The EGYPTIAN SPINE Journal

Online ISSN : 2314-8969
Print ISSN: 2314-8950
www.esj.journals.ekb.eg

REVIEW ARTICLE EgySpineJ 36:2-13, 2020 DOI: 10.21608/esj.2020.48902.1153

The Posterior Surgical Approach in Treatment of Neuromuscular Scoliosis Patients: A Systematic Review of Literature

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ABSTRACT

Background Data: Neuromuscular scoliosis (NS) causes disorders to the spinal cord, which affects the innervation and tone of the musculoskeletal system. NS can affect the quality of life by causing spinal deformity, sitting difficulties, and back pain. Progression of NS after skeletal maturity is common, and the incidence of surgery in NS is high. Whether posterior surgical strategy in the management of NS results in higher correction and fewer complications than other approaches, either anterior alone or combined, is a controversial issue.

Study Design: Systematic review of the literature.

Purpose: To determine if the management of NS via the posterior approach has better results and fewer complications or not.

Methods: This study was conducted using the PubMed and Cochrane databases; it includes patients treated for NS deformity and the type of surgery, degree of correction achieved, and rate of complications were reported.

Results: Our systematic review yielded 104 citations with 9 studies meeting the required criteria. Six studies focused on the comparisons of posterior-only approach (POA) and anteroposterior approach (APA) and three studies on POA only regarding postoperative outcomes and complications such as correction angle of scoliosis (Cobb's angle), pelvic obliquity, lordosis, kyphosis, amount of blood loss, hospital stay and ICU stay, and operative time.

Conclusion: Posterior-only approach has the same results in correction of neuromuscular scoliosis deformity as anterior-posterior approach but with fewer complications. However, the anterior-posterior approach has more advantage in correcting severe rigid neuromuscular scoliosis. (2020ESJ215)

Keywords: Systematic review, Neuromuscular scoliosis, Anterior-posterior approach, Posterior-only approach, Surgical complication.

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Submitted: July 15th, 2020.
Accepted: September 20th, 2020.
Published: October 2020.

The article does not contain information about medical device(s)/drug(s).
No funds were received in support of this work.
The authors report no conflict of interest.

INTRODUCTION

Neuromuscular scoliosis (NS) has coronal, sagittal, and rotational deformities.[2] Patients with NS present with muscle spasms, mental retardation and GIT, and cardiac or chest problems.[24] Surgery is considered when the mean Cobb's angle is more than 50° affecting patient function. [13] The rate of curve progression is related to the magnitude of curve. [5,16]

Patients with Cobb's angle <50° curves will increase 0.8° every year and, in patients with curves, >50° will increase 1.4° every year.[21] Severe progression increases at skeletal maturity.[7] NS is usually treated by either a combined anteroposterior approach (APA) or posterior-only approach (POA) with controversy regarding which has better results with fewer complications.[22]

POA is commonly used nowadays by many surgeons for the correction of different spinal deformities. Modi et al.[14] reported patients with CP corrected from 76.8° to 30.1° after POA. POA has fewer complications than the combined approach and has less operative time, blood loss, and intensive care unit (ICU) stay. In the POA, the rate of complications reaches 23%, while in APO, it reaches 46%.[4]

On the other hand, APA has advantages over POA, including its easiness to correct severe degrees of deformities and rotation. Zhou et al.[35] reported that APA corrected severe angulation and made it more stable. Wang et al.[30] reported less loss of correction during follow-up. Jasiewicz et al.[8] stated that APA made stable correction with improvement in spinal balance. Master et al.[12] proved that POA and APA had no difference in the prevalence of complications.

In NS with pelvic obliquity (PO), there is flexion and internal rotation of one hip with abduction and external rotation of the other hip.[23] When spinal fusion does not extend to the pelvis, PO becomes worse. Whether NS could be treated by either POA or APA, which has better results, is still a matter of controversy.[7]

In this study, we review the literature and present a systematic review of the postoperative outcomes and complications of the posterior approach in the management of NS.

