

A Case of 360 Degree Cervical Decompression and Fusion in a 65 Year Old Man with Tandem Spinal Stenosis

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Abstract

Tandem spinal stenosis is a clinical phenomenon which is mostly due to degenerative changes in an individual. Most patients present with neck and low back pain with neurological deficits of varying degrees. It is a condition that commonly occurs in individuals greater than 55 years of age. Cervical compressive myelopathy is the most common condition associated with tandem spondylosis. We present the first documented combined anterior and posterior (360 degree) cervical decompression surgery done on account of tandem spinal stenosis in south western Nigeria.

A 65-year-old man who presented with severe neck and low back pain and progressive quadriparesis secondary to cervical compressive myelopathy with associated Tandem spinal stenosis. He subsequently had a combined anterior-posterior (360 degrees) cervical decompression and fusion with titanium plate and screws. An iliac crest (tri-cortical) bone graft was used. There was gradual resolution of both neurological deficit and pain noted by the patient after the above surgery was done.

Keywords: Spondylosis (TSS); Cervical compressive myelopathy

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Introduction

The term Tandem spinal stenosis (TSS) was first introduced by Dagi et al to describe concurrent symptomatic cervical and lumbar spondylosis. Hence, another term for tandem spinal spondylosis is cervical and lumbar spondylosis [1]. Tandem spinal stenosis is a myelopathy affecting both the cervical and lumbar vertebrae at the same time and is characterized by progressive compression of the spinal cord which can be caused by either congenital or degenerative changes [1,2].

Tandem Spinal Stenosis (TSS) is an infrequent but medically crucial phenomenon as its incidence is stated to be between 5-25% of spinal stenosis cases, it is noted to have a male predilection and affects majority of people over 55 years of age [3,4]. Cervical spine myelopathy has been noted to be the most affected region in patients with tandem spondylosis [3,4]. The most common cause of tandem spinal spondylosis is age but other etiologies exist and they include but not limited to habitual smoking, lifting heavy objects repeatedly, sitting for prolonged periods of time noted in sedentary workers or long distance truck drivers [4]. Symptomatic tandem spinal stenosis is usually characterized by the triad of intermittent neurogenic claudication, progressive gait disturbance, and findings of mixed myelopathy and poly- radiculopathy in both the cervical and

lumbar regions usually associated with clumsiness of the hands, spastic gait, and synesthesia to name a few symptoms. The most symptomatic level is the one usually treated first [1,3-5]. Most times conservative interventions tend to work but when they do not, surgical intervention then becomes the best course of action to improve the debilitating symptoms usually associated with Tandem spinal stenosis [6]. Some patients with complex cervical spine myelopathy suffer anterior and posterior cord compression, the phenomenon in which the compressed cord is less than 50% of the anterior-posterior diameter of the cervical canal is clinically known as "pinching" [7-9].

Case Report

A 65-year-old retired trader presented to the hospital with progressive weakness of the right upper limb of eight (8) months duration and bilateral lower limbs of nine (9) months prior to presentation.

Weakness started on the right lower limb thereafter had the same symptom on the left lower limb before progressing to the right upper limb. Weakness became a concern to the patient when he noticed he could not stand upright without the aid of a support. There was prior history of recurrent severe lower back

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and neck pain of about 5 years duration. Pain was graded 8 using the Numerical rating scales (NRS). There was associated history of paresthesia, tingling sensations affecting both upper and lower limbs significantly worse on the right side, inability to sign his signature and hold small objects for prolonged periods of time.

On examination, there was reduced muscle bulk noted on the right upper limb and both thighs. Weakness was noted in both upper and lower limbs as noted in the Medical Research Council (MRC) chart in **Table 1** below. He was noted to have hyper-reflexia and hypertonia of the affected limbs alongside loss of sensation over various dermatomes as noted in **Table 2** below.

X-ray of the cervical vertebrae revealed multilevel osteophytes, straightening of the cervical vertebrae, narrowing of C3-C6 disc spaces, osteopenia and sclerosis. MRI of the cervical vertebrae revealed a disc bulge with spinal canal stenosis and exit foramina

compression between C2-T1 with extradural spinal cord compression with myelomalacia at C3/C4 disc level. MRI of the Lumbar vertebrae revealed mild multilevel lumbar spondylosis with associated exit foramina stenosis and nerve compression at L3/L4, L4/L5, and L5/S1 levels. A diagnosis of Severe Tandem Stenosis (Cervical and Lumbar compressive myelopathy) Nurick grade 4 was made.

