Supplementary Table 2. Characteristics of all prospective comparative studies*

Studies	Year published	Intervention (Number of patients in percutaneous group, open group)	Diagnoses (Number of patients in percutaneous group, open group)	Inclusion criteria	Exclusion criteria
Parker et al.[19]	2014	Single-level TLIF (50, 50)	Degenerative spondylolisthesis grade I (50, 50)	Evidence on MRI of grade I degenerative spondylolisthesis Mechanical low back pain and radicular symptoms Unresponsive to at least 6 weeks of conservative therapy Between 18 and 70 years of age	Previous back operation An extraspinal cause of back pain or sciatica An active medical or workman's compensation lawsuit Any pre-existing spinal pathology Unwilling or unable to participate with follow-up procedures
Gu et al.[21]	2013	Two-level TLIF (44, 38)	Degenerative disc disease (15, 11) Spinal stenosis (18, 14) Spinal stenosis with segmental instability (11, 13)	Far-lateral disk herniation, huge lumbar disk herniation or recurrent lumbar disk herniation and symptomatic adjacent segment pathology/ degeneration; two-level lumbar stenosis both requiring facetectomy and fusion; symptomatic lumbar stenosis with degenerative disc disease combined with segmental instability; symptomatic degenerative disc disease Two-level fusions were needed between L3 and S1 Persistent or recurrent low back pain or leg pain lasting at least six moths and resulting in a significant reduction of quality of life, despite conservative therapy, including physical therapy and pain management	Previous spinal surgery, lumbar fracture, active infection, severe osteoporosis and severe obesity Combination of coronal and/or sagittal deformities that needed a surgical correction Degenerative spondylolisthesis with major instability or isthmic spondylolisthesis Any major psychological problem
Lee et al.[22]	2012	Single-level TLIF (72, 72)	Spondylolisthesis (Grade 1 and 2) Recurrent disc herniation Spinal stenosis requiring resection of more than 50% of either facet joint Degenerated collapsed disc requiring disc-space height restoration (Specific number NR)	Single level TLIF MIS cases utilizing Sextant I pedicle screw-rod instrumentation and Capstone interbody cage Unresponsive to at least 6 months of conservative therapy	Previous spinal instrumentation Tumor spinal pathologies Spinal infection Acute spinal trauma
Mobbs et al.[23]	2011	Single- or Multi-level PLIF (37, 30)	Isthmic spondylolisthesis (4, 9) Degenerative spondylolisthesis (18, 9) Degenerative scoliosis (1, 4) Degenerative disc disease with foraminal stenosis (14, 8)	Degenerative pathology only Mechanical low back pain, radicular symptoms, claudication or combination Unresponsive to at least 6 months of conservative therapy Between 18 and 75 years of age	NR
Kotani et al.[24]	2011	Single-level PLF (43, 37)	Degenerative spondylolisthesis (43, 37)	Apparent intermittent neurological claudication and/or radicular neurological sympoms	Low back pain alone
Wang et al.[25]	2011	Single- or two-level TLIF (25, 27)	Recurrent disc herniation (7, 8) Postsurgical foraminal stenosis (10, 9) Postsurgical segmental instability (5, 7) Postsurgical spondylolisthesis grade 1 (3, 3)	Failed discectomy and decompression by open posterior midline approach	NR
Wang et al.[26]	2010	Single-level TLIF (42, 43)	Degenerative spondylolisthesis (24, 22) Isthmic spondylolisthesis (18, 21)	Low back pain as their predominant complaint Unresponsive to at least 3 months of conservative therapy	NR
Schizas et al.[27]	2008	Single-level TLIF (18, 18)	Isthmic spondylolisthesis (15, 6) Degenerative disc disease with foraminal stenosis (2, 12) Iatrogenic spondylolysis (1, 0)	NR	NR
Park et al.[29]	2007	Single-level PLIF (32, 29)	Isthmic spondylolisthesis (6, 7) Degenerative spondylolisthesis (7, 5) Lumbar disc herniation (1, 3) Spinal stenosis with segmental instability (18, 14)	Segmental instability at the level of spinal stenosis Huge lumbar disc herniation Low-grade spondylolisthesis	Previous spinal surgery or those who needed multiple levels of decompression

*TLIF = transforaminal lumbar interbody fusion, PLIF = posterior lumbar interbody fusion, PLF = posterolateral fusion, and NR = not reported.