MATERIALS & METHODS

Search Strategies

Using Cochrane Library, Embase, and PubMed, we searched for the following: (1) scoliosis, kyphosis, lordosis; (2) posterior-only approach; (3) anteroposterior approach.

Inclusion/Exclusion Criteria

Inclusion criteria of studies in our systematic review were as follows: (1) patients with neuromuscular disease; (2) comparison between POA and combined anteroposterior approach or posterior-only approach; (3) the number of cases more than 10; (4) studies from 2006 up to 2019; (5) including pre- and postoperative Cobb's angle. On the other hand, exclusion criteria were as follows: (1) any other kind of scoliosis; (2) research on cadaveric specimens; (3) studies that did not include scoliotic angles; (4) case reports or case series.

Data Extraction

Two investigators extracted the data independently, and differences and disagreements were resolved by the research meeting. The data were recorded using a standard data extraction form, including the basic information of studies (the last author's name, date of publication, and sample size), the basic participants' information (age, sex, and type of the surgery), clinical data (blood loss, how long was the surgery, hospital stay, angle of main scoliosis, kyphosis, lordosis, the obliquity of the pelvis in pre- and postoperative periods, and complication rate).

Quality Assessment and Publication Bias Assessment

We used a methodological index for nonrandomized studies (MINORS) to qualify the quality of the including studies, which was recommended by a former study[34] to assess the bias

in nonrandomized studies. There are 12 questions in MINORS to judge the quality of the studies.

Statistical Analysis

Data were collected, coded, revised, and entered into the Statistical Package for Social Science (SPSS, IBM), version 23. The data were collected as mean, standard deviations, and ranges. The comparison between two independent groups with quantitative data and parametric distribution was conducted using an ***independent t-test***, whereas the comparison between two paired groups with quantitative data and parametric distribution was performed using ***paired t-test.*** The confidence interval was set to 95%, and the margin of error accepted was set to 5%. So, the p value was considered significant as follows: $p > 0.05$, nonsignificant; $p < 0.05$, significant; $p < 0.01$: highly significant.

RESULTS

After application of our inclusion/exclusion criteria and focusing on the intended outcomes, the electronic comprehensive literature search identified 9 studies (including 651 patients) of a total of 104 studies concerning NS that were included in the final analysis (Table 1); a detailed scheme of the literature search is given in Figure 1.

Cobb's Angle

Table 2 shows and compares the difference between POA and APA regarding pre- and postoperative Cobb's angle in the reported 9 studies. Cobb's angle was corrected from 76.57 ± 7.06 to 33.80 ± 7.71 in POA and from 87.78 ± 12.1 to 38.48 ± 9.20 in APA, and there was no significant difference between both POA and APA groups. In contrast, there has been a highly significant difference between pre- and postoperative angles in the POA group (42.77 ± 6.37, $p = 0.001$) and the APA group (49.30 ± 7.61, $p < 0.001$) and in both groups together ($p < 0.001$).

Pelvic Obliquity

Table 3 shows and compares the difference between POA and APA regarding pre- and postoperative PO. PO was corrected from 21.28 ± 8.49 to 6.91 ± 2.41 and from 20.1 ± 3.87 to 8.5 ± 3.84 in the POA and APA group, respectively, with a significant difference in correction in each group before and after surgery, POA, 37 ± 8.21 ($p = 0.001$); APA, 11.60 ± 5.75 ($p = 0.004$), and a highly significant difference between POA and APA postoperatively ($p < 0.001$).

Kyphosis

Table 4 shows and compares the difference between POA and APA regarding pre- and postoperative kyphosis in 7 studies. Kyphosis was corrected from 39.30 ± 10.58 to 27.51 ± 8.57 in the POA group and from 38.17 ± 18.79 to 33.45 ± 8.23 in the APA group, and the results of correction of angle of kyphosis showed that in the APA group, the difference was not significant in pre- and postoperative angle: 4.72 ± 12.59 ($p = 0.401$) but was highly significant in the POA group between pre- and postoperative kyphosis: 11.79 ± 4.39 ($p = 0.001$) and between both groups postoperatively ($p < 0.001$).

