

Long-Term Results of Anterior Cervical Discectomy in Relieving Neck Pain

Dr. Firas Jebbar¹, Dr. Dhafer Faisal Iawajah², Dr. Abdulqadder Nabil Mohammed³, and Dr. Ali Qais Abdulkafi⁴

¹M.B.Ch.B., F.B.B.M.S. \ (Neurosurgery), Iraqi Ministry of Health, Baghuba Health Department, Baghuba Teaching Hospital, Baghuba, Iraq

²M.B.Ch.B., C.A.B.N.S. \ (Neurosurgery), Iraqi Ministry of Defense, Baghdad, Al Hussein Military Hospital, Baghdad, Iraq

³M.B.Ch.B., F.I.B.M.S., F.W.F.N.S. \ (Neurosurgery), Iraqi Ministry of Health, Baghuba Health Department, Baghuba Teaching Hospital, Neurosurgery Unit, Baghuba, Iraq

⁴M.B.Ch.B., D.C.H. (Pediatrics), Iraqi Ministry of Health, Kirkuk Health Department, Kirkuk Teaching Hospital, Kirkuk, Iraq

Abstract: This study aimed to assess long-term outcomes of anterior cervical discectomy related to relieving Neck Pain were. Anterior cervical discectomy and fusion is a type of surgery that is performed to treat disc problems in the cervical region. In this study, we collected 117 patients who underwent anterior cervical discectomy were included in this study. The surgical data was segregated into two groups: the initial group of 60 patients underwent cervical intervertebral fusion, whereas the second group of 57 patients received the Cloward procedure. The study subjected patients to an extensive evaluation of pain severity and neck disability prior to and after surgery. The study was carried out over three distinct timeframes: 6 months, one year, and six years post-surgery. Pain and disability levels recorded in the neck, back, and head regions were measured after the surge via the Visual Analogue Scale (VAS). The clinical findings indicated a higher incidence of neck pain in men, with 67 male patients versus 50 female patients. The demographic results obtained revealed a fusion rate of 72.65% among the subjects, with a non-fusion rate of 27.35%. Our study evaluated pain scores and neck disability in patients who underwent cervical intervertebral fusion surgery. We found a significant improvement in neck pain scores post-surgery. Prior to the procedure, patients reported a pain score of 82, which reduced to 30 after six months, 41 after one year, and 20 after six years. The typical length of hospital stay ranged between two to three days, and all patients were monitored for two years following the surgery. Postoperative complications were observed, with the cervical intervertebral fusion group reporting complications in 12 patients and the Cloward procedure group in 16 patients. Finally, we conclude. This study demonstrated considerable enhancements in pain and disability rates in cervical intervertebral fusion patients after long-term surgery compared to those who underwent the Cloward procedure at the two-year follow-up.

Keywords: cervical intervertebral fusion; Cloward procedure; Neck pain; and Neck disability.

INTRODUCTION

Anterior cervical discectomy and fusion (ACDF) is a prevalent surgical procedure for the decompression of the neural elements in the cervical spine affected by various diseases, including degenerative conditions, trauma, and tumours. Robinson and Smith initially described this technique in 1955 [Verhagen, A. P. *et al.*, 2013; Vavruch, L. *et al.*, 2002; Jacobs, W. *et al.*, 2011]. Successful acclimatisation of bone fusion is imperative to achieve desirable results in DFCA. The success of fusion relies on systemic factors, surgical techniques employed, and the form of plate and grafts applied.

DFCA exhibits a low rate of pseudarthrosis, according to medical literature. Fusion is achieved in 83-97% of cases when autografts are used and in 82-94% when allografts are used [Faldini, C. *et al.*, 2010; Noriega, D. C. *et al.*, 2013].

Anterior cervical discectomy and fusion (ACDF) and cervical disc replacement (CDR) have emerged as highly effective treatments for

individuals suffering from chronic neck pain. Numerous studies have unequivocally demonstrated that both ACDF and CDR result in remarkable enhancements in pain relief, functional capabilities, patient satisfaction, and overall clinical success [Burkhardt, B. W. *et al.*, 2013]. In particular, ACDF has been proven to be highly beneficial for individuals experiencing neck pain that surpasses arm pain. It is worth noting that CDR has exhibited comparable effectiveness in alleviating neck pain and disability in these patients [Buttermann, G. R. *et al.*, 2018; Hermansen, A. *et al.*, 2018; Peolsson, A. *et al.*, 2011].

