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POSTOPERATIVE FUNCTIONAL EVALUATION OF ACDF VERSUS PCDF IN DCM: A SYSTEMATIC REVIEW AND META-ANALYSIS

AVALIAÇÃO FUNCIONAL PÓS OPERATÓRIA DA ACDF VERSUS PCDF EM MCD: UMA REVISÃO SISTEMÁTICA E META-ANÁLISE

EVALUACIÓN FUNCIONAL POSTOPERATORIA DE LA ACDF VERSUS PCDF EN MCD: UNA REVISIÓN SISTEMÁTICA Y METANÁLISIS

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ABSTRACT

This study aimed to evaluate the functional improvement of the neck when comparing anterior cervical decompression techniques with fusion and posterior decompression techniques with fusion. The review followed PRISMA guidelines and included a comprehensive search of PubMed, Scopus, EMBASE, Web of Science, LILACS, and gray literature databases. Intervention studies (randomized and non-randomized clinical trials) reporting postoperative functional assessment using the Neck Disability Index (NDI) in patients with degenerative cervical myelopathy undergoing one of two surgical approaches were selected. The risk of bias was assessed using the Cochrane Risk of Bias 2.0 (ROB 2.0) tools for randomized clinical trials and ROBINS-I for non-randomized studies. The meta-analysis was carried out to assess the functional improvement associated with each technique. Of the 1,311 studies identified, four met the eligibility criteria and were included in the qualitative and quantitative analysis, totaling 542 patients. Of these, 292 (53.9%) underwent the anterior surgical approach and 250 (46.1%) the posterior approach. After one year's follow-up, approximately 96% of patients who underwent the anterior approach had a reduction in NDI from 35.75±6.02 to 16.56±4.96, while around 93% of patients who underwent the posterior approach had an improvement from 35.70±6.10 to 20.25±8.13. The meta-analysis found no statistically significant difference between the approaches in terms of postoperative functional improvement ($p = 0.47$). The findings of this study suggest that both techniques provide similar functional benefits, with a tendency towards faster recovery in the former approach, as evidenced by a more marked reduction in NDI and VAS in this group. ***Level of Evidence II; Systematic Review of Level II or Level I studies with heterogeneous results.***

Keywords: Myelopathy; Discectomy; Laminectomy.

RESUMO

Este estudo teve como objetivo avaliar a melhora funcional do pescoço ao comparar as técnicas de descompressão cervical anterior com fusão e descompressão posterior com fusão. A revisão seguiu as diretrizes PRISMA e incluiu uma pesquisa abrangente nas bases de dados PubMed, Scopus, EMBASE, Web of Science, LILACS e literatura cinzenta. Foram selecionados estudos de intervenção (ensaios clínicos randomizados e não randomizados) que reportassem a avaliação funcional pós-operatória por meio do Neck Disability Index (NDI) em pacientes com mielopatia cervical degenerativa submetidos a uma das duas abordagens cirúrgicas. O risco de viés foi avaliado por meio das ferramentas Cochrane Risk of Bias 2.0 (ROB 2.0) para ensaios clínicos randomizados e ROBINS-I para estudos não randomizados. A meta-análise foi realizada para avaliar a melhora funcional associada a cada técnica. Dentre os 1.311 estudos identificados, quatro atenderam aos critérios de elegibilidade e foram incluídos na análise qualitativa e quantitativa, totalizando 542 pacientes. Destes, 292 (53,9%) foram submetidos à abordagem cirúrgica anterior e 250 (46,1%) à abordagem posterior. Após um ano de seguimento, aproximadamente 96% dos pacientes que realizaram a abordagem anterior apresentaram uma redução no NDI de 35,75±6,02 para 16,56±4,96, enquanto cerca de 93% dos pacientes submetidos à abordagem posterior tiveram uma melhora de 35,70±6,10 para 20,25±8,13. A meta-análise não identificou diferença estatisticamente significativa entre as abordagens em relação à melhora funcional pós-operatória ($p = 0,47$). Os achados deste estudo sugerem que ambas as técnicas proporcionam benefícios funcionais semelhantes, com uma tendência de recuperação mais rápida na abordagem anterior, conforme evidenciado por uma redução mais acentuada no NDI e na EVA nesse grupo. ***Nível de Evidência II; Revisão Sistemática de Estudos de Nível II ou Nível I com Resultados Heterogêneos.***

