

Original Research Article

A Prospective Study of Operative Outcomes of Anterior Cervical Discectomy and Fusion (ACDF) With a Tri-Cortical Iliac Bone Graft in the Treatment of Cervical Myeloradiculopathy (CMR)

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ABSTRACT

Background: Compression of the spinal cord and/or nerve roots in the cervical spine causes CMR (Cervical Myeloradiculopathy), which frequently results in severe morbidity, including pain, paralysis, sensory impairments, and bowel/bladder dysfunction. A common surgical procedure for CMR patients who have not responded to conservative treatment or who exhibit increasing neurological damage is ACDF (Anterior Cervical Discectomy and Fusion). This prospective study goal was to assess the operative results of ACDF in the management of (CMR).

Methods: This study included a cohort of 38 patients diagnosed with CMR, who underwent ACDF. preoperative assessments included clinical evaluation, imaging (MRI, CT), and neurological testing. Postoperative outcomes were measured based on pain relief, functional recovery, and neurological improvement using the modified JOA score. Additionally, the study evaluated complication rates, including infection, graft displacement, and neurological deterioration.

Results: The results indicate that ACDF leads to significant improvements in both pain and neurological function, with a favorable safety profile. The majority of patients experienced marked recovery within 6-12 months postoperatively, with a low incidence of complications.

Conclusion: This study reinforces the fact that ACDF is an effective and reliable gold standard surgical intervention for patients with CMR, offering substantial long-term relief and functional improvement.

Keywords: ACDF, Tri-Cortical Iliac Bone Graft, Cervical Myeloradiculopathy, Modified Joa, Cervical Spondylotic Myelopathy.

BACKGROUND

The most common cause of cervical spine dysfunction is CSM (Cervical Spondylomyositis), a progressive degenerative disease of the cervical spine.^[1,2] Both static and dynamic elements may be contributory. Compression of the neural tissue resulting from stenosis is the cause of static factors. In addition to mechanical compression, compromised venous and/or arterial blood flow can result in spinal cord ischemia. Therefore, in addition to cord ischemia, the pathogenesis of CSM is discovered to be

multifaceted, with both static causes generating canal stenosis and dynamic variables causing repetitive damage playing a role.

The presentation ranges from mild symptoms such as impaired hand dexterity to severe symptoms such as paralysis and incontinence, including balance issues. In North American regions, the incidence and prevalence of traumatic spinal cord injury were found to be 4.1 or 6 per 100,000 by CSM.^[3,4] In contrast to other spinal diseases where non-manipulated care is usually the first treatment system, early

surgical decompression for the treatment of CSM is extremely important. Strong data show that CSM patients have excellent outcomes when surgery is performed within 1 year after onset of symptoms.^[5,6] In general, there are three types of surgical techniques: anterior, posterior, and mixed. Laminectomy, laminoplasty, laminectomy with fusion form posterior methods whilst discectomy with fusion and corpectomy with fusion comprise the anterior approach. Although the anterior technique is preferred as CSM frequently involved one or two levels, there are concerns related to the frequency of surgical difficulties and uncertain outcomes. Thus, there is ongoing discussion on the best surgical approach for the therapy of CSM.^[7,8]

The tricortical ICBG (Iliac Crest Bone Graft) has been considered the gold standard graft material for ACDF due to its osteoinductive and osteoconductive properties, structural strength, and high fusion rates. Despite the emergence of interbody cages and bone graft substitutes, autologous tricortical iliac graft continues to demonstrate superior biomechanical stability and fusion outcomes.^[9]

As per our knowledge, there is sparse literature on return to work of CSM patients after surgery. Despite improved functional status after surgery, it is not known whether this improvement is sufficient to allow patients to resume their pre-disease occupation or whether functional scores like mJOA are associated with a return to work. Surgeons believe it is important to recognize not only functional improvements, but also the oft en overlooked prospects of returning to work, as they can provide better advice to patients prior to surgery. A lack of social support means that returning to work is extremely important, especially in developing countries. We intended to address all of these factors by determining the rates and of returning to work after surgical treatment with CSM.