The long-term follow-up studies conducted on ACDF patients have consistently reported favorable clinical outcomes and stable radiological results. Crucially, these studies have debunked any concerns regarding an acceleration of disc degeneration following the procedure [Faldini, C. *et al.*, 2010]. Moreover, patients undergoing both 3- and 4-level ACDF have witnessed significant

clinical improvement, with no significant disparities between the two groups [Hermansen, A. et al., 2013; Hermansen, A. M. et al., 2014]. This implies that regardless of the number of levels involved, anterior cervical discectomy can yield long-lasting relief for individuals grappling with chronic neck pain.

The fusion rate decreases as the number of levels increases. This is due to the elevated contact stresses at the graft-vertebral body interface that often leads to micromovement.

With allograft, the pseudarthrosis rate for 2-level DFCA is 63%, whereas for autograft, it is 17-23.5%. In 3-level DFCA, the incidence of pseudarthrosis is further raised to 37-70%. [Gore, D. R. et al., 1998; Hilibrand, A. S. et al., 1999] through previous study proved Anterior cervical discectomy has been shown to improve neck pain in the long term. Studies have demonstrated significant improvement in pain scores, function, and patient satisfaction after anterior cervical discectomy and fusion (ACDF) [Matsumoto, M. et al., 2010; Cloward, R. B. et al., 1958] or total disc replacement (TDR) procedures where Patients with mild to moderate neck disability (Neck Disability Index <50) who underwent ACDF showed significant improvement in neck pain, arm pain, physical function, and neck disability at all time points, except for SF-12 PCS and Patient-Reported Outcome Measurement Information System-Physical Function at six weeks and according to retrospective cohort study comparing ACDF with polymethylmethacrylate (PMMA) spacer, cage, or no spacer showed no statistically significant differences in long-term clinical outcomes, complication rates, or reoperation rates [Smith, G. W. et al., 1958; Carlsson, A. M. et al., 1983; Kosinski, M. et al., 2003]

METHODS

Study design

In our cross-sectional study, we explored the long-term outcomes associated with anterior cervical discectomy surgery in alleviating neck pain in patients aged between 26 and 64 years. We presented clinically relevant demographic data, including patients' age, sex, symptomology, fusion status, and occupational status, along with identified surgical procedures.

A total of 117 patients who underwent anterior cervical discectomy were enrolled in our study. Our surgical data was divided into two groups: the first group, comprising 60 patients, underwent

cervical intervertebral fusion, while the second group of 57 patients underwent the Cloward procedure and. We conducted a comprehensive evaluation to assess the extent of pain and neck disability that patients experienced both before and after their surgical procedures. This investigation encompassed three specific time periods: 6 months, one year, and six years following the surgery. To measure the levels of pain in the neck, back, and head regions, we utilized the Visual Analogue Scale (VAS).

Our study encompassed patient data both during and following surgery, which was performed under either general or local anesthesia. We also documented the duration of the surgical procedure, the length of hospital stays, and the details of follow-up appointments. A comparative analysis was conducted between the two groups to evaluate any postoperative complications. Patients were closely monitored for two years post-surgery, typically following a hospital stay of two to three days.

The study identified long-term outcomes for neck pain relief, which encompassed daily neck discomfort, arm pain, headaches, pain relief, daily hand weakness, and neck problems persisting over the last six months. The post-operative results revealed the proportion of patients who experienced physical functionality issues following anterior cervical discectomy for neck pain relief. We determined this based on four criteria: active cervical range of motion, handgrip strength, neck muscle endurance, and both static and dynamic balance.

Data collection

The study assessed the level of neck pain and disability in patients who had undergone two different surgical procedures. A total of 117 participants were recruited and divided into two groups, with one undergoing the Cloward procedure and the other undergoing cervical spinal fusion. Data was collected from different hospitals in Iraq over a period from April 2022 to October 2023.

Statistical analysis

Demographic data was analysed for the surgical outcomes of anterior cervical discectomy. Neck pain and disability improvements from baseline were assessed using the neck pain and disability score on the VAS and NDI scales over three time periods (6 months, one year, and six years), with scores ranging from 100 (worst) to 0 (no pain).