Descritores: *Mielopatia; Discectomia; Laminectomia.*

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RESUMEN

El objetivo de este estudio fue evaluar la mejoría funcional del cuello al comparar la descompresión cervical anterior con fusión y la descompresión cervical posterior con fusión. La revisión siguió las directrices PRISMA e incluyó una búsqueda exhaustiva en las bases de datos PubMed, Scopus, EMBASE, Web of Science, LILACS y de literatura gris. Se seleccionaron los estudios de intervención (ensayos clínicos aleatorios y no aleatorios) que informaron sobre la evaluación funcional postoperatoria mediante el Neck Disability Index (NDI) en pacientes con mielopatía cervical degenerativa sometidos a uno de dos abordajes quirúrgicos. El riesgo de sesgo se evaluó mediante la herramienta Cochrane Risk of Bias 2.0 (ROB 2.0) para los ensayos clínicos aleatorios y ROBINS-I para los estudios no aleatorios. El metaanálisis se realizó para evaluar la mejoría funcional asociada a cada técnica. De los 1.311 estudios identificados, cuatro cumplieron los criterios de elegibilidad y se incluyeron en el análisis cualitativo y cuantitativo, con un total de 542 pacientes. De ellos, 292 (53,9%) se sometieron al abordaje quirúrgico anterior y 250 (46,1%) al posterior. Tras un año de seguimiento, aproximadamente el 96% de los pacientes sometidos al abordaje anterior presentaron una reducción del NDI de 35,75±6,02 a 16,56±4,96, mientras que alrededor del 93% de los pacientes sometidos al abordaje posterior presentaron una mejoría de 35,70±6,10 a 20,25±8,13. El metaanálisis no halló diferencias estadísticamente significativas entre los abordajes en cuanto a la mejoría funcional postoperatoria (p = 0,47). Los hallazgos de este estudio sugieren que ambas técnicas proporcionan beneficios funcionales similares, con una tendencia hacia una recuperación más rápida en el primer abordaje, como lo demuestra una reducción más marcada del NDI y en la EVA en este grupo. ***Nivel de Evidencia II; Revisión Sistemática de Estudios de Nivel II o Nivel I con Resultados Heterogéneos.***

Descriptores: *Mielopatía; Discectomía; Laminectomía.*

INTRODUCTION

Degenerative cervical myelopathy (DCM) is a frequent cause of pain and functional incapacity, significantly affecting the quality of life of patients.[1–3] Among the most common conditions are cervical disc hernias, spondylosis and vertebral canal stenosis, which can lead to medular or radicular compression.[1,4,5] When conservative treatment proves to be ineffective, surgical intervention becomes necessary to prevent progression and try to obtain functional improvement.[6–8] Among the main surgical modalities, cervical discectomy with anterior cervical discectomy and fusion (ACDF) and posterior decompression and arthrodesis, each with distinct indications and implications in functional rebuilding, are highlighted.[8]

ACDF is widely used in the treatment of disc hernias and focal stenosis, being carried out by anterior route with removal of the intervertebral disc and subsequent vertebral fusion.[9] This approach has the advantage of preserving the posterior muscle of the neck, promoting a faster functional recovery.[10,11] The lateral decompression, often indicated for multi-segmental stenosis and cervical myelopathy, involves removal of posterior bone structures and subsequent fusion, which can result in greater cervical stiffness and prolonged recovery due to extensive dissection of cervical muscles.[8,12,13]

Despite the proven effectiveness of these techniques in relieving compressive symptoms, their impacts on postoperative functionality continue to be the subject of debate.[8,9] Cervical functional incapacity after surgery can significantly impact the quality of life of patients as well as the rehabilitation process, making it essential to carry out a comparative assessment between the two approaches.[14,15] The use of standardized scales, such as the Neck Disability Index (NDI) and the Visual Analogue Scale (VAS) for pain assessment, provides an objective analysis of functional outcomes.[16–18]

The choice of the most appropriate procedure should consider not only neural decompression but also the biomechanical and functional impacts in the postoperative period.[9] Studies have shown that ACDF may be associated with a lower incidence of painful symptoms and faster recovery. In contrast, the subsequent approach may result in greater rigidity and a longer rehabilitation period.[8,9] Currently, with advancements in terms of minimally invasive techniques and the use of modern implants, surgical outcomes have been modified, influencing the functional recovery of patients.[19,20]

However, a knowledge gap remains regarding which surgical approach offers the best long-term preservation of cervical function. Thus, comparative studies are of paramount importance in guiding clinical practice as well as in optimizing rehabilitation protocols.

In view of the above, the aim of this study was to compare the functional outcome of the neck in post-operative post-cervical decompression and arthrodesis versus post-decompression and arthrodesis, through a systematic review and meta-analysis.

METHODS

This systematic review was conducted in accordance with PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines.[21]

Electronic surveys without publication date or in English, Portuguese, and Spanish languages were conducted in February 2025 in the following databases: MEDLINE via PubMed, Web of Science, Scopus, Embase, and Lilacs. Additionally, the grey literature was researched using Google Scholar and ProQuest. The research strategy is detailed in Table 1. Manual searches were also carried out through cross-references to the reference lists of the articles included to identify additional publications that may have gone unnoticed during the electronic searches. The recovered studies were imported into the Rayyan® reference manager,[22] where duplicate references were removed.