He was counseled on his diagnosis, course of treatment, complications and prognosis. An Informed verbal and written consent was obtained and subsequently he was worked up for surgery and had a C3/C4 anterior discectomy and stabilization with Titanium plate and screws. A tri-cortical iliac crest bone graft was harvested and used for fusion of the C3/C4 segment anteriorly. Following which he was flipped to the prone position and had a C3-C6 Posterior laminectomy. Intra operative finding was degenerative changes at c3/c4 level anteriorly and

Table 1 Patients muscle power based on the Medical Research council (MRC) Manual Muscle Testing scale.

	Pre- Op	POD1		POD 7		2 weeks		
Upper Limb	R	L	R	L	R	L	R	L
Shoulder Abduction and adduction	2	3	2+	3+	3+	4	4	4+
Elbow flexors	2	3	2+	3+	3	4	3+	4+
Elbow extension	2	3	2+	3+	3+	4	4	5
Wrist Flexion	2	3	2+	3+	3+	4	4	5
Wrist extension	3	3	3	3+	3+	4	4	4+
	PRE – OP	POD 1		POD 6		2 WEEKS		
Lower Limb	R	L	R	L	R	L	R	L
Hip flexors	3	3	3	3	3+	3	3+	3+
Hip adductors	2	3	2	2	3	3	3+	3+
Hip abductors	2	3	2+	2+	3	3	3	3
Knee flexors	2	3	3+	3+	3+	3+	3+	3+
Knee Extensors	2	2	2	2	3	3	3	3
Internal rotators	3	3	2	2	3	3+	3	3
External rotators	3	3	2	2	3	3	3	3
Ankle dorsiflexion	1	2	3	3	3	3	3	3
Ankle plantar flexion	1	2	3+	3+	4	4	4	4
Dorsiflexion of the big toe	1	2	2+	2+	3	3	3	3
Plantar flexion of the big toe	1	1	2+	2+	3	3	3	3

Table 2 Patients sensation at various dermatome level.

	Pre – operative		POD 1		POD 7	
Dermatome Level	R	L	R	L	R	L
C5	Reduced	Normal	Reduced	Normal	Normal	Normal
C6	Reduced	Normal	Reduced	Normal	Normal	Normal
C7	Reduced	Normal	Reduced	Normal	Normal	Normal
C8	Reduced	Normal	Reduced	Normal	Normal	Normal
C9	Reduced	Normal	Reduced	Normal	Normal	Normal
T1	Reduced	Normal	Reduced	Normal	Normal	Normal
DERMATOME LEVEL	R	L	R	L	R	L
L1	NORMAL	Normal	Normal	Normal	Normal	Normal
L2	normal	Normal	Normal	Normal	Normal	Normal
L3	Normal	Normal	Normal	Normal	Normal	Normal
L4	Reduced	Normal	Slightly reduced	Normal	Slightly reduced	Normal
L5	Reduced	Normal	Slight reduced	Normal	Slightly reduced	Normal
S1	Normal	Normal				
S2	Normal	Normal				

posteriorly with thickened ligamentum flavum. Surgery was done under General anesthesia and an intraoperative fluoroscopy imaging (C- Arm) was used. Duration of surgery was six (6) hours. Estimated blood loss was 350 mls.

He was placed on a Philadelphia cervical collar which was used for about a period of 6 weeks after the surgery. He was managed in the recovery room for 24 hours and moved to the inpatient rehabilitation room where he was commenced on physiotherapy from Day 3 post op. he was also placed on analgesics, antibiotics, anticoagulants and anti-inflammatory agents. A daily chart to monitor his power, tone reflexes, sensation. were kept and this was Power and sensation to both upper and lower limbs were also noted to improve significantly at 7 days post op as noted in the **Tables 1 and 2** below. Pain score was charted and noted to drop from 8 preoperatively to 4 post operatively using the. Two weeks post op, Sutures were removed, he was also able to ambulate with a Zimmer's frame. He was seen last in clinic 3 months post-surgery and Nurick score had improved to grade 3 where he was noted to be walking with a walking stick and carry out some activities unaided.

Discussion

There are many studies published about spinal stenosis of either the cervical or lumbar vertebrae but very few on concurrent cervical and lumbar stenosis [1]. Tandem spinal stenosis is a common condition that occurs in patients greater than 55 years of age, as seen in the index case presented patient was aged 65 years of age. Most commonly affected gender is the male gender [2,3].

As in the index case there may be predominant features from a particular level at the initial phase [3,4]. Due to the progressive canal and intervertebral canal compromise caused by the vertebrae bone spondylosis, large osteophytes formation, thickening of the ligamentum flavum and listhesis there is a quick progression of clinical symptoms which further affects both levels [4,5,8].

