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Fusion Outcomes Following Two-Level Anterior Cervical Decompression and Fusion with Autologous Iliac Crest Bone Graft and Plating

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Purpose

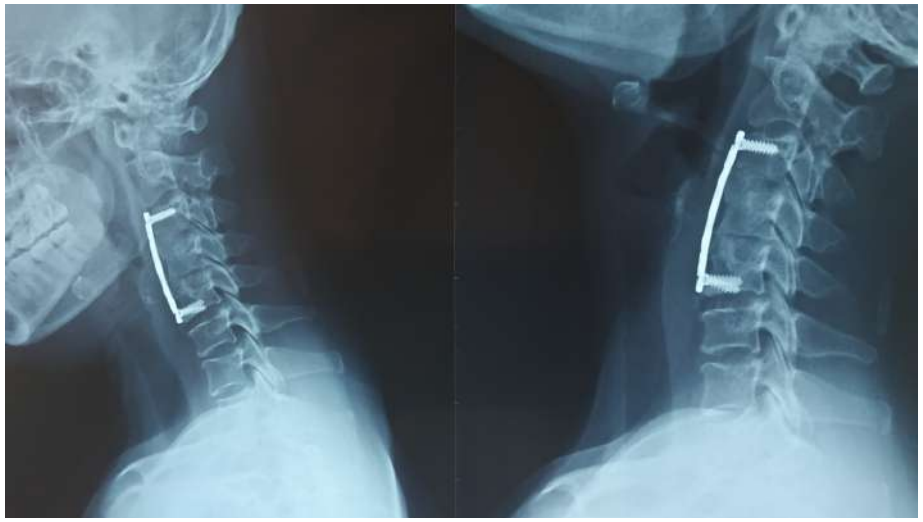
- Achieving solid fusion remains a critical determinant of success in two-level anterior cervical decompression and fusion (ACDF).
- Although standalone cages have been associated with higher subsidence and lower fusion rates, the use of autologous bone graft and anterior cervical plating has been advocated to enhance stability and promote fusion.
- However, limited prospective data exist on fusion outcomes and their clinical relevance in two-level disease.
- The purpose of the study is to assess fusion rates, fusion time, and the relationship. between fusion status and clinical outcomes following two-level ACDF with autologous iliac crest bone graft and plating.

Material and Methods

- A prospective study was conducted involving 26 patients with two-level degenerative cervical disc disease treated with ACDF using iliac crest graft and plating at Yangon Orthopedic Hospital, Myanmar, between Sept 2020 and Aug 2023.
- Demographic data and clinical outcomes using the modified mJOA score, NDI, and VAS for neck and radicular pain were assessed.
- Fusion was assessed using serial upright lateral and dynamic flexion-extension cervical radiographs obtained at 2, 4, 6, 8, and 10 months postoperatively.
- MRI & CT cervical spines were used to detect nature of pathology and confirm fusion.
- Subgroup analysis was performed to compare clinical outcomes between patients with f used and those with incompletely fused lesions.
- Patients were followed for a minimum of 10 months.

Material and Methods (Cont)

- Fusion was defined by the presence of trabecular bridging and absence of radiolucent line at the graft-endplate interface in CT and/or static X-ray, or absence of motion characterized by the distance between interspinous tips less than 4mm or Cobb angle changes less than 4 degrees on motion (Noordhoek et al., 2019).
- Fusion rate is defined by the proportion of patients with fusion (Joo et al., 2010).



Flexion and Extension Xrays (6mth).

(8mth)

Post-op CT (8mth)

Results

Table 1 Fusion time

Mean fusion time (Both) = 8.0

Group	2mths n (%)	4mths n (%)	6mths n (%)	8mths n (%)	10mths n (%)
Fusion	0 (0.0)	0 (0.0)	6 (23.1)	10 (50.0)	6 (60.0)
Non- fusion	26 (100.0)	26 (100.0)	20 (76.9)	10 (50.0)	4 (40.0)
Total	26 (100.0)	26 (100.0)	26 (100.0)	20 (100.0)	10 (100.0)