Lordosis

Table 5 shows and compares the difference between POA and APA regarding pre- and postoperative lordosis in 7 studies. Lordosis was corrected from 2.14 ± 43.93 to 5.69 ± 50.16 in the POA group and from 25.03 ± 43.54 to 49.37 ± 10.56 in the APA group, and results of correction of lordosis revealed no significant difference in pre- and postoperative deformity in the APA group, 24.33 ± 46.52 ($p = 0.256$) and in the POA group, 3.54 ± 15.30 ($p = 0.563$).

Blood Loss

In Table 6, the average blood loss was 1600.29 ± 743.1 ml in POA and 2333.67 ± 753.67 ml in APA, with less blood loss in the POA group compared to the APA group.

Intensive Care Unit Stay

In Table 7 and Figure 7, the ICU stay was 4.04 ± 2.88 days in POA and 5.70 ± 1.06 days in APA, with less ICU stay in the POA group compared to the APA group.

Hospital Stay

In Table 8 and Figure 8, the hospital stay was 16.58 ± 4.06 days in POA and 21.80 ± 8.86 days in APA, with less hospital stay in the POA group compared to the APA group.

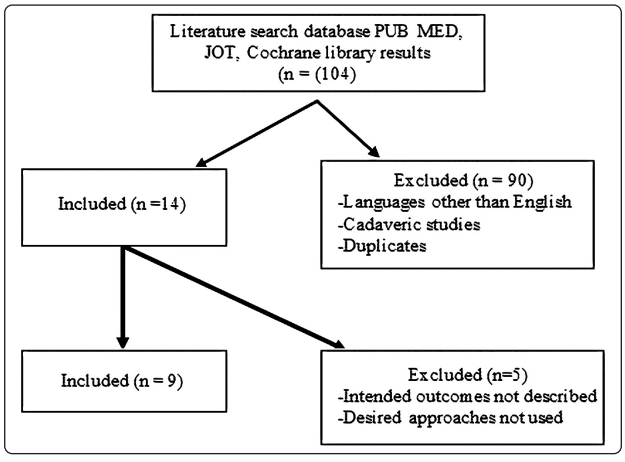

Figure 1. Flowchart showing the procedure and result of studies selection.

Operative Time

In Table 9 and Figure 9, the operative time was 5.81 ± 1.19 hours in POA and 8.93 ± 1.41 hours in APA, with less operative time in the POA group compared to the APA group.

Table 1. Summary of the included studies in our review.

Study	Year	Type of the study	Sample size
Teli et al. [25]	2006	Retrospective	60
Tsirikos et al. [28]	2008	Retrospective	287
Auerbach et al. [1]	2009	Retrospective	61
Moon et al. [15]	2011	Retrospective	54
Keeler et al. [9]	2010	Retrospective	26
Awwad et al. [2]	2014	Retrospective	20
Beckmann et al. [3]	2016	Retrospective	57
Nectoux et al. [17]	2016	Retrospective	28
Nedelcu et al. [18]	2016	Retrospective	58
Total number			**651**

Table 2. **Correction of Cobb's Angle in each study in both POA and APA.**

Study	POA			APA		
	No.	Preoperative	Postoperative	No.	Preoperative	Postoperative
Teli et al. [25]	34	74	31	26	76	31
Tsirikos et al. [28]	242	74.6	21.7	45	86.4	29.2
Auerbach et al. [1]	42	72.1	35.8	19	90.8	39.2
Moon et al. [15]	24	73.5	40.2	30	76.3	40.2
Keeler et al. [9]	26	83.9	32.6	26	88.2	36.3
Awwad et al. [2]	20	83.9	42.2	-	-	-
Beckmann et al. [3]	35	84	43	22	109	55
Nectoux et al. [17]	28	80.1	34.8	-	-	-
Nedelcu et al. [18]	58	63	22.9	-	-	-
Total	481	76.57 ± 7.06	33.80 ± 7.71	168	87.78 ± 12.1	38.48 ± 9.20
t-test/p value1*		t = 20.136/p < 0.001 (HS)			t = 15.876/p < 0.001 (HS)	
t-test/p value2•		t = 14.466/p < 0.001 (HS)				
t-test/p value3•		t = 6.431/p < 0.001 (HS)				
Diff. between pre and post		42.77 ± 6.37			49.30 ± 7.61	
t-test/p value4•	t = 10.856/p < 0.001 (HS)					

P1: Comparison between pre and post in each group.