Supplementary Table 2. Continued*

Studies	Comparison group	N	Age	Gender Male (%)	Fusion level	Instrumentations including cage and pedicle screw	Bone graft	Follow-up† (months)	CMS
Parker et al.[19]	Percutaneous group	50	53.5 ± 12.5	16 (32)	L3-4; 4 L4-5; 32 L5-S1; 14	A single PEEK interbody cage and percutaneous pedicle screw system (implants NR)	Local autogenous bone with or without bone extensors (i.e., DBM)	24, % followed: NR	74
	Open group	50	52.6 ± 11.6	18 (36)	L3-4; 3 L4-5; 30 L5-S1; 17	A single PEEK interbody cage and conventional pedicle screw system (implants NR)	Local autogenous bone with or without bone extensors (i.e., DBM)	24, % followed: NR	
Gu et al.[21]	Percutaneous group	44	66.4 ± 6.7	19 (43.2)	L3-5; 13 L4-S1; 31	A single PEEK interbody cage (Capstone; Medtronic, USA) and percutaneous pedicle screw system (Sextant; Medtronic, USA)	Local autologous bone	20.6 ± 4.5, % followed: NR	74
	Open group	38	64.1 ± 7.8	15 (39.5)	L3-5; 14 L4-S1; 24	NR	NR	20.0 ± 3.3, % followed: NR	
Lee et al.[22]	Percutaneous group	72	52.2 ± 13.8	20 (27.8)	L3-4; 6 L4-5; 49 L5-S1; 17	A single PEEK interbody cage (Capstone; Medtronic, USA) and percutaneous pedicle screw system (Sextant; Medtronic, USA)	Local autogenous bone with DBM (Osteofil; Medtronic, USA)	24, 95.8% (69/72) followed for 24 months	77
	Open group	72	56.6 ± 14.6	22 (30.6)	L3-4; 4 L4-5; 54 L5-S1; 14	A single PEEK interbody cage (Capstone; Medtronic, Memphis, TN, USA) and conventional pedicle screw system (implants NR)	Local autogenous bone with DBM (Osteofil; Medtronic, USA) and one case with rhBMP-2 (Infuse; Medtronic, USA)	24, 91.7% (66/72) followed for 24 months	
Mobbs et al.[23]	Percutaneous group	37	68.56 ± 12.99	19 (51.4)	T11-12; 0 L2-3; 1 L3-4; 2 L4-5; 20 L5-S1; 6 Multi-level; 8	A single rotatable interbody cage (implants NR) and percutaneous pedicle screw systems (Denali/Serengeti system; K2M, USA and MANTIS; Stryker, USA)	Local autogenous bone with or without synthetic bone	11.5 (5.4 -20.1), % followed: NR	72
	Open group	30	67.48 ± 13.19	16 (53.3)	T11-12; 1 L2-3; 0 L3-4; 0 L4-5; 15 L5-S1; 9 Multi-level; 5	A single rotatable interbody cage and conventional pedicle screw system (implants NR)	Local autogenous bone with or without synthetic bone	18.7 (8.1-40.0), % followed: NR	
Kotani et al.[24]	Percutaneous group	43	63 ± 9	14 (32.6)	L3-4; 4 L4-5; 76 (No specific declaration between groups)	Percutaneous pedicle screw system (Sextant; Medtronic, USA)	Autogenous posterior iliac crest bone	32 (24-49), % followed: NR	80
	Open group	37	66 ± 9	12 (32.4)		Conventional polyaxial pedicle screw and rod system (implants NR)	Autogenous posterior iliac crest bone	40 (24-60), % followed: NR	
Wang et al.[25]	Percutaneous group	25	54.8 ± 10.9	13 (52.0)	L3-4; 2 L4-5; 11 L5-S1; 9 Two-level; 3	A single PEEK interbody cage (OIC; Stryker, USA) and percutaneous pedicle screw system (Sextant; Medtronic, USA)	Local autogenous bone with or without autogenous iliac crest bone	Overall, 27.5 (12-38), % followed: NR	68
	Open group	27	56.2 ± 13.6	15 (55.6)	L3-4; 2 L4-5; 11 L5-S1; 10 Two-level; 4	A single PEEK interbody cage (OIC; Stryker, USA) and conventional pedicle screw system (implants NR)	NR		
Wang et al.[26]	Percutaneous group	42	47.9 ± 8.5	13 (30.1)	L3-4; 3 L4-5; 21 L5-S1; 18	A single PEEK interbody cage (OIC, Stryker, USA) and percutaneous pedicle screw system (Sextant; Medtronic, USA)	Local autogenous bone	Overall, 26.3 (13-35), % followed: NR	70
	Open group	43	53.2 ± 10.6	16 (37.2)	L3-4; 3 L4-5; 23 L5-S1; 17	NR	NR		
Schizas et al.[27]	Percutaneous group	18	45.5 ± NR	NR	L5-S1; 12 Other level NR; 6	A single PEEK interbody cage (Medtronic, USA) and percutaneous pedicle screw system (Sextant (11 cases); Medtronic, USA and Viper (7 cases); DePuy Spine, USA)	Local autologous bone with autogenous iliac crest bone	22, % followed: NR	61
	Open group	18	48.1 ± NR	NR	L5-S1; 11 Other level NR; 7	NR	Local autologous bone with autogenous iliac crest bone	24, % followed: NR	
Park et al.[29]	Percutaneous group	32	62.1 ± 9.6	8 (25)	L3-4; 2 L4-5; 23 L5-S1; 7	A single PEEK interbody cage (Telamon; Medtronic, USA) and percutaneous pedicle screw system (Sextant; Medtronic, USA)	Local autogenous bone	12, % followed: NR	56
	Open group	29	59 ± 12.2	13 (44.8)	L3-4; 3 L4-5; 18 L5-S1; 8	A single PEEK interbody cage (Telamon; Medtronic, USA) and conventional pedicle screw system (implants NR)	Local autogenous bone	12, % followed: NR	

*CMS = Coleman Methodology Score, PEEK = polyetheretherketone, NR = not reported, DBM = demineralized bone matrix, and rhBMP-2 = recombinant human bone morphogenetic protein-2.