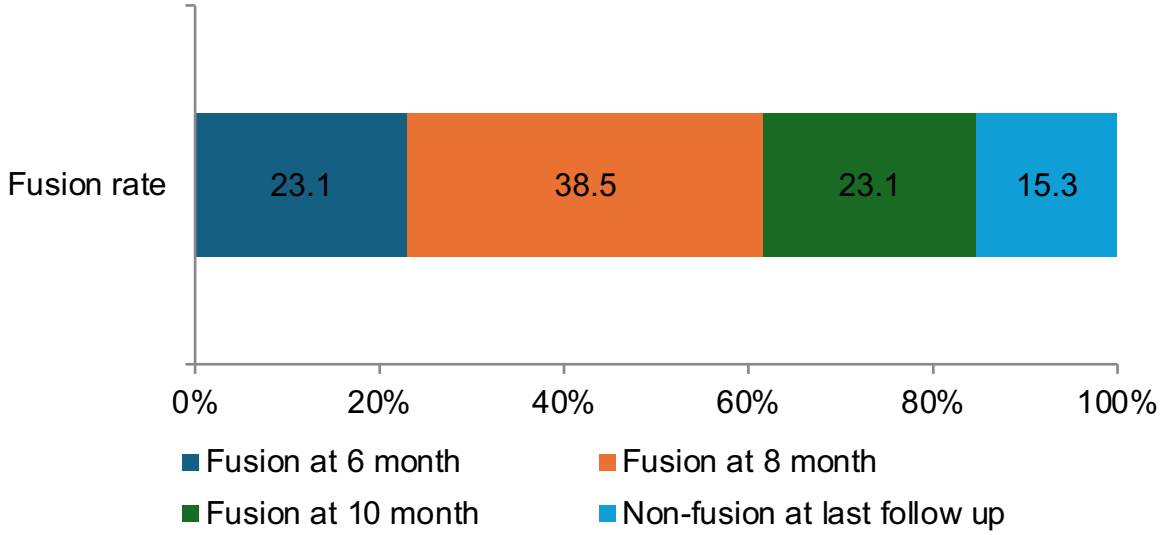
- No patients achieved fusion within the first four months postoperatively.
- Fusion in 6 participants in sixth month, another 10 participants in 8th months and another 6 participants in last follow up of 10th month.
- Four patients (15.4%) demonstrated incomplete fusion at final follow-up.
- Mean fusion time in all participants is 8±1.5 months.

Results (Cont)

Table 2 No of fused participants (Fusion rate)

No. of fused participant	2mths n (%)	4mths n (%)	6mths n (%)	8mths n (%)	10mths n (%)
No. in each month	0 (0.0)	0 (0.0)	6 (23.1)	10 (38.5)	6 (15.3)
Total no.	0 (0.0)	0 (0.0)	6 (23.1)	16(61.5)`	22(84.6)

- 23.1% fused in 6th month,
- Another 38.5% fused between 6th and 8th months,
- Another 15.3% fused between 8th and 10th months.
- A total of 22 out of 26 participants fused by the 10th month.
- Four patients (15.4%) demonstrated incomplete fusion at final follow-up
- Thus, the fusion rate is 84.6% at the last follow-up of tenth month.



Distribution of fused participants with regards to follow-up months

Results (Cont)

Table 3 Comparison of change in mean parameter based on fusion

Change in mean Parameters	patients with fusion (n=22)	patients without fusion (n=4)		*P value
	Mean±SD	Mean±SD	Difference	
Δ SL	8.1±3.8	7.8±3.2	0.3	0.811
Δ CL	9.0±5.3	7.8±5.5	1.2	0.918
Δ SVA	-2.5±5.8	-4.5±0.8	2.0	0.918
Δ T1S	4.1±3.9	5.0±1.2	-0.9	0.515
Δ T1S-CL	-5.0±6.4	-2.7±6.6	-2.3	0.607
Δ mJOA	7.0±3.1	3.5±0.5	3.5	0.032
Δ NDI	-13.7±20.1	-43.0±5.7	29.3	0.032
Δ VASNP	-1.3±3.0	-7.5±0.5	6.2	0.004
Δ VASRP	-4.0±3.1	-6.5±0.5	2.5	0.112

- The mean change in alignment and clinical parameters was compared between fusion and non-fusion patients but there is no significant difference was detected.
- Despite differences in fusion status, both the fused and incompletely fused groups showed significant improvements in neurologic al function, pain, and disability scores as well as distortion of sagittal alignment.
- P values were calculated by **the Mann-Whitney U test.**

Discussion

- Fusion after ACDF was evaluated using the interspinous distance difference on dynamic lateral radiographs.
- Fusion was achieved in 23.1% of patients by six months, and the overall fusion rate reached 84.6% at ten months, with a mean fusion time of 8 ± 1.5 months.
- This result was comparable, though slightly lower, than previous studies reporting fusion rates of 88–90%. The lower fusion rate may be related to shorter follow-up, patient-based analysis, and incomplete fusion at lower operated level in some cases.
- Variations in fusion assessment methods between studies may also explain the differen ces in reported rates. The interspinous distance method was chosen because it reflects segmental stability, which correlates well with clinical outcome.

Conclusion

- Two-level ACDF using autologous iliac crest graft and anterior cervical plating provides a high fusion rate with acceptable fusion time and favorable outcomes.
- Clinical improvement was observed irrespective of fusion status within the short- term follow-up period, suggesting that early neurological and functional recovery may not be solely dependent on radiographic fusion.
- Nevertheless, the achieved fusion rate supports the continued use of autograft and plating as a reliable strategy for enhancing stability and fusion in two-level degenerative cervical disc disease.
- Longer follow-up and larger studies are recommended further to clarify the long- term clinical impact of fusion status.

Thank You

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