

Material	Advantages	Disadvantages	Applications
Stainless Steel	Strong Stiff Inexpensive	Poor biocompatibility High imaging artifacts	Use now mostly limited for use in rods for scoliosis correction
Titanium	Lightweight Strong Flexible Biocompatible	Relatively expensive Imaging artifacts	Screw Rods Cages Plates
Polyetheretherketone	Lightweight Flexible Biocompatible Low imaging artifacts	High Young's modulus Some grafting issues but improved with coatings	Rods Cages Screws Disc replacements
Cobalt Chromium	Strong Flexible Biocompatible	Relatively expensive High imaging artifacts	Mainly used for pediatric scoliosis correction rods
Ceramic	Relatively inexpensive Biocompatible Water resistant	High Young's modulus Low tensile strength Poor crack resistance Low fracture toughness Brittle even with doping Grafting issues but can be improved with coating/doping	Cages Doped with apatite-wollastonite
Nitinol	Strong Maintains shape memory	Relatively expensive Stiffness may not be enough to maintain correction	Not widely used, may be used for pediatric scoliosis surgeries
Tantalum	High frictional characteristics	Very expensive Stiffness may not be enough to maintain correction	Not frequently used due to price. Largely been replaced by titanium.
Biodegradable Materials (ie. PLA, PLGA, PLDLLA, PLLA)	Biocompatible Osteoconductive	Inferior biomechanical properties compared to permanent materials Reported high failure rates of 26.4%-50% in posterior lumbar instrumented fusions	Interbody cages ACDF plates and screws
3D Printed Materials (ie. PEKK)	Osteoconductive Antibacterial properties	Few robust clinical studies	Interbody cages

Abbreviations: PLA = polylactic acid; PLGA = poly-lactide-co-glycolide; PLDLLA = poly-L-lactide-co-D, L-lactide acid; PLLA = poly-L-lactide acid; ACDF = anterior cervical discectomy and fusion; PEKK = polyetheretherketone.