P2: Comparison between POA and APA regarding preoperative measures.

P3: Comparison between POA and APA regarding postoperative measures.

P4: Comparison between POA and APA regarding the difference between pre and post.

**: paired t-test; •: independent t-test*

POA: posterior-only approach; APA: anterior-posterior approach; No.: number of the patients.

The table shows that there is no significant difference between two groups [there was a highly significant difference between the correction of Cobb's Angle pre and postoperatively in POA (p = 0.001) same as in the APA group (P<0.001) and between both groups postoperatively (< 0.001)].

Table 3. Correction of the pelvic obliquity in each study in both POA and APA.

Study	POA			APA		
	No.	Preoperative	Postoperative	No.	Preoperative	Postoperative
Teli et al. [25]	34	15	9	26	19	10
Tsirikos et al. [28]	242	16.7	4.6	45	20.8	5.4
Auerbach et al. [1]	42	18.8	6.1	19	25.8	9
Keeler et al. [9]	26	18.1	4.9	26	15.6	4.2
Moon et al. [15]	24	19.5	9.7	30	22.9	7.4
Awwad et al. [2]	20	42.3	9.8			
Beckmann et al. [3]	35	15	9	22	16.5	15
Nectoux et al. [17]	28	20.9	4.2			
Nedelcu et al. [18]	58	25.2	4.9			
Total	481	21.28 ± 8.49	6.91 ± 2.41	168	20.1 ± 3.87	8.5 ± 3.84
t-test/p value1*		t = 5.248/p = 0.001			t = 4.939/P = 0.004	
t-test/p value2•		t = 1.739/p = 0.083 (NS)				
t-test/p value3•		t = 6.228/p < 0.001 (HS)				
Diff. between pre and post		14.37 ± 8.21			11.60 ± 5.75	
t-test/p value4•		t = 4.040/p < 0.001 (HS)				

P1: Comparison between pre and post in each group.
P2: Comparison between POA and APA regarding preoperative measures.
P3: Comparison between POA and APA regarding postoperative measures.
P4: Comparison between POA and APA regarding the difference between pre and post.
*: paired t-test; •: independent t-test.
The results showed that there was a highly significant difference regarding the correction of pelvic obliquity in each group before and after surgery (POA, p = 0.001; APA, p = 0.004) and highly significant difference between POA and APA postoperatively (p < 0.001) with more correction in APA.

Table 4. Correction of kyphosis in each study in both POA and APA.

Study	POA			APA		
	No.	Preoperative	Postoperative	No.	Preoperative	Postoperative
Teli et al. [25]	34	53	41	26	55	45
Tsirikos et al. [28]	242	54.2	34.6	45	65.7	38.2
Auerbach et al. [1]	42	28.1	20.1	19	22.9	29.9
Keeler et al. [9]	26	33.8	18.3	26	25	25
Moon et al. [15]	24	34.8	27.6	30	20.4	24.6
Awwad et al. [2]	20	30.2	20.4			
Beckmann et al. [3]	35	41	31	22	40	38
Total	423	39.30±10.58	27.51±8.57	168	38.17±18.79	33.45±8.23
t-test/p value1*		t = 7.093/p < 0.001 (HS)			t = 0.917/p = 0.401 (NS)	
t-test/p value2•		t = 0.923/p = 0.356 (NS)				
t-test/p value3•		t = 7.686/p < 0.001 (HS)				
Diff. between pre and post		11.79 ± 4.39			4.72 ± 12.59	
t-test/p value4•		t = 10.115/p < 0.001 (HS)				