The acronym PICOS (Population, Intervention, Comparison, Outcomes, and Study Design) was adapted to guide the formulation of the systematic review question. The following criteria were defined: P: Patients of any age with degenerative cervical myelopathy undergoing surgery; I: Previous approach (discectomy and anterior cervical fusion with or without plaque and/or corpectomy and anterior cervical fusion); 1 to 4 levels; C: posterior approach (decompression and posterior arthrodesis and/or laminectomy with fusion); O: Relation and/or influence on postoperative pain and functional improvement of the neck by NDI or VAS; S: Intervention studies, type of clinical trial (randomized or non-randomized, with at least 10 patients. The exclusion criteria were as follows: (1) studies that have performed other types of surgery (non-fusion laminectomy, combined pre- and post-surgical surgery, hybrid procedures); (2) studies that have performed surgery for reasons other than degenerative myelopathy (trauma, infection, review surgery, tumors); (3) studies that have not evaluated NDI and/or VAS; (4) observational studies (cohort, case-control and transversal), reviews, case reports, protocols, brief communications, personal opinions, letters, briefings, book chapters and studies in animals, *in vitro* or *in vivo*; (5) studies in which the full text was not available; (6) studies with duplicate samples; and (7) studies with insufficient number of cases for meaningful analysis.

The selection process was carried out in two phases by two independent researchers. The first phase involved reading the titles and summaries of the studies selected in Rayyan®.[22] The studies that met all the inclusion criteria were passed to the second phase of the selection process by reviewing the full text and confirming the eligibility criteria. Disagreements were resolved first by discussion and then by consultation with a third author when necessary. The data was extracted by two reviewers and validated by the entire research team. The following key data were extracted, where available: study characteristics (author/year, country and

study design); population characteristics (sample size, gender, age and patients' conditions/comorbidities); DCM characteristics (time of pathology, extent, clinical aspect, symptomatology); NDI and VAS data (pre- and postoperative); statistical data and key outcomes/conclusions.

The methodological quality of the included studies was independently evaluated by two researchers using the Cochrane Risk of Bias tool for randomized trials (ROB 2.0).[23] The randomized trials were evaluated for "low risk of bias", "high risk of bias," or "some concerns" (no information or uncertainty about the potential bias). To evaluate the methodological quality of non-randomized individual comparative studies, Cochrane's tool for assessing the risk of submission in non-randomized intervention studies (ROBINS--I) was used,[24] Which classifies the studies as having "low risk of bias", "moderate risk of bias", "serious risk of bias", "critical risk of submission", or no information (uncertainty about potential submission). Disagreements were resolved by consensus between the two authors or by discussion with a third author

The collected data was organized in Microsoft Excel 2019 (Microsoft®) and, initially, a descriptive statistic of the studies included was carried out, presenting measures of central trend (average and standard deviation) for continuous variables, such as age, time of pathology, and NDI and VAS scores in pre- and postoperative. For categorical variables such as sex and the presence of comorbidities, the results were expressed in absolute frequencies and percentages.

In the second stage, a meta-analysis was performed to compare postoperative functional disability among patients undergoing ACDF and arthrodesis and subsequent cervical decompression with fusion. The software Review Manager 5.4 (RevMan 5.4, The Nordic Cochrane Centre) was used to generate forest plots. Presenting effect measurements with their respective confidence intervals of 95% (95% CI), adopting a level of significance of 5% ($p < 0.05$). Statistical heterogeneity between the studies was evaluated using the Cochran test (Q) and inconsistency index (I2). For cases where heterogeneity was low ($I2 < 50\%$), a fixed effect model was used. Already for moderate to high heterogeneity ($I2 \geq 50\%$), a model of random effects was applied to better address the variations between studies.

RESULTS

The searches identified 1,249 records in databases and 62 additional records obtained through other methods (52 from grey literature and 10 from the references of the included articles), totaling 1,311 studies. After the removal of duplicates, there were 757 references left. The initial sorting, which involved reviewing titles and summaries, was completed. After confirming the eligibility criteria and discussing the divergences, 76 studies were selected for full-text review. Of these, four studies fall under the study eligibility criteria.[25–28] The Cohen kappa statistic for agreement among reviewers in Phase 2 was 0.897 (P = 0,000). The search process, selection, and reasons for exclusion of studies are illustrated in the flowchart. (Figure 1)

The studies included in this research were published in English between 2011 and 2021. Two studies were conducted in the United States,[25,28] while the other two were conducted in Canada and Egypt.[26,27] The four articles were intervention studies in patients with DCM, of which two were randomized clinical trials,[25,26] and two were non-randomized, 27,28, totaling 542 patients, ranging from 50 to 264 patients per study.[25–28]

