

**Electromyographic analysis of mechanical load scenarios of the cervicothoracic junction:
First in-vivo study to evaluate the potential decrease of myofascial dehiscences following
posterior cervicothoracic fusion**

Objective:

Soft tissue complications following cervicothoracic fusion surgery occur frequently. Postoperative myofascial dehiscence (PMD) can cause disability and pain. This study aimed to analyze how much mechanical stress daily activities postoperatively exert on the posterior muscles and fascia after cervicothoracic fusion surgery.

Methods:

Surface electromyography (EMG) was applied next to the upper thoracic spine at the trapezius muscle. Volunteers performed 22 different daily activities, such as tooth brushing or. During the exercises, the electromyographic activity was measured. For each volunteer, root mean square (RMS) values were determined. All exercises were then repeated with the use of a clavicular bandage to unload the shoulder and cervicothoracic muscles. Afterwards the rankings were statistically compared interindividually.

Results:

Among the different tasks significant differences in regard to the RMS-values were noted. For instance, horizontal positions caused significantly lower muscle activation compared to all other exercises ($p \leq 0.001$). Notably, no relevant electromyographic differences were detected between the tasks with and without a clavicular bandage. Relevant results are presented in table 1.

Conclusions:

This in-vivo electromyographic analysis of cervicothoracic muscle activity demonstrates that myofascial strain differs among various daily activities. Data indicate that postoperative mobilization protocols and behavioral instructions may have the potential to reduce the biomechanical load and consequently the risk of PMD and therefore may reduce the risk for surgical wound-related complications, disability, and need for revision surgery.

Ranking	Activity	Mean RMS- value (μ V) without clavicular bandage	Mean RMS- value (μ V) with clavicular bandage	p- value
1	Taking on and off a T-shirt	18.23	18.44	0.793
2	Taking on and off trousers	17.82	18.12	0.672
3	Lifting a 5 kg weight	15.85	16.62	0.438
4	Walking with swinging arms	15.32	11.78	0.001
5	Standing up from supine position	14.91	16.67	0.114
6	Standing up gentle from supine position	14.12	12.91	0.217
7	Using knife and fork	13.80	14.76	0.243
8	Touching the back of the neck	13.64	13.94	0.806
9	Taking a 500 ml water bottle from the bed stand	13.62	14.71	0.260
10	Standing up from a chair and sitting down again	13.08	11.73	0.201
11	Tying shoes	12.92	14.19	0.324
12	Brushing teeth	12.01	11.92	0.920
13	Coughing	11.42	8.30	0.011
14	Passive mobilization out of bed	11.01	12.28	0.236
15	Shoulder abduction up to 90°	10.98	9.76	0.275
16	Putting on an apron	10.85	12.16	0.314
17	Shoulder anteversion up to 90°	9.51	9.96	0.716
18	Opening and closing a water bottle	9.39	11.60	0.020
19	Prone position	5.41	4.10	0.018
20	Right lateral position	3.87	4.26	0.536

21	Left lateral position	3.58	3.35	0.780
22	Supine position	1.55	1.32	0.445

Figure 1: RMS values with and without the use of a clavicular bandage.