The analysis takes into account a p-value of <0.05.
The surgical data for patient outcomes was

modelled and analysed using the SPSS program
version 22.0.

RESULTS

Table 1: Clinical demographic characteristics of patients with anterior Cervical Discectomy

Characteristics	Number of patients [117]	[%]
Age		
< 40	36	30.77%
> 40	81	69.23%
Sex		
Females	50	42.74%
Males	67	57.26%
Symptoms		
Stiff neck	35	29.91%
Sharp pain	24	20.51%
Pain when moving	21	17.95%
Radiating pain	19	16.24%
Headache	18	15.38%
Fusion status		
Fusion	85	72.65%
Non-fusion	32	27.35%
Education status		
Primary	30	25.64%
Secondary	40	34.19%
College	47	40.17%
Work status		
Physical strain	30	25.64%
Poor posture	32	27.35%
Osteoarthritis	20	17.09%
A flare-up of cervical spondylosis	12	10.26%
Sleeping awkwardly	17	14.53%
An accident which can cause whiplash	6	5.13%
Surgical procedure		
Cloward procedure	47	40.17%
Cervical intervertebral fusion	70	59.83%

Table 2: Assessment of pain score by VAS in terms of neck, back, and head

Items	Cervical Intervertebral Fusion Group	Cloward procedure Group	P-value
Neck	8.2 ± 0.8	8.84 ± 0.6	0.748
Head	7.31 ± 0.55	7.71 ± 1.22	0.528
Back	6.82 ± 1.48	7.01 ± 1.21	0.946

Table 3: Intraoperative and postoperative outcomes

Outcomes	Cervical intervertebral fusion [60]	Cloward procedure [57]	P-value
Duration of surgery, hours [mean ± SD]	4.0 ± 0.3	4.6 ± 2.3	0.034
Type of anesthesia			
GA	45 [75%]	31 [51.67%]	< 0.001
LA	15 [25%]	26 [43.33%]	< 0.001
Hospitalization time, days	1.4 ± 0.6	2.3 ± 1.6	0.851
Follow-up	Two years	Two years	0.05

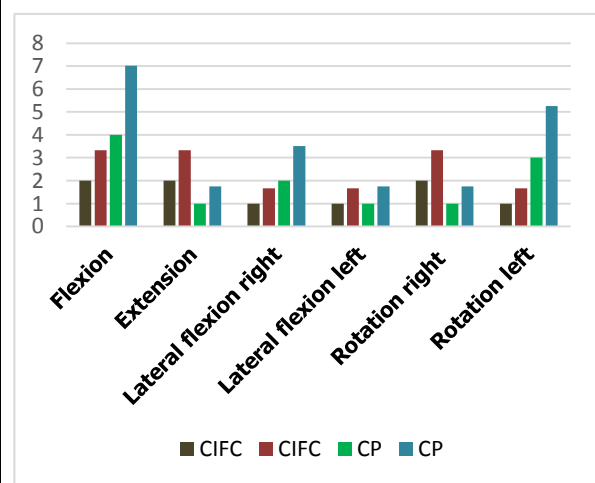
Table 4: Post-operative complications

Complications	Cervical intervertebral fusion [60]	Cloward procedure [57]	P-value
Infection	4 [6.67%]	6 [10.53%]	0.042
Nerve injury	1 [1.67%]	2 [3.51%]	0.0485
Swallowing difficulties	3 [5%]	3 [5.26%]	0.05
Spinal fluid leak	2 [3.33%]	3 [5.26%]	0.0483
Hematoma	2 [3.33%]	2 [3.51%]	0.0497
Total	12 [20%]	16 [28.7%]	0.0451