Of the 542 patients, 292 (53.9%) performed anterior/ventral surgical approaches with fusion. Of these, the majority were male (169, 57.9%), with an average age of 65.80±4.90 years. The average extension of DCM was 2.67 levels[25–28] and Ghogawala et al. (2021),[28] reported this data in absolute numbers and percentages, including eight patients (25%) with extension to two levels, 16 (50%) in three levels, 7 (21.9%) in four levels and one (3.1%) in five levels for the first study and 22 (34.9) in two levels, 33 (52.4 in 3 levels and 8 (12.7) in 4 levels for the last study. The mean pre-operative NDI was 35.75±6.02.[25–28] In addition, pre-operative VAS (0-10) of 5±2.6 was reported in thirty-two patients.[27] (Table 1)

The post-surgical complications were reported heterogeneously. Ghogawala et al. (2011),[25] reported a 30-day complication rate of 17.9% (5/28), of which 80% were dysphagia. Already in the study by Fehlings et al. (2013), 20 patients (11.8%) experienced some type of complication, with notable complications including a new neurological defect (n = 7), deterioration of the spinal cord (n = 1), and superficial infection (n = 1). El-Glandour et al. (2020) report the presence of dysphagia (n = 5), laryngeal nerve paralysis

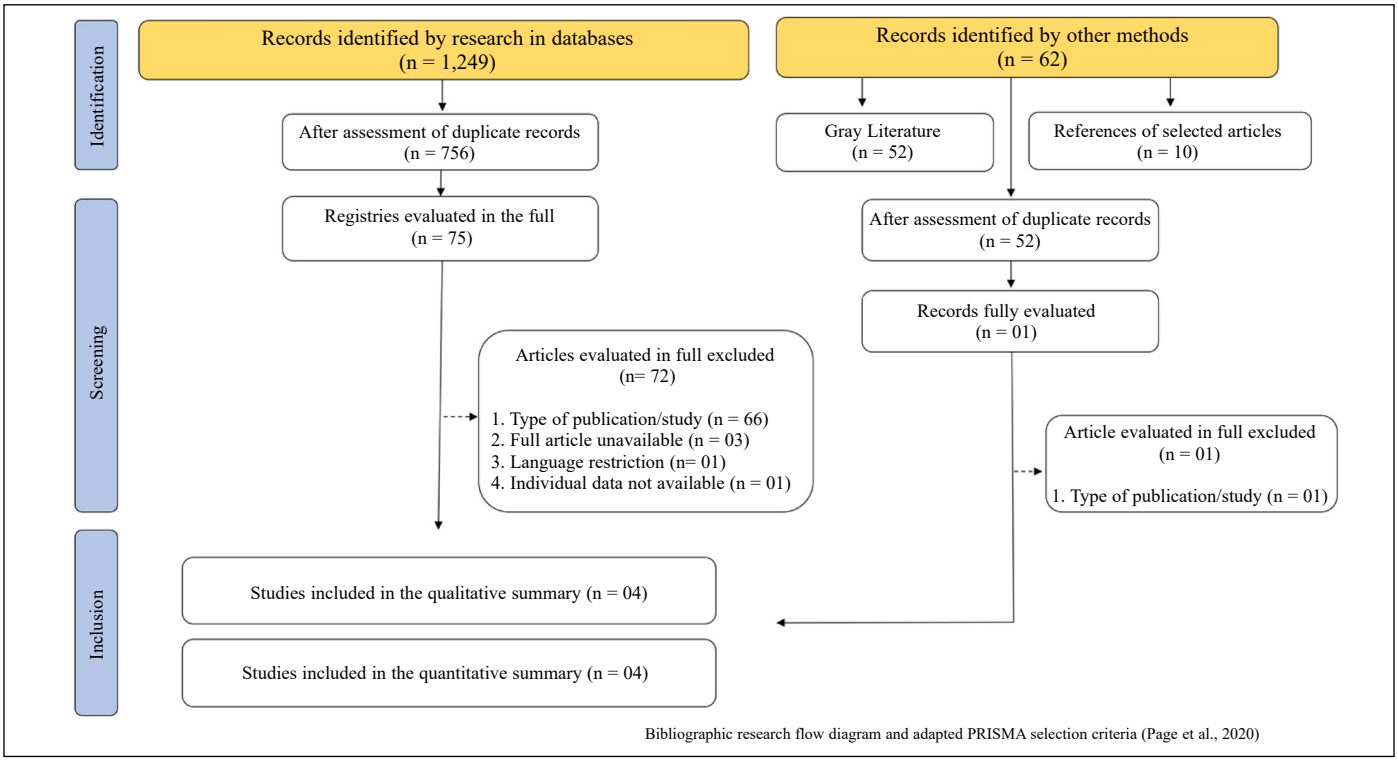

Figure 1. Diagram of bibliographic research flow and adapted selection criteria of the Preferred Report Items for Systematic Reviews and Meta-Analyses.

