within the previous two and a half months, he was referred to the hospital again, and his cervical MRI was obtained. He was subsequently admitted to the rheumatology clinic in our hospital. He was then experiencing occipital neuralgia, but he was able to walk. During his follow-up in the clinic, he suddenly suffered from quadriparesis. Radiological evaluation indicated anterior atlantoaxial subluxation and spinal cord compression (Figure 1A and B). He was in Class IIIa RA, based on evaluation of neurological outcomes in the Ranawat Classification of RA (Table 1) ⁽⁹⁾. C- 1 laminectomy, and C 1-2 transarticular screw fixation were performed (Figure 1C). Postoperative course of the patient was uneventful and his neurological deficits improved. After 5 years of follow-up period, patient was neurologically normal.

Table 1. The Ranawat classification.

Class	Description
I	No neurologic deficit
II	Subjective weakness, dysesthesia, hyperreflexia
III	Objective weakness and long tract signs
IIIa	Patient is ambulatory
IIIb	Patient is not ambulatory

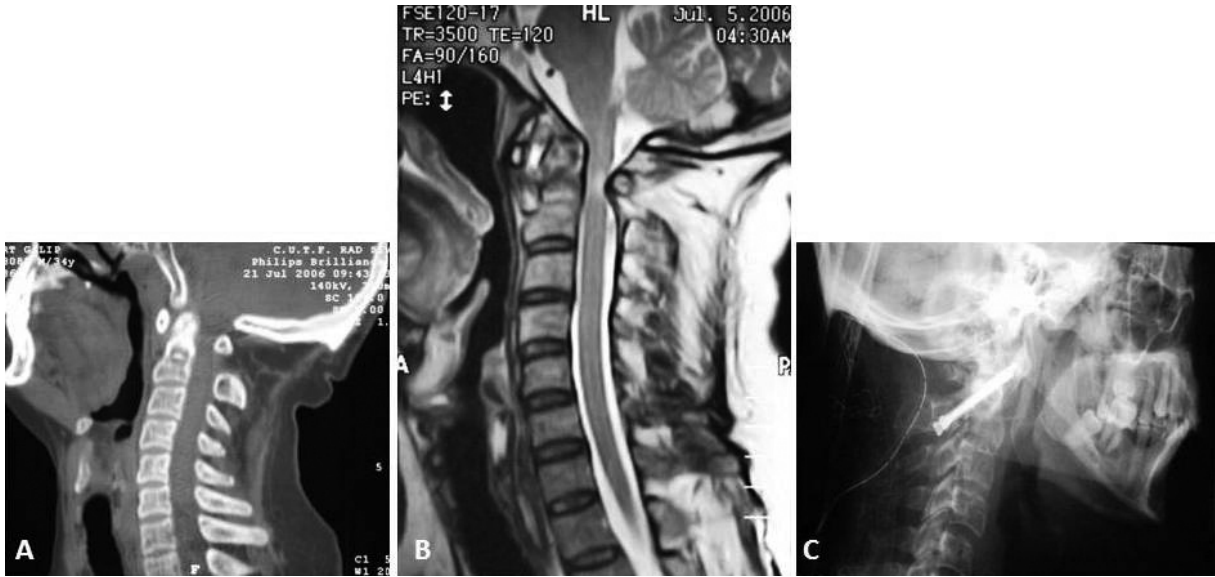


Figure 1. Sagittal CT (A) and sagittal T2-weighted MRI (B) revealed atlantoaxial dislocation and spinal cord signal changes. Lateral X-ray graph (C) after screw fixation.



Figure 2. Severe upper cervical spine dislocation in sagittal MRI (A); craniocervical fixation in lateral cervical X-ray (B).

