

TABLE 1: PICO search strategy Table for the systematic review		
Study Component	Inclusion	Exclusion
Participants	<ul style="list-style-type: none"> • Adult patients (18 – 80 years old) • Patients with herniated or degenerative cervical neck discs 	<ul style="list-style-type: none"> • History of tumour • Infection • SCI • Trauma/Fracture • Skeletally immature patients • Scoliosis or cervical deformity
Intervention	1 – 2 levels ACDF using osteobiologics other than BMP (DBM, HA, β -TCP, ceramics)	<ul style="list-style-type: none"> • Anterior and posterior cervical fusions • Anterior cervical corpectomy and fusion
Comparator(s)	Compare according DBM, HA, β -TCP 1 or 2 surgical levels	Use of BMP
Outcomes	Complications	<ul style="list-style-type: none"> • No complications reported • Reporting no complications • Cage subsidence • Donor site complications
Study Design	RCTs, cohort studies, prospective or retrospective studies with ≥ 10 patients per group	<ul style="list-style-type: none"> • In vitro studies, animal studies • Case reports • Comparative studies with < 10 patients per treatment group
Publication	Studies published in English in peer reviewed journals, publicly published HTAs or available FDA reports. (Each publication with a full review should be indicated whether or not it is an industry supported study.) Databases to be searched: PubMed, EMBASE, Cochrane, clinical trial.gov	<ul style="list-style-type: none"> • Abstracts, editorials, letters • Duplicate publications of the same study which do not report on different outcomes • Single reports from multicentre trials • Studies reporting on the technical aspects of biologics use in fusion surgery • White papers • Narrative and systematic reviews • Articles identified as preliminary reports when results are published in later versions
Timing	Published in 2000 or later	

Abbreviations: DBM: demineralized bone matrix; HA: hydroxyapatite; β -TCP: β -tricalcium-phosphate; BMP: Bone morphogenetic protein; ACDF: Anterior cervical discectomy and fusion; RCT: Randomized controlled trial; SCI: Spinal cord injury

TABLE 2: MINORS scores of the included observational studies.

First author, year	MINORS score*
Agrillo U et al. ⁷ , 2002	12 / 16
Cauthen JC et al. ⁸ , 2003	18 / 24
Cosar M et al. ⁹ , 2008	11 / 16
Akula M et al. ¹⁰ , 2008	10 / 16
Moon HJ et al. ¹¹ , 2010	8 / 16
Niu CC et al. ¹² , 2010	21 / 24
Zagra A et al. ¹³ , 2013	15 / 24
Shin JS et al. ¹⁵ , 2014	17 / 24
Kim SJ et al. ¹⁶ , 2014	20 / 24
Chin K et al. ¹⁹ , 2017	20 / 24
Yu J et al. ²¹ , 2017	18 / 24
Shiban E et al. ²² , 2018	11 / 16

(*) MINORS maximum score 16 points for non-comparative studies and 24 for comparative studies.

TABLE 3: Surgical data and outcomes of the included studies.

First author/year	Year	Treatment	Plating (Yes / No)	Osteobiologic used	Follow-up (months)	Fusion rate (12 months)
Hacker RJ et al. ⁶	2000	Titanium alloy BAK/C (N=179) HA-coated BAK/C (N=167) Tricortical iliac bone or allograft (N=142)	No No No	ABG ABG, HA ABG, allograft	24	97.1% / 72.7% ∞ 98.9% / 87.5% ∞ 89.7% / 83.3% ∞
Agrillo U et al. ⁷	2002	Carbon fiber cage (N=45)	No	HA	22.3 (14 – 38)	100%
Cauthen JC et al. ⁸	2003	Cage (N=30) Dowel (N=32) Dowel-plate (N=26)	No No Yes	ABG, Allograft, DBM	24 (12 – 66)	97% 84% 85%
Cosar M et al. ⁹	2008	β-TCP/HA ceramic graft (N=17)	No	β-TCP/HA	20 (18 – 24)	NR
Akula M et al. ¹⁰	2008	Titanium plate cage (N=50)	Yes	ABG, HA	24 (9 – 62)	NR
Moon HJ et al. ¹¹	2010	PEEK cage (N=27)	No	DBM	25.5 (13 – 60)	88.9%
Niu CC et al. ¹²	2010	Titanium cage (N=28) PEEK cage (N=25)	No No	β-TCP Allograft	31.9 ± 3.4 30.4 ± 3.3	86.5% 100%
Zagra A et al. ¹³	2013	Tricortical iliac bone (N=24) Titanium cage (N=29) PEEK cage (N=33)	Yes No No	ABG ABG β-TCP	84 (60 – 144)	100% 100% 100%
Kim CH et al. ¹⁴	2013	PEEK cage (N=29) Tricortical iliac crest bone (N=23)	No Yes	HA + BMA ABG	31 ± 17 (12 – 63)	76% (6 months) 92% (6 months)
Shin JS et al. ¹⁵	2014	Zero-profile device (N=20) PEEK cage (N=20) Tricortical iliac bone (N=20)	No No Yes	DBM DBM ABG	13.2 ± 1.0 13.1 ± 1.2 13.7 ± 1.1	NR NR NR
Kim SJ et al. ¹⁶	2014	Double cylindrical cage (N=48) Tricortical iliac bone (N=48)	No Yes	ABG + DBM ABG	12	97.9% 97.9%
Xie Y et al. ¹⁷	2015	PEEK cage (N=35) PEEK cage (N=33)	Yes Yes	CS/DBM ABG (iliac)	24	94.3% 100%
Yi J et al. ¹⁸	2015	PEEK cage (N=38) PEEK cage (N=39)	Yes Yes	HA + DBM HA + β-TCP	12	87% / 87%* 87% / 72%*
Chin K et al. ¹⁹	2017	PEEK cage outpatient (N=75) PEEK cage inpatient (N=70)	Yes Yes	DBM DBM	24	NR NR
Farrokhi MR et al. ²⁰	2017	Acrylic cage (N=32) PEEK cage (N=32)	No No	β-TCP β-TCP	12	96.9% 93.8%
Yu J et al. ²¹	2017	PEEK cage (N=37) PEEK cage (N=31) Tricortical iliac bone (N= 47)	No Yes Yes	DBM DBM ABG	36.9 (24 – 67) 39.1 (24 – 65) 38.5 (24 – 60)	97.4% 96.3% 97.8%
Shiban E et al. ²²	2018	PEEK cages (N=194)	No	DBM	36 (12 – 56)	79% single level 82% two levels