Table 1. Characteristics of studies.

Characteristics	Previous (n = 292)	After (n = 250)
Sex		
Male	169 (57.90%)	149 (59.60%)
Female	123 (42.10%)	101 (40.40%)
Age (years)		
Average	56.81±4.91	60.68±4.89
Extension (level)		
Average	2.67	3.67
Follow-up (months)		
Average	12	12
Neck Disability Index (NDI)		
Pre-surgical (medium)	35.75±6.02	35.70±6.10
Post-surgical (medium)	16.56±4.96*	20.25±8.13
Analog Visual Scale		
Pre-surgical	5±2.6	4.3±2.1
Post-surgical	2.6±1.7	3.7±2.1

*Data available in 279 patients (95.5%). **Data available on 233 patients (93.2%).

(n = 2), transient C5 paralysis (n = 1), and transient weakness (n = 2) in turn. Additionally, 66 patients presented complications, of which 31 patients (47%) presented major or minor complications (> or < 3 months), fourteen patients (21%) developed complications longer than 3 months, and eighteen patients (27%) had complications less than this period.[28] Of the minor complications, dysphagia (temporary) was the most common (18, 27%), while the largest were represented by prolonged dysphagia (9, 14%) and motor radiculopathy (1, 2%).

Following the previous surgical technique, in a 12-month follow-up period, 279 patients (95.5%) had an average NDI of 16.56±4.96,[25–28] and 32 patients had a VAS (0-10) of 2.6±1.7.[27]

Two hundred and fifty patients (46.1%) performed posterior/dorsal surgical approaches, the majority of whom were male (149, 59.60%) with an average age of 60.68±4.89 years.[25–28] The median extension of DCM was slightly higher compared to patients with prior surgical approach, 3.67 levels.[25,26,28] Additionally, extension of two levels in nine patients (27.3%), three levels in 12 patients (36.4%), four levels in 9 patients (27.3) and five levels in 3 (9.1%),[27] and extension of one level in three patients (3%), two levels in 29 patients (29%), three levels in 55 patients (55%), four levels in 11 patients (11%), five levels in 2 patients (2%).[28]

The mean preoperative NDI was 35.70±6.10[25–28] and preoperative VAS (0-10) was 4.3±2.1 in thirty-three patients.[27]

The rate of complications in 30 days was 13.6% (3/22), all related to postoperative C5 paralysis, according to Ghogawala et al. (2011).[25] Fehlings et al. (2013),[26] report that 17 patients (17.9%) presented complications, including new neurological deficit in three patients, spinal cord deterioration in 1 patient and superficial infections in 4 patients. El-Ghandour et al. (2020),[27] described transient C5 paralysis in 3 patients (9.1%), transient weakness in three patients (9.1%), surface wound infection in three patients (9.1%), dural laceration in two patients (6.1%) and deep infection in one patient (3%). Ghogawala et al. (2021)[28] analyzed dorsal fusion in 69 patients. They identified any type of complication (occurring within 3 months or longer) in 20 cases (29%), with 15 of them occurring after more than 3 months (22%) and in 5 cases before 3 months (7%). These include motor radiculopathy (8, 12%), thrombosis (1, 1%) and delay in wound healing (1, 1%) complications present in more than 3 months, and motor radiculopathy (2, 3%), infection (2, 3%) and delay in wound healing (1, 1%) less than 3 months. For dorsal laminoplasty in 28 patients, complications occurred in 3 cases (11%), with two occurring after more than 3 months (7%) (spinal cord lesion) and one before 3 months (4%) (infection).[28]

After the subsequent surgical technique and follow-up for 12 months, 233 patients (93.2%) had an average NDI of 20.25±8.13,[25–28] while 32 patients had a VAS (0-10) of 3.7±2.1.[27]

All studies included were classified as having low risk of bias (n = 4; 100%).[25–28] Two studies presented a score of "some concerns" associated with the randomization process. (Figure 2)

Ghogawala et al. (2011),[25] report that after one year, evaluations of surgical outcomes were available for 46 of 50 patients (92%). Patients undergoing dorsal surgery presented a tendency to higher NDI scores, indicating greater postoperative incapacity (P = 0.07).