METHODOLOGY

Over the course of a year, 38 individuals with

cervical myelopathy disease participated in this prospective observational study. Patients who met the inclusion criteria were enrolled in the study with informed consent from their parents after receiving approval and clearance from the institutional ethical committee. A proforma was used to gather data using the sequential sampling approach. A thorough clinical history was acquired. In addition to radiographic examinations such as X-rays, CT scans, and MRIs of the entire spine, basic regular blood tests were performed. The study did not include patients with cervical myelopathy caused by tumours, infections, acute disc disease, or ossified posterior longitudinal ligaments. In each of these instances, neck function was scored using the Modified Japanese Orthopaedic Association (MJOA) both before and after surgery. Neurovascular injury, wound haemorrhage, infection, scar dehiscence, hoarseness of voice, dysphagia, oesophageal injury, tracheal injury, dural rips, CSF leaks, and other surgical complications were reported.

IBM SPSS Statistics for Windows, Version 29.0 (Armonk, NY: IBM Corp.) was used to evaluate the data after it had been entered into Microsoft Excel 2016. For categorical variables, frequency analysis and percentage analysis were employed to explain the data's descriptive statistics; for continuous variables, the mean and standard deviation were utilised. Fisher's exact test or the chi-Square test was employed to identify significant associations in categorical data. Based on the data distribution, any additional tests that are deemed essential will be handled at the time of analysis. The probability value of 0.05 was regarded as the significant level in all of the aforementioned statistical techniques.

RESULTS

In our study, the most commonly affected age group was 41-50 years. Male patients, 68.43% with cervical spondylosis, were more frequent compared to female patients, 31.57%.

Age	No. Of Cases	Percentage
20-30	7	18.42%
31-40	9	23.68%
41-50	17	44.74%
51-60	5	13.16%
Total	38	100%

Table 1: Age Distribution of the Patients

A majority of patients presented with Radicular pain, followed by axial neck pain and myelopathy pain, as shown in Table 2.

Symptoms	No. Of Case	Percentage
Axial Neck Pain	11	28.95%
Radicular Pain	23	60.53%
Myelopathic Pain	4	10.52%
Total	38	100%

Table 2: Clinical Symptoms

IVDP was the most common pathological cause for the CMR with C5-C6 level affected in

a majority of the patients. The distribution is as shown in Table 3.

Pathology	Level	No. Of Case	Percentage
IVDP	C3-C4	3	7.89%
IVDP	C4-C5	7	18.43%
IVDP	C5-C6	15	39.47%
IVDP	C6-C7	6	15.78%
SUBLUXATION	C4-C5	1	2.64%
C5 Compression Fracture	C4-C6	4	10.52%
C6 Compression Fracture	C5-C7	1	2.64%
Multilevel IVPD	C3-C4 & C6-C7	1	2.64%
Total		38	100%

Table 3: Pathology and Level of Fusion

In our study, patients with higher postoperative MODIFIED JOA scores were more in number compared to preoperative

scores. This was more evident with scores above 12.

Score	Pre – Op	Post – Op
5 To 6	2	0
10 To 11	10	4
12 To 13	17	21
14 To 15	9	11
16 To 18	0	2

Table 4: Modified Joa Scale

Post-op complications noted in our study included dysphagia (10 patients), hoarseness of voice (2 patients) and infection (1 patient)

as shown in Table 5. Hematoma, vascular injuries and CSF leak were not observed.

Complications Encountered	Number
Dysphagia	10
Hoarseness Of Voice	2
Hematoma	0
Vascular Injuries	0
Infections	1
Csf Leak	0

Table 5: Post-Op Complications

DISCUSSION

Compression of the cervical spinal cord, frequently brought on by degenerative changes, trauma, or congenital abnormalities, results in cervical myelopathy, a progressive spinal cord ailment. It is the most frequent

cause of adult spinal cord dysfunction and, if left untreated, can cause severe neurological damage.