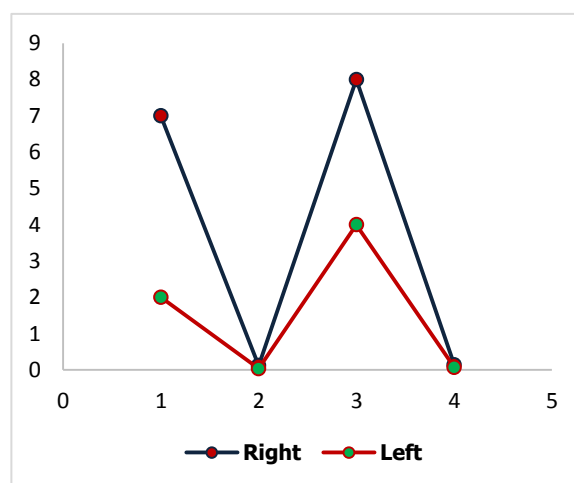
Table 5: Determine long-term patient outcomes of relieving Neck Pain

Variables	Cervical intervertebral fusion [60]	Cloward procedure [57]	P-value
Daily neck problems			0.0881
Yes	1 [1.67%]	3 [5.26%]	
No	59 [98.33%]	54 [94.74%]	
Daily arm pain			0.561
Yes	2 [3.33%]	4 [7.02%]	
No	58 [96.67%]	53 [92.98%]	
Daily headache			0.106
Yes	3 [5%]	6 [10.53%]	