Case 2

The patient was a 43-year-old man who had been diagnosed with rheumatoid arthritis 22

years ago. He was admitted to the rheumatology clinic in our hospital while natural course of his RA gradually worsened. He was unable to walk and feed himself for four months. The progres-

sion of his disease state had been already evaluated by rheumatologists as steroid myopathy in several different clinics. An SSEP study was performed, resulting in disclosure of neurogenic impairment to that end, cervical MR imaging was performed. The patient was admitted to the neurosurgery department. He had severe quadriplegia and was in Class IIb based on the Ranawat Classification of RA. A radiological evaluation indicated vertical-posterior atlantoaxial subluxation, C3-4, C4-5 subluxations, and a severe spinal cord compression (Figure 2A). Decompressive laminectomies and posterior craniocervical fixation were planned. However, respiratory insufficiency and urinary retention in addition to severe motor impairment developed during preoperative preparation. Cervical traction was performed, and evident recovery was observed as for neurological findings, and vertebral subluxations improved slightly. Then, we changed our surgical plan, and performed craniocervical fixation without laminectomy (Figure 2B). He recovered neurologically after surgery. During his follow-up of 4 years his neurologic health state improved.

DISCUSSION

Rheumatoid arthritis affects cervical spine in 17-86 % of the patients in the Western population and 65-70 % in India ⁽⁷⁾. Rheumatoid synovitis can result in ligamentous distension and rupture, loss of articular cartilage, and bony erosions. These lesions lead to ligament laxity and subsequent joint instability. The most common cervical spine impairments are atlantoaxial subluxation, followed by basilar invagination and subaxial subluxation or a combination of these three conditions ⁽⁷⁾. Atlantoaxial subluxation is the result of the destruction and laxity of transverse, alar and apical ligaments. Bone and cartilage loss from the occipitoatlantal and atlantoaxial joints lead to basilar invagination. Subaxial subluxation occurs at a later stage in the disease, and tends to involve multiple spinal levels. It is

the result of destruction of the facet joints, interspinous ligament, and discovertebral junction ⁽³⁾. One of our cases had anterior atlantoaxial subluxation, which is the most common type of dislocation. The other case had a combination of posterior atlantoaxial and subaxial subluxations. The latter case experienced more severe spinal cord compression and neurological affliction. Progressive instability of the cervical spine may compromise neural or vascular structures. The clinical manifestations included radiculopathy, myelopathy, quadriplegia, and sudden death in extreme cases ⁽³⁾. In our latter case, respiratory insufficiency and urinary retention developed in addition to heavy motor affliction during the preoperative period. Cervical traction was performed, and evident recovery was observed as for neurological findings, and subluxations improved slightly. As such, cervical traction may provide information about whether cervical deformity and neurological affliction can be recovered via surgery or not. This result in the second case introduced a chance for complete vertebral alignment under general anesthesia, which was achieved in the prone position. Laminectomy and posterior craniocervical fixation had been planned before cervical traction; however, posterior craniocervical fixation was performed without prior laminectomy. Meanwhile, the first case had anterior atlantoaxial subluxation, and complete reduction was not achieved despite attempts at vertebral alignment in the prone position under general anesthesia. Therefore, C1 laminectomy and C1-2 transarticular screw fixation were performed. We think that pannus formation impedes successful reduction in atlantoaxial subluxation.

The severity of cervical spine involvement in rheumatoid arthritis is related to the duration of the disease (>5 years), CRP-seropositivity, elevated CRP, an increase in the number of joint erosions, and a decrease in carpal height ratio ^(2,3,6,7). Subaxial subluxation often occurs at multiple levels, and neural compression is usually

