Reference

Kuiken T, Dumanian G, Lipschutz R, Miller L, Stubblefield K

Rehabilitation Institute of Chicago and Department of PM&R at Feinberg School of Medicine, Northwestern University, Chicago, Illinois, USA

The use of targeted muscle reinnervation for improved myoelectric prosthesis control in a bilateral shoulder disarticulation amputee

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Products

Myoelectric prosthesis in combination with Targeted Muscle Reinnervation

Major Findings

The effect of Targeted Muscle Reinnervation (TMR) on the control of a myoelectric upper limb prosthesis:

→ Patients moved double amount of blocks during Box and Blocks test.
→ The speed assessed by Clothespin Relocation Task was increased 26%.
→ The patient was able to simultaneously control two degrees of freedom with proportional control.
→ Myoelectric prosthesis was easier to use and it felt more natural.

Things patent **can do better** with the myoelectric prosthesis after TMR	New things patient **can only do** with the myoelectric prosthesis after TMR
take out garbage	feed himself
carry groceries	shave
pick-up yard	put socks on
vacuum clean	weed in garden
dust mop	water the yard
pick up toys	open small jar
put a hat on	use pair of handicap scissors
put on glasses	throw a ball
wash driveway	

The patient´s self-reported functional improvements with the myoelectric prosthesis after TMR procedure compared to the myoelectric prosthesis before TMR.

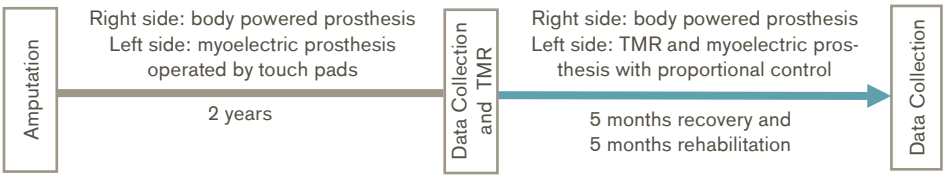
Population

Subject:	one male subject with bilateral amputation at the shoulder disarticulation level, TMR performed only on the left side
Amputation causes:	trauma
Age at amputation:	52 years
Age at TMR:	54 years
Previous prosthesis:	*Right side:* The body powered arm had a voluntary opening split hook (Homer 5XA), modified four-function wrist unit, internal locking elbow and LTI Collier manual locking shoulder joint. *Left side:* Greifer terminal device; a powered wrist rotator; a Boston digital arm and an LTI-Collier manual locking shoulder joint operated by a single mechanical chin switch.

Prosthesis fitted after TMR: *Right side:* The body powered prosthesis was unchanged from the initial design with the exception of adding an electronic lock to the shoulder, operated by a single touch pad in the apex of the right socket
Left side: Greifer terminal device; a powered wrist rotator; a Boston digital arm and an LTI-Collier manual locking shoulder joint operated by a single mechanical chin switch. An electronic lock was also added to the left shoulder joint, operated with a single touch pad in the apex of the left socket.

Study Design

Interventional case report:



The 54-year old man with bilateral shoulder disarticulation, previously fitted with a body powered prosthesis on the right side and a myoelectric prosthesis on the left side, underwent TMR. After rehabilitation, a myoelectric prosthesis with proportional control (enabled by the three most robust EMG signals) was fitted on the left side.

Results

Body Function		Activity			Participation	Others	
Mechanics	**Pain**	**Grip patterns / force**	**Manual dexterity**	**Activities of daily living (ADL)**	**Satisfaction and Quality of life (QoL)**	**Training**	**Technical aspect**

Category	**Outcomes**	**Results for myoelectric prosthetic use before (operated with a single touch pad) and after TMR surgery (TMR induced proportional control):**	**Sig.***
Manual dexterity	Box and Blocks	The patient moved twice as many blocks following TMR.	n.a.
	Clothespin Relocation Task	The patient moved the clothes pins on average 26% faster after TMR.	n.a.
Activities of daily living (ADL)	Self-reported	The tasks that the patient reported to do better with the myoelectric prosthesis: take out garbage; carry groceries; pick-up yard; vacuum clean; dust mop; pick up toys; put a hat on; put on glasses; wash driveway	n.a.
		The tasks that the patient reported to be able to do with the myoelectric prosthesis and not with previous prosthesis: feed himself shave; put socks on; weed in garden; water the yard; open small jar; use pair of handicap scissors; throw a ball	n.a.
Satisfaction	Self-reported	The patient strongly preferred the myoelectric prosthesis with TMR induced proportional control.	n.a.

* no difference (0), positive trend (+), negative trend (–), significant (++/––), not applicable (n.a.)

Author's Conclusion

"By anastomosing the residual peripheral nerves to the pectoralis major muscle in a shoulder disarticulation patient additional independent myoelectric control signals were developed. These additional control signals allowed simultaneous control of two degrees-of-freedom using just the EMG signals. In this patient, both objective testing and subjective impressions, demonstrated improvement in the speed and ease of use of the prosthesis. Sensory reinnervation of the chest with the nerve transfers occurred in areas where the subcutaneous fat was removed." (Kuiken et al., 2004)