# Lumbar arthroplasty history

The origins of lumbar disc replacement started in 1966 with Fernström [1] who implanted a stainless-steel ball within 191 lumbar and 13 cervical discs spaces of 125 patients with clinical outcomes similar to fusion. However, the ball was associated with significant complications caused by subsidence and extrusions. A couple of decades later, in the early 1980s, at Charité Hospital, Dr Karin Buettner-Janz, an orthopedic spine surgeon as well as former Olympic gymnast, and Kurt Schellnack, an engineer, published their first experience with the original Charité artificial disc for the lumbar spine, which ushered in the modern era for lumbar arthroplasty [2].

The Charité artificial disc went through revisions over 6 years, resulting in the SB Charité III, and the first clinical experience was published in 1994 using the final version of the SB Charité III (DePuy Spine Inc, Raynham, Massachusetts) [3].

The clinical trial in the United States for Food and Drug Administration (FDA) approval began in 2000, and the device was cleared for use in 2004. Since then, multiple other lumbar arthroplasty devices have been developed and have become available in the United States and Europe [4].

The second generation of artificial disc design, ProDisc-L (Centinel Spine, West Chester, Pennsylvania), was granted FDA approval in 2006, followed by a third-generation artificial disc design, activL (Aesculap Implant Systems, Center Valley, Pennsylvania) in 2015.

In addition to these devices, Acroflex (Acromed Corporation, Cleveland, Ohio), the Maverick (Medtronic, Dublin, Ireland), Kineflex (Spinal Motion, Mountainview, California), FlexiCore (Stryker, Kalamazoo, Michigan), LP-ESP (FH Orthopedics, Heimsbrunn, France), and M6-L (Orthofix, Lewisville, Texas) lumbar discs have either completed their trials, are actively ongoing or have been discontinued or withdrawn without FDA approval. All of these devices are available outside of the United States. Additionally, XL TDR (NuVasive, San Diego, California) and Triumph (Globus Medical, Audubon, Pennsylvania), which offered insertion techniques via lateral and posterior approaches, respectively, are only investigational at this point or available outside the United States [5].

There had been a rise in disc arthroplasty in the years following FDA approval of the Charité, with the largest rise in the first year from 2004 to 2005. However, enthusiasm for arthroplasty was tempered the following decade. Early problems with implantation of the Charité artificial discs by the general spine surgeon community resulted in a number of reported serious adverse events to the FDA and numerous litigation cases. Also, the Centers for Medicare and Medicaid Services issued a National Coverage Determination in 2006, which negatively impacted people’s access to the procedure for those who were over the age of 60. As a result, the number of United States lumbar arthroplasty procedures dropped from 3650 in 2005 to 1863 in 2010, whereas revision procedures increased to 499 from 420 during the same time interval [6].

Additionally, improvements in pain management, fusion techniques, and less-invasive methods also contributed to reductions in arthroplasty. In 2011, Johnson & Johnson acquired Synthes, which included the ProDisc-L, and by 2012, they stopped worldwide sales of the Charité artificial disc. Although ProDisc-L was still available, surgeon interest in arthroplasty was poor following the Charité experience. A slow, but steady, increase in lumbar arthroplasty interest and utilization has occurred following the introduction of the third-generation device, activL, in 2015. Currently, 65% of insurance providers now cover single-level lumbar arthroplasty compared to 25% in 2015 and 13% in 2012. All current studies have generated a large body of evidence on the safety and efficacy of arthroplasty and have demonstrated overall noninferiority to fusion. Spinal surgeons should be aware that

arthroplasty is a very acceptable alternative within the surgical armamentarium and should not shy away from utilizing arthroplasty when indicated [7].

# References


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