

Adjacent segment pathology of the cervical spine: A case report

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ABSTRACT

Adjacent segment pathology (ASP) refers to degenerative changes at segments immediately contiguous to previous spinal fusion. Its pathophysiology is hypothesized as being possibly due to altered biomechanical stresses on adjacent levels following spinal fusion or due to patient propensity to develop progressive degenerative change. This case report describes a 61-year-old female who presented with neck pain and cervical radiculopathy attributed to an anterior cervical discectomy and spinal fusion performed for degenerative disc disease 30 years earlier. ASP was seen on magnetic resonance imaging (MRI) and radiograph. Treatment consisted of cervical manipulation, soft-tissue mobilization, flexion-distraction decompression, and therapeutic ultrasound to release restriction and restore muscle strength. Following 34 sessions of chiropractic intervention, her symptoms were resolved. Patients with ASP will have ongoing shared care between general practitioners and secondary or tertiary care pain units. This report aims to build a shared understanding from the wider vision of ASP and help primary practitioners to manage ASP effectively.

Keywords: Adjacent segment pathology, chiropractic manipulation, degenerative change, spinal fusion

Introduction

Adjacent segment pathology (ASP) refers to degenerative changes observed at functional spinal units adjacent to the site of previous fusion procedure.^[1] All spinal surgeries altering motion across a joint can contribute to additional stress and mechanical loads on the segments immediately above and below the surgery site and accelerate subsequent degeneration. These conditions can compress nerves in the spine, causing pain and additional conditions like radiculopathy and myelopathy. ASP can be complicated by age-related changes, anatomical disruption, surgical technique, malalignment of the spine, and preexisting

comorbidities (e.g., degenerative spondylosis, osteoporosis, diabetes mellitus, and smoking).^[2,3]

The accelerated degeneration of the adjacent segments could be a multisegmental problem and can be challenging to manage. This article will enhance readers understanding of ASP and help primary practitioners to manage ASP effectively. This case report has been prepared after obtaining written informed consent from the patient to have the case details and accompanying images published. Owing to the nature of the retrospective chart review, IRB approval is not required.

Case Report

A 61-year-old female presented with severe neck pain that radiated into the right shoulder and upper arm for 2 months duration. The patient described experiencing the same symptoms 30 years earlier and was treated successfully with C5-C6 and C6-C7 anterior cervical discectomy and fusion. Following surgical

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Received: 12-07-2021

Revised: 02-10-2021

Accepted: 16-10-2021

Published: 16-02-2022

Access this article online

Quick Response Code:



Website:
www.jfmpc.com

DOI:
10.4103/jfmpc.jfmpc_1380_21

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How to cite this article: Chu EC, Lee LY. Adjacent segment pathology of the cervical spine: A case report. J Family Med Prim Care 2022;11:787-9.

intervention, the patient experienced approximately 20 years of symptomatic improvement, but the patient observed progressive deterioration of her condition over the past 10 years and had been followed by her orthopedic surgeon. Two months prior to presentation, the patient experienced rapid deterioration of her neck pain, which was associated with numbness, radiating pain, and weakness of the right arm. She had attempted 20 sessions of physical therapy with minimal relief.

At the initial visit, the patient presented with a guarded neck posture. Neck motion was limited to 10° active extension (normal >60°) and 40° of bilateral rotation (normal >80°), and joint restriction at C3/4 and C7/T1 levels. Neurological examination demonstrated reduced motor strength in the right biceps and wrist extensors rated +4/5 and numbness in the right C5 dermatome. Subsequent magnetic resonance imaging and radiograph [Figures 1 and 2a] showed cervical hypolordosis, interbody fusion of C5–C7 vertebrae, generalized disc desiccation, reduced height of the C3/C4 and C4/C5 discs, narrowing of the spinal canal at C4/C5 and C7/T1 levels, and right C4/C5 neural foraminal narrowing. Radiographic and clinical findings suggested adjacent segment pathology at C4/C5 and C7/T1 with right C5 nerve root compression.

Chiropractic intervention consisted of diversified chiropractic manipulation of the middle and lower cervical segments to release restriction along with soft tissue mobilization of the nuchal deep tissue to reduce stiffness. Six weeks later, the patient reported reduced radicular symptoms and regained motor strength (5/5) of the right biceps and wrist extensors. Subsequently, flexion-distraction technique (to decompress and stretch the cervical spine) and therapeutic ultrasound (to promote muscle healing and relieve pain) were applied for an additional 2 months. At the completion of treatment sessions, her symptoms were resolved and her neck extension was regained to 50° (normal >60°) and bilateral rotations to 65° (normal >80°).