No	57 [95%]	51 [89.47%]	
Pain medication			0.914
Yes	3 [5%]	4 [7.02%]	
No	57 [95%]	53 [92.98%]	
Daily hand weakness			0.034
Yes	2 [3.33%]	2 [3.51%]	
No	58 [96.67%]	55 [96.49%]	
Neck problems last six months			0.863
Yes	2 [3.33%]	4 [7.02%]	
No	58 [96.67%]	53 [92.98%]	

A. CAROM



B. Hand-grip strength



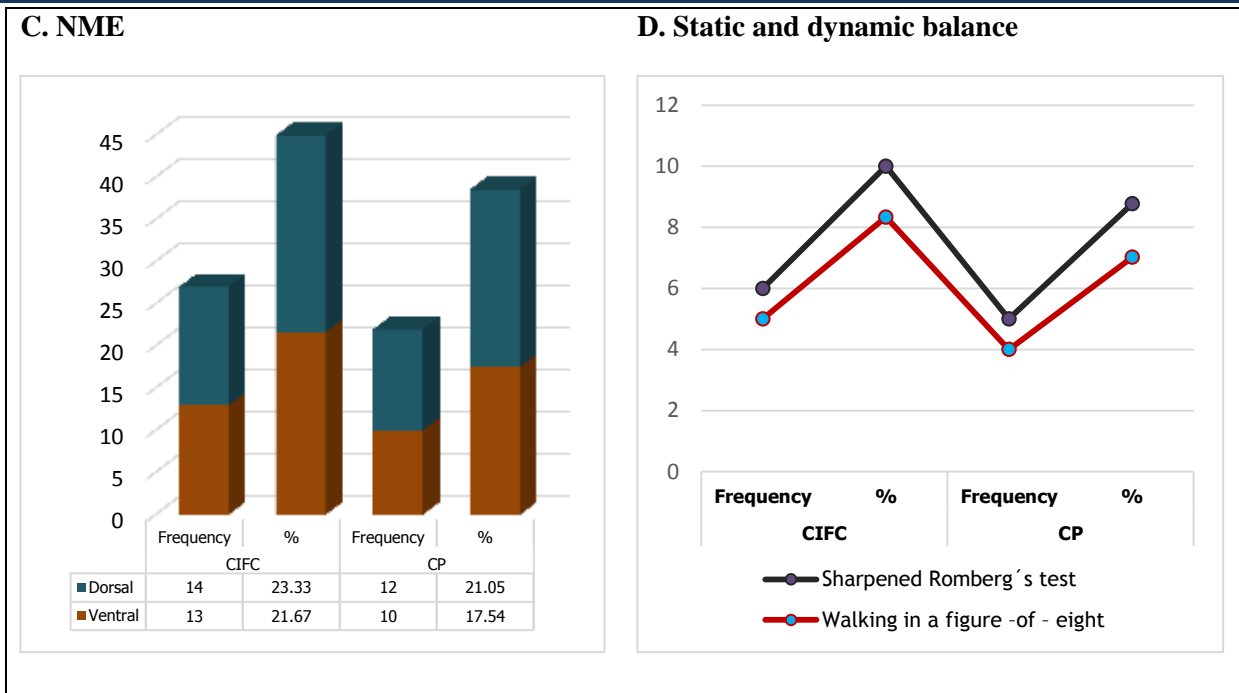
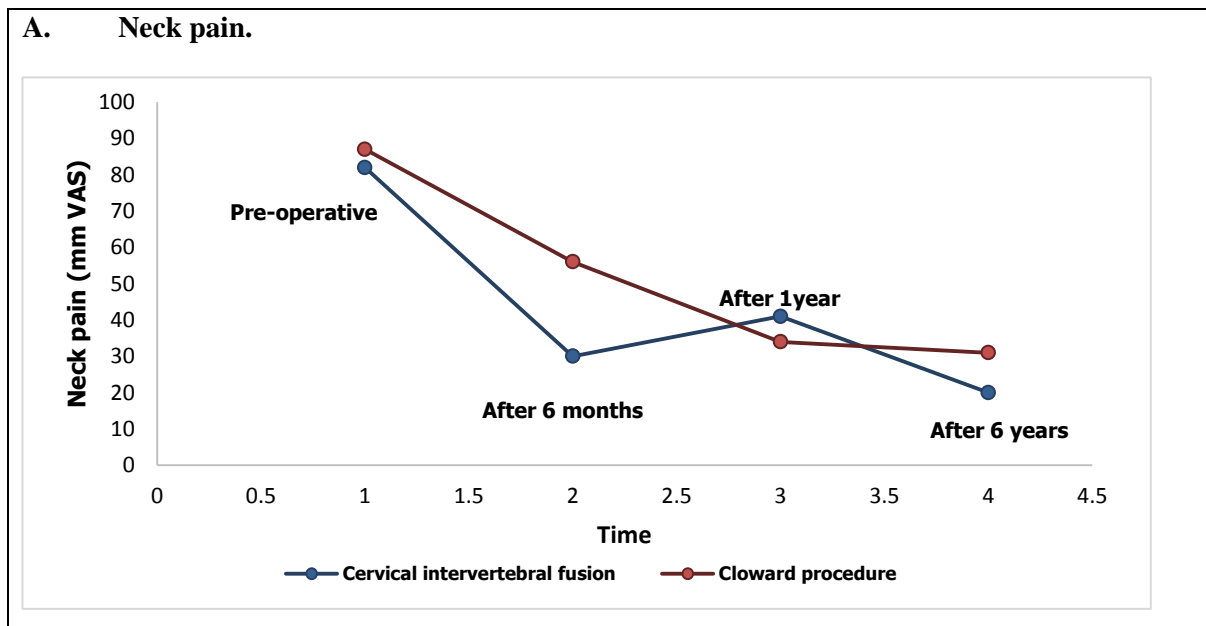