Fehlings et al. (2013),[26] analyzed the treatment-related

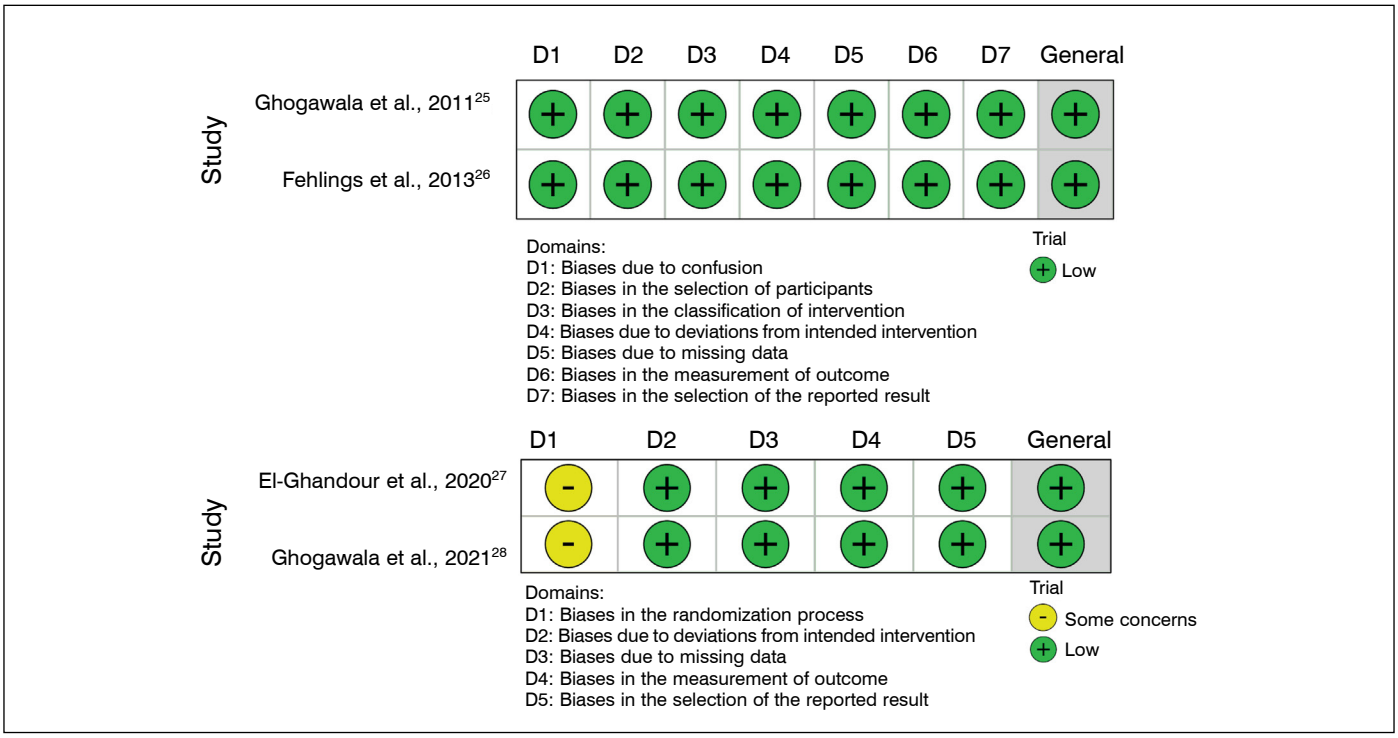

Figure 2. The bias risk analysis in individual randomized clinical trials was carried out using the Cochrane ROB 2.0 tool. Green = low. The risk of bias in non-randomized clinical trials was evaluated using the Cochrane ROBINS-I tool. Green = low or moderate, yellow = some concerns, red = serious or critical.

complications in two distinct groups: 20 patients (11.8%) in the previous approach group and 17 patients (17.9%) in the later approach group presented complications (P = 0.197). A new neurological deficit was observed in seven subjects (4.1%) in the previous group and three subjects (3.2%) in the latter group (P = 1.00). Superficial infections were identified in five cases in total, with one in the previous group and four in the posterior group (P = 0.058). The other 22 recorded complications consisted of a heterogeneous mix of adverse events.

El-Ghandour et al. (2020),[27] evaluated VAS and NDI scores, and observed better results in the decompression group prior to the end of one year. The average VAS score one year after surgery was 2.6±1.7 in the previous decompression group and 3.7±2.1 in the posterior decompression group (P < 0.05). The improvement in VAS relative to baseline was 2.4±2.6 in the previous decompression group and 0.6±2.4 in the posterior decompression group (P < 0.05). The mean NDI one year after surgery was 13.6±5.7 in the previous decompression group and 17.5±6.3 in the posterior decompression group (P < 0.05). The improvement in NDI relative to baseline was 13.8±8.3 in the previous decompression group and 10.8±7.2 in the posterior decompression group (P = 0.13).