Figure 1: Sagittal T2-weighted MR image showed generalized desiccation and reduced height of the discs, cervical hypolordosis, interbody fusion of C5–C7 vertebrae, and cord compression at C4/C5 and C7/T1 levels (arrows). MRI suggested adjacent segment pathology at C4/C5 and C7/T1 levels

At 11-month follow-up, radiograph showed that the cervical sagittal alignment was improved in terms of forward shifting of the gravity line (*dashed white line*) and C-2 plumb line (*red line*), relative to the C7 [Figure 2b]. The patient entered an elective spinal rehabilitation program once monthly for continuing care for the next 6 months and remained symptom-free.

Discussion

ASP is recognized by clinicians as a debilitating condition characterized by axial pain and radiculopathy after spinal fusion. The progression of ASP can result from compressive loading on the adjacent segments and the compromised nutrient diffusion in the intervertebral discs after segment fusion.^[4] Biomechanical and clinical data have demonstrated that motion preservation technologies minimize stresses placed on adjacent functional segments.^[2] The latest data suggested that positive effects after artificial disc replacement are found in terms of a reduced incidence of ASP and reoperation as compared with anterior cervical discectomy and interbody fusion procedures.^[2,5]

The radiographic changes of the adjacent segments include osteophyte formation, disc degeneration, foraminal narrowing, spinal stenosis, spinal instability, and scoliosis.^[6] As in all degenerative conditions, the goals of ASP treatment are to alleviate pain, strengthen paravertebral musculature, improve range of motion, limit progressive changes, and avoid unnecessary surgery. Apart from physical suffering, persistent pain has clear emotional and behavioral consequences that have an impact on the outcome of treatment. With proper instruction and support, psychological approaches can improve pain management outcomes.

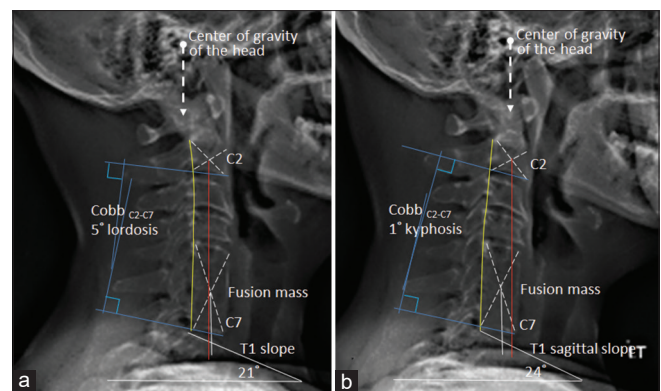


Figure 2: Cervical alignment investigated on sagittal radiographs. (a) At initial assessment, sagittal radiograph showed straightening of the cervical spine, arthritic C1-C2 joint, fusion mass of C5 through C7, osteophytic spurs, and interspace narrowing at multiple levels. The gravity line (*dashed white line*) dropped posterior to the cervical spine and the C2 plumb line (*red line*) lay behind the center of the C7, indicative of posterior translation of the center of gravity of the head. (b) At 11-month follow-up, repeat radiograph depicted no obvious interval changes in structures. However, improved sagittal balance was observed in terms of forward shifting of the gravity line (*dashed white line*) and C-2 plumb line (*red line*), related to the C7 center. In a balanced state, the gravity line is always in front of the center of the C7 vertebra

General practitioners have a key role to play in securing better outcomes for their patients. Patients can have both nociceptive and neuropathic pain and will have ongoing shared care between general practitioners and secondary or tertiary care pain units. It is inappropriate to place total reliance on further surgery. Multidisciplinary care allows patients to receive coordinated support and comprehensive care. Nonsurgical treatments such as medications, physiotherapy, manipulative therapy, psychotherapy, and nerve stimulation/modulation techniques can be helpful in most spine symptoms. Minimally invasive surgery is reserved for ASP patients with gradual emergence of neurological deficits.^[7] However, there are no comparative studies on the efficacy of conservative treatment versus surgical treatment.^[8] The current study aims to share an understanding of tasks between primary and secondary care for alleviating musculoskeletal pains like ASP.

Conclusion

Presented is a case of symptomatic ASP after anterior cervical discectomy and spinal fusion. Appropriate conditioning and proper retrieval of biomechanical elasticity can allow the spine to function properly. Conservative treatments should always be contemplated as an alternative method for ASP patients before resorting to surgery.

Key messages

1. Adjacent segment pathology (ASP) refers to degenerative changes at segments immediately contiguous to previous spinal fusion.
2. Symptomatic ASP is a disappointing long-term outcome for patients after spinal fusion.
3. Patients with ASP will have ongoing shared care between general practitioners and secondary or tertiary care pain units.
4. Nonsurgical measures should be used for the initial treatment of ASP.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his/her consent for his/her clinical information to be reported in the journal. The patient understands that his/her name and initials will not be published and due efforts will be made to conceal their identity.

Ethical approval

This article does not contain any studies with human or animal subjects performed by the authors. The authors attest that this

case report was determined not to require Institutional Review Board/Ethics Committee review, and the corresponding protocol/approval number is not applicable as this was a retrospective case report.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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