caused by bony structures and rarely by herniated disc material ⁽³⁾. Cervical spine radiograms should be considered in the clinical evaluation, particularly in cases of erosive hand joint disease, CRP-seropositivity, and prolonged disease states of ≥ 5 years ⁽³⁾. Bone and soft tissue changes in the cervical spine are evident as demonstrated by MRI, which effectively reveals the effect of inflammatory process on the neural tissue, ligaments, bursae, and fat pads. Thus, an MRI should be used as the first imaging modality, followed by plain films if neural compression is suspected ⁽³⁾. Lizuka et al. ⁽⁴⁾ analyzed characteristics of bony ankylosis of the upper cervical spine facet joints in patients with a cervical spine involvement secondary to rheumatoid arthritis using CT and then the authors examined the characteristics of the patients showing such ankylosis. Their findings had demonstrated that the patients with upper cervical ankylosis had also suffered from severe cervical myelopathy. In addition, they suggested that the occurrence of bony ankylosis was a risk factor for atlantoaxial and/or subaxial instability or stenosis. Oda et al. ⁽⁸⁾ evaluated 239 patients with rheumatoid arthritis for relationship of space available for the spinal cord (SAC) at C1 level with myelopathy. They concluded that distribution patterns of SAC showed that SAC was a reliable parameter for the development of myelopathy in patients with upper cervical subluxation in rheumatoid arthritis. The patients with a 14 mm or less SAC are in high risk for myelopathy. We believe that thin axial slices and sagittal-coronal reconstruction in high-resolution CT scans particularly contribute to the surgical planning and clinical evaluation despite the superiorities of MRI. Therefore, if the surgical treatment is planned, a CT scan should be performed. CT scan ensures effective surgical planning and may decrease the incidence of surgical complications.

Although it is reported that neurological findings of spinal cord compression may occur ear-

lier, Fujiwara et al. reported that the average duration of rheumatoid arthritis till the onset of neurological deficit was 17.7 years ⁽³⁾. In both of our cases, rheumatoid arthritis was 20 years old when neurological manifestations emerged. It is clear that a long time interval is required till the appearance of neurological findings in cases with spinal cord compression. A radiological evaluation of the cervical spine should be conducted if RA persisted more than 5 years.

Advances in surgical techniques and new spinal instruments have multiplied the number of surgical procedures for the treatment of cervical spinal pathologies in rheumatoid arthritis. Schmitt-Sody et al. ⁽¹⁰⁾ emphasized the importance of timing of cervical stabilization surgery in patients with rheumatoid arthritis and they concluded that early operative treatment may delay the detrimental course of cervical myelopathy in rheumatoid arthritis. Transarticular screw fixation at C1-2 level is the most favorable technique for the treatment of atlantoaxial subluxation, which is the most frequent cervical spinal pathology in rheumatoid arthritis. These practical and rational techniques ensure instant fixation. Decompression and craniocervical fixation are also rational choices for the treatment of subluxations occurring in the craniocervical junction and/or subaxial levels. Since patients with severe degrees of RA have already limited neck ROM, restricted neck movements after craniocervical fixation of a long segment is not an important concern for these patients ⁽⁶⁾. Further limitation of their neck movements considerably reduces the disabling neck pain that they often experience ⁽⁶⁾. Stabilization of the cervical spine often leads to gradual reduction of pannus and prevents progression of cranial settling, lateral joint erosion, and alterations in kyphotic curvature ⁽⁶⁾.

Surgery contributes to the prolongation of lifespan of rheumatoid patients with myelopathy. Conservatively treated patients have a much

higher mortality rate. Perioperative mortality after cervical spine surgery for rheumatoid arthritis has been reported to range from 4 to 17 %. Cumulative postoperative improvement rates from Class IIIb to Class I/II, and also from Class IIIb to Class I/II in patients with cervical rheumatoid arthritis have been cited to be 24.6, and 61.8 %, respectively ⁽⁶⁾. In both of our cases, postoperative improvement from Class IIIb to Class I was satisfactory. Even a shift from Ranawat's Class IIIb to Class IIIa represents a significant improvement for these patients in terms of their quality of lives and daily activities ^(2,6,12).

CONCLUSION

A multidisciplinary approach for the treatment of the patients with rheumatoid arthritis is mandatory, especially in the long-term follow-up. We believe that surgical morbidity and mortality may be decreased to acceptable levels with careful perioperative care, convenient anesthesia techniques, complete investigation of cervical spinal pathology and proper surgical techniques. Moreover, surgical results are related not only to the severity and duration of myelopathy, but also to success of adequate decompression and vertebral alignment.

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