The age group most frequently impacted in our study was 41–50 years old. Cervical spondylosis was more common in male

patients (68.43%) than in female patients (31.57%). The C5-C6 level was impacted in most of the patients, and IVDP was the most frequent pathogenic cause of CMR. Axial neck discomfort, myelopathy pain, and radicular pain were the most common presentations.

These findings were consistent with the Kumar R et al.^[9] study, which found that the majority of patients were between the ages of 36 and 50. Ninety percent of patients had degenerative causes of compressive myelopathy, while the remaining patients had traumatic reasons. C5-6 was the most prevalent degree of participation (33.6%). When they first arrived at the hospital, all of the patients had a history of nape of the neck pain. The second most frequent symptoms were sensory ones (95%), such as tingling, paraesthesia, and numbness.

Similar to our analysis, the age group most frequently impacted in the Kamani MM et al.^[10] study was between 40 and 50 years old. This was similarly similar to Azimi et al.'s findings, which showed a range of 54+8.3 years.^[11] In the Kamani MM et al. study,^[10] 17 (85%) of the patients were male; this is similar to the findings of Ali et al. The most prevalent level of disc prolapse seen in our analysis was C5-C6, which was similar to the Ali et al. series.^[12]

Compared to preoperative scores, there were more patients in our study with higher postoperative MODIFIED JOA ratings. With scores higher than 12, this was more noticeable. According to the MJOA score, all patients in the Kamani MM et al.^[10] trial were classified as mild at the end of six months. Fehling MG et al.'s findings, which showed a notable improvement in the MJOA scores at the conclusion of a one-year follow-up, were similar to this.^[8]

Numerous issues have been linked to ACDF. Recurrent laryngeal nerve paresis, oesophageal injuries, tracheal injuries, injuries to the jugular vein and carotid artery, wound haematomas causing respiratory difficulty, dural tears, and cord injuries have all been documented by the authors. The most often documented side effect of ACDF is postoperative dysphagia, which ranges from 0 to 24%.^[13-15] It was discovered to be connected to the usage of anterior cervical plates in the majority of instances.

In our study, post-operative problems included infection (1 patient), hoarseness of voice (2 patients), and dysphagia (10 patients). There were no haematomas, vascular damage, or

CSF leaks. In the Kumar R, et al.^[9] trial, almost 4% of patients experienced postoperative dysphagia, which went away seven days after the procedure. There have also been reports of recurrent laryngeal nerve paresis in the literature, with an incidence of roughly 8.3%. Although studies have not demonstrated a substantial difference in the incidence of RLN paresis with side, the left anterior cervical approach has a theoretical advantage. Three of the seven patients (2.5%) in the Kumar R et al.^[9] series who experienced hoarseness of voice improved after six months. Most C6-7 level or C7-T1 level procedures were linked to the incidence of postoperative hoarseness of voice. According to their subjective satisfaction with the procedure and their return to their homes or jobs, the patients' surgical outcomes were good.

One of our patients had dysphonia, but he healed after three months. This is similar to the 3% reporting rate for recurrent laryngeal nerve palsy found in a research by Liao JC et al.^[16] None of our subjects had any other problems, such as implant failure, infection, or wound haemorrhage. According to Fehling MG et al.'s dataset, surgical decompression of degenerative cervical myelopathy improved both quality of life and functional result.^[8]

One or two level ACDF for spondylotic radiculo-myelopathy was shown by Islam and associates to be a successful treatment with a quick return to activity.^[17] Hessler and colleagues determined that ACDF was a safe and successful treatment for degenerative cervical disc disease after reporting an 80% improvement in their patients' neurological condition and symptoms.^[18] In their case series of doing ACDF in 129 instances, Ali et al. reported 71.43% great results.^[12] High fusion rates and low follow-up rates following anterior cervical discectomy with fusion were reported by Shibani E et al.^[19]

Recent studies comparing tricortical iliac graft with interbody cages show comparable fusion rates but suggest cages may reduce donor site morbidity. However, tricortical autograft remains superior in cost-effectiveness and avoids device-related complications.^[20]