P1: Comparison between pre and post in each group.
P2: Comparison between POA and APA regarding preoperative measures.
P3: Comparison between POA and APA regarding postoperative measures.
P4: Comparison between POA and APA regarding the difference between pre and post.
*: paired t-test; •: independent t-test.
The results of correction of angle of kyphosis showed that, in the APA group, there was no significant difference pre- and postoperatively (p = 0.401); however, it was highly significant in the POA group between pre- and postoperative measures (p = 0.001) and between both groups postoperatively (p < 0.001).

Table 5. Correction of the lordosis in each study in both POA and APA.

Study	POA			APA		
	No.	Preoperative	Postoperative	No.	Preoperative	Postoperative
Teli et al. [25]	34	57	50	26	57	50
Tsirikos et al. [28]	242	35.4	43.7	45	53.4	41.1
Auerbach et al. [1]	42	38.8	46	19	55.3	60.9
Keeler et al. [9]	26	−56.6	−59.3	26	−54.8	59.6
Moon et al. [15]	24	8	42.5	30	7.3	33.6
Awwad et al. [2]	20	−28.6	−38.1			
Beckmann et al. [3]	35	−39	−45	22	32	51
Total	423	2.14 ± 43.93	5.69 ± 50.16	168	25.03 ± 43.54	49.37 ± 10.56
t-test/*p* value1*		t = 0.612/*p* = 0.563 (NS)			t = 1.281/*p* = 0.256 (NS)	
t-test/*p* value2•		t = 43.54/*p* < 0.001 (HS)				
t-test/*p* value3•		t = 11.184/*p* < 0.001 (HS)				
Diff. between pre and post		3.54 ± 15.30			24.33 ± 46.52	
t-test/*p* value4•	t = 8.156/*p* < 0.001 (HS)					

P1: Comparison between pre and post in each group.

P2: Comparison between POA and APA regarding preoperative measures.

P3: Comparison between POA and APA regarding postoperative measures.

P4: Comparison between POA and APA regarding the difference between pre and post.

**: paired t-test; •: independent t-test.*

The results of correction of angle of lordosis revealed that there was no significant difference between pre and postoperative measures in both POA and APA groups (p = 0.563 and 0.256, resp.); however, postoperatively a highly significant difference between both groups APA and POA was found (p < 0.001).

Table 6. Blood loss in each study in both POA and APA.

Study	POA		APA	
	No.	Blood loss	No.	Blood loss
Teli et al. [25]	34	1550	26	2600
Tsirikos et al. [28]	242	2800	45	3400
Auerbach et al. [1]	42	1218	19	1591
Keeler et al. [9]	26	873	26	1361
Moon et al. [15]	24	2400	30	2700
Beckmann et al. [3]		1500		2350
Nectoux et al. [17]		861		
Total	368	1600.29 ± 743.1	146	2333.67 ± 753.67
Test value	10.050			
p value	<0.001 (HS)			

Independent t-test.

Table 7. The intensive care unit (ICU) stay (days) in each study in both POA and APA.

Study	POA		APA	
	No.	ICU (days)	No.	ICU (days)
Tsirikos et al. [28]	242	4.9	45	6.7
Auerbach et al. [1]	42	3.9	19	4.6
Keeler et al. [9]	26	2	26	6.5
Beckmann et al. [3]	35	1	22	5
Nectoux et al. [17]		8.4		
Total	345	4.04 ± 2.88	112	5.70 ± 1.06
Test value	5.966			
p value	<0.001 (HS)			

Independent t-test.

Table 8. Hospital stay (days) in each study in both POA and APA.

Study	POA		APA	
	No.	Hospital stay	No.	Hospital stay
Tsirikos et al. [28]	242	18.6	45	24.5
Auerbach et al. [1]	42	10.6	19	11.9
Beckmann et al. [3]	35	17.6	22	29
Nectoux et al. [17]		19.5		
Total	319	16.58 ± 4.06	86	21.80 ± 8.86
Test value	7.901			
p value	<0.001 (HS)			

Independent t-test.

