Dynamic pedicle-based stabilization: a true blessing?

TO THE EDITOR: We read with great interest the study published by Meyer et al.,1 which compared the outcome following lumbar fusion versus pedicle-based dynamic stabilization (Meyer B, Thomé C, Vajkoczy P, et al. Lumbar dynamic pedicle-based stabilization versus fusion in degenerative disease: a multicenter, double-blind, prospective, randomized controlled trial. J Neurosurg Spine. 2022;37(4):515-524). We would like to extend our heartfelt congratulations to the team for the design and conduct of this trial. However, we want to address a few issues.

Lumbar interbody fusion techniques ensure a 360° fixation and also address anterior pathology like a prolapsed intervertebral disc. Restoration of disc height leads to indirect decompression of the foram with improvement in radicular pain. Fujimori et al. have demonstrated that transforaminal lumbar interbody fusion leads to better improvement of pain in patients with spondylolisthesis compared with posterolateral fusion.2 As Meyer et al. stated that they did not access the anterior column, were patients with prolapsed intervertebral discs excluded from the study?

The success rate was calculated based on improvement in Oswestry Disability Index (ODI) scores by 15% at the end of 24 months, which is low. Austevoll et al.3 recommended using an ODI score improvement of 30% from baseline. The SPORT (Spinal Patient Outcomes Research Trial) has demonstrated an average improvement in ODI score of 24 in patients with lumbar spondylolisthesis 2 years after surgery.4 In the lumbar canal stenosis component of the study, the average improvement in ODI in the surgical group was 20.5.5 Therefore, at least a 20% improvement should be expected following surgery.

Dynamic stabilization is expected to avoid adjacent-segment disease. However, 5 patients in the dynamic stabilization group developed adjacent-segment degeneration as opposed to 4 patients in the fusion group. Donnally et al., in their meta-analysis on adjacent-segment disease following lumbar fusion versus motion-preserving procedures, reported no statistically significant difference between the two groups.6 This puts into perspective the aim of performing dynamic stabilization. Also, since the recruitment ended in 2015, 7-year follow-up data on the study participants would have given a better picture.

One of the strong advantages of dynamic stabilization conveyed in this study was the shorter duration of surgery and less blood loss. However, neither of these had any effect on the outcome in terms of blood transfusion requirement and duration of hospital stay. So, does this numerical advantage have any significant effect barring the operative costs?

One of the greatest shortcomings of this study is a lack of follow-up imaging. In the group of patients with dynamic stabilization who did manage to improve, we cannot deduce if the result was due to induction of fusion or if it was due to preservation of motion per se. As pointed out by the authors, unintended facet arthrodesis was observed in 52.1% of the patients following Dynesys dynamic stabilization as reported by Fay et al.7 Also, a screw pullout rate of 19.7% has been reported by Ko et al. following dynamic stabilization.8 Both could have been assessed on follow-up CT.

We highly commend the authors on recognizing some of these shortcomings and we hope to see the long-term follow-up results from the study.

Vishwa Bharathi Gaonkar, MCh
Artemis Hospital, Gurgaon, Haryana, India

Manbachan Singh, MCh
Fortis Memorial Hospital, Gurgaon, Haryana, India

Sanjeev Srivastava, DNB
Pawan Goyal, MCh
Sanjay K. Rajan, MCh
Aditya Gupta, MCh
Artemis Hospital, Gurgaon, Haryana, India

References


**Disclosures**

The authors report no conflict of interest.

**Correspondence**

Visha Bharathi Gaonkar: vibha.gaonkar92@gmail.com.

**INCLUDE WHEN CITING**

Published online June 2, 2023; DOI: 10.3171/2023.3.SPINE23277.

**Response**

We appreciate the interest of Gaonkar and colleagues in our work and their efforts in pointing out the obvious, that is, that no clinical study will ever be perfect when looked at in retrospect. However, we take issue with some points they raised.

In low-grade degenerative instabilities of the lumbar spine, anterior support is not needed to achieve the same functional results as with posterior surgery alone. This is exactly the point our study proves with the to-date best available level of evidence for dynamic/semirigid systems and the reason why many spine surgeons rely on instrumented posterolateral fusion. In particular, the Scandinavian groups have shown very convincingly that there is no difference in functional outcome. Citing an underpowered, retrospective study is certainly not the best way to “prove” this wrong.

A 15-point absolute improvement in ODI was considered appropriate at the time our study concept was established in 2009, and it still is. While we acknowledge the authors’ enthusiasm, we recommend reading the literature very carefully before jumping to conclusions or writing letters. At the 12-month follow-up, Austevoll et al. reported an absolute change in ODI from 40 to 23 for lumbar spinal stenosis patients and from 41 to 22 for lumbar degenerative spondylolisthesis patients, which was then used to calculate a clinically meaningful difference occurring at a relative ODI change of 30%. The absolute treatment effect of surgery for ODI scores reported in the SPORT publications was −16.7 at 2 years. Therefore, the absolute reduction in the ODI score for our groups is exactly in the expected range.

As discussed in our article, the former concept of “dynamic” pedicle screw–based stabilization has changed toward a semirigid fixation allowing for “slow fusion,” being in essence similar to instrumented posterolateral fusion. This concept evolved over the years and also includes the fact that ASD cannot be avoided by these systems as opposed to true motion preservation devices (i.e., lumbar total disc replacement). Hence, this is another hitherto unproven fact, which was evidenced in this study.

Gaonkar and colleagues seem to have calculated from the end of recruitment in 2015 and the publication date in 2022 that a 7-year follow-up could have been achieved. A predefined 2-year follow-up with a recruitment period from 2011 to late 2015 equals a last-patient-out date in December 2017 and a data lock until the second half of 2018. This is followed by an analysis, writing, and submission period. A final acceptance to publication period of 1 year comes on top.

Without going into economic details, among direct costs, operating room time is the most expensive resource in countries like ours. An average reduction of 15% in operating room time per procedure adds up to a significant amount of money given the frequency of procedures. Less blood loss during surgery is usually considered beneficial per se. And we never claimed that to be a “strong” advantage, but merely a modest achievement.

This is not a relevant shortcoming, because it is simply a minor mechanical detail. From a patient’s perspective, it is not important if their condition improves regardless of whether fusion occurred or not, as long as painful pathological motion of the segment is restricted. That the concept of these systems has changed from dynamic toward semirigid and rather being a slow fusion device has been outlined above. Before our study, we had seen that 1) the range of motion allowed by this specific device is so small that it cannot be seen on functional radiographs and 2) the rate of hardware failure even in the long run is very low. All patients in this study who developed a problem such as symptomatic screw loosening underwent follow-up imaging. Therefore, the rate of hardware failure in both groups is well known and documented.

In summary, our study shows a well-evidenced but moderate gain in knowledge. This finding shows that in clinical science one often needs enormous efforts to propagate a very small achievement or possible change in clinical practice. This subsequent exchange shows that detachment from mechanistic viewpoints and strong beliefs might help in understanding this.

Bernhard Meyer, MD

On behalf of the authors of the DYNORFUSE Study Group

Technical University of Munich, Germany

**References**


3. Weinstein JN, Lurie JD, Tosteson TD, et al. Surgical versus...


**INCLUDE WHEN CITING**
Published online June 2, 2023; DOI: 10.3171/2023.5.SPINE23316.

©AANS 2023, except where prohibited by US copyright law.