Anterior Cervical Discectomy and Fusion (ACDF) using a tri-cortical iliac bone transplant was successful in treating a variety of degenerative disorders. A brief discretion of the cases are as below:

Case No. 1

A 30-year-old female presented with pain over the nape of her neck radiating to the left upper limb since 6 months ago. On clinical examination, upper limb power was 4/5; reflexes were exaggerated. Nerve root involvement at the C4-C5 level. MRI showed C4-C5 IVDP. Anterior cervical microdiscectomy with iliac bone graft fusion & stabilization with plate & screw at the level of C4-C5 was carried out. Postoperatively, she had excellent pain relief with improvement in power (5/5).

Case No. 2.

A 30-year-old male presented with pain over the nape of his neck and weakness of all 4 limbs following a fall from a height. On clinical examination: Power was 3/5, and reflexes were brisk. Subluxation at the C4-C5 level was noted in the MRI. An anterior cervical microdiscectomy at the C4-C5 level with an iliac bone graft fusion & stabilization with a plate & screw was done. Postoperatively, immense pain relief was achieved with a power of 4/5.

Case No. 3

A 55-year-old male patient presented with complaints of weakness of all 4 limbs following a fall from height. On clinical examination, power was 3/5, and reflexes were brisk. MRI showed a C6 compression fracture with cord edema. Surgical management involved C6 median corpectomy with anterior cervical

microdiscectomy at C5-C7 & stabilization with plate & screw with iliac bone graft, which was done under GA. Postoperatively, he had immense pain relief with the power of 4/5.

Case No. 4

A 55-year-old male patient presented with complaints of pain over the nape of the neck radiating to the right upper limb. On clinical examination, power was 4/5, and reflexes were exaggerated. Nerve root involvement at the C6-C7 level was noted on MRI with C3-C4 and C6-C7 IVDP. Management involved anterior cervical microdiscectomy at the C3-C4 and C6-C7 levels & stabilization with a plate & screw. Post-operatively, immense pain relief was achieved with Power-5/5.

Case No. 5

A 20-year-old male patient presented with complaints of weakness of all 4 limbs following a fall from a height. On clinical examination, power was 2/5, and reflexes were brisk. MRI showed a C5 compression fracture with cord edema. A C5 median corpectomy with anterior cervical microdiscectomy at C4-C6 & stabilization with a plate & screw with an iliac bone graft was performed. Postoperatively, immense pain relief was achieved with improvement in power (4/5). The single-center study, very small sample size, brief follow-up duration, and lack of a comparison group are some of the drawbacks of this work.

