

Surgical and Conservative Treatment Approaches in Cases of Central Cord Syndrome: A Systematic Review and Meta-Analysis

Pooja Venkatesh, BS¹; Abigail Jenkins, BA¹; Soumitra Anand, BSA¹; Michael Farid, BSE²; Momodou G Bah, MPH³; Umaru Barrie, PhD¹; Remi Wilson, MD¹; Kristen Hall, MBA¹; Christie Caldwell, PA-C¹; Mazin Al Tamimi, MD¹; Salah G Aoun, MD¹

1. Department of Neurological Surgery, University of Texas Southwestern Medical Center, Dallas, TX, USA
2. Weill Cornell Medical College, New York, NY, USA
3. College of Human Medicine, Michigan State University, East Lansing, MI, USA

OBJECTIVE

- Investigate the ongoing discourse on the management of Central Cord Syndrome (CCS) by examining the roles of conservative and surgical interventions.

INTRODUCTION

- Debate exists amongst clinicians regarding the best management technique for CCS due to its complexity¹.
- The central focus of prior studies have focused on either conservative or surgical management, rather than a comparative analysis of both¹⁻³.
- Raises questions about outcome differences and associated risks among intervention methods.

METHODS

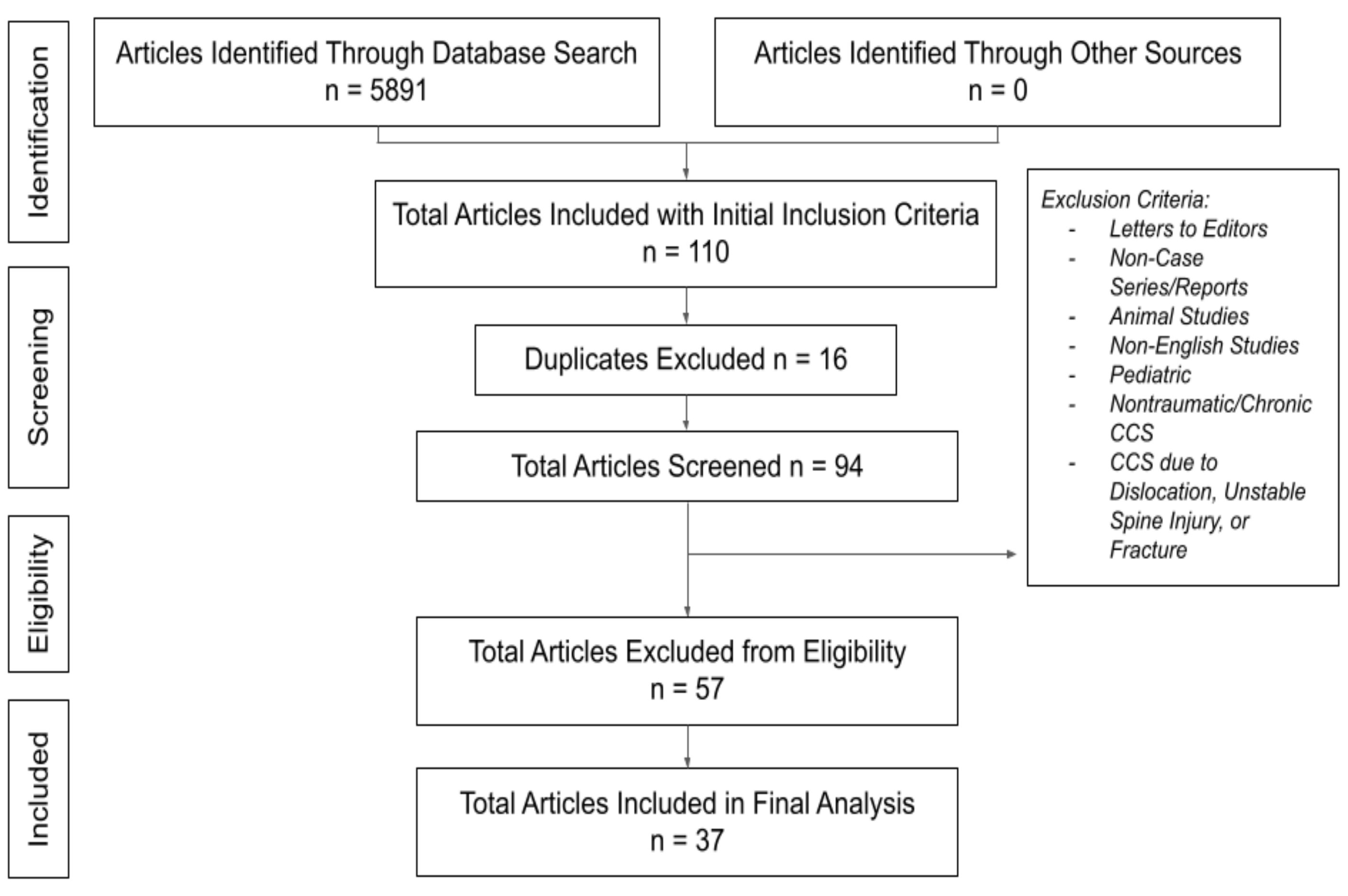


Figure 1. Systematic review and meta-analysis following PRISMA guidelines

RESULTS

CCS Onset, Presentation (N)	N (%) or mean ± SD	CCS Treatment, Outcomes (N)	N (%) or mean ± SD	
Age (99)	51.9 ± 16.4 years	Time from Injury to Treatment (88)	6.4 ± 9.9 days	
Sex (99)	M: 79 (79.8%) F: 20 (20.2%)	Management (99)	Surgical: 53 (53.5%)	
Cause of CCS (83)	Fall: 40 (40.4%)	Surgical Treatment (88)	Conservative: 19 (19.2%)	
	MVA: 31 (31.3%)		Both: 27 (27.3%)	
	Sports Trauma: 7 (7.1%)		Surgical Decompression: 59 (67.0%)	
	Other: 9 (9.1%)		ACDF: 41 (46.6%)	
	Pain: 27 (32.1%)		Posterior Approach: 10 (11.4%)	
Presenting Symptoms (84)	Hemorrhage: 5 (6.0%)	Conservative Treatment (87)	Steroids: 32 (36.8%)	
	UE Motor Deficits: 58 (69.0%)		Collar/Brace: 36 (41.4%)	
	LE Motor Deficits: 22 (26.2%)		Length of Follow Up	
	Sensory Deficits: 28 (33.3%)		Complications (64)	
Spinal Cord Location (98)	Asymptomatic: 3 (3.7%)	Neurologic Outcome (97)	Wound Infection: 2 (3.1%)	
	Cervical: 98 (100%)		Respiratory: 2 (3.1%)	
	Thoracic: 6 (6.1%)		Cardiac: 3 (4.7%)	
	Lumbar: 0 (0%)		Improved: 89 (91.8%)	
	Multilevel: 6 (6.1%)		Neutral: 1 (1.0%)	
Spinal Findings (99)	Spinal Stenosis: 57 (57.6%)	Symptom Free (78)	Worsened: 6 (6.2%)	
	Disc Herniation/Bulge: 34 (34.3%)		24 (30.8%)	
	Autofusion: 6 (6.1%)		Death (99)	2 (2.0%)
	Spondylosis: 37 (37.4%)			

