

SHORT COMMUNICATION  
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## CUMULATIVE TRAUMA DISORDERS OF THE UPPER LIMBS IN WORKERS ON AN AGRICULTURAL FARM

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The work associated with repetitive efforts and inadequate resting periods, strong physical exertion, awkward postures or static positioning exposes workers to the risk of cumulative trauma disorders of the upper limbs. These risk factors are present in many agricultural activities. A study was carried out among workers on an agricultural farm. The workers' histories were taken and they were given periodical medical check-ups. The presence of upper limb disorders was shown in a group of workers. A sample of 42 people was selected for the study by means of specific tests: electromyography, ultrasonography and laser-doppler flowmetry. The tests showed a high incidence of carpal tunnel syndrome and microcirculation disorders. The study confirmed that electromyography, ultrasonography and/or laser-doppler flowmetry are highly useful tools for identifying cumulative trauma disorders.

*Key terms:*  
agricultural workers, carpal tunnel syndrome,  
electromyography, laser-doppler flowmetry,  
ultrasonography,

The work involving the performance of repetitive tasks, inadequate resting periods, strong physical exertion, awkward postures or static positioning exposes the workers to the risk of cumulative trauma disorders of the upper limbs (1-8). Those risk factors can be found in many agricultural activities. Furthermore, most of the tools that are used today in agricultural farms, like lawnmowers, bushmowers and small tractors, transmit vibrations to the hand and arm subjecting the workers to the risk of vibration syndrome (9-11). To our knowledge, this type of risk to agricultural workers has not yet been properly investigated.

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## SUBJECTS AND METHODS

A group of 74 workers engaged in plant trimming on an agricultural farm belonging to the University of Bologna were given periodical medical check-ups. The group consisted of seven sowers, 39 farm workers, 10 gardeners and 18 tractor drivers. Examinations focussed on the possible development of cumulative trauma disorders and/or hand-arm vibration syndrome (carpal tunnel syndrome, tendonitis, Raynaud's phenomenon, etc.).

The medical histories and results of clinical examination showed the presence of upper limb disorders in 50 workers (68%). Diabetic patients, workers who drank more than 750 ml of wine daily, and those who presented with an exposure to possible neurotoxic substances e.g. pesticides were excluded.

Forty-two workers (57%) were selected for the study, 24 men and 18 women, mean age 37.8 years (SD 8.7), with 6.2 years (SD 3.9) of mean seniority in these activities; 39 were right- and three were left-handed. Diagnostic tests employed were electromyography, ultrasonography and laser doppler flowmetry. The results were analysed by means of the chi-squared test with the Yates correction, or the Fisher's exact test.

An electromyographic evaluation, using a Nicolet C4 instrument, was performed in 37 workers. The carpal tunnel syndrome diagnosis was based on the presence of a prolonged motor and sensory wrist latency with a slackening of the sensory and/or motor conduction velocity in the palm-wrist segment. A prolonged motor and sensory latency with a significant difference ( $\geq 10$  m/sec.) in the sensory conduction of the speed beneath the palm-wrist segment on the other examined segments (second finger-palm and wrist-arm) shows a likely early deficit of the median nerve within the carpal tunnel.

The ultrasonographic evaluation of the wrist muscle-tendon structures was made, bilaterally, in 29 patients using a Siemens Sonoline 1 instrument with a 7.5 MHz linear probe and water spacer. Special attention was paid, because of their incidence, to the flexor digitorum superficialis and profundus tendons dimension and ultrasound image, the canal and precanalar segment of the median nerve, and to the transverse carpal ligament morphology and thickness.

Laser doppler flowmetry was performed in 32 workers using a Periflux, Perimed, Pf 4001 Master instrument, putting the sound on the medium finger tip of the predominant limb. Resting flow, venoarteriolar reflex, peak flow and peak flow 40 C and recovery time after cold stimulation were evaluated.

## RESULTS

The electromyography demonstrated 14 cases of carpal tunnel syndrome (36% of those tested). In seven cases damage was bilateral. The disturbance of the median nerve function was variable: seven patients were in the irritative phase, in six the condition was deteriorating, and one underwent surgery. Another six

patients according to electromyography were suspected of having carpal tunnel syndrome (Figure).