Table 9. Operative time (hours) in each study in both POA and APA.

Study	POA		APA	
	No.	Op. time	No.	Op. time
Teli et al. [25]	34	7	26	7.3
Tsirikos et al. [28]	242	3.9	45	7.1
Auerbach et al. [1]	42	5.6	19	9
Keeler et al.[9]	26	6.1	26	10.1
Moon et al. [15]	24	7.3	30	10.1
Beckmann et al. [3]	35	4.3	22	10
Nectoux et al. [17]		6	-	-
Nedelcu et al. [18]	58	6.3	-	-
Total	461	5.81 ± 1.19	168	8.93 ± 1.41
Test value	27.644			
p value	<0.001 (HS)			

Independent t-test.

DISCUSSION

This systematic review of the surgical approach of NS includes 9 studies (total number of patients = 651) discussing POA alone or both POA and APA regarding postoperative outcomes such as correction angle of scoliosis, PO, lordosis, kyphosis, amount of blood loss, hospital stay, ICU stay, operative time, and rate of complications. NS treatment in children is challenging for a spine surgeon; the pathology is a complex spinal deformity that may worsen after reaching skeletal maturity causing major affection on the quality of life. Achieving curve correction and pelvic balance is necessary for surgical treatment. An anterior approach makes the curve more flexible and allows more correction; however, major complications may be associated with this approach.[32]

Cobb's Angle

Results of correction of angle of scoliosis (Cobb's angle) showed that there is no significant difference between both groups [POA group had a highly significant difference between pre and postoperative deformity ($p = 0.001$) same as in the APA group ($p < 0.001$) and between both groups postoperatively ($p < 0.001$)]; however, some studies proved that POA achieved better correction than APA and avoids the need for further anterior release and fusion surgery.[14] Tokala et al.[27] indicated that POA achieved satisfactory correction of severe degrees in NS and proved that POA was not a contraindication for severe degrees of NS. The study of Tsirikos

et al.[29] of 38 patients who underwent POA and 7 who had staged anteroposterior spinal arthrodesis reported that scoliosis was corrected from mean 82.5° to 21.4° (74.1%) and PO was corrected from mean 24° to 4° (83.3%).

Pelvic Obliquity

PO correction is achieved by a balanced pelvis and spine in the coronal plane.[20] Balance failure may cause significant complications, including skin ulcers, pain, sitting inability, and osteomyelitis.[33] There is a relationship between the magnitude of PO and unilateral hip dislocation. The magnitude of PO is associated with sitting tolerance, balance, and function. Correction of PO is important as it enhances sitting and improves the overall function.[32]

Scoliosis and PO are associated with neuromuscular diseases.[26] The amount of neuromuscular involvement and the age at the onset of the disease affect the severity of the disease. Scoliosis and PO are more common in nonambulators with total involvement of the body.[31] The progression of the deformity can impair sitting balance, pulmonary function, and ambulation and cause many complications such as pressure sores.[23]

Correction of PO in NS comprises many challenges to the spine team.[15] The study of Lipton et al.[10] showed that PO is associated with curvature in the thoracolumbar or the lumbar region, with affection of sitting balance. Another study by Auerbach et al.[1] included 61 patients with NS and cerebral palsy treated with APA approach (group A: 19 patients) or POA (group B: 42 patients); before surgery, group A had a bigger scoliotic angle (91° in group A vs. 72° in group B) and more rigid curves (21% in group A vs. 40% in group B), with more PO (26° in group A vs. 19° in group B), than group B. The correction of PO was equal between groups A (71%) and B (74%). Moon et al.[15] showed that APA had the upper hand in correction of PO in rigid NS with cerebral palsy and fixation should reach the pelvis. Both Auerbach et al.[1] and Moon et al.[15] preferred the APA approach in severe rigid PO because PO affects the patient's sitting and walking.