The clinical sequelae related to compression of the cervical and lumbar spinal cord represent a broad spectrum as seen in the case presented; patients present with features such as diminished hand dexterity, weakness of both lower limbs associated with balance difficulties or in severe cases symptoms of incontinence and complete paralysis [1,2,5,8]. As noted in the index patient symptoms were progressive in nature initially noticed by the need for support to ambulate associated with inability to sign his signatures which tallies with the clinical features documented in literature [2,5,8].

The diagnosis of patients with Tandem Spinal stenosis is mainly based on Magnetic Resonance imaging Particularly in evaluation of the vertebral discs, its relationship to the nerve roots and related structures with precise diagnosis that guides the patient's management where it's usually depicted as a concurrent cervical and lumbar spinal stenosis with one level worse than the other or both being the same [6].

Most patients usually start with non-surgical interventions like medications, physiotherapy and in our environment traditional

bone setter but due to the rapid progression of symptoms it usually results in them seeking in surgical interventions [1,2,7].

Surgical approach to the spine might be simply classified into anterior, posterior or the combined approaches. Surgical intervention was directed at decompression of the stenotic lesions in both the cervical and lumbar regions. The most symptomatic level was usually treated first [1,2,8-10]. As noted in this case after the most symptomatic and most superior level was decompressed there was marked improvement to the neurological deficits earlier noted.

The 360 degree cervical decompression and fusion was used in this case study and can be attributed to some of the indications noted by Kim and Colleagues [10] which include acute spinal trauma, post-laminectomy kyphosis, kyphotic deformity with intact posterior tension band, multilevel spondylosis and ossification of the posterior longitudinal ligament (OPLL), and preexisting risk factors for pseudarthrosis [10]. From the imaging studies noted in **Figure 1** the patient had more than three levels of intervertebral cord compression which has been noted be one of the major indication for 360 degree cervical decompression. It's worthy to note that every patient and case should be managed and treated as an individual. The indications are merely guidelines and need to be streamlined to the severity of neurological symptoms and neurological imaging observed in the patient: as seen in this patient symptoms progressed quickly and radiological imaging showed both Anterior and posterior compression of the spinal column and its cord [10].

360 degree cervical decompression and fusion (CAPDF) surgery for complex cervical spondylosis myelopathy is a relatively new technique that was previously used for Thoracolumbar spine disorders [8-11]. It remains one of the viable options in the surgical management of complex cervical spondylotic myelopathy in the world especially when more than three levels of the cervical vertebrae needs to be decompressed [12]. Literature In Nigeria concerning combined anterior and posterior decompression and fusion is not only very scanty but those on cervical decompression are few [13,14]. This limitations can be attributed to low numbers of Magnetic Resonance imaging for diagnosis and low numbers of Intra operative fluoroscopy in orthopedic theatre across the country [13,14].

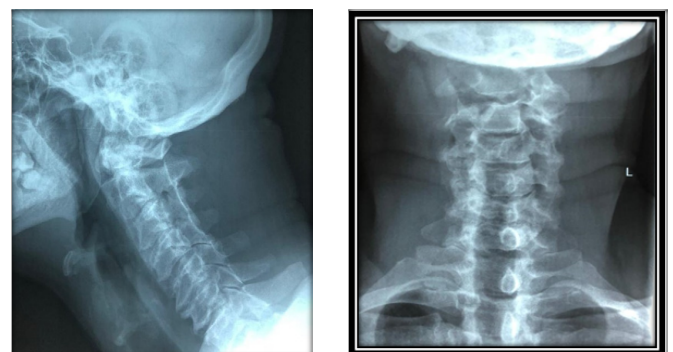


Figure 1 A and B Shows pre-operative Lateral and anterior views of the cervical vertebrae showing straightening, disc space narrowing, osteopenia and multilevel osteophytes.

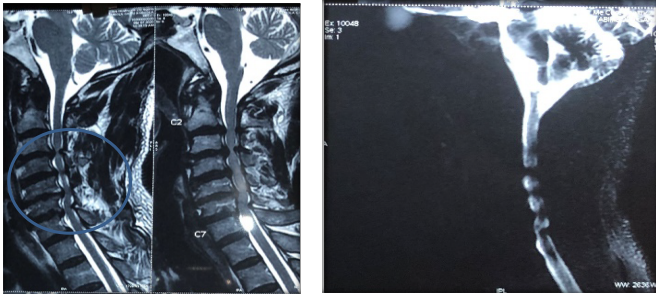


Figure 2 Shows pre-operative T2 weighted MRI Imaging study of the Cervical Vertebrae showing severe narrowing of the spinal cord at C2/C3, C4/C5, C5 /C6 levels. D : T2 weighted image of the cervical vertebrae showing complete multilevel obliteration of the spinal cord cerebrospinal fluid in the cervical vertebrae.

