Abstract
Aims: C6 quadriplegic patients lack voluntary control of their triceps muscle but can still perform reaching movements to grasp objects or point to targets. The present study documents the kinematic properties of reaching in these patients. Materials and methods: We investigated the kinematics of prehension and painting movements in four quadriplegic patients and five control subjects. Prehension and pointing movements were recorded for each subject using various object positions (i.e., different directions and distances from the subject). The 3D motion was analyzed with Fastrack Polhemus sensors. Results: During prehension tasks, the velocity profile of control subjects showed two peaks (go and return); the first velocity peak was scaled to the distance of the object. In quadriplegic patients, there was a third intermediary peak corresponding to the grasping of the object. The amplitude of the first peak was slightly smaller than in control subjects. Velocity was scaled to the distance of the object, but with a greater dispersion than in control subjects. Total movement time was longer in quadriplegics because of the prolonged grasping phase. There were few differences in the pointing movements of normal and quadriplegic subjects. The scapula contributed more to the reaching phase of both movements in quadriplegic patients. Conclusion: In spite of some quantitative differences, the kinematics of the hand during reaching and pointing in quadriplegic patients are surprisingly similar to those of control subjects.

Author Keywords
3-D motion analysis; Pointing movements; Prehension; Reaching; Spinal cord injury; Tetraplegia

Index Keywords
adult, amplitude modulation, arm movement, article, biosensor, case report, clinical trial, controlled clinical trial, controlled study, female, hand function, human, kinetics, male, motion, motor dysfunction, priority journal, quadriplegia, scapula, velocity, vertebra fracture; Adult, Arm, Biomechanics, Cervical Vertebrae, Female, Hand, Hand Strength, Humans, Male, Middle Aged, Movement, Quadriplegia, Spinal Cord Injuries

Tradenames
Fastrack, Polhemus; Spatial Tracking System VPL, Polhemus

Manufacturers
Polhemus

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**Correspondence Address**
Laffont I.; Serv. Medecine Physique Readaptation; Unite Widal 1; Hopital Raymond POINCARE;
104, Boulevard Raymond POINCARE 92380 Garches, France

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