Figure 1: Identify patients' rate with problems in physical function after anterior Cervical Discectomy in Relieving Neck Pain.



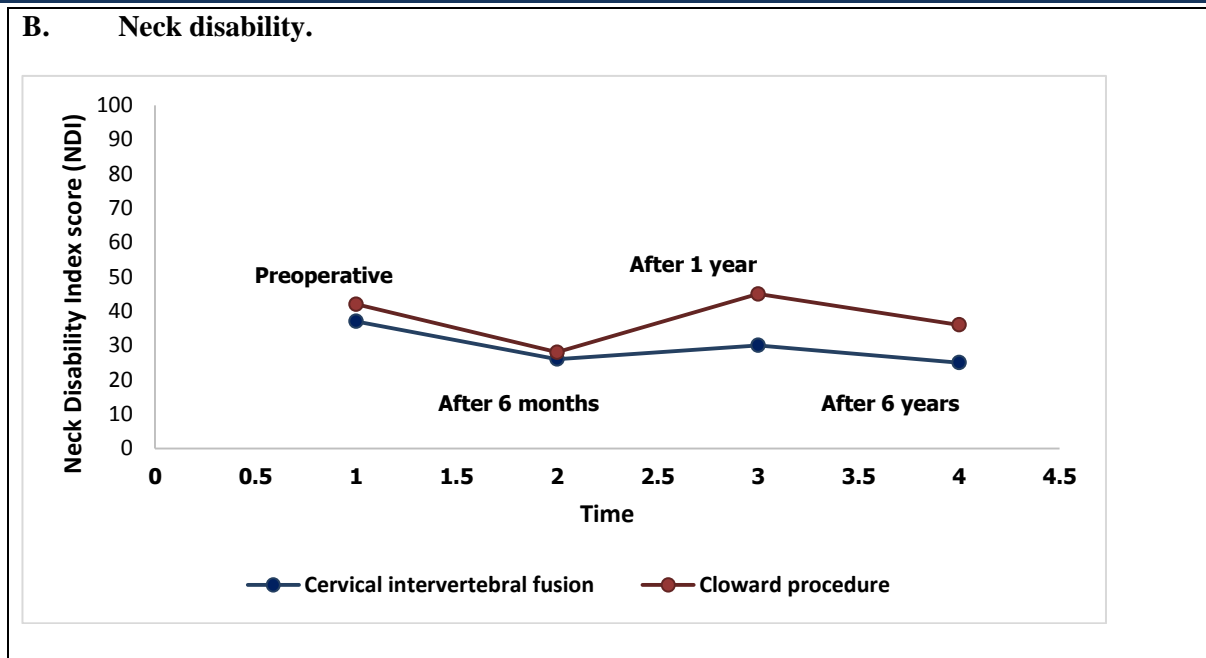


Figure 2: Assessment pain score of patients after surgery by VAS scale in terms of a) neck pain and b) neck disability.

DISCUSSION

The study under consideration was conducted with 117 patients who were diagnosed with neck pain and subsequently underwent anterior cervical discectomy. The data yielded from the study depicted that patients above the age of 40 were affected at a 70% higher rate in comparison to their counterparts who were below the age of 40. In addition to this, the clinical data revealed a higher prevalence of neck pain in males, with 67 male patients as compared to 50 female patients.

The diagnostic results highlighted that the most persistent symptom was neck stiffness, which was noted in 35 patients, followed by severe pain, which was experienced by 24 patients. The demographic data collected during the study illustrated a prevalence rate of fusion of 72.65% among the patients, while the rate among the non-fusion patients was recorded as 27.35%.

The severity of pain experienced by patients prior to surgery was also documented, with the highest pain levels reported in both groups being between 8 and 9 on the Visual Analogue Scale (VAS), followed by the head and the back, both scoring between 7 and 8 on the VAS.

The surgical data incorporated the records of 70 patients who underwent cervical intervertebral fusion surgery, which was the most common procedure, while the remaining 47 patients underwent the Cloward procedure. The average duration of the surgeries was observed to be

between 4 and 5 hours, with a majority of the patients from both groups, 45 patients from the cervical intervertebral fusion group and 31 patients from the Cloward procedure group undergoing the procedures under general anesthesia. The typical hospital stay ranged from two to three days, and all patients were followed up for a period of two years post-surgery.

The postoperative complications were also noted, with the cervical intervertebral fusion group recording complications in 12 patients and the Cloward procedure group in 16 patients. The most common complications were infections and difficulties in swallowing. A long-term evaluation of the surgical and pathological improvements in patients revealed significant improvements in patients who underwent cervical intervertebral fusion surgery in comparison to those who underwent the Cloward procedure.

The most prominent factors in these improvements were daily neck problems, with one case reported, daily arm pain, with two cases, and neck problems in the last six months, with only two cases. A comparison of the postoperative results between the two groups showed differences in flexion, grip strength of the right hand, endurance of the neck and dorsal muscles, and static and dynamic balance, as measured by the Sharpened Romberg's test. To further of outcomes, our findings assessed pain score and neck disability, which found improvements in pain score of neck pain after surgery for patients undergoing cervical

intervertebral fusion surgery where the preoperative pain score of patients was 82, after six months, was 30 after one year was 41 after six years was 20.

