

**HAND ARM
VIBRATION**



Neurological Impairment from Hand– Arm Vibration Exposure

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Background

- hand–arm vibration are known to cause vibration white fingers, neurosensory injury and carpal tunnel syndrome (CTS)
- there is limited knowledge of the LOEL for hand–arm vibration induced disease
- its important to know at what level of vibration you can expect harmful effects in cases with workers compensation claims or for preventive work
- in our earlier study we found a relation between the level of exposure and the occurrence of carpal tunnel syndrom, using a JEM based exposure calculation
- the aim of the present study is to investigate neurological impairment or neuropathic symptoms in relation to HAV exposure, using a JEM



Methods

- case-control study
- the material was derived from another study that consist of 441 744 subjects
- the original register excluded following diagnoses: seropositive rheumatoid arthritis (M05), other arthritis (M06), ankylosing spondylitis (M45), Crohn's disease (K50), ulcerative colitis (K51) or sarcoidosis (D86)
- 1623 cases of paresthesia (ICD-10 R20.2 paresthesia of skin) was identified by using National Board of Health and Welfare (SoS) outpatient register for specialised care
- all cases was matched to one control by sex, age and county of residence



Methods

- data on occupational codes and employment time were derived from Statistics Sweden (SCB) occupational register
- an estimation of individual HAV exposure was done by using a JEM to evaluate employment time, level of exposure in different occupations
- mean yearly exposure was stratified into groups of 0, 0.01–2.5 and $>2.5 \text{ m/s}^2$ per year
- cumulative exposure of HAV was stratified into groups of 0, 0.01–2.03, 2.04–9.07 and $>9.08 \text{ m/s}^2$
- conditional logistic regression was used to calculate the odds ratio (OR) for HAV exposure between cases and controls



Results

- 1623 cases with paresthesia of skin (R20.2) with a matched control for each case
- cases had 2.9 year of exposure before diagnosis and both higher cumulative and mean yearly exposure

TABLE 1. Baseline Characteristics of the Study Participants with Paresthesia's of skin and the Matching Control Group

		N	Mean	Median	Std. Deviation	Min.	Max.
Men	Controls	633					
	Cases	633					
Women	Controls	990					
	Cases	990					
Age at cases diagnosis (years)	Controls	1623	45.5	46.0	11.4	20.0	65.0
	Cases	1623	45.5	46.0	11.4	20.0	65.0
Years with exposure prior to diagnosis	Controls	1623	2.7	0	4.8	0	17.0
	Cases	1623	2.9	0	4.9	0	21.0
Cumulative exposure	Controls	1623	1.9	0	5.7	0	66.7
	Cases	1623	2.3	0	6.2	0	77.0
Mean yearly exposure	Controls	1623	0.2	0	0.6	0	4.7
	Cases	1623	0.4	0	0.6	0	5.5

Results

- no relationship between paresthesia and mean yearly occupational vibration exposure
- statistically significant relationship between paresthesia and the highest exposed group measured as cumulative exposure OR 1.37 (CI 1.04-1.81)
- significant increase for men in the highest exposed group measured as cumulative exposure OR 1.4 (CI 1.02-1.90) but not for women.

Exposure	Gender	Cases	Controls	OR	p-Value	95% CI
Mean yearly exposure						
0	Total	1131	1163	1		
0.01-2.5		464	433	1.11	0.20	0.94-1.31
2.5+		28	27	1.08	0.77	0.63-1.84
0	Men	349	375	1		
0.01-2.5		257	234	1.19	0.15	0.94-1.51
2.5+		27	24	1.20	0.51	0.69-2.10
0	Women	782	788	1		
0.01-2.5		207	199	1.85	0.67	0.84-1.31
2.5+		1	3	0.34	0.35	0.04-3.24
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Cumulative exposure						
0	Total	1131	1163	1		
0.01-2.03		180	196	0.94	0.60	0.76-1.17
2.04-9.07		166	148	1.18	0.19	0.92-1.50
9.08+		146	116	1.37	0.03	1.04-1.81
0	Men	349	375	1		
0.01-2.03		58	64	0.96	0.82	0.65-1.41
2.04-9.07		99	94	1.13	0.45	0.82-1.58
9.08+		127	100	1.40	0.04	1.02-1.90
0	Women	782	788	1		
0.01-2.03		122	132	0.94	0.62	0.72-1.22
2.04-9.07		67	54	1.24	0.25	0.86-1.79
9.08+		19	16	1.21	0.59	0.61-2.40

Conclusions

- significantly increase of paresthesia of the skin was found when cumulative exposure was above 9.08 m/s^2 for both the total group and for men
- the findings indicate that >3 year of exposure at a level equal to the action limit ($2,5 \text{ m/s}^2$) is enough to increase the risk for paresthesia
- limitation: ICD-10 code R20.2 also includes paresthesia in feet which could alter the results



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