By means of electromyography carpal tunnel syndrome was found in 44% of the female workers and in 30% of the males, which was not statistically significant. Carpal tunnel syndrome was detected more often in workers who mainly trimmed plants than among agricultural workers who were engaged in such task only occasionally (Table).

Table. Prevalence of carpal tunnel syndrome (CTS) and Raynaud's phenomenon with regard to sex and occupational task

	Trimmers	Farmers	P	Men	Women	P
CTS	7	5	n.s.	7	7	n.s.
Negative	11	16		11	8	
Raynaud	5	4	n.s.	4	6	=0.03
Negative	8	11		16	3	

n.s. - non significant (Fisher's exact test)

Laser-doppler flowmetry showed alterations resembling Raynaud's syndrome in 10 out of 32 examined workers (31%) and suspected alterations in three workers (9%). Of the 29 workers examined by means of ultrasonography tendonitis was verified in five workers (17%) (Figure).

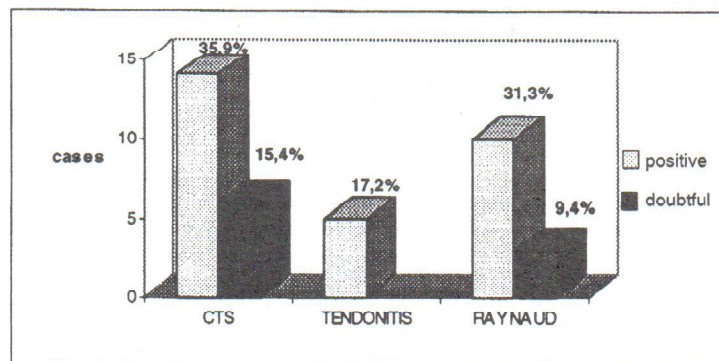


Figure. Upper limb disorders in workers on an agricultural farm

The differences detected between trimmers and farmers regarding Raynaud's phenomenon (39 and 27%) were not so marked to confirm that such disease is more frequently observed in farmers, i.e. both groups of workers, with different jobs, were exposed to the same risk (Table). However, the phenomenon was more frequent among women than among men (55 and 19%; P=0.03). No stat-



istically significant difference was established between female farmers and trimmers in respect to the predominance of Raynaud's phenomenon. It is therefore concluded that although the sample was small, the female sex seems to be a risk factor in the development of Raynaud's phenomenon. The lesion was more frequently observed on the right arm (93% of the cases) as the workers examined were mostly right-handed. In the seven patients with bilateral lesions, these were three times more serious in the right arm.

## CONCLUDING COMMENT

In this study we found a high incidence of carpal tunnel syndrome and micro-circulation disorders in agricultural workers. The results confirm the risk of cumulative trauma disorders in different farming tasks irrespective of the use of vibrating tools. Therefore, it is recommended to subject agricultural workers to specific and periodical examinations, using electromyography, ultrasonography, and/or laser doppler flowmetry as useful tools for diagnosing cumulative trauma disorders.

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#### Sažetak

### KUMULATIVNI TRAUMATSKI POREMEĆAJI GORNJIH UDOVA U RADNIKA NA POLJOPRIVREDNOM DOBRU

Pokreti koji se ponavljaju, neprimjereni odmori, teška fizička opterećenja te nefiziološki položaji tijela dovode do povećanog rizika razvoja bolesti kumulativne traume gornjih udova. Ovi čimbenici rizika prisutni su u mnogim poljoprivrednim djelatnostima. Od 74 radnika na poljoprivrednom dobru podvrgnuta periodskim pregledima, u 42 je primijenjena elektromiografija, ultrasonografija i mjerenje krvnog protoka laser-doppler metodom. Testovima je utvrđena visoka učestalost sindroma karpalnog tunela i poremećaja mikrocirkulacije. Ispitivanje je potvrdilo da su elektromiografija, ultrasonografija i/ili laser-doppler mjerenje krvnog protoka veoma korisne metode u dijagnostici bolesti kumulativne traume.

#### Ključne riječi:

elektromiografija, laser-doppler mjerenje krvnog protoka, sindrom karpalnog tunela, ultrasonografija

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