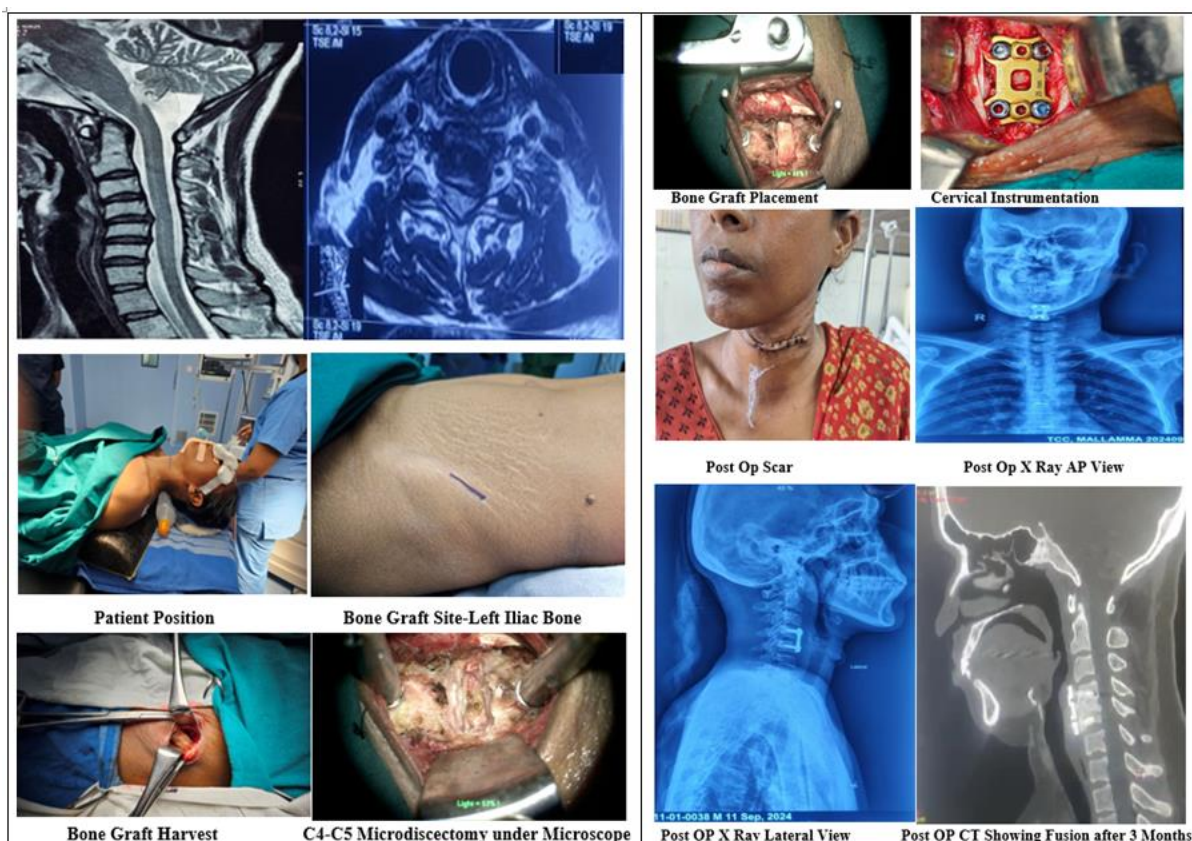


Figure 1

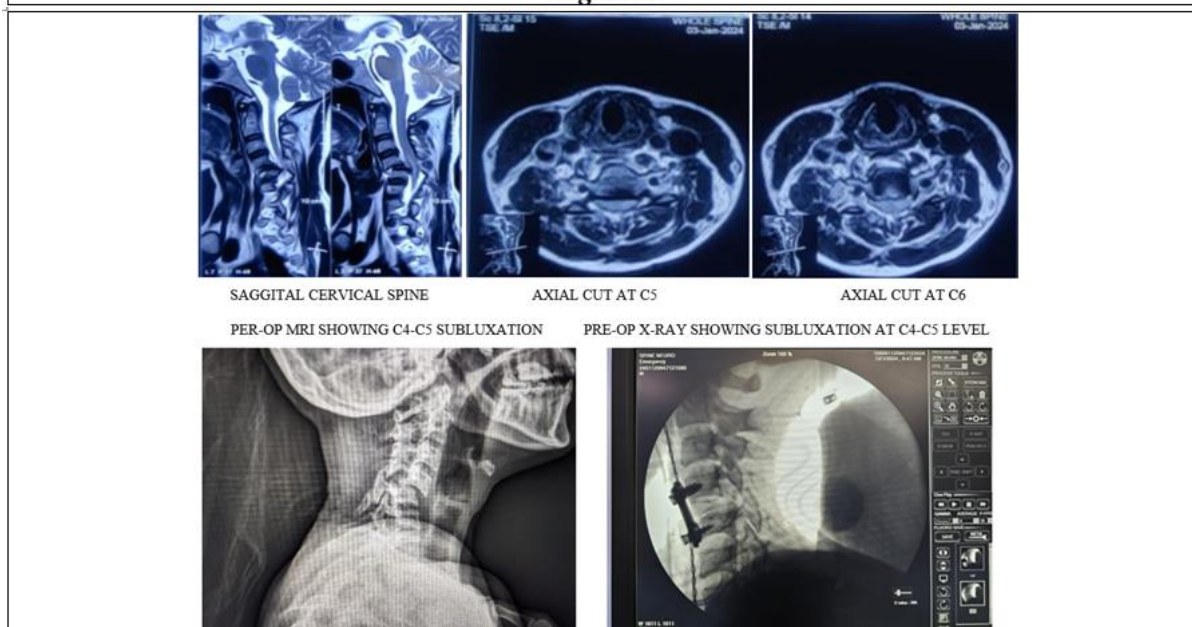