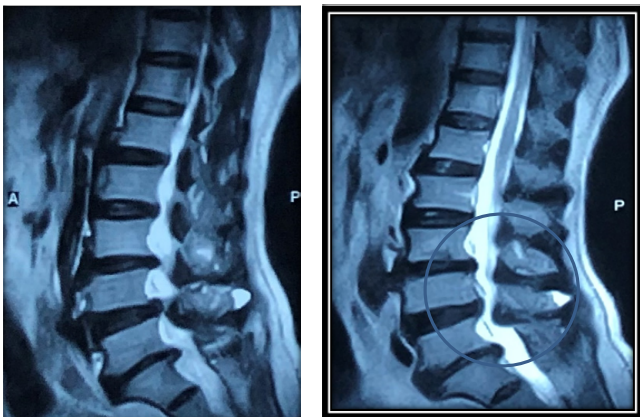


Figure 3 MRI showing mild multilevel lumbar spondylosis with exit foramina stenosis and nerve compression at L3/L4, L4/L5 and L5/S1 levels.

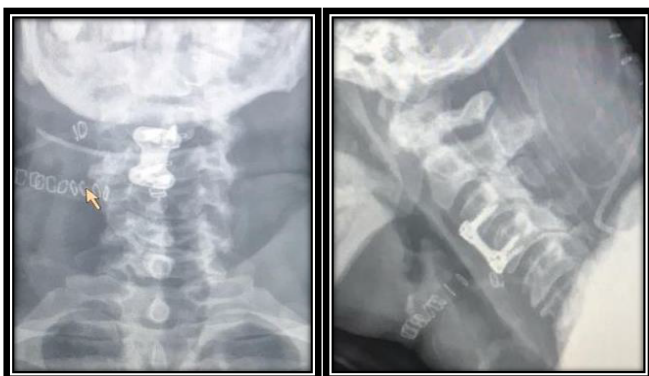


Figure 4 Post-surgical x-ray imaging showing the implant at C3/ C4 spine segment.

360 degree cervical decompression fusion provides cure for all components of stenotic disease especially when compared with the anterior and posterior decompression surgery; it was

done in this index patient at c3/c4 level because that is the level where the pinching of the spinal cord took place [8]. Posterior decompression was only better in terms of cost, surgical time, blood loss and complication rate [14,15]. In 2017, Zhou and colleagues [16] carried out a comparative study between posterior cervical decompression and combined anterior and posterior cervical decompression and noted that the mean estimated blood loss for combined anterior –posterior (360 degree) decompression and fusion was 701 mls while that noted in this patient was about 350 mls [16]. This reduction in estimated blood loss can be attributed to the administration of intravenous Tranexamic acid preoperatively, infiltration of adrenaline into the soft tissues surrounding the incision site, use of bipolar diathermy and ensuring that the mean arterial blood pressure was kept at less than 70 mmhg at incision as ensured by the anesthetist in this procedure [17-19]. This is highly advised during major orthopedic surgeries as it reduces the rate of both intraoperative and post-operative blood transfusion. Duration of surgery is usually noted to be longer in 360 degree cervical decompression and fusion surgery and has a mean of about 7 hours which is close to the duration of the surgery carried on the index patient (6 hours) [20].

Aggressive physiotherapy is the key to adequate rehabilitation as noted by Danielsen et al. [21] in 2000. The index patient was introduced to aggressive back exercises from the first day post op and this aided in good recovery time [21]. La Rosa and colleagues [22] in 2004 noted in their study that the Prognosis of resolution is usually much better in patient who have decompression surgery done within one year of onset of symptoms as most patients Nurick grade was noted to improve by at least 1 [22,23]. This is noted in our patient who presented within nine (9) months and made significant improvement within 3 months.

Complications related to cervical spine surgery are well documented in the literature, including dysphagia, dysphonia, wound infection, neurological deficits, delayed c5 palsy, adjacent level disease, instrumentation failure, and pseudarthrosis [24-27] but however this were not noted in the index patient.

Conclusion

Tandem Spinal Stenosis is very common but commonly under diagnosed in our environment. With the availability of radiological imaging such as Magnetic Resonance Imaging and intraoperative C-arm, diagnosis and treatment can be made easy. It is important that the most superior and most affected region be operated on first as noted in the case discussed.

The index case is the first reported case of (360degrees)cervical decompression and fusion for complex cervical spondylotic myelopathy secondary to tandem spinal stenosis in a country where the incidence of tandem spinal stenosis seems to be on the increase. The surgical management follows the guidelines in the management of tandem spinal stenosis worldwide and identifies ways by which estimated blood loss and complications can be minimized. Our experience can thus serve as a guide for diagnosis, treatment and rehabilitation of these patients.

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