Extensive research underscores the efficacy of both the Cloward method and the Cervical intervertebral fusion procedure as paramount techniques for the alleviation and management of neck pain. These studies indicate profound long-term positive outcomes, not only in pain reduction but also in the enhancement of the physical and functional capacities of patients. [Kosinski, M. *et al.*, 2013]

An analysis of the anterior cervical discectomy surgery revealed substantial variances and characteristic modifications. An interesting observation was the superior efficacy of general anesthesia over local anesthesia during the procedure. The primary reason for this was attributed to the exceptional capability of general anesthesia to maintain stable blood circulation throughout the surgical process. [Reid, S. A. *et al.*, 2015]

Conversely, local anesthesia was found to have its own set of benefits. Despite its lesser effectiveness in preserving blood circulation stability during surgery, it resulted in a higher degree of patient satisfaction. Furthermore, the use of local anesthesia was associated with a reduction in postoperative nausea and vomiting, demonstrating a notable advantage over general anesthesia. [Jacobson, G. P. *et al.*, 1990; Jacobson, G. P. *et al.*, 1990]

A separate investigation conducted in New Zealand identified smoking, gender, and comorbidities as the principal determinants influencing patients' long-term quality of life [Kammerlind, A-S. *et al.*, 2005]. However, the study concluded that neither the Cloward method nor the Cervical intervertebral fusion procedure exhibited a definitive superiority in terms of enhancing patients' pain and disability levels or decreasing postoperative complications during long-term follow-up. [Cherkin, D. C. *et al.*, 1996]

CONCLUSION

The study undertaken has conclusively identified a notable enhancement and influence in mitigating the intensity of neck discomfort, with a marginally greater focus on disability post-surgery. The investigation further revealed that a specific technique exerts a positive impact on long-term Anterior Cervical Discectomy and Fusion (ACDF)

results for males in comparison to females. Nevertheless, some patients experienced accompanying disability and discomfort, potentially influencing their overall quality of life after extended periods of follow-up. The study demonstrated significant advancements in pain reduction and disability rates for patients who underwent Cervical Intervertebral Fusion compared to their counterparts who underwent the Cloward procedure, with a follow-up duration of two years. However, it is critical to note that the study corroborated the lack of significant association between patients in the combination groups and the optimal technique across both types of surgical procedures in terms of ameliorating pain intensity, disability, and their long-term quality of life.

REFERENCES

1. Verhagen, A. P., van Middelkoop, M., Rubinstein, S. M., Ostelo, R., Jacobs, W. and Peul, W, *et al.* "Effect of various kinds of cervical spinal surgery on clinical outcomes." *Pain*, 154.12 (2013): 2388–2396.
2. Vavruch, L., Hedlund, R., Javid, D., Leszniewski, W. and Shalabi, A. "A prospective randomized comparison between the Cloward procedure and a carbon fiber cage in the cervical spine: a clinical and radiologic study." *Spine (Phila Pa 1976)*, 27.16 (2002): 1694–1701.
3. Jacobs, W., Willems, P. C., van Limbeek, J., Bartels, R., Pavlov, P. and Anderson, P. G, *et al.* "Single or double-level anterior interbody fusion techniques for cervical degenerative disc disease." *Cochrane Database Syst Rev*, 4 (2011): CD004958.
4. Faldini, C., Leonetti, D., Nanni, M., Di Martino, A., Denaro, L. and Denaro, V, *et al.* "Cervical disc herniation and cervical spondylosis surgically treated by Cloward procedure: a 10-year-minimum follow-up study." *J Orthop Traumatol*, 11.2 (2010): 99–103.
5. Noriega, D. C., Kreuger, A., Brotat, M., Ardura, F., Hernandez, R. and Munoz, M. F, *et al.* "Long-term outcome of the Cloward procedure for single-level cervical degenerative spondylosis: Clinical and radiological assessment after a 22-year mean follow-up." *Acta Neurochir (Wien)*, 155.12 (2013): 2339–2344.
6. Burkhardt, B. W., Brielmaier, M., Schwerdtfeger, K. and Oertel, J. M. "Clinical outcome following anterior cervical