Ghogawala et al. (2021),[28] identified that ventral surgery was associated with a significantly higher risk of complications compared to dorsal surgery (47.6% vs. 24.0%; difference of 23.6%; 95% CI: 8.7%-38.5%; P = 0.002). Among the complications, dysphagia was the most prevalent, occurring in 41% of patients undergoing the ventral approach, while it was not observed in any patient of the dorsal approach. In addition, ventral surgery showed a lower incidence of new neurological deficit (2% vs. 9%), readmissions in 30 days (0% vs. 7%), and a higher reoperation rate (6% vs. 4%). There was no significant difference in the risk of major complications between the groups (22.2% for the ventral approach vs. 17.0% for the dorsal approach; difference of 5.2%; 95% CI: from -7.4% to 17.9%; P = 0.41). However, the ventral approach was associated with a higher risk of minor complications (27.0% vs. 7.0%; difference, 20.0%; 95% CI: 7.9%-32.0%; P < 0.001), with dysphagia being the most common.

The analysis included four studies, totaling 279 patients in the group undergoing anterior cervical arthrodesis and 233 patients in the group undergoing posterior cervical arthrodesis.[25–28] The combined mean difference between the groups was -0.23 [-0.85, 0.39], with a p-value of 0.47, indicating the absence of a statistically significant difference between approaches to postoperative functional incapacity.

The statistical heterogeneity between the studies was evaluated using the Cochran test (x^2) and the inconsistency index (I^2). The value of I^2 = 97% indicated very high heterogeneity, suggesting substantial variation between studies. The Cochran test yielded a p-value of < 0.00001, confirming this variability. Given this high level of heterogeneity, a model of random effects was employed to better account for the variations between studies.

The graphic representation in the forest chart demonstrated that the confidence intervals of all individual studies included the zero value, indicating that no study found a statistically significant difference between surgical approaches (Figure 3). The study by Fehlings et al. (2013)[26] had the highest weight in the analysis (87.7%), due to its larger sample size.

DISCUSSION

DCM is a progressive condition that affects predominantly patients over 50 years of age and is caused by chronic spinal cord compression in the cervical region.[2] This compression leads to neurological deficits and functional impairment, resulting in cervical pain, limb weakness, spasticity, changes in walking, and loss of manual dexterity.[5,6] These symptoms make daily activities, such as holding objects and walking, difficult, and in advanced stages, the disease can progress to incontinence and loss of independent mobility, making surgical intervention essential to avoid irreversible damage.[2,5]

In this context, the NDI is a fundamental tool in screening functional disability in patients with CMD.[16] This questionnaire assesses the impact of the disease on daily activities, including cervical mobility, sleep, and work performance, enabling the classification of disability severity.[18] In addition to assisting in the diagnosis, the NDI is essential to monitor the progression of the disease and evaluate the effectiveness of conservative or surgical treatments. Studies show that improvements in NDI reflect significant functional gains, making it a valuable resource in clinical follow-up of these patients.[16,29,30]

Several observational studies and systematic reviews in this area sought to compare the effectiveness of previous and subsequent approaches in DCM involving more than one level to determine which technique offers the most benefit.[3,7,8,31] The heterogeneity of the complications and outcomes reported, coupled with the scarcity of methodologically well-designed studies, prevents a consensus on the superiority of one technique over the other. Faced with this scenario, we conducted a systematic review and meta-analysis based

