**#18** - Clinical Study

## Clinical And Neurophysiological Outcome Of A Randomized Controlled Trial For Surgical Vs Non-Surgical Treatment Of Lumbar Spinal Stenosis: The Uppsala Spinal Stenosis Trial (UppSten)

Orthopaedics / Spine / Degenerative Spine Surgery

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**Background**
Lumbar spinal stenosis (LSS) is the most common indication for spinal surgery. However, only two-thirds of the patients undergoing surgery for LSS report satisfaction with the results, whereas non-surgical treatment has also shown positive results.

**Objectives**
To evaluate whether surgery leads to superior results when compared with non-surgical treatment with structured physical therapy. Moreover, to investigate, by means of electrodiagnostic analysis (EDX), whether the degree of neurological affection influences the outcome of surgery for LSS.

**Study Design & Methods**
The Uppsala Spinal Stenosis Trial (UppSten) was a single center randomized controlled trial including 155 patients with symptomatic LSS who were randomized during 2018-2021 into surgery with decompression or structural physical training (PT). The study included a multidimensional follow-up, including clinical, neurophysiological, radiological and laboratory data.
The current analysis included 154 baseline patients and 136 patients who have already passed their 6-month clinical follow-up (FU). The primary outcome was the Oswestry Disability Index (ODI). Secondary outcomes were the Numeric Rating Scale (NRS) for back and leg pain, the EuroQol Five-Dimensional descriptive system questionnaire (EQ-5D) and the six-minute walking test (6MWT). The EDX included 70 patients; 36 underwent surgery and 34 performed PT. The focus of this analysis was on the segments L5 and S1. The denervation and reinnervation process was measured with motor nerve conduction studies (compound motor action potential; CMAP), concentric needle electromyography (EMG) and motor unit number index (MUNIX).

**Results**
At baseline the two groups showed no significant difference ($p>0.05$) for ODI, NRS for back and leg pain and EQ-5D. They differed however regarding the 6MWT.
At six months FU, there was a significant difference ($p<0.05$) in favor of surgery for all the above outcomes but for the 6MWT where the groups did not differ. In the surgical group there was a significant improvement from baseline for all outcomes including 6MWT ($p<0.05$). In the non-surgical group, none of the outcomes showed significant improvement ($p>0.05$).
The neurophysiological analysis showed no correlation between worse baseline ODI and greater neurogenic involvement with MUNIX and EMG. However, worse baseline ODI related to low degree

of possible central activation in the measurement of MUNIX in the S1 segment after intervention. MUNIX (L5) and EMG (S1), both worsened for the PT group but not after surgery. Moreover, there was an improvement of the low central activation after surgery for MUNIX in L5 segment.
A significant correlation was found between baseline 6MWT and the MUNIX difference for abductor hallucis (AH) after surgery but not after PT.

**Conclusions**

Our results support that the surgical treatment for LSS leads to superior clinical outcome compared to the non-surgical one when it comes to ODI, NRS for back and leg pain, EQ-5D and 6MWT.
Regarding neurophysiology, the EDX cannot predict the clinical outcome measured with ODI when modest neurogenic involvement is present.
Surgery preserves the neurogenic degree of involvement while non-surgical treatment seems to worsen the neurogenic EDX involvement. A possible explanation could be that the neural compression in the PT group have continued 6 months longer and thus timing of surgery is of importance. Furthermore, there are indications that decreased muscle activation improves after surgery, but not after training.
Finally, we concluded that the 6MWT correlates with MUNIX difference for HA in the surgical group.