Table 1. Summary of patient demographics, management, and neurologic outcome for all case reports included in the systematic review.

- 37 articles encompassing 99 cases of adult CCS: 79 males and 20 females.
- Conservative management more prevalent in CCS due to:
 - Sports trauma (35.3% vs. 1.23%, p=0.0000)
 - Patients with upper extremity motor deficits (94.1% vs. 50.6%, p<0.01)
 - Pain symptoms (52.9% vs. 21%, p<0.05);
- Predictors of surgical intervention:
 - >24 hours post-injury (p<0.001, OR: 17.18, 95% CI: 3.00-182.81)
 - Spondylosis (p<0.01, OR: 8.84, 95% CI: 1.82-86.09)
- Surgical intervention less likely with increased patient age (p<0.01, OR: 0.96, 95% CI: 0.93-0.98).
- Predictors of conservative management:
 - CCS due to sports trauma (p<0.001, OR: 0.03, 95% CI: 0.00-0.29)
- No statistically significant difference in improvements between surgical and conservative management (87.7% vs. 100%, p=0.2765).

RESULTS

Variable	OR	95% CI	P		
CAUSE OF CCS	Age	1.01	0.98	1.05	0.4465
	Gender	Inf	1.12	Inf	0.0369
	Occurrence of spinal hyperflexion during injury	2.13	0.65	7.32	0.1840
	Fall	0.81	0.24	2.71	0.7884
	Motor Vehicle Accident	2.29	0.62	10.69	0.2617
SYMPTOMS	Sports Trauma	0.03	0.00	0.29	0.0002
	Other	0.39	0.07	2.84	0.3528
	Pain	1.50	0.37	6.13	0.5447
	Headache	0.67	0.01	55.54	1.0000
	Hemorrhage	0.61	0.04	9.19	0.6337
LOCATION	Upper Extremity Motor Deficits	0.64	0.01	7.20	1.0000
	Lower Extremity Motor Deficits	1.52	0.38	6.30	0.5477
	CN Palsy	Inf	0.02	Inf	1.0000
	Cerebellar Symptoms	Inf	0.43	Inf	0.1468
	Asymptomatic	Inf	0.14	Inf	0.5631
SPINAL PRESENTATION ON IMAGING	Thoracic	0.40	0.05	4.79	0.2823
	Multilevel	0.40	0.05	4.79	0.2823
	Spinal Stenosis	1.04	0.25	3.78	1.0000
	Ligament Ossification	1.37	0.14	69.24	1.0000
	Disc Herniation	0.99	0.30	3.61	1.0000
TIMING OF MANAGEMENT	Discoligamentous Injury	2.32	0.47	22.72	0.3492
	Autofusion	0.04	0.00	0.41	0.0013
	Spinal Fracture	0.12	0.01	1.17	0.0354
	Spondylosis	8.84	1.82	86.09	0.0020
	Spinal Cord Edema	1.11	0.19	11.82	1.0000
Management Within 24 Hours Of Injury	0.06	0.01	0.34	0.0002	
Management More than 24 Hours After Injury	17.18	3.00	182.81	0.0002	
Time from Diagnosis To Intervention (days)	5.59	1.52	20.59	0.0097	

Table 2. Predictors of Surgical (Vs Conservative) Management

CONCLUSION

- The method of intervention, or combination, does not significantly impact patient outcomes
- Early surgical intervention within 24 hours of injury does not appear to be superior to conservative management with possible deferred operation.

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