Figure 2

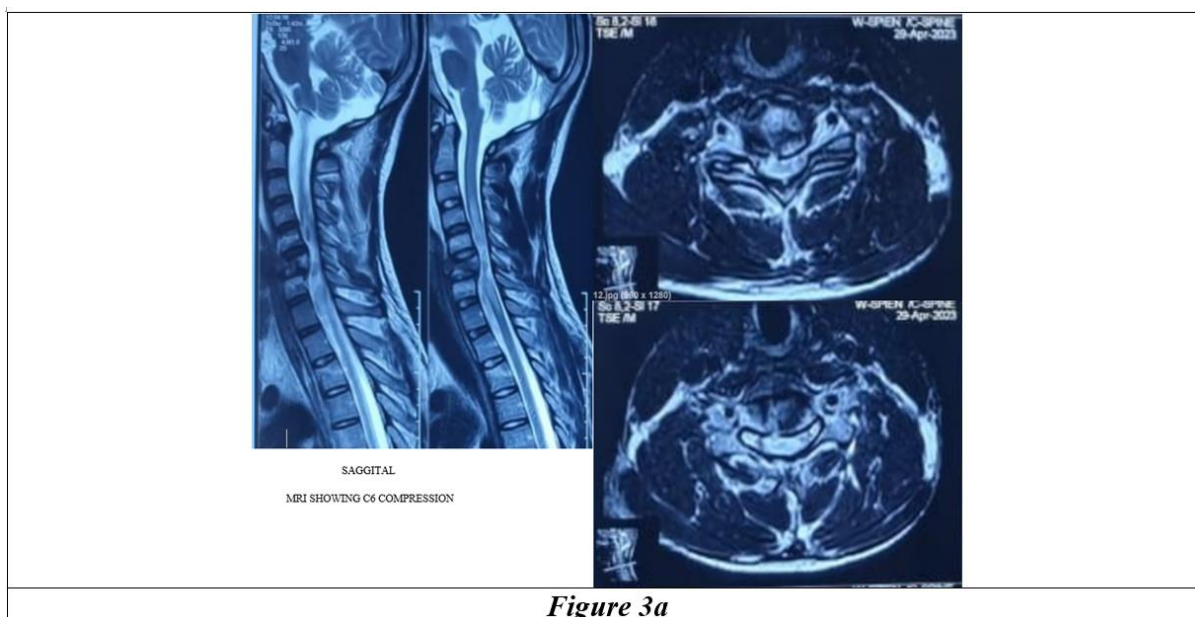