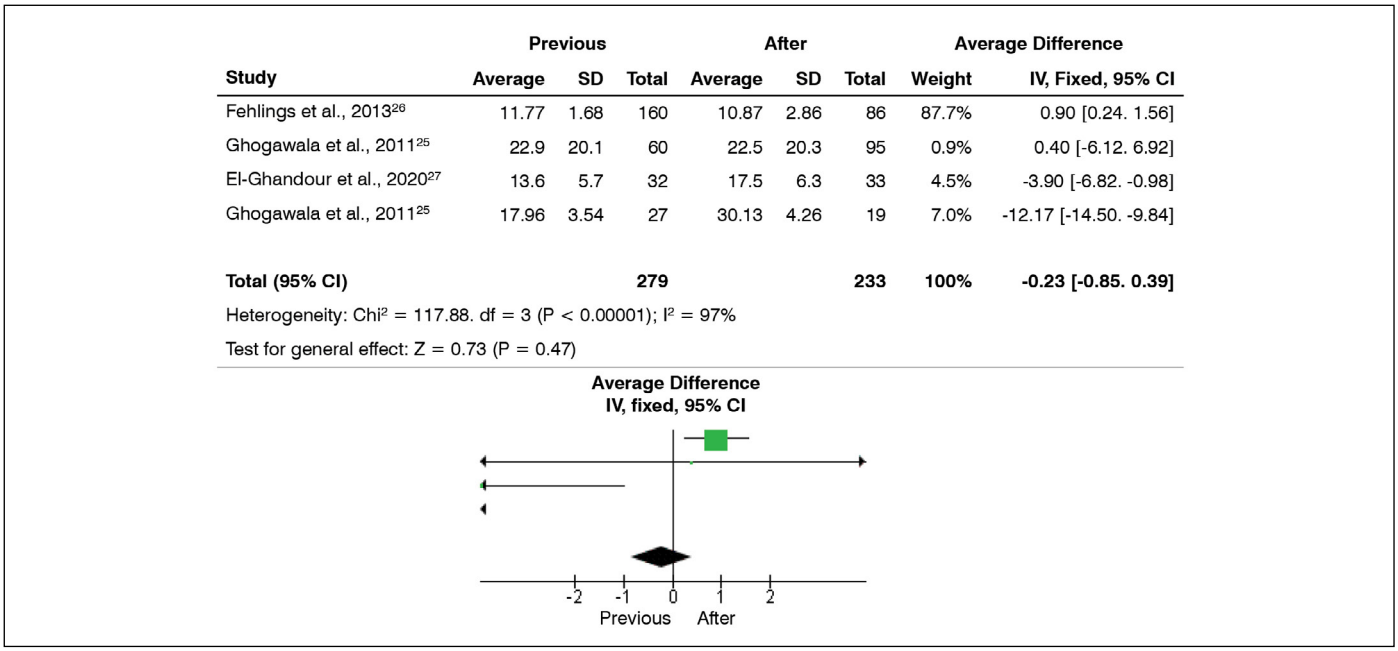

Figure 3. Forest chart of studies evaluating postoperative functional disability among patients undergoing prior and postoperative surgery.

solely on intervention studies, aiming to evaluate the functional improvement of patients undergoing different surgical approaches.

The results of this study indicate that both techniques showed significant functional improvement after 12 months, with no statistically significant difference between the approaches. The mean NDI in the previous approach group decreased from 35.75±6.02 to 16.56±4.96, while in the posterior arthrodesis group, the reduction was from 35.70±6.10 to 20.25±8.13. Similarly, improvement in VAS was also evident, with the previous technique presenting a final score of 2.6±1.7 and the posterior of 3.7±2.1.[25–28]

The meta-analysis revealed a combined average difference of -0.23 [-0.85, 0.39], with p = 0.47, indicating the absence of a statistically significant difference between the techniques regarding postoperative functional incapacity. However, the high heterogeneity (I^2 = 97%) suggests substantial variation between studies, justifying the use of a random-effects model for the analysis.[25–28]

Interestingly, our results are, in a way, consistent with the literature. While the Audat and collaborators' study (2018) 29 showed a statistically significant improvement in the previous group, Asher et al. (2019)[30] observed a non-significant improvement in the same group. Although the meta-analysis showed no statistically significant differences, our data suggest a more pronounced trend toward functional improvement in the previous approach.

Additionally, it is essential to consider individual factors when choosing between the approaches, such as the extent of the pathology, the patient's clinical condition, and the surgeon's experience with each technique. The previous approach may be preferable in cases of less extensive disease and where dysphagia is not a limiting factor.[8,11,15] In contrast, the latter approach may be advantageous for more extensive diseases and when there is a higher risk of complications related to the anterior pathway.[12,13]

Another relevant factor to consider is the long-term success rate. Some reports suggest that fusion stability may differ between techniques over time. The observational study of Audat and collaborators,[29] identified improvement in NDI in three and five years from 3.31 ± 5.24 and 2.94 ± 5.48 for the previous approach and 6.93 ± 8.16 and 5.8 ± 7.39 for the subsequent approach, respectively. The above approach promotes faster initial functional recovery; however, there is no consensus in the literature regarding reoperation and/or re-evaluation rates. While some studies report a greater association with this outcome,[28] others show lower rates when compared to the latter approach.[32] In contrast, the latter approach, although associated with greater postoperative pain and longer rehabilitation time, tends to provide more lasting stabilization in more extensive cases.[12,13,28]

One of the main limitations of this systematic review was the limited number of intervention studies identified, which restricted the conduct of more robust analyses and the obtaining of definitive conclusions. In addition to the scarcity of clinical trials, the significant heterogeneity between the studies included (I^2 = 97%) compromised the comparability of the results and increased the uncertainty of the estimates. This variability can be attributed to differences in the study design, population characteristics, applied interventions, and outcome criteria. Despite these limitations, the available data provide important information on the subject, highlighting the need for future studies with more standardized methodologies and more representative samples to strengthen the evidence base in the area.

CONCLUSION

In conclusion, the results of this study indicate that both anterior cervical decompression with fusion and posterior decompression with fusion promote functional improvements of the neck over time, without a statistically significant difference in postoperative outcomes after 12 months. However, our results suggest a faster functional recovery with the previous approach, evidenced by a more marked decrease in NDI and VAS in this group.

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