

INPLASY

Is the Porous-Ti cage superior to the PEEK cage in T/PLIF? A systematic review and meta-analysis

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ADMINISTRATIVE INFORMATION**Support -** No.**Review Stage at time of this submission -** Completed but not published.**Conflicts of interest -** None declared.**INPLASY registration number:** INPLASY202520012**Amendments -** This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 3 February 2025 and was last updated on 3 February 2025.**INTRODUCTION**

Review question / Objective The association between the type of cage used and clinical outcomes in patients undergoing T/PLIF for lumbar degenerative disease(LDD) remains controversial. We conducted a meta-analysis to evaluate the impact of porous titanium(porous-Ti) cages compared to PEEK cages on postoperative fusion rates and subsidence rates.

Rationale Previous meta-analyses have indicated that porous-Ti cages significantly improve bone fusion rates and reduce subsidence rates. However, the studies included were either entirely composed of, or largely composed of, independent lateral lumbar interbody fusion (SA-LLIF) procedures. Some studies suggest that in the LLIF procedure, PEEK cages combined with additional posterior fixation significantly improve fusion rates and reduce subsidence rates compared to SA-LLIF. Therefore, we believe that comparing porous-

Ti and PEEK cages in unstable intervertebral environments may be biased, as it magnifies the drawbacks of smooth-surfaced PEEK cages. Based on this, our aim is to investigate whether porous-Ti cages retain their advantages in a stable intervertebral environment(T/PLIF). Furthermore, given that T/PLIF is the most commonly applied procedure for treating LDD, it is necessary to conduct a separate meta-analysis for this procedure.

Condition being studied The combination of interbody fusion cages and pedicle screw-rod systems for lumbar decompression and fusion is a common surgical procedure for treating LDD, including PLIF and TLIF. With the global aging population, the number of T/PLIF procedures in the United States increased by 62.3% from 2004 to 2015, along with a rise in associated complications. Pseudarthrosis and cage subsidence not only prolong postoperative recovery but may also increase the risk of postoperative pain, neurological damage, and

spinal dysfunction, with severe cases potentially requiring revision surgery. Therefore, in T/PLIF procedures, improving fusion rates and reducing cage subsidence have become key objectives in clinical spinal research.

METHODS

Search strategy

PubMed

(((((Polyetheretherketone)) OR (PEEK)) OR (polyetheretherketone[MeSH Terms])) AND (((3D-Printed Titanium) OR (Porous Titanium)) OR (3D Titanium)) OR (Titanium[MeSH Terms]))

Embase

('Polyetheretherketone' OR 'PEEK') AND ('3D-Printed Titanium' OR 'Porous Titanium' OR '3D Titanium') Sort by: Publication Year

Cochrane

Polyetheretherketone OR PEEK in All Text AND 3D-Printed Titanium OR Porous Titanium OR 3D Titanium in All Text

Scopus

(((ALL ("Polyetheretherketone") OR ALL ("PEEK"))) AND ((ALL ("3D-Printed Titanium") OR ALL ("Porous Titanium") OR ALL ("3D Titanium")))) Sort on: Date (newest).

Participant or population Patients undergoing T/PLIF procedure due to degenerative lumbar spine diseases.

Intervention Porous titanium(porous-Ti) cages.

Comparator PEEK cages.

Study designs to be included Randomized controlled trials, prospective cohort studies, or retrospective case-control studies.

Eligibility criteria Inclusion criteria: • Age: 18-75; • Patients, conforming to diagnostic standards of lumbar spinal stenosis, prolapse of lumbar intervertebral disc, and lumbar spondylolisthesis, who have no responses to half-year conservative treatment and plan to receive PLIF; • Patients with complete and valid peri-operative data; • Patients signed the informed consent.

Exclusion criteria: • Patients confirmed or suspected to be allergic to implant; • Patients with spinal tumors or infectious diseases; • Patients with serious systemic diseases and intolerant of

surgeries; • Patients with peri-operative data incomplete.

• Patients with coronary heart disease, diabetes and other basic diseases.

Information sources Medline, Embase, Cochrane, and Scopus databases from November 3, 2024, to January 17, 2025.

Main outcome(s) Our primary outcomes were the fusion rates and subsidence rates. For fusion rates, we separately calculated the early (6 months) and final fusion rates (≥ 12 months), as well as the excellent fusion rates at each time point. Secondary outcomes included lumbar lordosis, segmental lordosis, patient-reported outcomes (ODI and VAS-back), surgical complications, and reoperation rates.

Additional outcome(s) No.

Data management Use Zotero to manage references and Excel to manage data.

Quality assessment / Risk of bias analysis The methodological quality of the included studies was assessed using the Newcastle–Ottawa Scale, with higher scores reflecting better methodological quality. Articles were categorized as low, moderate, or high quality, based on scores of 0–3, 4–6, and 7–9, respectively.

Strategy of data synthesis The meta-analysis was conducted using Review Manager 5.4 (Revman, The Cochrane Collaboration, Oxford, UK). The combined estimates for continuous and dichotomous outcomes were presented as mean differences (MD) and odds ratios (OR), respectively, with corresponding 95% confidence intervals (CI). A random-effects model was applied to analyze the data, with statistical heterogeneity assessed using the I^2 statistic. If heterogeneity is high ($I^2 > 50\%$), We first conducted subgroup analyses (e.g., based on the criteria for fusion or subsidence). If heterogeneity remains unresolved, sensitivity analysis will be performed by sequentially removing individual studies and re-conducting the meta-analysis. The results with the minimum heterogeneity, defined as $I^2 < 50\%$, will be considered the final outcomes.

Subgroup analysis Subgroup analysis should be performed if heterogeneity is high ($I^2 > 50\%$).

Sensitivity analysis If heterogeneity persists, sensitivity analysis should be conducted.

Language restriction English.

Country(ies) involved China.

Other relevant information No

Keywords Lumbar degenerative disease, Lumbar fusion, Porous titanium cage, PEEK cage, Fusion rate, Subsidence rate.

Dissemination plans Publicly published.

Contributions of each author

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