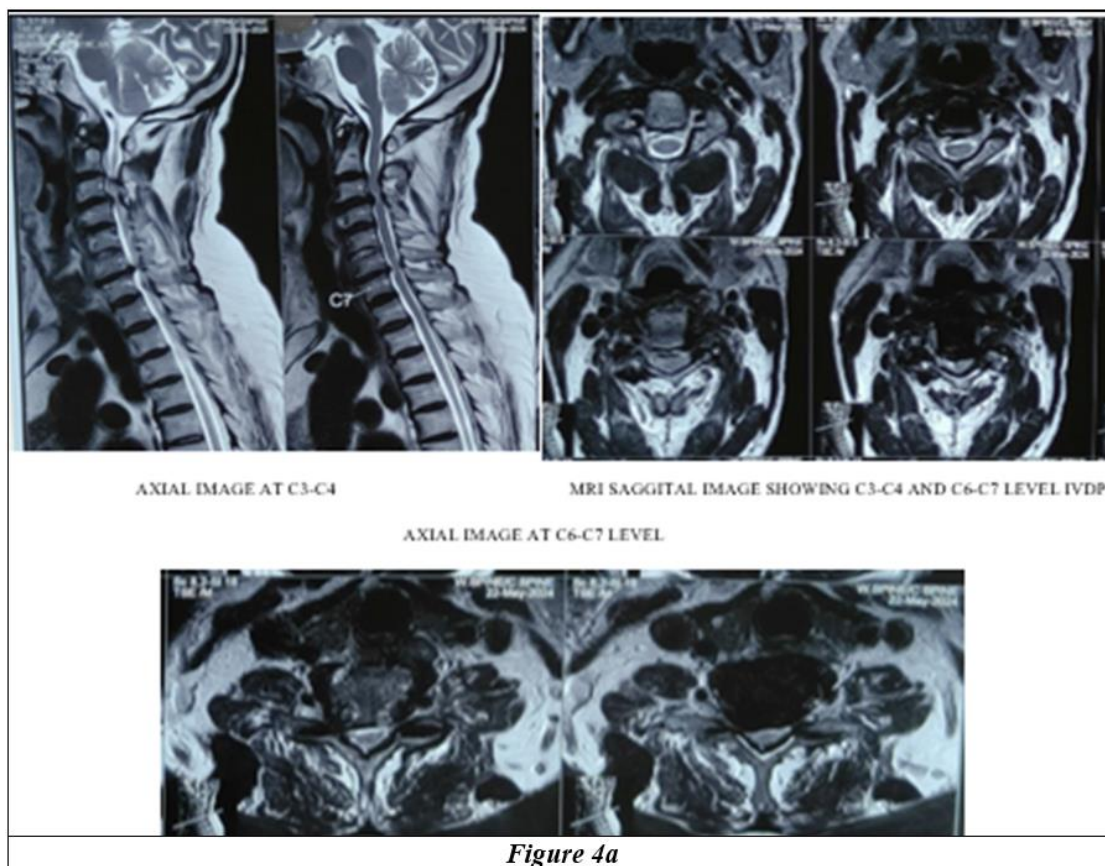
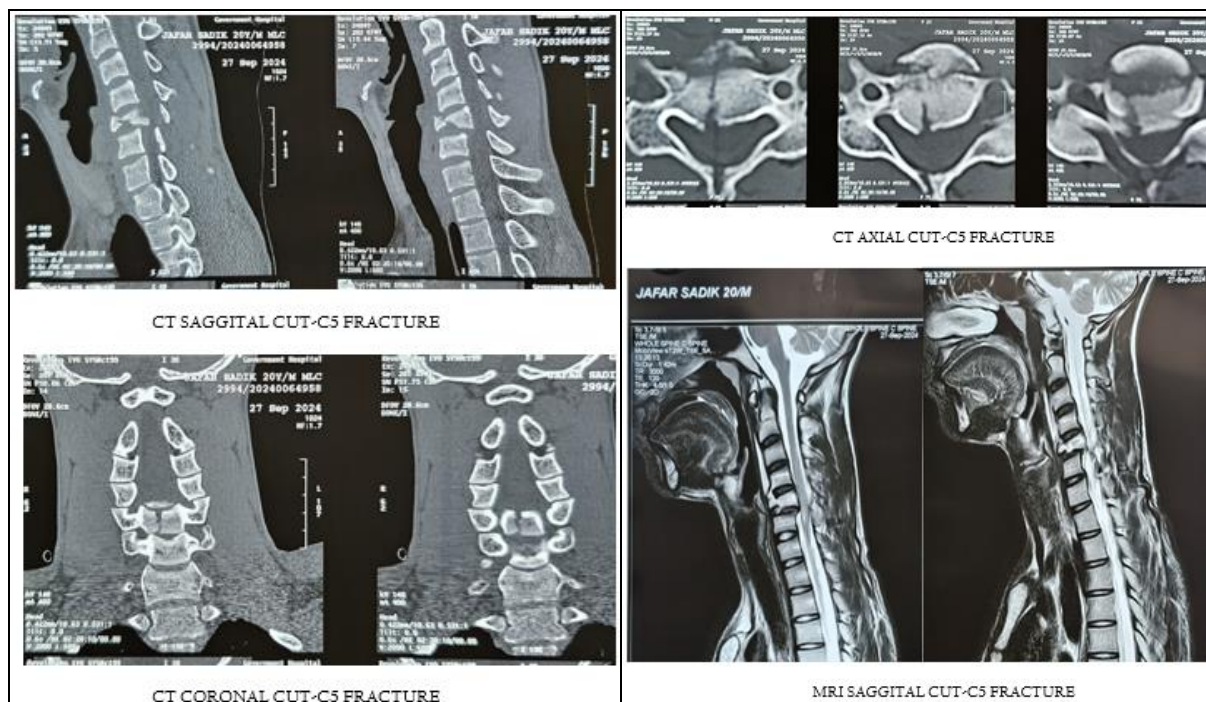


