



## Editorial on “Lumbar spinal stenosis: comparison of surgical practice variation and clinical outcome in three national spine registries” by Lønne *et al.*

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In the paper entitled “Lumbar spinal stenosis: comparison of surgical practice variation and clinical outcome in three national spine registries”, Lønne *et al.* present an observational study based on a combined cohort from the national spine registries of Norway, Sweden and Denmark. The authors aimed to compare the variation of practice-based surgical procedures—decompression only or decompression plus arthrodesis—as well as their effectiveness in patients with lumbar spinal stenosis (LSS) with or without degenerative spondylolisthesis. The ongoing controversy about adding arthrodesis in LSS patients, especially if there is coexisting degenerative spondylolisthesis, was enough motivation to conduct a pragmatic study on this topic. Further, this registry-based study allows for surgeons and patients to include their preferences in the workup-flow before undergoing surgery—like in the “real world” of clinical practice.

The authors can be congratulated on the excellence of their investigation, as observational multinational register studies with more than 10,000 patients are a rarity in spine surgery research. This study demonstrates that even in similar health care and insurance systems, which these Scandinavian countries share, the surgical treatment decisions can be very different. These real-life data from three different Scandinavian spine registries present significant different use of concomitant arthrodesis. The authors reported no superior treatment effectiveness in LSS patients that underwent additional fusion surgery in

comparison to simple decompression. Further, patients with additional arthrodesis stayed longer at hospital and caused higher treatment costs.

There are several limitations to the work of Lønne *et al.* They are limited information regarding the indications and reason of decision toward spinal fusion, particularly since spondylolisthesis does not necessarily means segmental instability or neuro-foraminal stenosis. It is however unlikely, that latter two conditions would be expected to be more prevalent between the here investigated country cohorts. Another weakness of the current study is that there are no detailed data on the important reoperation rates. From the past, we know that long-term reoperation rates can reach up to 20% (1). Therefore, all experts in the field agree that at least two years of follow-up should be a minimum, since many studies have shown that even after this period the immediate conclusion might change over time (2-4). Lønne *et al.* can only present results for a follow-up of one year so far. Moreover, the working hypothesis was retrospectively decided on and the current study was not initially designed for this research question. Regarding the perioperative complication, Lønne *et al.* remain relatively superficial and only describe the frequency of dural tears and bleeding. Fusion surgery, however, is associated with increased risk of major complications; it doubles the risk of severe adverse events (i.e., acute myocardial infarct, respiratory failure, pneumonia) and shows higher infection rates due to osteosynthesis material (5). Furthermore,

the longer operating times of fusion, compared with decompression alone, surgery increase the risks from anesthesia and their consequences in the typically elderly patient population. In these patients, osteoporosis is also a common concomitant disease. This can increase the risk of screw loosening and the subsidence of the intersomatic cage and therefore increases the risk of pseudoarthrosis. Nevertheless, surgeons use fusion procedures more and more (5) with the aim of preventing possible postoperative instability—especially if degenerative spondylolisthesis is present—despite the lack of consensus on this issue topic (6). Instability has been linked to low back pain, although often incorrectly, a frequent symptom in LSS patients. This may explain the different treatment strategies shown in a previous study by Lønne *et al.* where the fusion rate in patients without spondylolisthesis was 29% in the US and only 6% in Norway (7). In the current study, the authors observed that the rate of arthrodesis was not the same in all countries, Norway had the lowest rate, then Sweden and highest in Denmark. They did not find that the treatment effectiveness had a corresponding trend. Consequently, Lønne *et al.* do not support the argument that the addition of arthrodesis prevents low back pain related instability in LSS patients.

The findings of Lønne *et al.* are in line with the recent Swedish randomized controlled trial (RCT) of 247 patients by Försth *et al.* published in *New England Journal of Medicine* (NEJM). The authors reported neither reduced reoperation rates nor improvement in Oswestry Disability Index (ODI) in LSS patients receiving additional arthrodesis (1). Further, the more technically advanced decompression with fusion procedure was associated with higher costs but did not provide improvement with respect to the primary outcome measures. As a comparison, consider the results from the RCT by Ghogawala *et al.* (8) from the US with 66 patients. They reported that the addition of arthrodesis for LSS patients reduced the risk for reoperation and improved more the physical health-related quality of life (SF-36) than the laminectomy group (8). The study of Ghogawala, also published in the NEJM, was heavily criticized (9). Only 66 patients remained to be randomly assigned to the two treatment groups, resulting in 35 and 31 patients, respectively, per treatment group—an extremely small number of patients. Furthermore, Ghogawala *et al.* attempted to dismiss the ODI findings as secondary outcome and the reoperation rate (decompression alone group, 34%) during follow-up was noticeably high.

All health care systems have financial and economic

pressures and this needs to be remembered when planning surgical services to our spine patients. Therefore, while the economic status of a country should not have any direct influence on the decision for optimal treatment, the cost of the treatments should also not be ignored. In the current health care climate, clinical outcomes of different surgical techniques must be interpreted in the context of cost-effectiveness and benefit to the patient. A procedure that costs significantly more than another, such as in spinal surgery, should only be supported by conclusive evidence and must have a positive impact on the patient outcome. Fusion procedures are also associated with increased resource use (5). Costs of fusion surgery are twice as high and the estimated hospital stay is longer (1).

One of the main concerns with lumbar spine surgery is the avoidance of reoperations. There are two difficulties here. First, simple decompression can increase the likelihood of the progression of instability and therefore lead to progression of symptoms. Second, the apparent risk of degeneration in adjacent segments increases after fusion. Today's minimally invasive surgical techniques could potentially help to minimize these difficulties (10-14), but need to be investigated in detail. For future studies, it is important to continue to collect more data and establish evidence about reoperation rates to support physicians and patients in their decision-making.

In contrast to randomized studies, this study by Lønne *et al.* was able to create a real picture of the joint decision-making process between the surgeon and the patient before undergoing surgery. We are already looking forward to the long-term results of Lønne *et al.*, which will contribute to the evidence base for the different treatment options for patients with LSS and facilitate the decision-making process.

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## Footnote

*Conflicts of Interest:* The authors have no conflicts of interest to declare.

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