In our review, results showed that there was a highly significant difference regarding the correction of PO in each group before and after surgery (POA, $p = 0.001$; APA, $p = 0.004$) and also a highly significant difference between POA and APA postoperatively ($p < 0.001$). As Beckmann et al.[4] recommended, POA had better results than APA. In contrast, Teli et al.[25] reported that the correction of scoliosis deformity and PO was about 47% in APA and was 40% in POA, with improvement in patient satisfaction, sitting, and quality of life. Anterior release in the combined approach leads to better intraoperative flexibility for better correction. However, the results of Shao et al. [23] meta-analysis reported that there was a significant difference between the two groups, which suggested that APA was preferred in the correction of PO. In the case of NS associated with cerebral palsy, fixation should include the pelvis and anterior fusion made a difference between APA and POA.[19] Shao et al.[23] recommended APA as a preferred approach in large rigid spastic PO.

Angle of Kyphosis and Lordosis

In our review, the results of correction of angle of kyphosis showed that in the APA group, there was no significant difference between pre- and postoperative values ($p = 0.401$); however, there was a highly significant difference in the POA group between pre- and postoperative deformity ($p = 0.001$) and between both groups postoperatively ($p < 0.001$).

On the other hand, the results of correction of angle of lordosis revealed no difference between pre- and postoperative values in both POA and APA groups ($p = 0.563$ and 0.256, resp.); however, postoperatively, there was a highly significant difference between both groups ($p < 0.001$).

Auerbach et al.[1] showed that there were no significant differences in large Cobb's angle correction (60% in APA vs. 58% in POA), but APA had a greater percentage of correction postoperatively. At long-term follow-up, there were no differences in the loss of correction of the curve (8.1° in APA vs. 6.7° in POA). The study of Awwad et al.[2] using POA reported that the

mean preoperative thoracic kyphosis angle was 30.2° (range, 5–73), which was corrected by 67% to 20.4° (range, 4–30) at the long-term follow-up, whereas lordosis angle in the lumbar region was −28.6° (range, −90 to +33), which was corrected by 71% to −39.1° (range, −76 to +19) at the final follow-up, with trunk shift correction from 5.7 cm preoperatively to 1.8 cm postoperatively and 2.1 cm at final follow-up. In contrast, Zhou et al.[35] reported that, in APA, the mean Cobb's angle was 105.1° corrected to 27.5° at the last follow-up, and the percentage of correction of lordosis was 82.1%. Moreover, Wang et al.[30] reported that APA decreased the loss of Cobb's angle during follow-up. Another study by Jasiewicz et al.[8] reported that the APA approach of severe scoliosis achieved more stable correction in sagittal and coronal planes.

Blood Loss

Our results regarding the amount of blood loss between POA and APA showed that there was a significant decrease in the amount of blood loss in the POA group compared to the APA group ($p < 0.001$).[12,15,17] Keeler et al.[9] reported that the POA approach had lower blood loss (0.873 vs. 1.361 L). El Banna et al.[6] reported that blood loss in POA was 0.2–1 L (0.5 ± 0.222 L) and blood transfusion was up to 1 L (0.391.4 ± 0.212 L). Study results of Tsirikos et al.[29] revealed a significant difference between POA and APA; that is, the average blood loss was 800 ml in POA, whereas it was 900 ml in APA.

Intensive Care Unit Stay

Our results regarding the ICU stay between POA and APA showed that there was a significant decrease in the period of ICU stay in POA group compared to APA group ($p < 0.001$). Keeler et al.[9] indicated that the POA approach had a decreased rate of postoperative intubation (38% in POA vs. 81% in APA) and shorter length of mechanical ventilation (2 days in POA vs. 6.5 days in APA). Tsirikos et al.[29] reported that there was a significant difference between APA and POA; that is, ICU stay was 3.5 days in POA, whereas it was 8.9 days in APA.