- discectomy and fusion with and without anterior cervical plating for the treatment of cervical disc herniation—a 25-year follow-up study." *Neurosurg Rev*, 41.2 (2018): 473–482.
7. Buttermann, G. R. "Anterior cervical discectomy and Fusion Outcomes over ten years: a prospective study." *Spine (Phila Pa 1976)*, 43.4 (2018): 207–214.
 8. Hermansen, A., Hedlund, R., Vavruch, L. and Peolsson, A. "A comparison between the carbon fiber cage and the Cloward procedure in cervical spine surgery: a ten- to thirteen-year follow-up of a prospective randomized study." *Spine (Phila Pa 1976)*, 36.12 (2011): 919–925.
 9. Peolsson, A., Vavruch, L. and Öberg, B. "Disability after Anterior Decompression and Fusion for Cervical Disc Disease." *Adv Physiotherapy*, 4.3 (2002): 111–124.
 10. Hermansen, A., Hedlund, R., Vavruch, L. and Peolsson, A. "Positive predictive factors and subgroup analysis of clinically relevant improvement after anterior cervical decompression and fusion for cervical disc disease: a 10- to 13-year follow-up of a prospective randomized study." *J Neurosurg Spine*, 19.4 (2013): 403–411.
 11. Hermansen, A. M., Cleland, J. A., Kammerlind, A. S. and Peolsson, A. L. "Evaluation of physical function in individuals 11 to 14 years after anterior cervical decompression and fusion surgery—a comparison between patients and healthy reference samples and between 2 surgical techniques." *J Manipulative Physiol Ther*, 37.2 (2014): 87–96.
 12. Gore, D. R. and Sopic, S. B. "Anterior discectomy and fusion for painful cervical disc disease: A report of 50 patients with an average follow-up of 21 years." *Spine (Phila Pa 1976)*, 23.18 (1998): 2047–2051.
 13. Hilibrand, A. S., Carlson, G. D., Palumbo, M. A., Jones, P. K. and Bohlman, H. H. "Radiculopathy and myelopathy at segments adjacent to the site of a previous anterior cervical arthrodesis." *J Bone Joint Surg Am*, 81.4 (1999): 519–528.
 14. Matsumoto, M., Okada, E., Ichihara, D., Watanabe, K., Chiba, K. and Toyama, Y., *et al.* "Anterior cervical decompression and fusion accelerates adjacent segment degeneration: Comparison with asymptomatic volunteers in a ten-year magnetic resonance imaging follow-up study." *Spine (Phila Pa 1976)*, 35.1 (2010): 36–43.
 15. Cloward, R. B. "The anterior approach for removal of ruptured cervical disks." *J Neurosurg*, 15.6 (1958): 602–617.
 16. Smith, G. W. and Robinson, R. A. "The treatment of certain cervical-spine disorders by anterior removal of the intervertebral disc and interbody fusion." *J Bone Joint Surg Am*, 40-A (1958): 607–624.
 17. Carlsson, A. M. "Assessment of chronic pain. I. Aspects of the reliability and validity of the visual analogue scale." *Pain*, 16.1 (1983): 87–101.
 18. Kosinski, M., Bayliss, M. S., Bjorner, J. B., Ware, J. E. Jr., Garber, W. H. and Batenhorst, A., *et al.* "A six-item short-form survey for measuring headache impact: the HIT-6." *Qual life research: Int J Qual life aspects Treat care rehabilitation*, 12.8 (2003): 963–974.
 19. Reid, S. A., Callister, R., Snodgrass, S. J., Katekar, M. G. and Rivett, D. A. "Manual therapy for cervicogenic dizziness: long-term outcomes of a randomised trial." *Man Ther*, 20.1 (2015): 148–156.
 20. Jacobson, G. P. and Newman, C. W. "The development of the Dizziness Handicap Inventory." *Arch Otolaryngol Head Neck Surg*, 116.4 (1990): 424–427.
 21. Jacobson, G. P. & Newman, C. W. "The development of the Dizziness Handicap Inventory." *Arch Otolaryngol Head Neck Surg*, 116.4 (1990): 424–7.
 22. Kammerlind, A-S., Bergquist Larsson, P., Ledin, T. & Skargren, E. "Reliability of clinical balance tests and subjective ratings in dizziness and disequilibrium." *Adv Physiotherapy*, 7 (2005): 96–107.
 23. Cherkin, D. C., Deyo, R. A., Street, J. H. & Barlow, W. "Predicting poor outcomes for back pain seen in primary care using patients' own criteria." *Spine (Phila Pa 1976)*, 21 (1996): 2900–7.

Source of support: Nil;

Conflict of interest: Nil.

Cite this article as:

Jebbar, F., Iawajah, D.F., Mohammed, A.N. and Abdulkafi, A.Q. "Long-Term Results of Anterior Cervical Discectomy in Relieving Neck Pain." *Sarcouncil Journal of Medical Series* 2.11 (2023): pp 1-8.