Figure 3a



Figure 3b





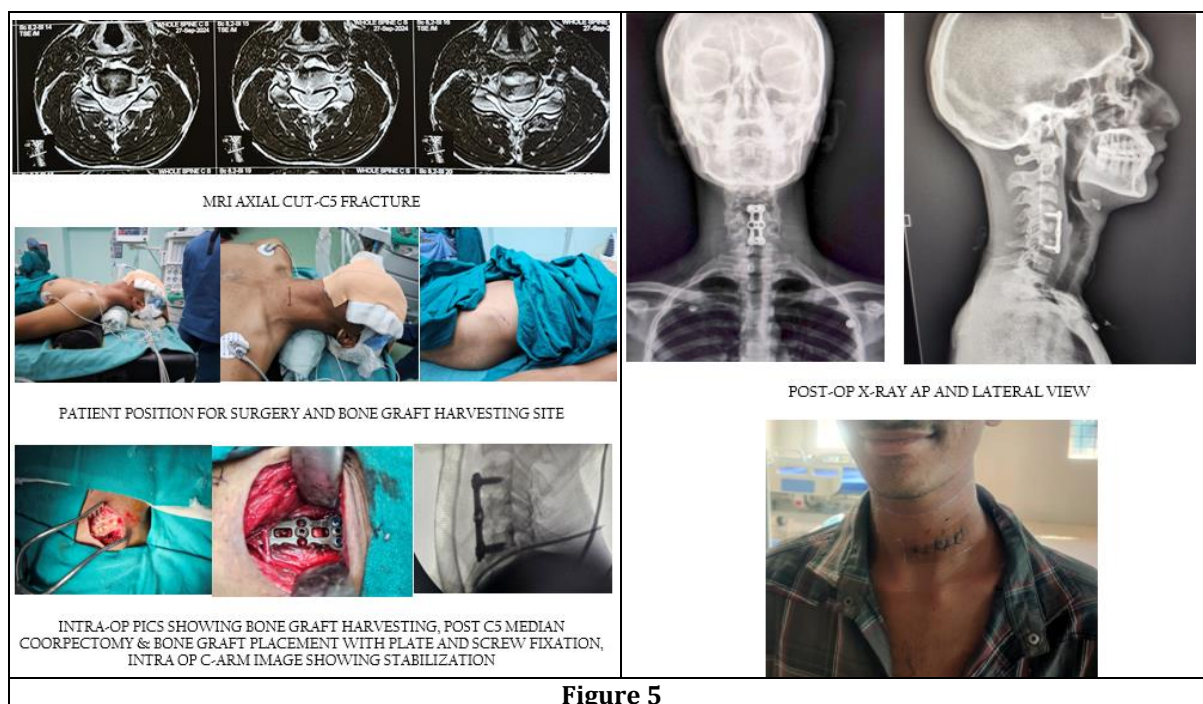


Figure 5

CONCLUSION

Anterior cervical discectomy and fusion with a tri-cortical iliac bone graft is an effective and gold standard treatment for cervical spondylotic myelo- radiculopathy involving one or two levels with good functional outcomes and negligible complications.

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