Hospital Stay

The study showed a significant decrease in the duration of hospital stay between POA and APA ($p < 0.001$); that is, POA had a decreased hospital stay compared to APA. Beckmann et al.[4] reported that the percentage of complications was 23% in POA and 46% in APA. On the other hand, Tsirikos et al.[29] revealed a significant difference between POA and APA where the hospital stay was 17.6 days in POA and 27.4 days in APA.

Operative Time

POA had a decreased operative time compared to APA. Meanwhile, Keeler et al.[9] reported that POA had shorter surgical time (6.1 hours in POA vs. 10.3 hours in APA). The surgical duration of the approach ranged between 1.5 and 4 hours with a mean (2.5.7 ± 1 hours).[6] The results of the study of Tsirikos et al.[28] showed that POA was associated with a reduced operative time compared to APA. However, the results of Master et al.[12] indicated that there was no difference in complications between APA and POA. Master et al.[12] reported that the rate of major complications was 28%, with no noticeable differences between POA and APA, whereas Beckmann et al.[4] study showed that POA had shorter operation time and shorter ICU and hospital stays than APA. Preoperative curve flexibility is an important factor in the correction of the curve, whereas the operation duration is important to suspect complication rates.[11] El Banna et al.[6] reported that patients with POA had decreased morbidity rate (surgical duration, avoidance of intubation, and less blood loss) with better results than APA.

CONCLUSION

Posterior-only approach (POA) had the same results in correction of NS deformity as the anterior-posterior approach (APA) but with fewer complications. However, the APA has more advantage in correcting severe rigid NS. Based on this, we recommend using the POA in the surgical treatment of NS.

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الملخص العربي

دراسة منهجية عن النهج الخلفي في علاج مرضى الجنف العصبي العضلي

البيانات الخلفية: يؤدي الجنف العصبي العضلي إلى مجموعة واسعة من اضطرابات العمود الفقري التي تؤثر على الجهاز العضلي الهيكلي.ويكون السبب مشاكل اما فى الاعصاب او فى العضلات او فى الاتنين. يمكن أن يؤثر الجنف العصبي العضلي على نوعية الحياة من خلال التسبب في تشوه العمود الفقري وصعوبات الجلوس وآلام الظهر .. وتدهور الجنف العصبى العضلى بعد نضج الهيكل العظمي أمر شائع وتكون نسبه إجراء جراحة تصيح عالية. ويبقى السؤال هل الاستراتيجية الجراحية الخلفية في إدارة الجنف العصبي العضلي لديها تصحيح أعلى ومضاعفات أقل من الأساليب الأخرى سواء الأمامية وحدها أو مجتمعة .

تصميم الدراسة: دراسة منهجية.

الغرض: تهدف الدراسة الى تحديد هل النهج الخلفي في إدارة الجنف العصبي العضلي ألديه فضل نتيجة وأقل مضاعفات أم لا؟

الطرق: تم إجراء بحث باستخدام قواعد بيانات PubMed و Cochrane لتحديد المرضى الذين تم علاجهم من الجنف العصبي العضلي وتحديد نوع الجراحة ودرجة التصحيح ومعدل المضاعفات.

النتائج: الدراسة الحالية هي مراجعة منهجية للنهج الجراحي للجنف العصبي العضلي أسفرت عن 104 دراسه مع 9 دراسات تفي بالمعايير. تركز ست دراسات على مقارنات النهج الخلفي والنهج الأمامي الخلفي وثلاث دراسات تركز على النهج الخلفى فيما يتعلق بنتائج ما بعد الجراحة والمضاعفات كزاوية تصحيح الجنف [زاوية كوب]، انحراف الحوض، اللورد، الحداب وكمية فقدان الدم، مدة الإقامة في المستشفى ووحدة العناية المركزة ووقت العملية.

الخلاصة: النهج الخلفي والنهج الأمامي والخلفي لهما نفس النتائج في تصحيح الجنف العصبى العضلى ولكن مع مضاعفات أقل فى النهج الخلفى ومع ذلك يمتلك النهج الأمامى الخلفى ميزة لتصحيح الجنف الصلب الشديد.